EX01

```
      PROGRAM XBJECT
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 1
C
C             THE PROGRAM XBJECT BACK-PROJECTS A POINT SOURCE PROJECTION
C        FUNCTION FOR PARALLEL BEAM, FAN BEAM CURVED DETECTOR, FAN BEAM
C        FLAT DETECTOR GEOMETRIES AND COMPARES THE RESULT WITH A 1/R
C        RESPONSE.
C
      DIMENSION B(4096),BX(4096),P(100),AG(180)
      COMMON/BLANK/WORK(2600)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU  ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG   ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT   ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID   , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN   , PAR( 4))
C
      EXTERNAL BRF,PRF,BRFF2,PRFF
C
      DATA BX/3055*0.,1.,1040*0./
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=180
      MODANG=5
      KDIMU=100
      IMIT=1
      NWORK=2600
      NFLOAT=2
      ISTORE=0
      IPRINT=7
      LUNATN=0
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E01.OUT',FORM='FORMATTED')
C
C        PARALLEL BEAM GEOMETRY
C
      CALL SETUP (IPAR,PAR,AG)
C
      DO 10 M=1,NANG
          CALL PJECT (BX,P,M,PRF)
   10     CALL BJECT (B,P,M,BRF)
C
      WRITE (LUNOUT,22)
      CALL ARRAY (B,NDIMU)
C
      DO 12 I=1,64
          DO 12 J=1,64
              K=(J-1)*64+I
   12         B(K)=B(K)*SQRT((I-48.)**2+(J-48.)**2)
C
      WRITE (LUNOUT,22)
      CALL ARRAY (B,NDIMU)
C
C        FAN BEAM GEOMETRY - CURVED DETECTOR
C
      IGEOM=1
      RFAN=80.
C
      CALL SETUP (IPAR,PAR,AG)
C
      DO 14 M=1,NANG
          CALL PJECT (BX,P,M,PRFF)
   14     CALL BJECT (B,P,M,BRFF2)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
      DO 16 I=1,64
          DO 16 J=1,64
              K=(J-1)*64+I
   16         B(K)=B(K)*SQRT((I-48.)**2+(J-48.)**2)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        FAN BEAM GEOMETRY - FLAT DETECTOR
C
      IGEOM=2
      RFAN=80.
C
      CALL SETUP (IPAR,PAR,AG)
C
      DO 18 M=1,NANG
          CALL PJECT (BX,P,M,PRFF)
   18     CALL BJECT (B,P,M,BRFF2)
C
      WRITE (LUNOUT,26)
      CALL ARRAY (B,NDIMU)
C
      DO 20 I=1,64
          DO 20 J=1,64
              K=(J-1)*64+I
   20         B(K)=B(K)*SQRT((I-48.)**2+(J-48.)**2)
C
      WRITE (LUNOUT,26)
      CALL ARRAY (B,NDIMU)
C
      CLOSE (LUNOUT)
C
C
C
   22 FORMAT(1X//' PARALLEL BEAM GEOMETRY')
   24 FORMAT(1X//' FAN BEAM GEOMETRY - CURVED DETECTOR')
   26 FORMAT(1X//' FAN BEAM GEOMETRY - FLAT DETECTOR')
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1		RECONSTRUCT IN A SQUARE ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	180		NUMBER OF PROJECTION ANGLES
5	5		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	1		TRANSMISSION DATA
8	2600		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	7		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT PROJECTION DATA AND UNCERTAINTIES PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED       180    (   264)

BLANK COMMON REQUIRED       360    (   550)

BLANK COMMON REQUIRED       540    (  1034)

BLANK COMMON REQUIRED       740    (  1344)

BLANK COMMON REQUIRED       804    (  1444)

A TOTAL OF  92 (  5 THRU  96) OF THE 100 USER PROJECTION BINS WILL BE USED

 92 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=    804 FLOATING POINT WORDS.
```

```
    EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
    E     NN  N D   D       S     E       T   U   U P   P
    EEE   N N N D   D        SSS  EEE     T   U   U PPPP
    E     N  NN D   D           S E       T   U   U P
    EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
                    PPPP      J EEEEE  CCC  TTTTT
                    P   P     J E     C   C   T
                    PPPP      J EEE   C       T
                    P     J   J E     C   C   T
                    P      JJJ  EEEEE  CCC    T
```

```
BLANK COMMON REQUIRED       896    (  1600)

BLANK COMMON REQUIRED       986    (  1732)

BLANK COMMON REQUIRED      2389    (  4525)
```

```
                    BBBB      J EEEEE  CCC  TTTTT
                    B   B     J E     C   C   T
                    BBBB      J EEE   C       T
                    B   B J   J E     C   C   T
                    BBBB   JJJ  EEEEE  CCC    T
```

```
BLANK COMMON REQUIRED      2297    (  4371)

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2389 FLOATING POINT WORDS.
```

```
          EEEEE N   N DDDD        PPPP      J EEEEE  CCC  TTTTT
          E     NN  N D   D       P   P     J E     C   C   T
          EEE   N N N D   D       PPPP      J EEE   C       T
          E     N  NN D   D       P      J  J E     C   C   T
          EEEEE N   N DDDD        P       JJJ  EEEEE  CCC    T


BLANK COMMON REQUIRED      2389    (  4525)

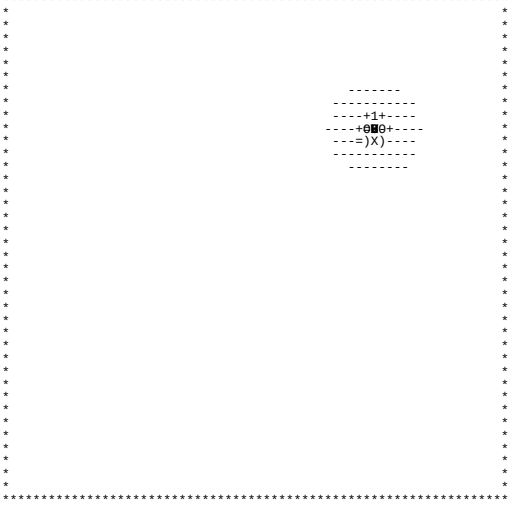

BLANK COMMON REQUIRED      2297    (  4371)

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2389 FLOATING POINT WORDS.


          EEEEE N   N DDDD        BBBB      J EEEEE  CCC  TTTTT
          E     NN  N D   D       B   B     J E     C   C   T
          EEE   N N N D   D       BBBB      J EEE   C       T
          E     N  NN D   D       B   B J   J E     C   C   T
          EEEEE N   N DDDD        BBBB    JJJ  EEEEE  CCC    T


PARALLEL BEAM GEOMETRY

XMIN =   0.49E-02     XMAX =   0.21E+01     XSUM =   0.2039E+03
```



```
                    -         =         +         )         1         Z
0.4890E-02 0.1634E+00 0.3958E+00 0.5015E+00 0.5754E+00 0.6600E+00 0.7445E+00

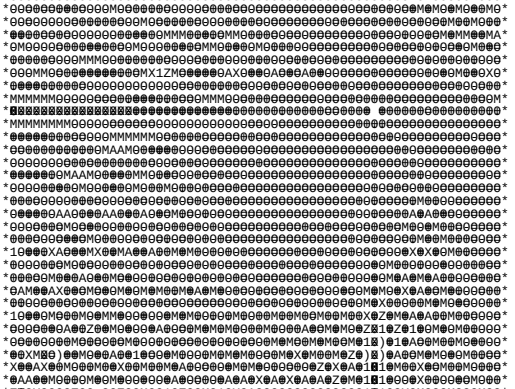
Z         X         A         M         0         0         @         @
0.8185E+00 0.8713E+00 0.9241E+00 0.1040E+01 0.1157E+01 0.1231E+01 0.1315E+01

@         @         @         @         @         @         @         @
0.1389E+01 0.1547E+01 0.1738E+01 0.1843E+01 0.1928E+01 0.2012E+01 0.2086E+01

@
0.2118E+01

PARALLEL BEAM GEOMETRY

XMIN =   0.00E+00     XMAX =   0.18E+01     XSUM =   0.4099E+04
```



```
                    -         =         +         )         1         Z
0.0000E+00 0.1327E+00 0.3274E+00 0.4158E+00 0.4778E+00 0.5485E+00 0.6193E+00

Z         X         A         M         0         0         @         @
0.6813E+00 0.7255E+00 0.7697E+00 0.8671E+00 0.9644E+00 0.1026E+01 0.1097E+01

@         @         @         @         @         @         @         @
0.1159E+01 0.1292E+01 0.1451E+01 0.1539E+01 0.1610E+01 0.1681E+01 0.1743E+01

@
0.1770E+01


          SSS  EEEEE TTTTT U   U PPPP
         S     E       T   U   U P   P
          SSS  EEE     T   U   U PPPP
             S E       T   U   U P
          SSS  EEEEE   T    UUU  P


         INTEGER PARAMETER ARRAY  (IPAR)

 I   IPAR(I)      DESCRIPTION

 1        64      LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
 2         1      RECONSTRUCT IN A SQUARE ARRAY
 3         1      GEOMETRY FLAG
 4       180      NUMBER OF PROJECTION ANGLES
 5         5      MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND 2*PI
                  STARTING AT ZERO
 6       100      NUMBER OF RAYS FOR EACH PROJECTION
 7         1      TRANSMISSION DATA
 8      2600      DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9         2      NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10         0      EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11         7      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED
                  PRINT PROJECTION DATA AND UNCERTAINTIES
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12         0      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE



         FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.000      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF
                  ROTATION
 2    50.500      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3    80.000      DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN
                  UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


BLANK COMMON REQUIRED      180    (   264)


BLANK COMMON REQUIRED      360    (   550)


BLANK COMMON REQUIRED      540    (  1034)


BLANK COMMON REQUIRED      740    (  1344)


BLANK COMMON REQUIRED      804    (  1444)

A TOTAL OF 100 (  1 THRU 100) OF THE 100 USER PROJECTION BINS WILL BE USED

100 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2389 FLOATING POINT WORDS.


            EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
            E     NN  N D   D       S     E       T   U   U P   P
            EEE   N N N D   D        SSS  EEE     T   U   U PPPP
            E     N  NN D   D           S E       T   U   U P
            EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


                  PPPP      J EEEEE  CCC  TTTTT
                  P   P     J E     C   C   T
                  PPPP      J EEE   C       T
                  P     J   J E     C   C   T
                  P      JJJ  EEEEE  CCC    T


BLANK COMMON REQUIRED      904    (  1610)


                  BBBB      J EEEEE  CCC  TTTTT
                  B   B     J E     C   C   T
                  BBBB      J EEE   C       T
                  B   B J   J E     C   C   T
                  BBBB    JJJ  EEEEE  CCC    T


BLANK COMMON REQUIRED      804    (  1444)

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2389 FLOATING POINT WORDS.
```

```
     EEEEE N   N DDDD        PPPP      J EEEEE  CCC  TTTTT
     E     NN  N D   D       P   P     J E     C   C   T
     EEE   N N N D   D       PPPP      J EEE   C       T
     E     N  NN D   D       P     J   J E     C   C   T
     EEEEE N   N DDDD        P      JJJ  EEEEE  CCC    T
```

BLANK COMMON REQUIRED 904 (1610)

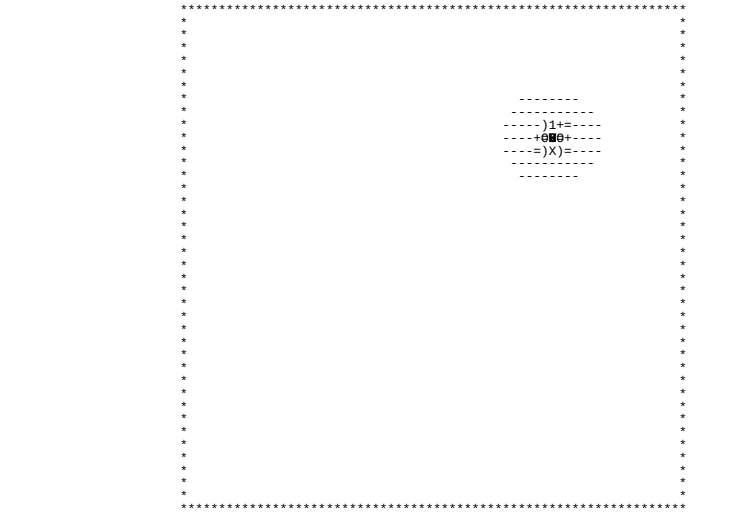
BLANK COMMON REQUIRED 804 (1444)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 2389 FLOATING POINT WORDS.

```
     EEEEE N   N DDDD        BBBB      J EEEEE  CCC  TTTTT
     E     NN  N D   D       B   B     J E     C   C   T
     EEE   N N N D   D       BBBB      J EEE   C       T
     E     N  NN D   D       B   B J   J E     C   C   T
     EEEEE N   N DDDD        BBBB   JJJ  EEEEE  CCC    T
```

FAN BEAM GEOMETRY - CURVED DETECTOR

XMIN = 0.55E-02 XMAX = 0.21E+01 XSUM = 0.2038E+03



```
                -       =       +       )       1       Z
0.5465E-02 0.1601E+00 0.3870E+00 0.4901E+00 0.5623E+00 0.6448E+00 0.7273E+00

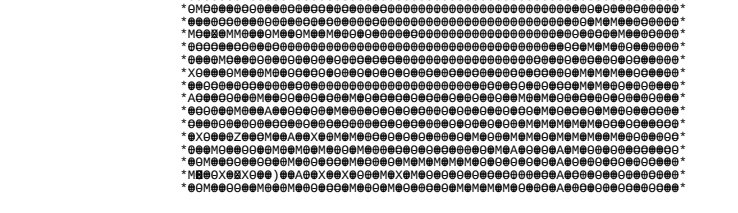
Z       X       A       M       0       0       0       0
0.7995E+00 0.8510E+00 0.9026E+00 0.1016E+01 0.1129E+01 0.1202E+01 0.1284E+01

0       0       0       0       0       0       0       0
0.1356E+01 0.1511E+01 0.1697E+01 0.1800E+01 0.1882E+01 0.1965E+01 0.2037E+01

0
0.2068E+01
```

FAN BEAM GEOMETRY - CURVED DETECTOR

XMIN = 0.00E+00 XMAX = 0.16E+01 XSUM = 0.4098E+04




```
                -       =       +       )       1       Z
0.0000E+00 0.1216E+00 0.2998E+00 0.3809E+00 0.4376E+00 0.5024E+00 0.5672E+00

Z       X       A       M       0       0       0       0
0.6240E+00 0.6645E+00 0.7050E+00 0.7941E+00 0.8833E+00 0.9400E+00 0.1005E+01

0       0       0       0       0       0       0       0
0.1062E+01 0.1183E+01 0.1329E+01 0.1410E+01 0.1475E+01 0.1540E+01 0.1596E+01

0
0.1621E+01
```

```
      SSS  EEEEE TTTTT U   U PPPP
     S     E       T   U   U P   P
      SSS  EEE     T   U   U PPPP
         S E       T   U   U P
      SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	2	GEOMETRY FLAG FAN BEAM GEOMETRY (FLAT DETECTOR)
4	180	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	1	TRANSMISSION DATA
8	2600	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	7	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT PROJECTION DATA AND UNCERTAINTIES PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	80.000		DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 180 (264)

BLANK COMMON REQUIRED 360 (550)

BLANK COMMON REQUIRED 540 (1034)

BLANK COMMON REQUIRED 740 (1344)

BLANK COMMON REQUIRED 804 (1444)

A TOTAL OF 100 (1 THRU 100) OF THE 100 USER PROJECTION BINS WILL BE USED

112 PROJECTION BINS WILL BE USED OF WHICH 12 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 2389 FLOATING POINT WORDS.

```
     EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
     E     NN  N D   D       S     E       T   U   U P   P
     EEE   N N N D   D        SSS  EEE     T   U   U PPPP
     E     N  NN D   D           S E       T   U   U P
     EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
     PPPP      J EEEEE  CCC  TTTTT
     P   P     J E     C   C   T
     PPPP      J EEE   C       T
     P     J   J E     C   C   T
     P      JJJ  EEEEE  CCC    T
```

BLANK COMMON REQUIRED 916 (1624)

THE NUMBER OF BINS PROJECTED OUTSIDE THE USER PROJECTION ARRAY = 12

THE NUMBER OF BINS PROJECTED BELOW THE USER ARRAY = 6

THE NUMBER OF BINS PROJECTED ABOVE THE USER ARRAY = 6

```
     BBBB      J EEEEE  CCC  TTTTT
     B   B     J E     C   C   T
     BBBB      J EEE   C       T
     B   B J   J E     C   C   T
     BBBB   JJJ  EEEEE  CCC    T
```

```
BLANK COMMON REQUIRED       804    (  1444)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2389 FLOATING POINT WORDS.


             EEEEE N   N DDDD        PPPP      J EEEEE  CCC  TTTTT
             E     NN  N D   D       P   P     J E     C   C   T
             EEE   N N N D   D       PPPP      J EEE   C       T
             E     N  NN D   D       P     J   J E     C   C   T
             EEEEE N   N DDDD        P      JJJ  EEEEE  CCC    T


BLANK COMMON REQUIRED       916    (  1624)

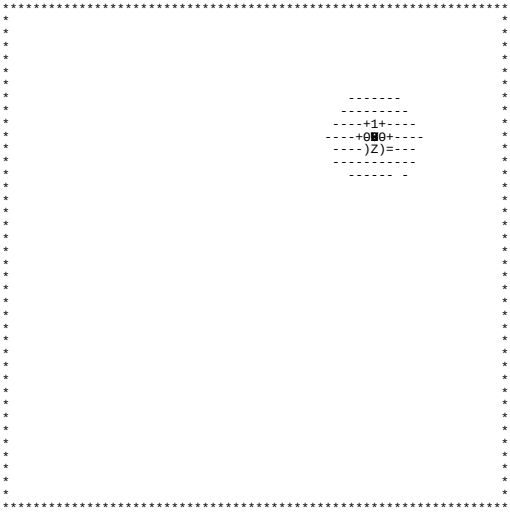
BLANK COMMON REQUIRED       804    (  1444)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2389 FLOATING POINT WORDS.


             EEEEE N   N DDDD        BBBB      J EEEEE  CCC  TTTTT
             E     NN  N D   D       B   B     J E     C   C   T
             EEE   N N N D   D       BBBB      J EEE   C       T
             E     N  NN D   D       B   B J   J E     C   C   T
             EEEEE N   N DDDD        BBBB   JJJ  EEEEE  CCC    T


FAN BEAM GEOMETRY - FLAT DETECTOR

XMIN =   0.55E-02     XMAX =   0.22E+01     XSUM =   0.2039E+03
```



```
                 -         =         +         )         1         Z
0.5465E-02 0.1674E+00 0.4048E+00 0.5128E+00 0.5883E+00 0.6747E+00 0.7610E+00

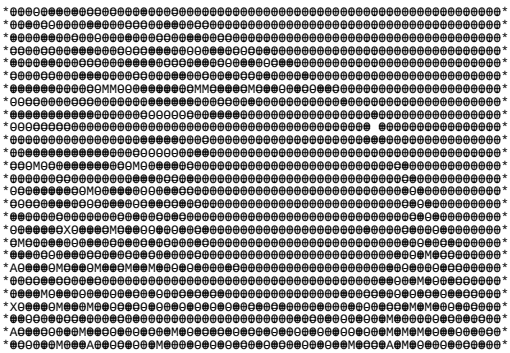
Z         X         A         M         Θ         Θ         Θ         Θ
0.8366E+00 0.8905E+00 0.9445E+00 0.1063E+01 0.1182E+01 0.1258E+01 0.1344E+01

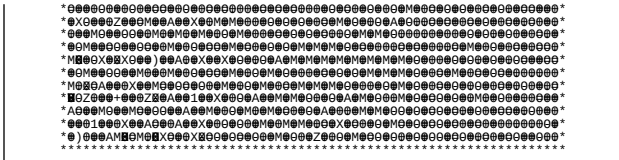
Θ         Θ         Θ         Θ         Θ         Θ         Θ         Θ
0.1419E+01 0.1581E+01 0.1776E+01 0.1884E+01 0.1970E+01 0.2056E+01 0.2132E+01

Θ
0.2164E+01

FAN BEAM GEOMETRY - FLAT DETECTOR

XMIN =   0.00E+00     XMAX =   0.16E+01     XSUM =   0.4099E+04
```





```
                 -         =         +         )         1         Z
0.0000E+00 0.1216E+00 0.2998E+00 0.3809E+00 0.4376E+00 0.5024E+00 0.5673E+00

Z         X         A         M         Θ         Θ         Θ         Θ
0.6240E+00 0.6645E+00 0.7050E+00 0.7942E+00 0.8833E+00 0.9400E+00 0.1005E+01

Θ         Θ         Θ         Θ         Θ         Θ         Θ         Θ
0.1062E+01 0.1183E+01 0.1329E+01 0.1410E+01 0.1475E+01 0.1540E+01 0.1596E+01

Θ
0.1621E+01
```

EX02

```
      PROGRAM XCONVO
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 2
C
C             THE PROGRAM XCONVO USES THE CONVOLUTION ALGORITHM TO
C        RECONSTRUCT EMISSION AND TRANSMISSION PROJECTION DATA FOR
C        PARALLEL BEAM, FAN BEAM CURVED DETECTOR, AND FAN BEAM FLAT
C        DETECTOR.
C
      DIMENSION X(4096),XE(4096)
      COMMON/BLANK/WORK(2000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BIN,BINF,SHLO,LAKS,RALA
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=0
      NANG=72
      MODANG=5
      KDIMU=100
      NWORK=2000
      NFLOAT=2
      ISTORE=0
      IPRINT=12
      LUNATN=0
      AXISU=50.5
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E02.OUT',FORM='FORMATTED')
C
      IMIT=-1
      DO 10 I=1,2
          IMIT=IMIT+1
C
          IGEOM=0
          PWID=1.
          RFAN=0.
          CATN=0.
C
          CALL SETUP (IPAR,PAR,DUM)
C
C         RECONSTRUCTION OF PARALLEL BEAM GEOMETRY USING SHLO CONVOLVER
C
          CALL CONVO (X,XE,SHLO,BIN,1)
C
C         DISPLAY OF THE RECONSTRUCTED IMAGE X AND THE ERRORS XE
C
          WRITE (LUNOUT,12)
          IF (IMIT.EQ.0) WRITE (LUNOUT,22)
          IF (IMIT.EQ.1) WRITE (LUNOUT,24)
          CALL ARRAY (X,NDIMU)
          WRITE (LUNOUT,14)
          CALL ARRAY (XE,NDIMU)
C
C         RECONSTRUCTION OF PARALLEL BEAM GEOMETRY USING RALA CONVOLVER
C
          CALL CONVO (X,XE,RALA,BIN,1)
C
C         DISPLAY OF THE RECONSTRUCTED IMAGE X AND THE ERRORS XE
C
          WRITE (LUNOUT,16)
          IF (IMIT.EQ.0) WRITE (LUNOUT,22)
          IF (IMIT.EQ.1) WRITE (LUNOUT,24)
          CALL ARRAY (X,NDIMU)
          WRITE (LUNOUT,14)
          CALL ARRAY (XE,NDIMU)
C
          IGEOM=1
          PWID=1.33
          RFAN=125.
C
          CALL SETUP (IPAR,PAR,DUM)
C
C         RECONSTRUCTION OF FAN BEAM GEOMETRY - CURVED DETECTOR USING
C           LAKS CONVOLVER
C
          CALL CONVO (X,XE,LAKS,BINF,1)
C
C         DISPLAY OF THE RECONSTRUCTED IMAGE X AND THE ERRORS XE
C
          WRITE (LUNOUT,18)
          IF (IMIT.EQ.0) WRITE (LUNOUT,22)
          IF (IMIT.EQ.1) WRITE (LUNOUT,24)
          CALL ARRAY (X,NDIMU)
          WRITE (LUNOUT,14)
          CALL ARRAY (XE,NDIMU)
C
          IGEOM=2
C
          CALL SETUP (IPAR,PAR,DUM)
C
C         RECONSTRUCTION OF FAN BEAM GEOMETRY - FLAT DETECTOR USING
C           LAKS CONVOLVER
C
          CALL CONVO (X,XE,LAKS,BINF,1)
C
C         DISPLAY OF THE RECONSTRUCTED IMAGE X AND THE ERRORS XE
C
          WRITE (LUNOUT,20)
          IF (IMIT.EQ.0) WRITE (LUNOUT,22)
          IF (IMIT.EQ.1) WRITE (LUNOUT,24)
          CALL ARRAY (X,NDIMU)
          WRITE (LUNOUT,14)
          CALL ARRAY (XE,NDIMU)
C
   10     CONTINUE
C
      CALL BCOM (MAXFW)
C
      CLOSE (LUNOUT)
C
C
C
   12 FORMAT(1X//' RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY USING SHL',
     1    'O CONVOLVER')
   14 FORMAT(1X//' ERRORS IN THE RECONSTRUCTED IMAGE')
   16 FORMAT(1X//' RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY USING RAL',
     1    'A CONVOLVER')
   18 FORMAT(1X//' RECONSTRUCTION FOR FAN BEAM GEOMETRY - CURVED DETEC',
     1    'TOR USING LAKS CONVOLVER')
   20 FORMAT(1X//' RECONSTRUCTION FOR FAN BEAM GEOMETRY - FLAT DETECTO',
     1    'R USING LAKS CONVOLVER')
   22 FORMAT(' EMISSION DATA')
   24 FORMAT(' TRANSMISSION DATA')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 2
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A CHEST PHANTOM.  ERRORS IN PROJECTION DATA ARE GIVEN IF
C        IMIT = 0, IE. IF IT IS EMISSION DATA.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION B(4096)
      DIMENSION A1(4),B1(4),X1(4),Y1(4),PHI(4),Z(4),ITYPE(4)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DATA ITYPE/1,1,1,1/
      DATA A1/40.,10.,14.,14./
      DATA B1/40.,10.,10.,10./
      DATA X1/0.,0.,10.,-10./
      DATA Y1/0.,-10.,0.,0./
      DATA PHI/0.,0.,1.57079633,1.57079633/
      DATA Z/5.,27.,-4.,-4./
C
      IF (M.EQ.1) THEN
          IF (IMIT.EQ.0) THEN
              PWIDTH=-PWID
          ELSE
              PWIDTH=PWID
          ENDIF
          CALL PHAN (4,10,ITYPE,Z,X1,Y1,A1,B1,PHI,B,NDIMU,PWIDTH)
          CALL ARRAY (B,NDIMU)
      ENDIF
C
      CALL PHANL (4,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      IF (IMIT.EQ.0) THEN
          DO 12 K=1,KDIMU
              DK=1.
              DK=MAX(DATA(K),DK)
   12         ERR(K)=SQRT(DK)
      ELSE
          DO 16 K=1,KDIMU
   16         ERR(K)=1.
      ENDIF
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0	RECONSTRUCT IN A CIRCULAR ARRAY
3	0	GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	0	EMISSION DATA
8	2000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)

```
11        12      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
                  PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12         0      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE



          FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.000      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
 2    50.500      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3     0.000  NA  NOT APPLICABLE  (NOT FAN BEAM GEOMETRY)
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


A TOTAL OF  68 ( 17 THRU  84) OF THE 100 USER PROJECTION BINS WILL BE USED


 68 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM


         MAXIMUM SIZE OF BLANK COMMON THUS FAR=    480 FLOATING POINT WORDS.


            EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
            E     NN  N D   D       S     E       T   U   U P   P
            EEE   N N N D   D        SSS  EEE     T   U   U PPPP
            E     N  NN D   D           S E       T   U   U P
            EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


                      CCC  OOOOO N   N V   V OOOOO
                     C   C O   O NN  N V   V O   O
                     C     O   O N N N  V V  O   O
                     C   C O   O N  NN  V V  O   O
                      CCC  OOOOO N   N   V   OOOOO



         PARAMETERS FOR SUBROUTINE CONVO

                  DESCRIPTION

IERR -       1    CALCULATE ERRORS


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      INTERPOLATION            NO                NO
CNV     CONVOLUTION              N/A                 NO                NO

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 67)
    0.637E+00  -0.212E+00  -0.424E-01  -0.182E-01  -0.101E-01
   -0.643E-02  -0.445E-02  -0.326E-02  -0.250E-02  -0.197E-02
   -0.160E-02  -0.132E-02  -0.111E-02  -0.943E-03  -0.813E-03
   -0.708E-03  -0.622E-03  -0.551E-03  -0.492E-03  -0.441E-03
   -0.398E-03  -0.361E-03  -0.329E-03  -0.301E-03  -0.276E-03
   -0.255E-03  -0.236E-03  -0.218E-03  -0.203E-03  -0.189E-03
   -0.177E-03  -0.166E-03  -0.155E-03  -0.146E-03  -0.138E-03
   -0.130E-03  -0.123E-03  -0.116E-03  -0.110E-03  -0.105E-03
   -0.995E-04  -0.947E-04  -0.902E-04  -0.861E-04  -0.822E-04
   -0.786E-04  -0.752E-04  -0.721E-04  -0.691E-04  -0.663E-04
   -0.637E-04  -0.612E-04  -0.589E-04  -0.567E-04  -0.546E-04
   -0.526E-04  -0.508E-04  -0.490E-04  -0.473E-04  -0.457E-04
   -0.442E-04  -0.428E-04  -0.414E-04  -0.401E-04  -0.389E-04
   -0.377E-04  -0.365E-04  -0.355E-04

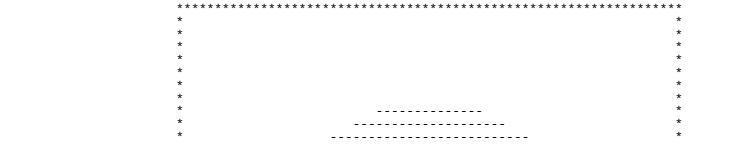

                      PPPP  H   H  AAA  N   N
                      P   P H   H A   A NN  N
                      PPPP  HHHHH A   A N N N
                      P     H   H AAAAA N  NN
                      P     H   H A   A N   N

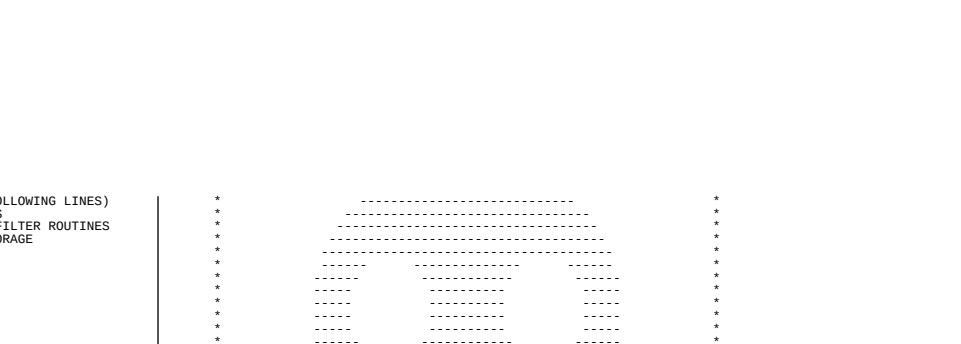


PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE          X         Y         A         B       PHI      DENS
      1   - EL@D@D     0.00 ,    5.00
                     (   0.00),(   0.00)(  40.00),(  40.00)         (   5.00)
      1   - EL $@$@$     0.00 ,  27.00
                     (   0.00),( -10.00)(  10.00),(  10.00)         (  27.00)
      1   - EL@$@,@$     1.57 ,   -4.00
                     (  10.00),(   0.00)(  14.00),(  10.00)         (  -4.00)
      1   - EL $@,@$     1.57 ,   -4.00
                     ( -10.00),(   0.00)(  14.00),(  10.00)         (  -4.00)


               EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
               E     NN  N D   D       P   P H   H A   A NN  N
               EEE   N N N D   D       PPPP  HHHHH A   A N N N
               E     N  NN D   D       P     H   H AAAAA N  NN
               EEEEE N   N DDDD        P     H   H A   A N   N


XMIN =   0.00E+00     XMAX =   0.32E+02     XSUM =   0.7526E+04
```





```
                 -          =          +          )          1          Z
0.0000E+00 0.2400E+01 0.5920E+01 0.7520E+01 0.8640E+01 0.9920E+01 0.1120E+02

Z          X          A          M          θ          ϴ          ⊕          ⊕
0.1232E+02 0.1312E+02 0.1392E+02 0.1568E+02 0.1744E+02 0.1856E+02 0.1984E+02

⊕          ⊕          ⊕          ⊠          ⊠          ⊠          ⊠          ■
0.2096E+02 0.2336E+02 0.2624E+02 0.2784E+02 0.2912E+02 0.3040E+02 0.3152E+02

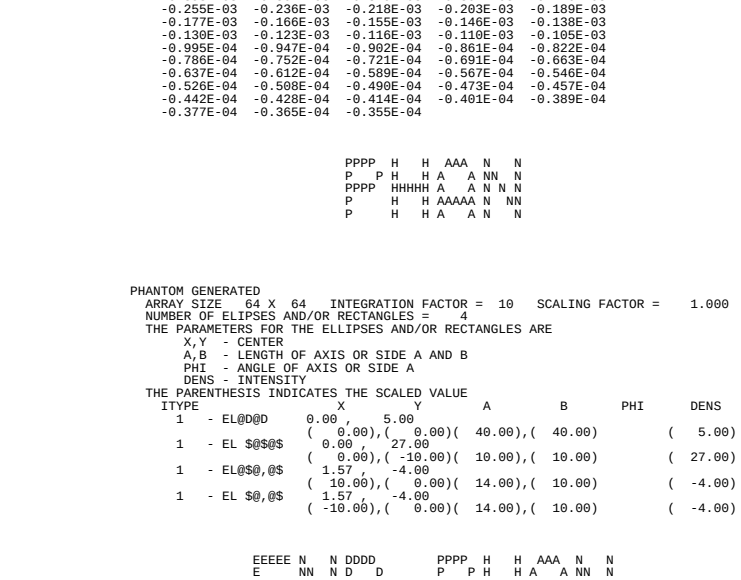
■
0.3200E+02
```

```
         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1187 FLOATING POINT WORDS.


            EEEEE N   N DDDD         CCC  OOOOO N   N V   V OOOOO
            E     NN  N D   D       C   C O   O NN  N V   V O   O
            EEE   N N N D   D       C     O   O N N N  V V  O   O
            E     N  NN D   D       C   C O   O N  NN  V V  O   O
            EEEEE N   N DDDD         CCC  OOOOO N   N   V   OOOOO


RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY USING SHLO CONVOLVER
EMISSION DATA

XMIN =  -0.23E+01     XMAX =   0.32E+02     XSUM =   0.7525E+04
```



```
                 -          =          +          )          1          Z
-.2305E+01 0.2822E+00 0.4077E+01 0.5802E+01 0.7009E+01 0.8389E+01 0.9769E+01

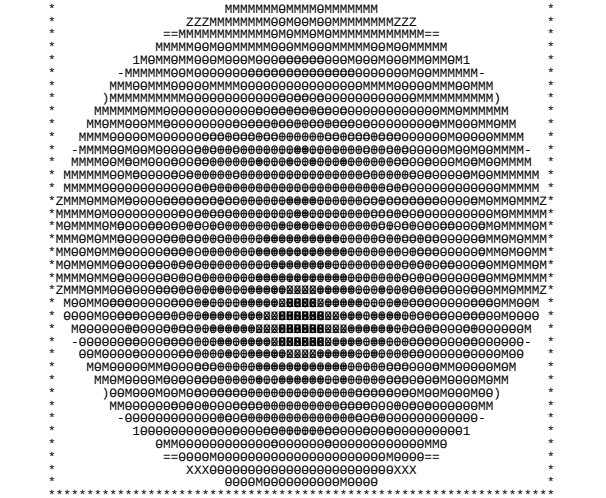
Z          X          A          M          θ          ϴ          ⊕          ⊕
0.1098E+02 0.1184E+02 0.1270E+02 0.1460E+02 0.1650E+02 0.1770E+02 0.1908E+02

⊕          ⊕          ⊕          ⊠          ⊠          ⊠          ⊠          ■
0.2029E+02 0.2288E+02 0.2598E+02 0.2771E+02 0.2909E+02 0.3047E+02 0.3167E+02

■
0.3219E+02


ERRORS IN THE RECONSTRUCTED IMAGE

XMIN =   0.00E+00     XMAX =   0.12E+02     XSUM =   0.2086E+05
```



```
                  -         =         +         )         1         Z
0.0000E+00 0.8744E+00 0.2157E+01 0.2740E+01 0.3148E+01 0.3614E+01 0.4081E+01

Z         X         A         M         0         0         0         0
0.4489E+01 0.4780E+01 0.5072E+01 0.5713E+01 0.6354E+01 0.6762E+01 0.7229E+01

0         0         0         0         0         0         0         0
0.7637E+01 0.8511E+01 0.9561E+01 0.1014E+02 0.1061E+02 0.1108E+02 0.1148E+02

0
0.1166E+02
```

```
 CCC  OOOOO N   N V   V OOOOO
C   C O   O NN  N V   V O   O
C     O   O N N N  V V  O   O
C   C O   O N  NN   V V  O   O
 CCC  OOOOO N   N    V   OOOOO
```

PARAMETERS FOR SUBROUTINE CONVO

	DESCRIPTION
IERR - 1	CALCULATE ERRORS

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	INTERPOLATION	NO	NO
CNV	CONVOLUTION	N/A	NO	NO

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 67)

0.785E+00	-0.318E+00	0.000E+00	-0.354E-01	0.000E+00
-0.127E-01	0.000E+00	-0.650E-02	0.000E+00	-0.393E-02
0.000E+00	-0.263E-02	0.000E+00	-0.188E-02	0.000E+00
-0.141E-02	0.000E+00	-0.110E-02	0.000E+00	-0.882E-03
0.000E+00	-0.722E-03	0.000E+00	-0.602E-03	0.000E+00
-0.509E-03	0.000E+00	-0.437E-03	0.000E+00	-0.378E-03
0.000E+00	-0.331E-03	0.000E+00	-0.292E-03	0.000E+00
-0.260E-03	0.000E+00	-0.233E-03	0.000E+00	-0.209E-03
0.000E+00	-0.189E-03	0.000E+00	-0.172E-03	0.000E+00
-0.157E-03	0.000E+00	-0.144E-03	0.000E+00	-0.133E-03
0.000E+00	-0.122E-03	0.000E+00	-0.113E-03	0.000E+00
-0.105E-03	0.000E+00	-0.980E-04	0.000E+00	-0.914E-04
0.000E+00	-0.855E-04	0.000E+00	-0.802E-04	0.000E+00
-0.753E-04	0.000E+00	-0.709E-04		

```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

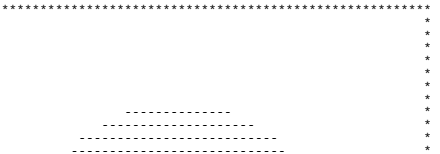
PHANTOM GENERATED
ARRAY SIZE 64 X 64 INTEGRATION FACTOR = 10 SCALING FACTOR = 1.000
NUMBER OF ELIPSES AND/OR RECTANGLES = 4
THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
X,Y - CENTER
A,B - LENGTH OF AXIS OR SIDE A AND B
PHI - ANGLE OF AXIS OR SIDE A
DENS - INTENSITY
THE PARENTHESIS INDICATES THE SCALED VALUE

ITYPE	X	Y	A	B	PHI	DENS
1 - EL@D@D	0.00 ,	5.00				
	(0.00),(	0.00)(	40.00),(	40.00)	(	5.00)
1 - EL $@$@$	0.00 ,	27.00				
	(0.00),(	-10.00)(	10.00),(	10.00)	(	27.00)
1 - EL@$@,@$	1.57 ,	-4.00				
	(10.00),(	0.00)(	14.00),(	10.00)	(	-4.00)
1 - EL $@,@$	1.57 ,	-4.00				
	(-10.00),(	0.00)(	14.00),(	10.00)	(	-4.00)

```
EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
E     NN  N D   D       P   P H   H A   A NN  N
EEE   N N N D   D       PPPP  HHHHH A   A N N N
E     N  NN D   D       P     H   H AAAAA N  NN
```

```
EEEEE N   N DDDD        P     H   H A   A N   N
```

XMIN = 0.00E+00 XMAX = 0.32E+02 XSUM = 0.7526E+04



```
                  -         =         +         )         1         Z
0.0000E+00 0.2400E+01 0.5920E+01 0.7520E+01 0.8640E+01 0.9920E+01 0.1120E+02

Z         X         A         M         0         0         0         0
0.1232E+02 0.1312E+02 0.1392E+02 0.1568E+02 0.1744E+02 0.1856E+02 0.1984E+02

0         0         0         0         0         0         0         0
0.2096E+02 0.2336E+02 0.2624E+02 0.2784E+02 0.2912E+02 0.3040E+02 0.3152E+02

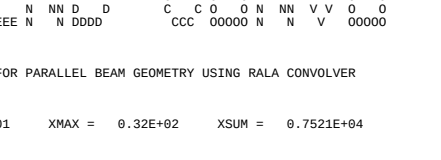
0
0.3200E+02
```

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1187 FLOATING POINT WORDS.

```
EEEEE N   N DDDD        CCC  OOOOO N   N V   V OOOOO
E     NN  N D   D      C   C O   O NN  N V   V O   O
EEE   N N N D   D      C     O   O N N N  V V  O   O
E     N  NN D   D      C   C O   O N  NN   V V  O   O
EEEEE N   N DDDD        CCC  OOOOO N   N    V   OOOOO
```

RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY USING RALA CONVOLVER
EMISSION DATA

XMIN = -0.28E+01 XMAX = 0.32E+02 XSUM = 0.7521E+04



```
                  -         =         +         )         1         Z
-.2819E+01 -.1807E+00 0.3688E+01 0.5447E+01 0.6678E+01 0.8085E+01 0.9492E+01

Z         X         A         M         0         0         0         0
```

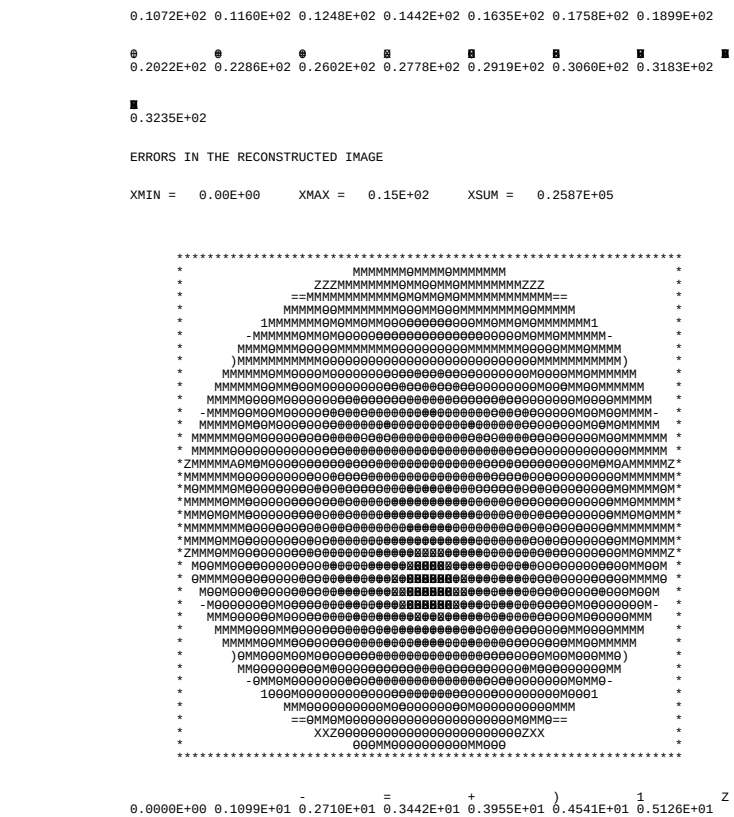
```
0.1072E+02 0.1160E+02 0.1248E+02 0.1442E+02 0.1635E+02 0.1758E+02 0.1899E+02

@          @          @          &          &          &          &          &
0.2022E+02 0.2286E+02 0.2602E+02 0.2778E+02 0.2919E+02 0.3060E+02 0.3183E+02

&
0.3235E+02

ERRORS IN THE RECONSTRUCTED IMAGE

XMIN =   0.00E+00     XMAX =   0.15E+02     XSUM =   0.2587E+05
```

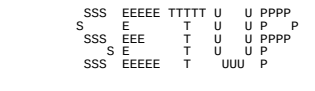


```
                -          =          +          )          1          Z
0.0000E+00 0.1099E+01 0.2710E+01 0.3442E+01 0.3955E+01 0.4541E+01 0.5126E+01

Z          X          A          M          0          8          @          @
0.5639E+01 0.6005E+01 0.6371E+01 0.7177E+01 0.7983E+01 0.8495E+01 0.9081E+01

@          @          @          &          &          &          &          &
0.9594E+01 0.1069E+02 0.1201E+02 0.1274E+02 0.1333E+02 0.1391E+02 0.1443E+02

&
0.1465E+02
```



INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0	RECONSTRUCT IN A CIRCULAR ARRAY
3	1	GEOMETRY FLAG
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	0	EMISSION DATA
8	2000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	12	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.330		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	125.000		DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

A TOTAL OF 90 (6 THRU 95) OF THE 100 USER PROJECTION BINS WILL BE USED

90 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1187 FLOATING POINT WORDS.

PARAMETERS FOR SUBROUTINE CONVO

DESCRIPTION

IERR - 1 CALCULATE ERRORS

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	INTERPOLATION	NO	YES
CNV	CONVOLUTION	N/A	NO	YES

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 89)

```
     0.785E+00  -0.318E+00   0.000E+00  -0.354E-01   0.000E+00
    -0.127E-01   0.000E+00  -0.650E-02   0.000E+00  -0.394E-02
     0.000E+00  -0.264E-02   0.000E+00  -0.189E-02   0.000E+00
    -0.142E-02   0.000E+00  -0.111E-02   0.000E+00  -0.889E-03
     0.000E+00  -0.729E-03   0.000E+00  -0.609E-03   0.000E+00
    -0.516E-03   0.000E+00  -0.443E-03   0.000E+00  -0.385E-03
     0.000E+00  -0.338E-03   0.000E+00  -0.299E-03   0.000E+00
    -0.267E-03   0.000E+00  -0.239E-03   0.000E+00  -0.216E-03
     0.000E+00  -0.196E-03   0.000E+00  -0.179E-03   0.000E+00
    -0.164E-03   0.000E+00  -0.151E-03   0.000E+00  -0.140E-03
     0.000E+00  -0.129E-03   0.000E+00  -0.120E-03   0.000E+00
    -0.112E-03   0.000E+00  -0.105E-03   0.000E+00  -0.985E-04
     0.000E+00  -0.927E-04   0.000E+00  -0.873E-04   0.000E+00
    -0.825E-04   0.000E+00  -0.781E-04   0.000E+00  -0.741E-04
     0.000E+00  -0.704E-04   0.000E+00  -0.670E-04   0.000E+00
    -0.639E-04   0.000E+00  -0.610E-04   0.000E+00  -0.584E-04
     0.000E+00  -0.559E-04   0.000E+00  -0.536E-04   0.000E+00
    -0.515E-04   0.000E+00  -0.496E-04   0.000E+00  -0.477E-04
```

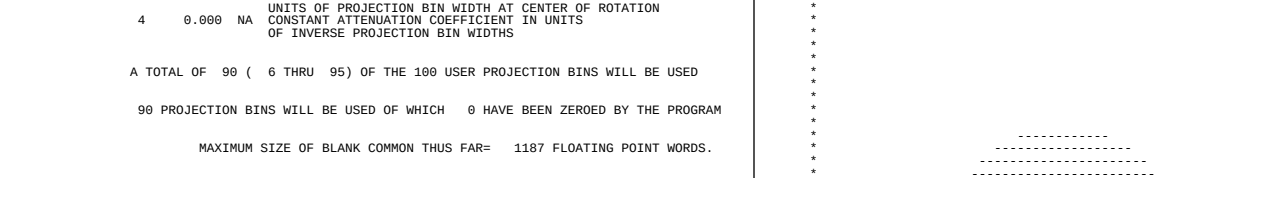
THE WEIGHTS USED FOR THE FAN BEAM CONVOLUTION (WEIGHT(I),I=1, 90)

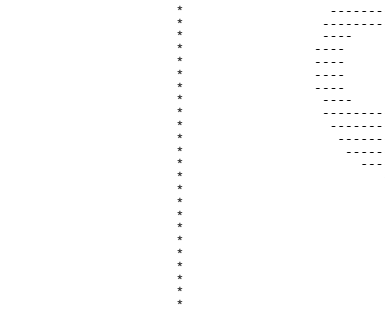
```
     0.937E+00   0.940E+00   0.943E+00   0.945E+00   0.948E+00
     0.950E+00   0.953E+00   0.955E+00   0.958E+00   0.960E+00
     0.962E+00   0.964E+00   0.966E+00   0.968E+00   0.970E+00
     0.972E+00   0.974E+00   0.976E+00   0.978E+00   0.979E+00
     0.981E+00   0.982E+00   0.984E+00   0.985E+00   0.987E+00
     0.988E+00   0.989E+00   0.990E+00   0.991E+00   0.992E+00
     0.993E+00   0.994E+00   0.995E+00   0.996E+00   0.996E+00
     0.997E+00   0.998E+00   0.998E+00   0.999E+00   0.999E+00
     0.999E+00   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.999E+00
     0.999E+00   0.999E+00   0.998E+00   0.998E+00   0.997E+00
     0.996E+00   0.996E+00   0.995E+00   0.994E+00   0.993E+00
     0.992E+00   0.991E+00   0.990E+00   0.989E+00   0.988E+00
     0.987E+00   0.985E+00   0.984E+00   0.982E+00   0.981E+00
     0.979E+00   0.978E+00   0.976E+00   0.974E+00   0.972E+00
     0.970E+00   0.968E+00   0.966E+00   0.964E+00   0.962E+00
     0.960E+00   0.958E+00   0.955E+00   0.953E+00   0.950E+00
     0.948E+00   0.945E+00   0.943E+00   0.940E+00   0.937E+00
```



```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                X          Y          A          B        PHI       DENS
      1   - EL@D@D     0.00 ,     5.00
                     (  0.00),(   0.00)(  30.08),(  30.08)          (   8.84)
      1   - EL $@$@$     0.00 ,   27.00
                     (  0.00),(  -7.52)(   7.52),(   7.52)          (  47.76)
      1   - EL@$@,@$    1.57 ,    -4.00
                     (   7.52),(   0.00)(  10.53),(   7.52)          (  -7.08)
      1   - EL $@,@$    1.57 ,    -4.00
                     (  -7.52),(   0.00)(  10.53),(   7.52)          (  -7.08)
```

```
XMIN =   0.00E+00     XMAX =   0.57E+02     XSUM =   0.7522E+04
```





```
                -         =         +         )         1         Z
0.0000E+00 0.4245E+01 0.1047E+02 0.1330E+02 0.1528E+02 0.1755E+02 0.1981E+02

Z         X         A         M         Θ         Θ         @         @
0.2179E+02 0.2321E+02 0.2462E+02 0.2774E+02 0.3085E+02 0.3283E+02 0.3509E+02

@         @         @         ▒         ▒         ▒         ▒         ▒
0.3708E+02 0.4132E+02 0.4642E+02 0.4925E+02 0.5151E+02 0.5377E+02 0.5576E+02

▒
0.5660E+02
```

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1497 FLOATING POINT WORDS.

```
    EEEEE N   N DDDD         CCC  OOOOO N   N V   V OOOOO
    E     NN  N D   D       C   C O   O NN  N V   V O   O
    EEE   N N N D   D       C     O   O N N N  V V  O   O
    E     N  NN D   D       C   C O   O N  NN  V V  O   O
    EEEEE N   N DDDD         CCC  OOOOO N   N   V   OOOOO
```

RECONSTRUCTION FOR FAN BEAM GEOMETRY - CURVED DETECTOR USING LAKS CONVOLVER EMISSION DATA

XMIN = -0.50E+01 XMAX = 0.57E+02 XSUM = 0.7484E+04

```
                -         =         +         )         1         Z
-.5040E+01 -.3792E+00 0.6457E+01 0.9565E+01 0.1174E+02 0.1423E+02 0.1671E+02

Z         X         A         M         Θ         Θ         @         @
0.1889E+02 0.2044E+02 0.2199E+02 0.2541E+02 0.2883E+02 0.3101E+02 0.3349E+02

@         @         @         ▒         ▒         ▒         ▒         ▒
0.3567E+02 0.4033E+02 0.4592E+02 0.4903E+02 0.5151E+02 0.5400E+02 0.5618E+02

▒
0.5711E+02
```

ERRORS IN THE RECONSTRUCTED IMAGE

XMIN = 0.00E+00 XMAX = 0.24E+02 XSUM = 0.4675E+05


```
                -         =         +         )         1         Z
0.0000E+00 0.1776E+01 0.4380E+01 0.5564E+01 0.6392E+01 0.7339E+01 0.8286E+01

Z         X         A         M         Θ         Θ         @         @
0.9115E+01 0.9707E+01 0.1030E+02 0.1160E+02 0.1290E+02 0.1373E+02 0.1468E+02

@         @         @         ▒         ▒         ▒         ▒         ▒
0.1551E+02 0.1728E+02 0.1941E+02 0.2060E+02 0.2154E+02 0.2249E+02 0.2332E+02

▒
0.2368E+02
```

```
     SSS  EEEEE TTTTT U   U PPPP
    S     E       T   U   U P   P
     SSS  EEE     T   U   U PPPP
        S E       T   U   U P
     SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0	RECONSTRUCT IN A CIRCULAR ARRAY
3	2	GEOMETRY FLAG FAN BEAM GEOMETRY (FLAT DETECTOR)
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	0	EMISSION DATA
8	2000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	12	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.330		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	125.000		DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

A TOTAL OF 94 (4 THRU 97) OF THE 100 USER PROJECTION BINS WILL BE USED

94 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1497 FLOATING POINT WORDS.

```
    EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
    E     NN  N D   D       S     E       T   U   U P   P
    EEE   N N N D   D        SSS  EEE     T   U   U PPPP
    E     N  NN D   D           S E       T   U   U P
    EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P

     CCC  OOOOO N   N V   V OOOOO
    C   C O   O NN  N V   V O   O
    C     O   O N N N  V V  O   O
    C   C O   O N  NN  V V  O   O
     CCC  OOOOO N   N   V   OOOOO
```

PARAMETERS FOR SUBROUTINE CONVO

DESCRIPTION

```
IERR -       1    CALCULATE ERRORS


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      INTERPOLATION           NO                  YES
CNV     CONVOLUTION             N/A                 NO                  YES

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 93)
     0.785E+00  -0.318E+00   0.000E+00  -0.354E-01   0.000E+00
    -0.127E-01   0.000E+00  -0.650E-02   0.000E+00  -0.393E-02
     0.000E+00  -0.263E-02   0.000E+00  -0.188E-02   0.000E+00
    -0.141E-02   0.000E+00  -0.110E-02   0.000E+00  -0.882E-03
     0.000E+00  -0.722E-03   0.000E+00  -0.602E-03   0.000E+00
    -0.509E-03   0.000E+00  -0.437E-03   0.000E+00  -0.378E-03
     0.000E+00  -0.331E-03   0.000E+00  -0.292E-03   0.000E+00
    -0.260E-03   0.000E+00  -0.233E-03   0.000E+00  -0.209E-03
     0.000E+00  -0.189E-03   0.000E+00  -0.172E-03   0.000E+00
    -0.157E-03   0.000E+00  -0.144E-03   0.000E+00  -0.133E-03
     0.000E+00  -0.122E-03   0.000E+00  -0.113E-03   0.000E+00
    -0.105E-03   0.000E+00  -0.980E-04   0.000E+00  -0.914E-04
     0.000E+00  -0.855E-04   0.000E+00  -0.802E-04   0.000E+00
    -0.753E-04   0.000E+00  -0.709E-04   0.000E+00  -0.669E-04
     0.000E+00  -0.631E-04   0.000E+00  -0.597E-04   0.000E+00
    -0.566E-04   0.000E+00  -0.537E-04   0.000E+00  -0.510E-04
     0.000E+00  -0.485E-04   0.000E+00  -0.462E-04   0.000E+00
    -0.441E-04   0.000E+00  -0.421E-04   0.000E+00  -0.402E-04
     0.000E+00  -0.384E-04   0.000E+00  -0.368E-04

THE WEIGHTS USED FOR THE FAN BEAM CONVOLUTION (WEIGHT(I),I=1, 94)
     0.937E+00   0.940E+00   0.942E+00   0.944E+00   0.947E+00
     0.949E+00   0.951E+00   0.954E+00   0.956E+00   0.958E+00
     0.960E+00   0.962E+00   0.964E+00   0.966E+00   0.968E+00
     0.970E+00   0.971E+00   0.973E+00   0.975E+00   0.977E+00
     0.978E+00   0.980E+00   0.981E+00   0.983E+00   0.984E+00
     0.986E+00   0.987E+00   0.988E+00   0.989E+00   0.990E+00
     0.991E+00   0.992E+00   0.993E+00   0.994E+00   0.995E+00
     0.996E+00   0.996E+00   0.997E+00   0.998E+00   0.998E+00
     0.999E+00   0.999E+00   0.999E+00   0.100E+01   0.100E+01
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.100E+01   0.999E+00   0.999E+00   0.999E+00   0.998E+00
     0.998E+00   0.997E+00   0.996E+00   0.996E+00   0.995E+00
     0.994E+00   0.993E+00   0.992E+00   0.991E+00   0.990E+00
     0.989E+00   0.988E+00   0.987E+00   0.986E+00   0.984E+00
     0.983E+00   0.981E+00   0.980E+00   0.978E+00   0.977E+00
     0.975E+00   0.973E+00   0.971E+00   0.970E+00   0.968E+00
     0.966E+00   0.964E+00   0.962E+00   0.960E+00   0.958E+00
     0.956E+00   0.954E+00   0.951E+00   0.949E+00   0.947E+00
     0.944E+00   0.942E+00   0.940E+00   0.937E+00

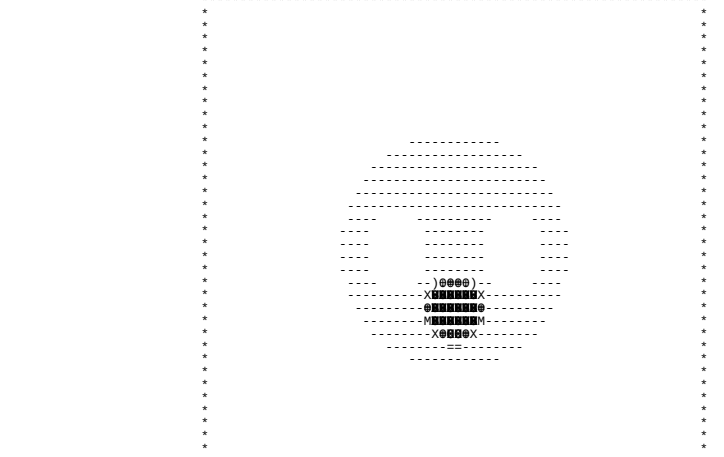

                         PPPP  H   H  AAA  N   N
                         P   P H   H A   A NN  N
                         PPPP  HHHHH A   A N N N
                         P     H   H AAAAA N  NN
                         P     H   H A   A N   N



PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE          X         Y         A         B       PHI      DENS
      1   - EL@D@D     0.00 ,    5.00
                    (   0.00),(   0.00)(  30.08),(  30.08)         (   8.84)
      1   - EL $@$@$     0.00 ,   27.00
                    (   0.00),(  -7.52)(   7.52),(   7.52)         (  47.76)
      1   - EL@$@,@$     1.57 ,   -4.00
                    (   7.52),(   0.00)(  10.53),(   7.52)         (  -7.08)
      1   - EL $@,@$     1.57 ,   -4.00
                    (  -7.52),(   0.00)(  10.53),(   7.52)         (  -7.08)


               EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
               E     NN  N D   D       P   P H   H A   A NN  N
               EEE   N N N D   D       PPPP  HHHHH A   A N N N
               E     N  NN D   D       P     H   H AAAAA N  NN
               EEEEE N   N DDDD        P     H   H A   A N   N


XMIN =   0.00E+00     XMAX =   0.57E+02     XSUM =   0.7522E+04
```



```
      *                                                                     *
      *                                                                     *
      *                                                                     *
      ***********************************************************************


                -         =         +         )         1         Z
0.0000E+00 0.4245E+01 0.1047E+02 0.1330E+02 0.1528E+02 0.1755E+02 0.1981E+02

Z         X         A         M         0         0         0         0
0.2179E+02 0.2321E+02 0.2462E+02 0.2774E+02 0.3085E+02 0.3283E+02 0.3509E+02

0         0         0         8         8         8         8         8
0.3708E+02 0.4132E+02 0.4642E+02 0.4925E+02 0.5151E+02 0.5377E+02 0.5576E+02

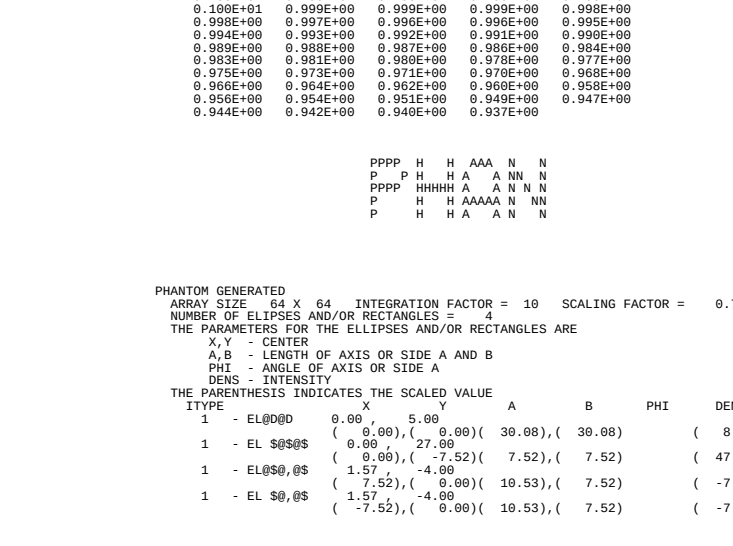
8
0.5660E+02

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1541 FLOATING POINT WORDS.


             EEEEE N   N DDDD         CCC  OOOOO N   N V   V OOOOO
             E     NN  N D   D       C   C O   O NN  N V   V O   O
             EEE   N N N D   D       C     O   O N N N V V V O   O
             E     N  NN D   D       C   C O   O N  NN  V V  O   O
             EEEEE N   N DDDD         CCC  OOOOO N   N   V   OOOOO


RECONSTRUCTION FOR FAN BEAM GEOMETRY - FLAT DETECTOR USING LAKS CONVOLVER
EMISSION DATA

XMIN =  -0.53E+01     XMAX =   0.57E+02     XSUM =   0.7478E+04
```



```
                -         =         +         )         1         Z
-.5349E+01 -.6650E+00 0.6205E+01 0.9327E+01 0.1151E+02 0.1401E+02 0.1651E+02

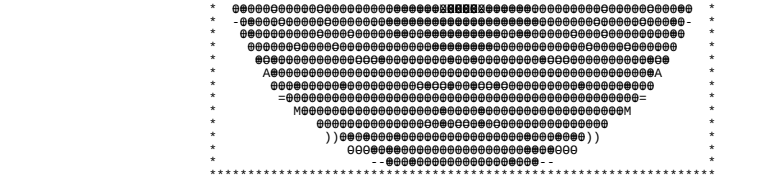
Z         X         A         M         0         0         0         0
0.1870E+02 0.2026E+02 0.2182E+02 0.2525E+02 0.2869E+02 0.3087E+02 0.3337E+02

0         0         0         8         8         8         8         8
0.3556E+02 0.4024E+02 0.4586E+02 0.4899E+02 0.5148E+02 0.5398E+02 0.5617E+02

8
0.5710E+02

ERRORS IN THE RECONSTRUCTED IMAGE

XMIN =   0.00E+00     XMAX =   0.24E+02     XSUM =   0.4759E+05
```



```
                -         =         +         )         1         Z
0.0000E+00 0.1776E+01 0.4382E+01 0.5566E+01 0.6395E+01 0.7342E+01 0.8290E+01

Z         X         A         M         0         0         0         0
0.9119E+01 0.9711E+01 0.1030E+02 0.1161E+02 0.1291E+02 0.1374E+02 0.1468E+02

0         0         0         8         8         8         8         8
0.1551E+02 0.1729E+02 0.1942E+02 0.2061E+02 0.2155E+02 0.2250E+02 0.2333E+02

8
0.2369E+02
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0		RECONSTRUCT IN A CIRCULAR ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	5		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	1		TRANSMISSION DATA
8	2000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	12		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12	0		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

A TOTAL OF 68 (17 THRU 84) OF THE 100 USER PROJECTION BINS WILL BE USED

68 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1541 FLOATING POINT WORDS.

```
EEEEE N   N DDDD        SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D      S     E       T   U   U P   P
EEE   N N N D   D       SSS  EEE     T   U   U PPPP
E     N  NN D   D          S E       T   U   U P
EEEEE N   N DDDD        SSS  EEEEE   T    UUU  P
```

```
 CCC  OOOOO N   N V   V OOOOO
C   C O   O NN  N V   V O   O
C     O   O N N N  V V  O   O
C   C O   O N  NN  V V  O   O
 CCC  OOOOO N   N   V   OOOOO
```

PARAMETERS FOR SUBROUTINE CONVO

		DESCRIPTION
IERR -	1	CALCULATE ERRORS

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	INTERPOLATION	NO	NO
CNV	CONVOLUTION	N/A	NO	NO

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 67)

```
 0.637E+00  -0.212E+00  -0.424E-01  -0.182E-01  -0.101E-01
-0.643E-02  -0.445E-02  -0.326E-02  -0.250E-02  -0.197E-02
-0.160E-02  -0.132E-02  -0.111E-02  -0.943E-03  -0.813E-03
-0.708E-03  -0.622E-03  -0.551E-03  -0.492E-03  -0.441E-03
-0.398E-03  -0.361E-03  -0.329E-03  -0.301E-03  -0.276E-03
-0.255E-03  -0.236E-03  -0.218E-03  -0.203E-03  -0.189E-03
-0.177E-03  -0.166E-03  -0.155E-03  -0.146E-03  -0.138E-03
-0.130E-03  -0.123E-03  -0.116E-03  -0.110E-03  -0.105E-03
-0.995E-04  -0.947E-04  -0.902E-04  -0.861E-04  -0.822E-04
-0.786E-04  -0.752E-04  -0.721E-04  -0.691E-04  -0.663E-04
-0.637E-04  -0.612E-04  -0.589E-04  -0.567E-04  -0.546E-04
-0.526E-04  -0.508E-04  -0.490E-04  -0.473E-04  -0.457E-04
-0.442E-04  -0.428E-04  -0.414E-04  -0.401E-04  -0.389E-04
-0.377E-04  -0.365E-04  -0.355E-04
```

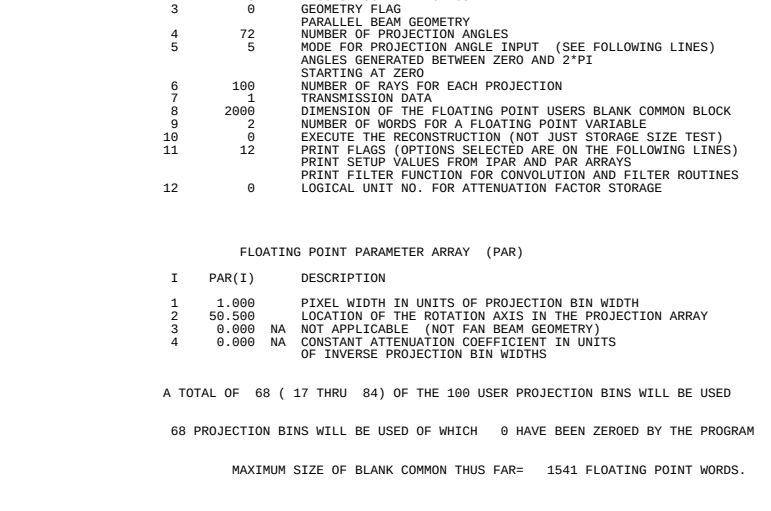
```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

PHANTOM GENERATED
ARRAY SIZE 64 X 64 INTEGRATION FACTOR = 10 SCALING FACTOR = 1.000
NUMBER OF ELIPSES AND/OR RECTANGLES = 4
THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
X,Y - CENTER
A,B - LENGTH OF AXIS OR SIDE A AND B
PHI - ANGLE OF AXIS OR SIDE A
DENS - INTENSITY
THE PARENTHESIS INDICATES THE SCALED VALUE

ITYPE	X	Y	A	B	PHI	DENS
1 - EL@D@D	0.00 ,	5.00				
	(0.00),(	0.00)(	40.00),(	40.00)	(	5.00)
1 - EL $@$@$	0.00 ,	27.00				
	(0.00),(	-10.00)(	10.00),(	10.00)	(	27.00)
1 - EL@$@,@$	1.57 ,	-4.00				
	(10.00),(	0.00)(	14.00),(	10.00)	(	-4.00)
1 - EL $@,@$	1.57 ,	-4.00				
	(-10.00),(	0.00)(	14.00),(	10.00)	(	-4.00)

```
EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
E     NN  N D   D       P   P H   H A   A NN  N
EEE   N N N D   D       PPPP  HHHHH A   A N N N
E     N  NN D   D       P     H   H AAAAA N  NN
EEEEE N   N DDDD        P     H   H A   A N   N
```

XMIN = 0.00E+00 XMAX = 0.32E+02 XSUM = 0.7526E+04



```
                -         =         +         )         1         Z
0.0000E+00 0.2400E+01 0.5920E+01 0.7520E+01 0.8640E+01 0.9920E+01 0.1120E+02

Z         X         A         M         0         0         0         0
0.1232E+02 0.1312E+02 0.1392E+02 0.1568E+02 0.1744E+02 0.1856E+02 0.1984E+02

0         0         0         8         8         8         8         8
0.2096E+02 0.2336E+02 0.2624E+02 0.2784E+02 0.2912E+02 0.3040E+02 0.3152E+02

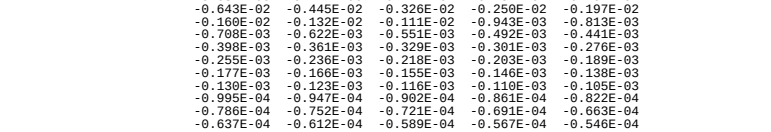
8
0.3200E+02
```

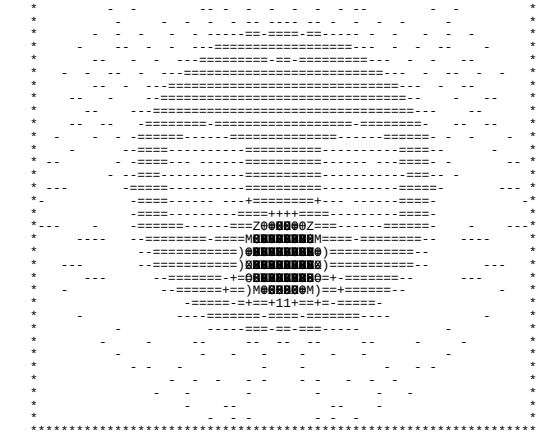
MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1541 FLOATING POINT WORDS.

```
EEEEE N   N DDDD        CCC  OOOOO N   N V   V OOOOO
E     NN  N D   D      C   C O   O NN  N V   V O   O
EEE   N N N D   D      C     O   O N N N  V V  O   O
E     N  NN D   D      C   C O   O N  NN  V V  O   O
EEEEE N   N DDDD        CCC  OOOOO N   N   V   OOOOO
```

RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY USING SHLO CONVOLVER
TRANSMISSION DATA

XMIN = -0.23E+01 XMAX = 0.32E+02 XSUM = 0.7525E+04





```
                    -           =           +           )           1           Z
-.2305E+01 0.2822E+00 0.4077E+01 0.5802E+01 0.7009E+01 0.8389E+01 0.9769E+01

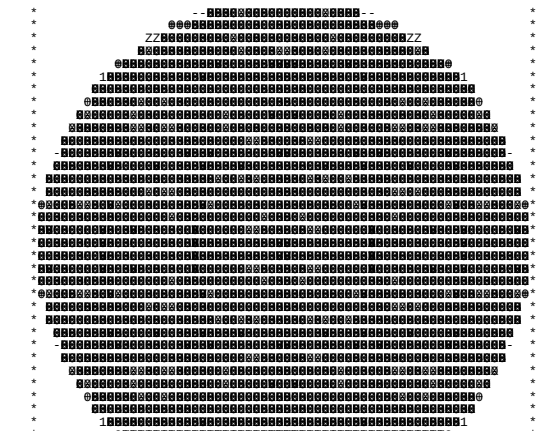
Z          X          A          M          Θ          Θ          Θ          Θ
0.1098E+02 0.1184E+02 0.1270E+02 0.1460E+02 0.1650E+02 0.1770E+02 0.1908E+02

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.2029E+02 0.2288E+02 0.2598E+02 0.2771E+02 0.2909E+02 0.3047E+02 0.3167E+02

Θ
0.3219E+02

ERRORS IN THE RECONSTRUCTED IMAGE

XMIN =   0.00E+00     XMAX =   0.67E-01     XSUM =   0.1953E+03
```



```
                    -           =           +           )           1           Z
0.0000E+00 0.4994E-02 0.1232E-01 0.1565E-01 0.1798E-01 0.2064E-01 0.2331E-01

Z          X          A          M          Θ          Θ          Θ          Θ
0.2564E-01 0.2730E-01 0.2897E-01 0.3263E-01 0.3629E-01 0.3862E-01 0.4129E-01

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.4362E-01 0.4861E-01 0.5460E-01 0.5793E-01 0.6060E-01 0.6326E-01 0.6559E-01

Θ
0.6659E-01
```

```
 CCC  OOOOO N   N V   V OOOOO
C   C O   O NN  N V   V O   O
C     O   O N N N  V V  O   O
C   C O   O N  NN   V V  O   O
 CCC  OOOOO N   N    V   OOOOO
```

```
         PARAMETERS FOR SUBROUTINE CONVO

                DESCRIPTION

IERR -      1   CALCULATE ERRORS
```

```
BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      INTERPOLATION           NO                  NO
CNV     CONVOLUTION             N/A                 NO                  NO

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 67)
     0.785E+00  -0.318E+00   0.000E+00  -0.354E-01   0.000E+00
    -0.127E-01   0.000E+00  -0.650E-02   0.000E+00  -0.393E-02
     0.000E+00  -0.263E-02   0.000E+00  -0.188E-02   0.000E+00
    -0.141E-02   0.000E+00  -0.110E-02   0.000E+00  -0.882E-03
     0.000E+00  -0.722E-03   0.000E+00  -0.602E-03   0.000E+00
    -0.509E-03   0.000E+00  -0.437E-03   0.000E+00  -0.378E-03
     0.000E+00  -0.331E-03   0.000E+00  -0.292E-03   0.000E+00
    -0.260E-03   0.000E+00  -0.233E-03   0.000E+00  -0.209E-03
     0.000E+00  -0.189E-03   0.000E+00  -0.172E-03   0.000E+00
    -0.157E-03   0.000E+00  -0.144E-03   0.000E+00  -0.133E-03
     0.000E+00  -0.122E-03   0.000E+00  -0.113E-03   0.000E+00
    -0.105E-03   0.000E+00  -0.980E-04   0.000E+00  -0.914E-04
     0.000E+00  -0.855E-04   0.000E+00  -0.802E-04   0.000E+00
    -0.753E-04   0.000E+00  -0.709E-04
```

```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                X         Y         A         B       PHI      DENS
      1   - EL@D@D     0.00 ,    5.00
                     (   0.00),(   0.00)(  40.00),(  40.00)         (   5.00)
      1   - EL $@$@$     0.00 ,   27.00
                     (   0.00),( -10.00)(  10.00),(  10.00)         (  27.00)
      1   - EL@$@,@$     1.57 ,   -4.00
                     (  10.00),(   0.00)(  14.00),(  10.00)         (  -4.00)
      1   - EL $@,@$     1.57 ,   -4.00
                     ( -10.00),(   0.00)(  14.00),(  10.00)         (  -4.00)
```

```
EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
E     NN  N D   D       P   P H   H A   A NN  N
EEE   N N N D   D       PPPP  HHHHH A   A N N N
E     N  NN D   D       P     H   H AAAAA N  NN
EEEEE N   N DDDD        P     H   H A   A N   N
```

```
XMIN =   0.00E+00     XMAX =   0.32E+02     XSUM =   0.7526E+04
```



```
                    -           =           +           )           1           Z
0.0000E+00 0.2400E+01 0.5920E+01 0.7520E+01 0.8640E+01 0.9920E+01 0.1120E+02

Z          X          A          M          Θ          Θ          Θ          Θ
0.1232E+02 0.1312E+02 0.1392E+02 0.1568E+02 0.1744E+02 0.1856E+02 0.1984E+02

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.2096E+02 0.2336E+02 0.2624E+02 0.2784E+02 0.2912E+02 0.3040E+02 0.3152E+02

Θ
0.3200E+02

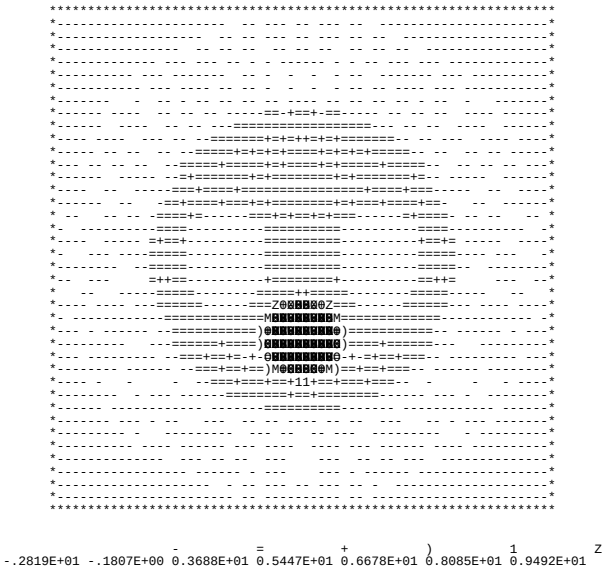
        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1541 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD        CCC  OOOOO N   N V   V OOOOO
E     NN  N D   D      C   C O   O NN  N V   V O   O
EEE   N N N D   D      C     O   O N N N  V V  O   O
```

```
          E     N  NN D   D       C   C O   O N  NN  V V  O   O
          EEEEE N   N DDDD         CCC  OOOOO N   N   V   OOOOO


RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY USING RALA CONVOLVER
TRANSMISSION DATA

XMIN =  -0.28E+01     XMAX =   0.32E+02     XSUM =   0.7521E+04
```



```
                  -           =           +           )           1           Z
-.2819E+01 -.1807E+00 0.3688E+01 0.5447E+01 0.6678E+01 0.8085E+01 0.9492E+01

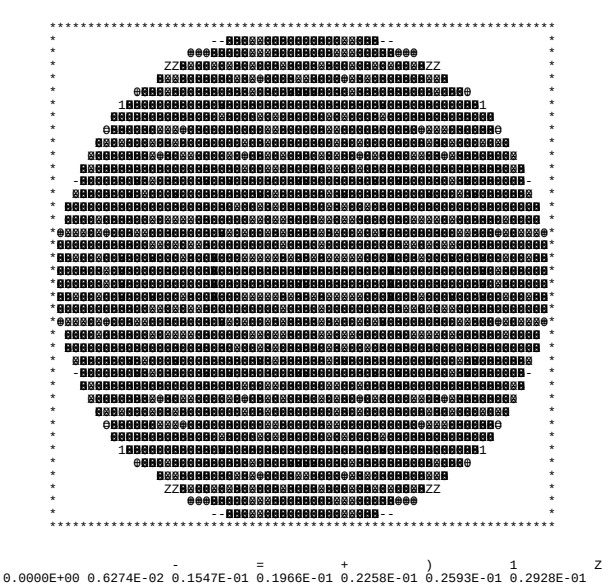
Z         X         A         M         0         0         @         @
0.1072E+02 0.1160E+02 0.1248E+02 0.1442E+02 0.1635E+02 0.1758E+02 0.1899E+02

@         @         @         &         &         &         &         &
0.2022E+02 0.2286E+02 0.2602E+02 0.2778E+02 0.2919E+02 0.3060E+02 0.3183E+02

&
0.3235E+02

ERRORS IN THE RECONSTRUCTED IMAGE

XMIN =   0.00E+00     XMAX =   0.84E-01     XSUM =   0.2422E+03
```



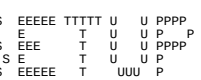
```
                  -           =           +           )           1           Z
0.0000E+00 0.6274E-02 0.1547E-01 0.1966E-01 0.2258E-01 0.2593E-01 0.2928E-01

Z         X         A         M         0         0         @         @
0.3220E-01 0.3430E-01 0.3639E-01 0.4099E-01 0.4559E-01 0.4852E-01 0.5186E-01

@         @         @         &         &         &         &         &
0.5479E-01 0.6106E-01 0.6859E-01 0.7277E-01 0.7612E-01 0.7947E-01 0.8239E-01

&
```

```
0.8365E-01
```



```
         INTEGER PARAMETER ARRAY  (IPAR)

 I   IPAR(I)      DESCRIPTION

 1        64      LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
 2         0      RECONSTRUCT IN A CIRCULAR ARRAY
 3         1      GEOMETRY FLAG
 4        72      NUMBER OF PROJECTION ANGLES
 5         5      MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND 2*PI
                  STARTING AT ZERO
 6       100      NUMBER OF RAYS FOR EACH PROJECTION
 7         1      TRANSMISSION DATA
 8      2000      DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9         2      NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10         0      EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11        12      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
                  PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12         0      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE



         FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.330      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF
                  ROTATION
 2    50.500      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3   125.000      DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN
                  UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


A TOTAL OF  90 (  6 THRU  95) OF THE 100 USER PROJECTION BINS WILL BE USED

 90 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1541 FLOATING POINT WORDS.


          EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
          E     NN  N D   D       S     E       T   U   U P   P
          EEE   N N N D   D        SSS  EEE     T   U   U PPPP
          E     N  NN D   D           S E       T   U   U P
          EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


           CCC  OOOOO N   N V   V OOOOO
          C   C O   O NN  N V   V O   O
          C     O   O N N N  V V  O   O
          C   C O   O N  NN   V V  O   O
           CCC  OOOOO N   N    V   OOOOO


         PARAMETERS FOR SUBROUTINE CONVO

                  DESCRIPTION

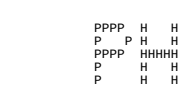
IERR -       1    CALCULATE ERRORS


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

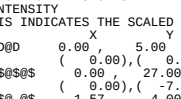
ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      INTERPOLATION             NO                YES
CNV     CONVOLUTION               N/A                 NO                YES

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 89)
     0.785E+00  -0.318E+00   0.000E+00  -0.354E-01   0.000E+00
    -0.127E-01   0.000E+00  -0.650E-02   0.000E+00  -0.394E-02
     0.000E+00  -0.264E-02   0.000E+00  -0.189E-02   0.000E+00
    -0.142E-02   0.000E+00  -0.111E-02   0.000E+00  -0.889E-03
     0.000E+00  -0.729E-03   0.000E+00  -0.609E-03   0.000E+00
    -0.516E-03   0.000E+00  -0.443E-03   0.000E+00  -0.385E-03
     0.000E+00  -0.338E-03   0.000E+00  -0.299E-03   0.000E+00
    -0.267E-03   0.000E+00  -0.239E-03   0.000E+00  -0.216E-03
     0.000E+00  -0.196E-03   0.000E+00  -0.179E-03   0.000E+00
    -0.164E-03   0.000E+00  -0.151E-03   0.000E+00  -0.140E-03
     0.000E+00  -0.129E-03   0.000E+00  -0.120E-03   0.000E+00
    -0.112E-03   0.000E+00  -0.105E-03   0.000E+00  -0.985E-04
     0.000E+00  -0.927E-04   0.000E+00  -0.873E-04   0.000E+00
    -0.825E-04   0.000E+00  -0.781E-04   0.000E+00  -0.741E-04
     0.000E+00  -0.704E-04   0.000E+00  -0.670E-04   0.000E+00
    -0.639E-04   0.000E+00  -0.610E-04   0.000E+00  -0.584E-04
     0.000E+00  -0.559E-04   0.000E+00  -0.536E-04   0.000E+00
    -0.515E-04   0.000E+00  -0.496E-04   0.000E+00  -0.477E-04

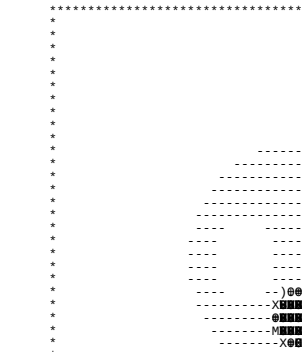
THE WEIGHTS USED FOR THE FAN BEAM CONVOLUTION (WEIGHT(I),I=1, 90)
     0.937E+00   0.940E+00   0.943E+00   0.945E+00   0.948E+00
     0.950E+00   0.953E+00   0.955E+00   0.958E+00   0.960E+00
     0.962E+00   0.964E+00   0.966E+00   0.968E+00   0.970E+00
     0.972E+00   0.974E+00   0.976E+00   0.978E+00   0.979E+00
     0.981E+00   0.982E+00   0.984E+00   0.985E+00   0.987E+00
     0.988E+00   0.989E+00   0.990E+00   0.991E+00   0.992E+00
     0.993E+00   0.994E+00   0.995E+00   0.996E+00   0.996E+00
     0.997E+00   0.998E+00   0.998E+00   0.999E+00   0.999E+00
     0.999E+00   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.999E+00
     0.999E+00   0.999E+00   0.998E+00   0.998E+00   0.997E+00
     0.996E+00   0.996E+00   0.995E+00   0.994E+00   0.993E+00
     0.992E+00   0.991E+00   0.990E+00   0.989E+00   0.988E+00
     0.987E+00   0.985E+00   0.984E+00   0.982E+00   0.981E+00
     0.979E+00   0.978E+00   0.976E+00   0.974E+00   0.972E+00
     0.970E+00   0.968E+00   0.966E+00   0.964E+00   0.962E+00
     0.960E+00   0.958E+00   0.955E+00   0.953E+00   0.950E+00
     0.948E+00   0.945E+00   0.943E+00   0.940E+00   0.937E+00
```




```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y   - CENTER
       A,B   - LENGTH OF AXIS OR SIDE A AND B
       PHI   - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE              X         Y        A         B       PHI      DENS
      1   - EL@D@D     0.00 ,    5.00
                     (   0.00),(   0.00)(  30.08),(  30.08)         (   6.65)
      1   - EL $@$@$     0.00 ,   27.00
                     (   0.00),(  -7.52)(   7.52),(   7.52)         (  35.91)
      1   - EL@$@,@$     1.57 ,   -4.00
                     (   7.52),(   0.00)(  10.53),(   7.52)         (  -5.32)
      1   - EL $@,@$     1.57 ,   -4.00
                     (  -7.52),(   0.00)(  10.53),(   7.52)         (  -5.32)
```




```
XMIN =   0.00E+00     XMAX =   0.43E+02     XSUM =   0.5656E+04
```



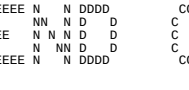
```
                -         =         +         )         1         Z
0.0000E+00 0.3192E+01 0.7874E+01 0.1000E+02 0.1149E+02 0.1319E+02 0.1490E+02

Z         X         A         M         0         0         0         0
0.1639E+02 0.1745E+02 0.1851E+02 0.2085E+02 0.2320E+02 0.2468E+02 0.2639E+02

0         0         0         8         8         8         8         8
0.2788E+02 0.3107E+02 0.3490E+02 0.3703E+02 0.3873E+02 0.4043E+02 0.4192E+02

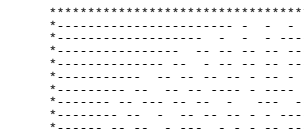
8
0.4256E+02
```

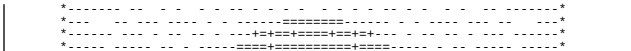
MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1541 FLOATING POINT WORDS.




```
RECONSTRUCTION FOR FAN BEAM GEOMETRY - CURVED DETECTOR USING LAKS CONVOLVER
TRANSMISSION DATA

XMIN =  -0.38E+01     XMAX =   0.43E+02     XSUM =   0.5627E+04
```





```
                -         =         +         )         1         Z
-.3790E+01 -.2851E+00 0.4855E+01 0.7191E+01 0.8827E+01 0.1070E+02 0.1257E+02

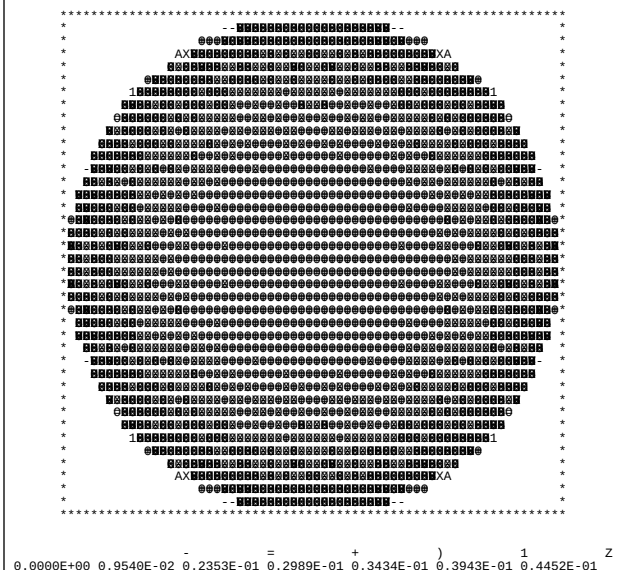
Z         X         A         M         0         0         0         0
0.1420E+02 0.1537E+02 0.1654E+02 0.1911E+02 0.2168E+02 0.2331E+02 0.2518E+02

0         0         0         8         8         8         8         8
0.2682E+02 0.3032E+02 0.3453E+02 0.3686E+02 0.3873E+02 0.4060E+02 0.4224E+02

8
0.4294E+02
```

ERRORS IN THE RECONSTRUCTED IMAGE

```
XMIN =   0.00E+00     XMAX =   0.13E+00     XSUM =   0.3477E+03
```

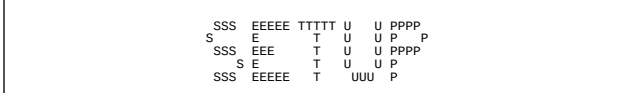


```
                -         =         +         )         1         Z
0.0000E+00 0.9540E-02 0.2353E-01 0.2989E-01 0.3434E-01 0.3943E-01 0.4452E-01

Z         X         A         M         0         0         0         0
0.4897E-01 0.5215E-01 0.5533E-01 0.6232E-01 0.6932E-01 0.7377E-01 0.7886E-01

0         0         0         8         8         8         8         8
0.8331E-01 0.9285E-01 0.1043E+00 0.1107E+00 0.1157E+00 0.1208E+00 0.1253E+00

8
0.1272E+00
```



INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0	RECONSTRUCT IN A CIRCULAR ARRAY
3	2	GEOMETRY FLAG FAN BEAM GEOMETRY (FLAT DETECTOR)
4	72	NUMBER OF PROJECTION ANGLES

```
 5         5      MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND 2*PI
                  STARTING AT ZERO
 6       100      NUMBER OF RAYS FOR EACH PROJECTION
 7         1      TRANSMISSION DATA
 8      2000      DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9         2      NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10         0      EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11        12      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
                  PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12         0      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE



         FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.330      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF
                  ROTATION
 2    50.500      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3   125.000      DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN
                  UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


A TOTAL OF  94 (  4 THRU  97) OF THE 100 USER PROJECTION BINS WILL BE USED


 94 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1541 FLOATING POINT WORDS.


           EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
           E     NN  N D   D       S     E       T   U   U P   P
           EEE   N N N D   D        SSS  EEE     T   U   U PPPP
           E     N  NN D   D           S E       T   U   U P
           EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P



                    CCC  OOOOO N   N V   V OOOOO
                   C   C O   O NN  N V   V O   O
                   C     O   O N N N  V V  O   O
                   C   C O   O N  NN  V V  O   O
                    CCC  OOOOO N   N   V   OOOOO



         PARAMETERS FOR SUBROUTINE CONVO

                  DESCRIPTION

IERR -       1    CALCULATE ERRORS


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      INTERPOLATION            NO                YES
CNV     CONVOLUTION              N/A                 NO                YES

THE VALUES FOR THE FILTER IN REAL SPACE (CONVOL(I),I=0, 93)
     0.785E+00  -0.318E+00   0.000E+00  -0.354E-01   0.000E+00
    -0.127E-01   0.000E+00  -0.650E-02   0.000E+00  -0.393E-02
     0.000E+00  -0.263E-02   0.000E+00  -0.188E-02   0.000E+00
    -0.141E-02   0.000E+00  -0.110E-02   0.000E+00  -0.882E-03
     0.000E+00  -0.722E-03   0.000E+00  -0.602E-03   0.000E+00
    -0.509E-03   0.000E+00  -0.437E-03   0.000E+00  -0.378E-03
     0.000E+00  -0.331E-03   0.000E+00  -0.292E-03   0.000E+00
    -0.260E-03   0.000E+00  -0.233E-03   0.000E+00  -0.209E-03
     0.000E+00  -0.189E-03   0.000E+00  -0.172E-03   0.000E+00
    -0.157E-03   0.000E+00  -0.144E-03   0.000E+00  -0.133E-03
     0.000E+00  -0.122E-03   0.000E+00  -0.113E-03   0.000E+00
    -0.105E-03   0.000E+00  -0.980E-04   0.000E+00  -0.914E-04
     0.000E+00  -0.855E-04   0.000E+00  -0.802E-04   0.000E+00
    -0.753E-04   0.000E+00  -0.709E-04   0.000E+00  -0.669E-04
     0.000E+00  -0.631E-04   0.000E+00  -0.597E-04   0.000E+00
    -0.566E-04   0.000E+00  -0.537E-04   0.000E+00  -0.510E-04
     0.000E+00  -0.485E-04   0.000E+00  -0.462E-04   0.000E+00
    -0.441E-04   0.000E+00  -0.421E-04   0.000E+00  -0.402E-04
     0.000E+00  -0.384E-04   0.000E+00  -0.368E-04

THE WEIGHTS USED FOR THE FAN BEAM CONVOLUTION (WEIGHT(I),I=1, 94)
     0.937E+00   0.940E+00   0.942E+00   0.944E+00   0.947E+00
     0.949E+00   0.951E+00   0.954E+00   0.956E+00   0.958E+00
     0.960E+00   0.962E+00   0.964E+00   0.966E+00   0.968E+00
     0.970E+00   0.971E+00   0.973E+00   0.975E+00   0.977E+00
     0.978E+00   0.980E+00   0.981E+00   0.983E+00   0.984E+00
     0.986E+00   0.987E+00   0.988E+00   0.989E+00   0.990E+00
     0.991E+00   0.992E+00   0.993E+00   0.994E+00   0.995E+00
     0.996E+00   0.996E+00   0.997E+00   0.998E+00   0.998E+00
     0.999E+00   0.999E+00   0.999E+00   0.100E+01   0.100E+01
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.100E+01   0.999E+00   0.999E+00   0.999E+00   0.998E+00
     0.998E+00   0.997E+00   0.996E+00   0.996E+00   0.995E+00
     0.994E+00   0.993E+00   0.992E+00   0.991E+00   0.990E+00
     0.989E+00   0.988E+00   0.987E+00   0.986E+00   0.984E+00
     0.983E+00   0.981E+00   0.980E+00   0.978E+00   0.977E+00
     0.975E+00   0.973E+00   0.971E+00   0.970E+00   0.968E+00
     0.966E+00   0.964E+00   0.962E+00   0.960E+00   0.958E+00
     0.956E+00   0.954E+00   0.951E+00   0.949E+00   0.947E+00
     0.944E+00   0.942E+00   0.940E+00   0.937E+00



                          PPPP  H   H  AAA  N   N
                          P   P H   H A   A NN  N
                          PPPP  HHHHH A   A N N N
                          P     H   H AAAAA N  NN
                          P     H   H A   A N   N



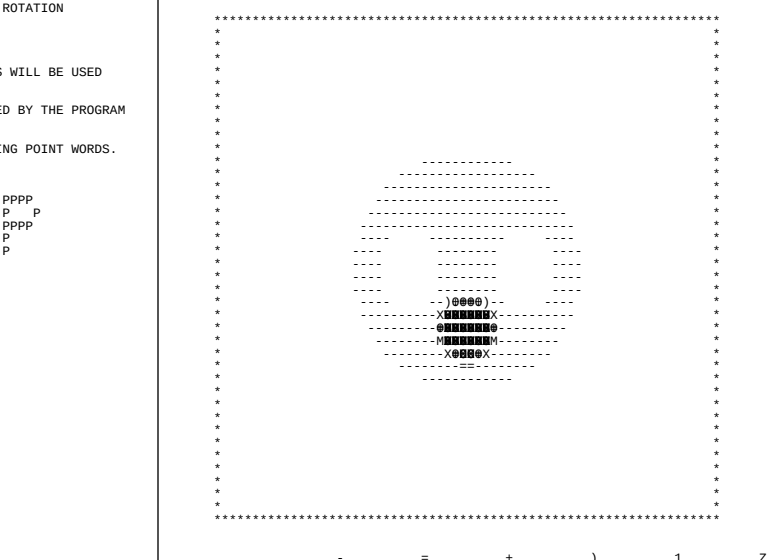
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE

   ITYPE                X         Y         A         B       PHI      DENS
     1   - EL@D@D     0.00 ,    5.00
                  (   0.00),(   0.00)(  30.08),(  30.08)         (   6.65)
     1   - EL $@$@$     0.00 ,   27.00
                  (   0.00),(  -7.52)(   7.52),(   7.52)         (  35.91)
     1   - EL@$@,@$     1.57 ,   -4.00
                  (   7.52),(   0.00)(  10.53),(   7.52)         (  -5.32)
     1   - EL $@,@$     1.57 ,   -4.00
                  (  -7.52),(   0.00)(  10.53),(   7.52)         (  -5.32)



           EEEEE N   N DDDD         PPPP  H   H  AAA  N   N
           E     NN  N D   D        P   P H   H A   A NN  N
           EEE   N N N D   D        PPPP  HHHHH A   A N N N
           E     N  NN D   D        P     H   H AAAAA N  NN
           EEEEE N   N DDDD         P     H   H A   A N   N


XMIN =   0.00E+00     XMAX =   0.43E+02     XSUM =   0.5656E+04
```



```
                        -         =         +         )         1         Z
0.0000E+00 0.3192E+01 0.7874E+01 0.1000E+02 0.1149E+02 0.1319E+02 0.1490E+02

Z         X         A         M         @         @         @         @
0.1639E+02 0.1745E+02 0.1851E+02 0.2085E+02 0.2320E+02 0.2468E+02 0.2639E+02

@         @         @         &         &         &         &         &
0.2788E+02 0.3107E+02 0.3490E+02 0.3703E+02 0.3873E+02 0.4043E+02 0.4192E+02

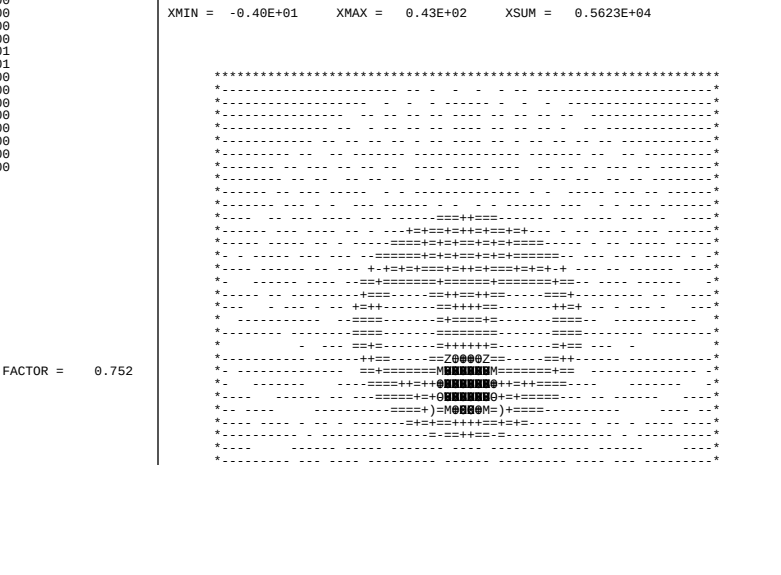
&
0.4256E+02
```

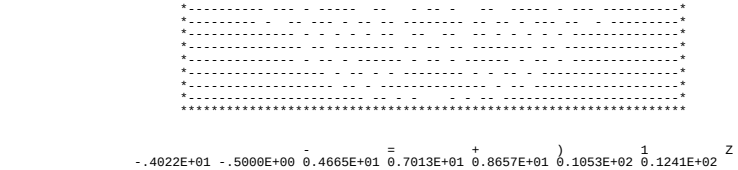
```
        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1541 FLOATING POINT WORDS.


           EEEEE N   N DDDD         CCC  OOOOO N   N V   V OOOOO
           E     NN  N D   D       C   C O   O NN  N V   V O   O
           EEE   N N N D   D       C     O   O N N N  V V  O   O
           E     N  NN D   D       C   C O   O N  NN   V V  O   O
           EEEEE N   N DDDD         CCC  OOOOO N   N    V   OOOOO


RECONSTRUCTION FOR FAN BEAM GEOMETRY - FLAT DETECTOR USING LAKS CONVOLVER
TRANSMISSION DATA

XMIN =  -0.40E+01     XMAX =   0.43E+02     XSUM =   0.5623E+04
```





```
                  -         =         +         )         1         Z
-.4022E+01 -.5000E+00 0.4665E+01 0.7013E+01 0.8657E+01 0.1053E+02 0.1241E+02

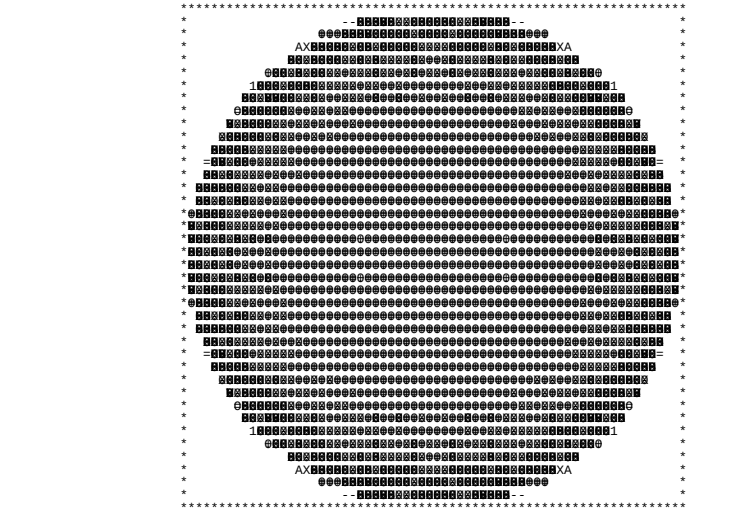
Z         X         A         M         0         0         0         0
0.1406E+02 0.1523E+02 0.1640E+02 0.1899E+02 0.2157E+02 0.2321E+02 0.2509E+02

0         0         0         8         8         8         8         8
0.2674E+02 0.3026E+02 0.3448E+02 0.3683E+02 0.3871E+02 0.4059E+02 0.4223E+02

8
0.4294E+02

ERRORS IN THE RECONSTRUCTED IMAGE

XMIN =   0.00E+00     XMAX =   0.14E+00     XSUM =   0.3575E+03
```



```
                  -         =         +         )         1         Z
0.0000E+00 0.1015E-01 0.2504E-01 0.3180E-01 0.3654E-01 0.4195E-01 0.4737E-01

Z         X         A         M         0         0         0         0
0.5210E-01 0.5549E-01 0.5887E-01 0.6631E-01 0.7376E-01 0.7849E-01 0.8391E-01

0         0         0         8         8         8         8         8
0.8865E-01 0.9880E-01 0.1110E+00 0.1177E+00 0.1232E+00 0.1286E+00 0.1333E+00

8
0.1353E+00
```

```
BBBB   CCC  OOOOO M   M
B   B C    C O   O MM MM
BBBB  C      O   O M M M
B   B C    C O   O M   M
BBBB   CCC  OOOOO M   M
```

```
***** THE LARGEST REQUIRED LENGTH OF BLANK COMMON THUS FAR IS   1541 *****
```

EX03

```
      PROGRAM XBKFIL
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 3
C
C              THE PROGRAM XBKFIL USES THE BACK-PROJECTION OF THE
C        FILTERED PROJECTION ALGORITHM TO RECONSTRUCT PARALLEL BEAM
C        PROJECTION DATA FOR VARIOUS TYPES OF FILTERS
C
      DIMENSION B(4096),AG(180)
      COMMON/TYPE/LTYPE
      COMMON/BLANK/WORK(2000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,HAN,HAM,PARZN,BUTER,RAMP
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=5
      KDIMU=100
      IMIT=1
      NWORK=2000
      NFLOAT=2
      ISTORE=0
      IPRINT=13
      LUNATN=0
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E03.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
      DO 20 LTYPE=1,5
          GO TO (10,12,14,16,18),LTYPE
C
   10     ORDERX=0.
          FREQX=.5
          CALL BKFIL (B,RAMP,BRF,ORDERX,FREQX)
          WRITE (LUNOUT,22)
          GO TO 20
C
   12     ORDERX=0.
          FREQX=.5
          CALL BKFIL (B,HAN,BRF,ORDERX,FREQX)
          WRITE (LUNOUT,24)
          GO TO 20
C
   14     ORDERX=0.
          FREQX=.5
          CALL BKFIL (B,HAM,BRF,ORDERX,FREQX)
          WRITE (LUNOUT,26)
          GO TO 20
C
   16     ORDERX=0.
          FREQX=.5
          CALL BKFIL (B,PARZN,BRF,ORDERX,FREQX)
          WRITE (LUNOUT,28)
          GO TO 20
C
   18     ORDERX=388.
          FREQX=.52
          CALL BKFIL (B,BUTER,BRF,ORDERX,FREQX)
          WRITE (LUNOUT,30)
C
   20     CALL ARRAY (B,NDIMU)
C
      CLOSE (LUNOUT)
C
C
C
   22 FORMAT(1X//' RECONSTRUCTION USING THE RAMP FILTER')
   24 FORMAT(1X//' RECONSTRUCTION USING THE HAN FILTER')
   26 FORMAT(1X//' RECONSTRUCTION USING THE HAM FILTER')
   28 FORMAT(1X//' RECONSTRUCTION USING THE PARZN FILTER')
   30 FORMAT(1X//' RECONSTRUCTION USING THE BUTER FILTER (ORDERX=388, ',
     1   'FREQX=.52)')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 3
C
C              THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A CHEST PHANTOM CONSISTING OF A HEART, LUNGS AND SURROUNDING
C        TISSUE.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION B(4096)
      DIMENSION AMAJ(5),AMIN(5),X1(5),Y1(5),PHI(5),Z(5),ITYPE(5)
      COMMON/TYPE/LTYPE
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DATA ITYPE/1,1,1,1,2/
      DATA AMAJ/40.,10.,14.,14.,6./
      DATA AMIN/40.,10.,10.,10.,6./
      DATA X1/0.,0.,10.,-10.,26./
      DATA Y1/0.,-10.,0.,0.,26./
      DATA PHI/0.,0.,1.57079633,1.57079633,0./
      DATA Z/5.,27.,-4.,-4.,32./
C
      IF (M.EQ.1.AND.LTYPE.EQ.1) THEN
C
          IF (IMIT.EQ.0) THEN
              PWIDTH=-PWID
          ELSE
              PWIDTH=PWID
          ENDIF
          CALL PHAN (5,10,ITYPE,Z,X1,Y1,AMAJ,AMIN,PHI,B,NDIMU,PWIDTH)
          CALL ARRAY (B,NDIMU)
C
      ENDIF
C
      CALL PHANL (5,ITYPE,Z,X1,Y1,AMAJ,AMIN,PHI,DATA,M)
C
      RETURN
      END
```

```
                         SSS  EEEEE TTTTT U   U PPPP
                        S     E       T   U   U P   P
                         SSS  EEE     T   U   U PPPP
                            S E       T   U   U P
                        SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1		RECONSTRUCT IN A SQUARE ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	5		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	1		TRANSMISSION DATA
8	2000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	13		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12	0		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED        72    (   110)


BLANK COMMON REQUIRED       144    (   220)


BLANK COMMON REQUIRED       216    (   330)


BLANK COMMON REQUIRED       416    (   640)


BLANK COMMON REQUIRED       480    (   740)


A TOTAL OF  92 (  5 THRU  96) OF THE 100 USER PROJECTION BINS WILL BE USED

 92 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=    480 FLOATING POINT WORDS.
```

```
            EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
            E     NN  N D   D       S     E       T   U   U P   P
            EEE   N N N D   D        SSS  EEE     T   U   U PPPP
            E     N  NN D   D           S E       T   U   U P
            EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
BBBB  K   K FFFFF  III  L
B   B K  K  F      I   L
BBBB  KKK   FFF    I   L
B   B K  K  F      I   L
BBBB  K   K F      III  LLLLL
```

PARAMETERS FOR SUBROUTINE BKFIL

DESCRIPTION

ORDERX - 0.0 FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX - 0.500 FREQUENCY PARAMETER FOR THE FILTER

BLANK COMMON REQUIRED 516 (1004)

BLANK COMMON REQUIRED 1126 (2146)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
FIL	FILTER	N/A	NO	N/A

BLANK COMMON REQUIRED 1382 (2546)

BLANK COMMON REQUIRED 1510 (2746)

THE VALUES FOR THE FREQUENCY SPACE FILTER (FILT(I),I=0,128) WITH A FREQUENCY
SPACING OF 1/256 =0.391E-02 CYCLES PER PROJECTION BIN ARE

0.000E+00	0.391E-02	0.781E-02	0.117E-01	0.156E-01
0.195E-01	0.234E-01	0.273E-01	0.312E-01	0.352E-01
0.391E-01	0.430E-01	0.469E-01	0.508E-01	0.547E-01
0.586E-01	0.625E-01	0.664E-01	0.703E-01	0.742E-01
0.781E-01	0.820E-01	0.859E-01	0.898E-01	0.938E-01
0.977E-01	0.102E+00	0.105E+00	0.109E+00	0.113E+00
0.117E+00	0.121E+00	0.125E+00	0.129E+00	0.133E+00
0.137E+00	0.141E+00	0.145E+00	0.148E+00	0.152E+00
0.156E+00	0.160E+00	0.164E+00	0.168E+00	0.172E+00
0.176E+00	0.180E+00	0.184E+00	0.188E+00	0.191E+00
0.195E+00	0.199E+00	0.203E+00	0.207E+00	0.211E+00
0.215E+00	0.219E+00	0.223E+00	0.227E+00	0.230E+00
0.234E+00	0.238E+00	0.242E+00	0.246E+00	0.250E+00
0.254E+00	0.258E+00	0.262E+00	0.266E+00	0.270E+00
0.273E+00	0.277E+00	0.281E+00	0.285E+00	0.289E+00
0.293E+00	0.297E+00	0.301E+00	0.305E+00	0.309E+00
0.312E+00	0.316E+00	0.320E+00	0.324E+00	0.328E+00
0.332E+00	0.336E+00	0.340E+00	0.344E+00	0.348E+00
0.352E+00	0.355E+00	0.359E+00	0.363E+00	0.367E+00
0.371E+00	0.375E+00	0.379E+00	0.383E+00	0.387E+00
0.391E+00	0.395E+00	0.398E+00	0.402E+00	0.406E+00
0.410E+00	0.414E+00	0.418E+00	0.422E+00	0.426E+00
0.430E+00	0.434E+00	0.438E+00	0.441E+00	0.445E+00
0.449E+00	0.453E+00	0.457E+00	0.461E+00	0.465E+00
0.469E+00	0.473E+00	0.477E+00	0.480E+00	0.484E+00
0.488E+00	0.492E+00	0.496E+00	0.500E+00	

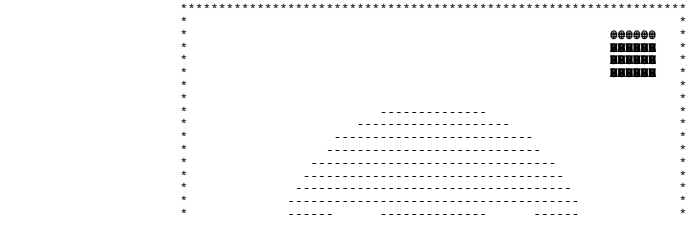
```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

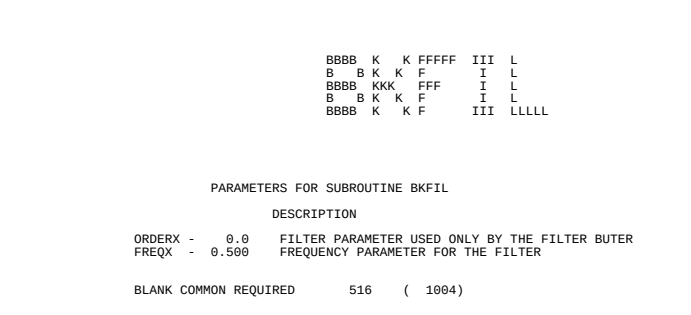
PHANTOM GENERATED
ARRAY SIZE 64 X 64 INTEGRATION FACTOR = 10 SCALING FACTOR = 1.000
NUMBER OF ELIPSES AND/OR RECTANGLES = 5
THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
X,Y - CENTER
A,B - LENGTH OF AXIS OR SIDE A AND B
PHI - ANGLE OF AXIS OR SIDE A
DENS - INTENSITY
THE PARENTHESIS INDICATES THE SCALED VALUE

ITYPE	X	Y	A	B	PHI	DENS
1 - ELLIPSE	0.00 ,	0.00	40.00 ,	40.00	0.00	5.00
	(0.00),(	0.00)(	40.00),(	40.00)		(5.00)
1 - ELLIPSE	0.00 ,	-10.00	10.00 ,	10.00	0.00	27.00
	(0.00),(	-10.00)(	10.00),(	10.00)		(27.00)
1 - ELLIPSE	10.00 ,	0.00	14.00 ,	10.00	1.57	-4.00
	(10.00),(	0.00)(	14.00),(	10.00)		(-4.00)
1 - ELLIPSE	-10.00 ,	0.00	14.00 ,	10.00	1.57	-4.00
	(-10.00),(	0.00)(	14.00),(	10.00)		(-4.00)
2 - RECTANGLE	26.00 ,	26.00	6.00 ,	6.00	0.00	32.00
	(26.00),(	26.00)(	6.00),(	6.00)		(32.00)

```
EEEEE N   N DDDD       PPPP  H   H  AAA  N   N
E     NN  N D   D      P   P H   H A   A NN  N
EEE   N N N D   D      PPPP  HHHHH A   A N N N
E     N  NN D   D      P     H   H AAAAA N  NN
EEEEE N   N DDDD       P     H   H A   A N   N
```

XMIN = 0.00E+00 XMAX = 0.32E+02 XSUM = 0.8678E+04





```
-          =          +          )          1          Z
0.0000E+00 0.2400E+01 0.5920E+01 0.7520E+01 0.8640E+01 0.9920E+01 0.1120E+02

Z          X          A          M          @          @          @          @
0.1232E+02 0.1312E+02 0.1392E+02 0.1568E+02 0.1744E+02 0.1856E+02 0.1984E+02

@          @          @          &          &          &          >          <
0.2096E+02 0.2336E+02 0.2624E+02 0.2784E+02 0.2912E+02 0.3040E+02 0.3152E+02

<
0.3200E+02
```

BLANK COMMON REQUIRED 1550 (3016)

BLANK COMMON REQUIRED 1510 (2746)

BLANK COMMON REQUIRED 1254 (2346)

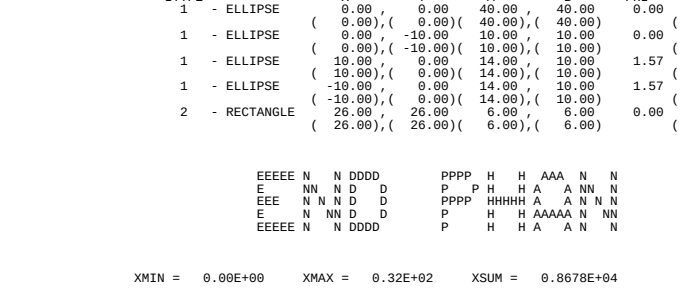
BLANK COMMON REQUIRED 1126 (2146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1550 FLOATING POINT WORDS.

```
EEEEE N   N DDDD       BBBB  K   K FFFFF  III  L
E     NN  N D   D      B   B K  K  F      I   L
EEE   N N N D   D      BBBB  KKK   FFF    I   L
E     N  NN D   D      B   B K  K  F      I   L
EEEEE N   N DDDD       BBBB  K   K F      III  LLLLL
```

RECONSTRUCTION USING THE RAMP FILTER

XMIN = -0.51E+01 XMAX = 0.33E+02 XSUM = 0.8401E+04



```
-          =          +          )          1          Z
-.5146E+01 -.2262E+01 0.1967E+01 0.3890E+01 0.5235E+01 0.6773E+01 0.8311E+01

Z          X          A          M          @          @          @          @
0.9657E+01 0.1062E+02 0.1158E+02 0.1369E+02 0.1581E+02 0.1715E+02 0.1869E+02

@          @          @          &          &          &          >          <
0.2004E+02 0.2292E+02 0.2638E+02 0.2830E+02 0.2984E+02 0.3138E+02 0.3273E+02

<
0.3330E+02
```

```
BBBB  K   K FFFFF  III  L
B   B K  K  F      I   L
BBBB  KKK   FFF    I   L
```

```
B   B K  K  F       I   L
BBBB  K   K F      III  LLLLL
```

PARAMETERS FOR SUBROUTINE BKFIL

DESCRIPTION

```
ORDERX -    0.0    FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX  -  0.500    FREQUENCY PARAMETER FOR THE FILTER
```

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
FIL	FILTER	N/A	NO	N/A

BLANK COMMON REQUIRED 1382 (2546)

BLANK COMMON REQUIRED 1510 (2746)

THE VALUES FOR THE FREQUENCY SPACE FILTER (FILT(I),I=0,128) WITH A FREQUENCY SPACING OF 1/256 =0.391E-02 CYCLES PER PROJECTION BIN ARE

0.000E+00	0.391E-02	0.781E-02	0.117E-01	0.156E-01
0.195E-01	0.233E-01	0.271E-01	0.309E-01	0.347E-01
0.385E-01	0.422E-01	0.459E-01	0.495E-01	0.531E-01
0.566E-01	0.601E-01	0.636E-01	0.669E-01	0.703E-01
0.735E-01	0.767E-01	0.798E-01	0.829E-01	0.859E-01
0.887E-01	0.916E-01	0.943E-01	0.970E-01	0.995E-01
0.102E+00	0.104E+00	0.107E+00	0.109E+00	0.111E+00
0.113E+00	0.115E+00	0.117E+00	0.118E+00	0.120E+00
0.122E+00	0.123E+00	0.124E+00	0.125E+00	0.126E+00
0.127E+00	0.128E+00	0.129E+00	0.130E+00	0.130E+00
0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
0.131E+00	0.131E+00	0.130E+00	0.130E+00	0.129E+00
0.129E+00	0.128E+00	0.127E+00	0.126E+00	0.125E+00
0.124E+00	0.123E+00	0.121E+00	0.120E+00	0.118E+00
0.117E+00	0.115E+00	0.113E+00	0.111E+00	0.109E+00
0.107E+00	0.105E+00	0.103E+00	0.101E+00	0.988E-01
0.965E-01	0.941E-01	0.917E-01	0.892E-01	0.867E-01
0.842E-01	0.816E-01	0.790E-01	0.764E-01	0.737E-01
0.711E-01	0.684E-01	0.657E-01	0.630E-01	0.603E-01
0.576E-01	0.549E-01	0.522E-01	0.496E-01	0.469E-01
0.443E-01	0.418E-01	0.392E-01	0.367E-01	0.342E-01
0.318E-01	0.295E-01	0.271E-01	0.249E-01	0.227E-01
0.206E-01	0.186E-01	0.167E-01	0.148E-01	0.130E-01
0.113E-01	0.976E-02	0.828E-02	0.691E-02	0.565E-02
0.450E-02	0.348E-02	0.258E-02	0.181E-02	0.117E-02
0.662E-03	0.296E-03	0.747E-04	0.944E-15	

BLANK COMMON REQUIRED 1550 (3016)

BLANK COMMON REQUIRED 1510 (2746)

BLANK COMMON REQUIRED 1254 (2346)

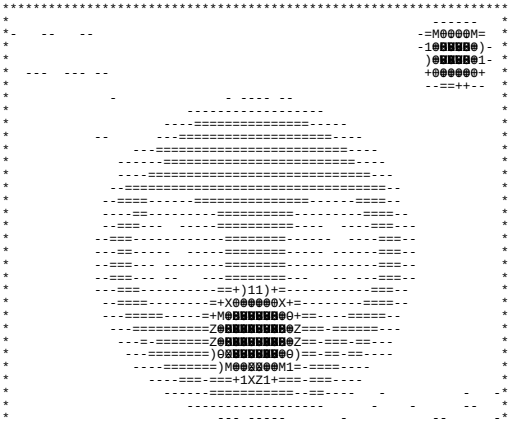
BLANK COMMON REQUIRED 1126 (2146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1550 FLOATING POINT WORDS.

```
EEEEE N   N DDDD        BBBB  K   K FFFFF  III  L
E     NN  N D   D       B   B K  K  F       I   L
EEE   N N N D   D       BBBB  KKK   FFF     I   L
E     N  NN D   D       B   B K  K  F       I   L
EEEEE N   N DDDD        BBBB  K   K F      III  LLLLL
```

RECONSTRUCTION USING THE HAN FILTER

XMIN = -0.17E+01 XMAX = 0.32E+02 XSUM = 0.8402E+04



```
-          =          +          )          1          Z
-.1747E+01 0.8163E+00 0.4576E+01 0.6284E+01 0.7480E+01 0.8847E+01 0.1021E+02
```

```
Z          X          A          M          0          0          0          0
0.1141E+02 0.1226E+02 0.1312E+02 0.1500E+02 0.1688E+02 0.1807E+02 0.1944E+02

0          0          0          0          0          0          0          0
0.2064E+02 0.2320E+02 0.2628E+02 0.2799E+02 0.2935E+02 0.3072E+02 0.3192E+02

0
0.3243E+02
```

```
BBBB  K   K FFFFF  III  L
B   B K  K  F       I   L
BBBB  KKK   FFF     I   L
B   B K  K  F       I   L
BBBB  K   K F      III  LLLLL
```

PARAMETERS FOR SUBROUTINE BKFIL

DESCRIPTION

```
ORDERX -    0.0    FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX  -  0.500    FREQUENCY PARAMETER FOR THE FILTER
```

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
FIL	FILTER	N/A	NO	N/A

BLANK COMMON REQUIRED 1382 (2546)

BLANK COMMON REQUIRED 1510 (2746)

THE VALUES FOR THE FREQUENCY SPACE FILTER (FILT(I),I=0,128) WITH A FREQUENCY SPACING OF 1/256 =0.391E-02 CYCLES PER PROJECTION BIN ARE

0.000E+00	0.391E-02	0.781E-02	0.117E-01	0.156E-01
0.195E-01	0.233E-01	0.272E-01	0.310E-01	0.348E-01
0.385E-01	0.423E-01	0.459E-01	0.496E-01	0.532E-01
0.568E-01	0.603E-01	0.638E-01	0.672E-01	0.706E-01
0.739E-01	0.771E-01	0.803E-01	0.834E-01	0.865E-01
0.895E-01	0.924E-01	0.952E-01	0.980E-01	0.101E+00
0.103E+00	0.106E+00	0.108E+00	0.110E+00	0.113E+00
0.115E+00	0.117E+00	0.119E+00	0.121E+00	0.123E+00
0.124E+00	0.126E+00	0.127E+00	0.129E+00	0.130E+00
0.131E+00	0.132E+00	0.133E+00	0.134E+00	0.135E+00
0.136E+00	0.136E+00	0.137E+00	0.137E+00	0.137E+00
0.138E+00	0.138E+00	0.138E+00	0.138E+00	0.137E+00
0.137E+00	0.137E+00	0.136E+00	0.136E+00	0.135E+00
0.134E+00	0.133E+00	0.132E+00	0.131E+00	0.130E+00
0.129E+00	0.128E+00	0.127E+00	0.125E+00	0.124E+00
0.122E+00	0.121E+00	0.119E+00	0.117E+00	0.116E+00
0.114E+00	0.112E+00	0.110E+00	0.108E+00	0.106E+00
0.104E+00	0.102E+00	0.999E-01	0.978E-01	0.957E-01
0.935E-01	0.914E-01	0.892E-01	0.870E-01	0.849E-01
0.827E-01	0.805E-01	0.784E-01	0.762E-01	0.741E-01
0.720E-01	0.700E-01	0.679E-01	0.659E-01	0.640E-01
0.621E-01	0.602E-01	0.584E-01	0.567E-01	0.550E-01
0.534E-01	0.518E-01	0.503E-01	0.489E-01	0.476E-01
0.464E-01	0.452E-01	0.442E-01	0.432E-01	0.424E-01
0.416E-01	0.410E-01	0.405E-01	0.401E-01	0.398E-01
0.397E-01	0.396E-01	0.398E-01	0.400E-01	

BLANK COMMON REQUIRED 1550 (3016)

BLANK COMMON REQUIRED 1510 (2746)

BLANK COMMON REQUIRED 1254 (2346)

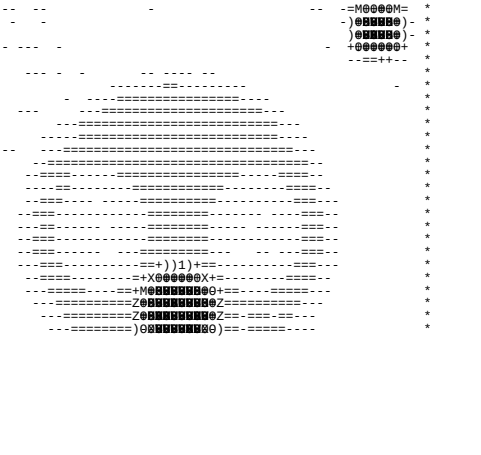
BLANK COMMON REQUIRED 1126 (2146)

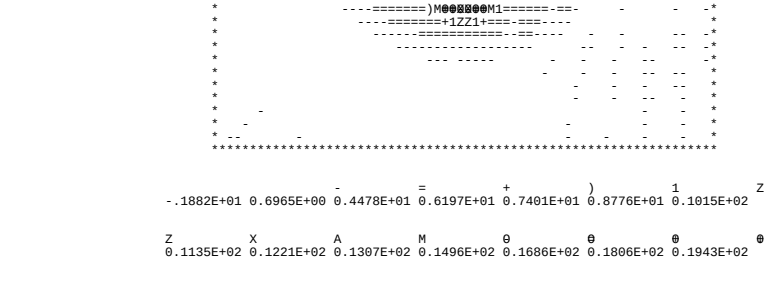
MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1550 FLOATING POINT WORDS.

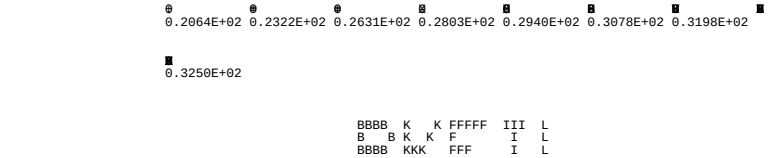
```
EEEEE N   N DDDD        BBBB  K   K FFFFF  III  L
E     NN  N D   D       B   B K  K  F       I   L
EEE   N N N D   D       BBBB  KKK   FFF     I   L
E     N  NN D   D       B   B K  K  F       I   L
EEEEE N   N DDDD        BBBB  K   K F      III  LLLLL
```

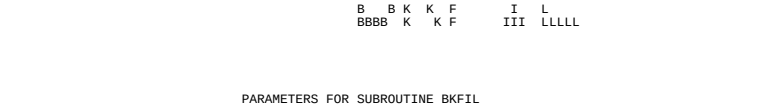
RECONSTRUCTION USING THE HAM FILTER

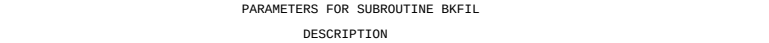
XMIN = -0.19E+01 XMAX = 0.32E+02 XSUM = 0.8402E+04











PARAMETERS FOR SUBROUTINE BKFIL

DESCRIPTION

ORDERX - 0.0 FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX - 0.500 FREQUENCY PARAMETER FOR THE FILTER

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
FIL	FILTER	N/A	NO	N/A

BLANK COMMON REQUIRED 1382 (2546)

BLANK COMMON REQUIRED 1510 (2746)

THE VALUES FOR THE FREQUENCY SPACE FILTER (FILT(I),I=0,128) WITH A FREQUENCY
SPACING OF 1/256 =0.391E-02 CYCLES PER PROJECTION BIN ARE

0.000E+00	0.390E-02	0.780E-02	0.117E-01	0.155E-01
0.194E-01	0.231E-01	0.269E-01	0.306E-01	0.342E-01
0.377E-01	0.412E-01	0.446E-01	0.480E-01	0.512E-01
0.543E-01	0.574E-01	0.603E-01	0.631E-01	0.659E-01
0.685E-01	0.710E-01	0.733E-01	0.756E-01	0.777E-01
0.797E-01	0.815E-01	0.833E-01	0.848E-01	0.863E-01
0.876E-01	0.888E-01	0.898E-01	0.908E-01	0.915E-01
0.922E-01	0.927E-01	0.930E-01	0.932E-01	0.933E-01
0.933E-01	0.931E-01	0.929E-01	0.924E-01	0.919E-01
0.913E-01	0.905E-01	0.896E-01	0.886E-01	0.875E-01
0.863E-01	0.851E-01	0.837E-01	0.822E-01	0.807E-01
0.791E-01	0.774E-01	0.757E-01	0.739E-01	0.721E-01
0.702E-01	0.683E-01	0.664E-01	0.645E-01	0.625E-01
0.605E-01	0.586E-01	0.567E-01	0.547E-01	0.528E-01
0.509E-01	0.490E-01	0.471E-01	0.452E-01	0.434E-01
0.416E-01	0.398E-01	0.381E-01	0.363E-01	0.346E-01
0.330E-01	0.313E-01	0.297E-01	0.282E-01	0.267E-01
0.252E-01	0.237E-01	0.223E-01	0.210E-01	0.197E-01
0.184E-01	0.172E-01	0.160E-01	0.149E-01	0.138E-01
0.127E-01	0.117E-01	0.108E-01	0.986E-02	0.899E-02
0.818E-02	0.741E-02	0.668E-02	0.600E-02	0.536E-02
0.476E-02	0.420E-02	0.369E-02	0.322E-02	0.279E-02
0.239E-02	0.203E-02	0.171E-02	0.142E-02	0.117E-02
0.941E-03	0.747E-03	0.580E-03	0.440E-03	0.323E-03
0.229E-03	0.155E-03	0.982E-04	0.573E-04	0.296E-04
0.126E-04	0.376E-05	0.473E-06	0.000E+00	

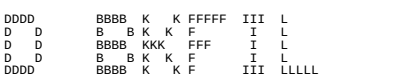
BLANK COMMON REQUIRED 1550 (3016)

BLANK COMMON REQUIRED 1510 (2746)

BLANK COMMON REQUIRED 1254 (2346)

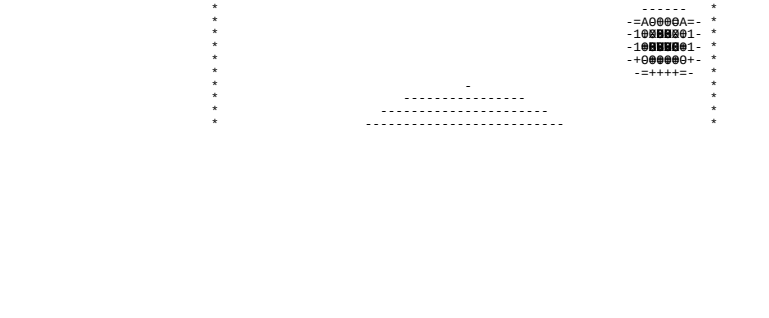
BLANK COMMON REQUIRED 1126 (2146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1550 FLOATING POINT WORDS.



RECONSTRUCTION USING THE PARZN FILTER

XMIN = -0.94E+00 XMAX = 0.32E+02 XSUM = 0.8397E+04



PARAMETERS FOR SUBROUTINE BKFIL

DESCRIPTION

ORDERX - 388.0 FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX - 0.520 FREQUENCY PARAMETER FOR THE FILTER

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
FIL	FILTER	N/A	NO	N/A

BLANK COMMON REQUIRED 1382 (2546)

BLANK COMMON REQUIRED 1510 (2746)

THE VALUES FOR THE FREQUENCY SPACE FILTER (FILT(I),I=0,128) WITH A FREQUENCY
SPACING OF 1/256 =0.391E-02 CYCLES PER PROJECTION BIN ARE

0.000E+00	0.391E-02	0.781E-02	0.117E-01	0.156E-01
0.195E-01	0.234E-01	0.273E-01	0.312E-01	0.352E-01
0.391E-01	0.430E-01	0.469E-01	0.508E-01	0.547E-01
0.586E-01	0.625E-01	0.664E-01	0.703E-01	0.742E-01
0.781E-01	0.820E-01	0.859E-01	0.898E-01	0.938E-01
0.977E-01	0.102E+00	0.105E+00	0.109E+00	0.113E+00
0.117E+00	0.121E+00	0.125E+00	0.129E+00	0.133E+00
0.137E+00	0.141E+00	0.145E+00	0.148E+00	0.152E+00
0.156E+00	0.160E+00	0.164E+00	0.168E+00	0.172E+00
0.176E+00	0.180E+00	0.184E+00	0.188E+00	0.191E+00
0.195E+00	0.199E+00	0.203E+00	0.207E+00	0.211E+00
0.215E+00	0.219E+00	0.223E+00	0.227E+00	0.230E+00
0.234E+00	0.238E+00	0.242E+00	0.246E+00	0.250E+00
0.254E+00	0.258E+00	0.262E+00	0.266E+00	0.270E+00
0.273E+00	0.277E+00	0.281E+00	0.285E+00	0.289E+00
0.293E+00	0.297E+00	0.301E+00	0.305E+00	0.309E+00
0.312E+00	0.316E+00	0.320E+00	0.324E+00	0.328E+00
0.332E+00	0.336E+00	0.340E+00	0.344E+00	0.348E+00
0.352E+00	0.355E+00	0.359E+00	0.363E+00	0.367E+00
0.371E+00	0.375E+00	0.379E+00	0.383E+00	0.387E+00
0.391E+00	0.395E+00	0.398E+00	0.402E+00	0.406E+00
0.410E+00	0.414E+00	0.418E+00	0.422E+00	0.426E+00
0.430E+00	0.434E+00	0.438E+00	0.441E+00	0.445E+00
0.449E+00	0.453E+00	0.457E+00	0.461E+00	0.465E+00
0.469E+00	0.473E+00	0.477E+00	0.480E+00	0.484E+00
0.488E+00	0.492E+00	0.496E+00	0.500E+00	

BLANK COMMON REQUIRED 1550 (3016)

BLANK COMMON REQUIRED 1510 (2746)

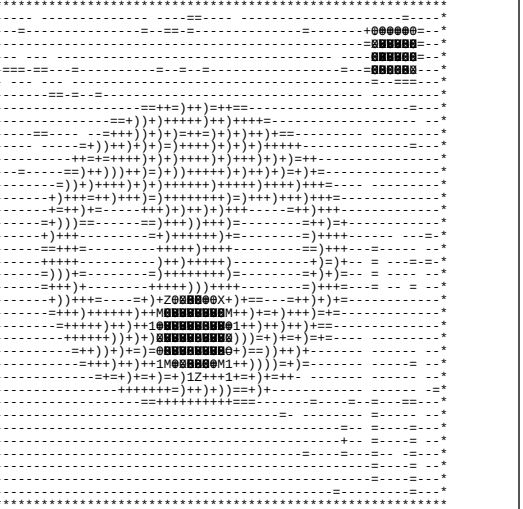
BLANK COMMON REQUIRED 1254 (2346)

BLANK COMMON REQUIRED 1126 (2146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 1550 FLOATING POINT WORDS.

RECONSTRUCTION USING THE BUTER FILTER (ORDERX=388, FREQX=.52)

```
XMIN =  -0.51E+01     XMAX =   0.33E+02     XSUM =   0.8401E+04
```



```
                -         =         +         )         1         Z
-.5146E+01 -.2262E+01 0.1967E+01 0.3890E+01 0.5235E+01 0.6773E+01 0.8311E+01

Z         X         A         M         Θ         Θ         Θ         Θ
0.9657E+01 0.1062E+02 0.1158E+02 0.1369E+02 0.1581E+02 0.1715E+02 0.1869E+02

Θ         Θ         Θ         Θ         Θ         Θ         Θ         Θ
0.2004E+02 0.2292E+02 0.2638E+02 0.2830E+02 0.2984E+02 0.3138E+02 0.3273E+02

Θ
0.3330E+02
```

EX04

```
      PROGRAM XFILBK
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ****************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ****************************************************************
C
C        EXAMPLE 4
C
C             THE PROGRAM XFILBK USES THE FILTER OF THE BACK-PROJECTION
C        ALGORITHM TO RECONSTRUCT PROJECTION DATA FOR PARALLEL BEAM,
C        FAN BEAM - CURVED DETECTOR, AND FAN BEAM - FLAT DETECTOR
C        GEOMETRIES.
C
      DIMENSION B(4096),AG(180)
      COMMON/BLANK/WORK(18500)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,BRFF2,HAN
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=5
      KDIMU=129
      IMIT=1
      NWORK=18500
      NFLOAT=2
      ISTORE=0
      IPRINT=13
      LUNATN=0
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E04.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR PARALLEL BEAM
C          GEOMETRY
C
      ORDERX=0.
      FREQX=.5
C
      CALL FILBK (B,HAN,BRF,ORDERX,FREQX)
C
      WRITE (LUNOUT,26)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,22)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,24) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      IGEOM=1
      IPRINT=5
      PWID=1.33
      RFAN=125.
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR FAN BEAM GEOMETRY
C          WITH CURVED DETECTOR
C
      ORDERX=0.
      FREQX=.5
C
      CALL FILBK (B,HAN,BRFF2,ORDERX,FREQX)
C
      WRITE (LUNOUT,28)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,22)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,24) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      IGEOM=2
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR FAN BEAM GEOMETRY
C          WITH FLAT DETECTOR
C
      ORDERX=0.
      FREQX=.5
C
      CALL FILBK (B,HAN,BRFF2,ORDERX,FREQX)
C
      WRITE (LUNOUT,30)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      KK1=1
      KU=NDIMU/15+1
      DO 20 K=1,KU
          WRITE (LUNOUT,22)
          KK2=MIN(15*K,NDIMU)
          DO 18 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   18         WRITE (LUNOUT,24) (B(I),I=ISUB1,ISUB2)
   20     KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   22 FORMAT(1X///////)
   24 FORMAT(1X,15F5.1)
   26 FORMAT(1X//' RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY')
   28 FORMAT(1X//' RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH CURVED DE',
     1    'TECTOR')
   30 FORMAT(1X//' RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH FLAT DETE',
     1    'CTOR')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ****************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ****************************************************************
C
C        EXAMPLE 4
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A CHEST PHANTOM CONSISTING OF A HEART, LUNGS AND SURROUNDING
C        TISSUE.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION B(4096)
      DIMENSION AMAJ(4),AMIN(4),X1(4),Y1(4),PHI(4),Z(4),ITYPE(4)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DATA ITYPE/1,1,1,1/
      DATA AMAJ/40.,10.,14.,14./
      DATA AMIN/40.,10.,10.,10./
      DATA X1/0.,0.,10.,-10./
      DATA Y1/0.,-10.,0.,0./
      DATA PHI/0.,0.,1.57079633,1.57079633/
      DATA Z/5.,27.,-4.,-4./
C
      IF (M.EQ.1) THEN
          IF (IMIT.EQ.0) THEN
              PWIDTH=-PWID
          ELSE
              PWIDTH=PWID
          ENDIF
          CALL PHAN (4,10,ITYPE,Z,X1,Y1,AMAJ,AMIN,PHI,B,NDIMU,PWIDTH)
          CALL ARRAY (B,NDIMU)
C
C        PRINTOUT OF THE VALUES FOR THE PHANTOM
C
          NMAT=NDIMU**2
          KK1=1
          KU=NDIMU/15+1
          DO 12 K=1,KU
              WRITE (LUNOUT,16)
              KK2=MIN(15*K,NDIMU)
              DO 10 J=1,NDIMU
                  ISUB1=NMAT-J*NDIMU+KK1
                  ISUB2=NMAT-J*NDIMU+KK2
   10             WRITE (LUNOUT,18) (B(I),I=ISUB1,ISUB2)
   12         KK1=KK2+1
C
      ENDIF
C
      CALL PHANL (4,ITYPE,Z,X1,Y1,AMAJ,AMIN,PHI,DATA,M)
C
      RETURN
C
C
C
   16 FORMAT(1X///////)
   18 FORMAT(1X,15F5.1)
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	0	GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	129	NUMBER OF RAYS FOR EACH PROJECTION
7	1	TRANSMISSION DATA
8	18500	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	13	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS PRINT FILTER FUNCTION FOR CONVOLUTION AND FILTER ROUTINES
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 144 (220)

BLANK COMMON REQUIRED 216 (330)

BLANK COMMON REQUIRED 474 (732)

BLANK COMMON REQUIRED 538 (1032)

A TOTAL OF 92 (5 THRU 96) OF THE 129 USER PROJECTION BINS WILL BE USED

92 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 538 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


FFFFF  III  L     BBBB  K   K
F       I   L     B   B K  K
FFF     I   L     BBBB  KKK
F       I   L     B   B K  K
F      III  LLLLL BBBB  K   K
```

PARAMETERS FOR SUBROUTINE FILBK

DESCRIPTION

ORDERX - 0.0 FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX - 0.500 FREQUENCY PARAMETER FOR THE FILTER

BLANK COMMON REQUIRED 574 (1076)

BLANK COMMON REQUIRED 1184 (2240)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
FIL	FILTER	N/A	NO	N/A

FILTERED BACK-PROJECTION RECONSTRUCTIONS MUST BE EXECUTED IN AN ARRAY WITH DIMENSIONS AT LEAST TWICE AS LARGE AS THE FINAL IMAGE. THUS, THE EFFECTIVE SIZE OF THE RECONSTRUCTION ARRAY WILL NOW BE INCREASED.

BLANK COMMON REQUIRED 1248 (2340)

A TOTAL OF 129 (1 THRU 129) OF THE 129 USER PROJECTION BINS WILL BE USED

182 PROJECTION BINS WILL BE USED OF WHICH 53 HAVE BEEN ZEROED BY THE PROGRAM

BLANK COMMON REQUIRED 17632 (42340)

BLANK COMMON REQUIRED 17814 (42626)

THE VALUES FOR THE FREQUENCY SPACE FILTER (FILT(I,J),I=0,J , J=0, 64) WITH A FREQUENCY SPACING OF 1/128 =0.781E-02 CYCLES PER PIXEL ARE

J= 0	0.000E+00				
J= 1	0.781E-02	0.110E-01			
J= 2	0.156E-01	0.174E-01	0.220E-01		
J= 3	0.233E-01	0.246E-01	0.279E-01	0.328E-01	
J= 4	0.309E-01	0.319E-01	0.345E-01	0.385E-01	0.433E-01
J= 5	0.385E-01	0.392E-01	0.413E-01	0.446E-01	0.488E-01
	0.536E-01				
J= 6	0.459E-01	0.465E-01	0.482E-01	0.510E-01	0.546E-01
	0.588E-01	0.635E-01			
J= 7	0.531E-01	0.536E-01	0.551E-01	0.574E-01	0.606E-01
	0.643E-01	0.684E-01	0.729E-01		
J= 8	0.601E-01	0.606E-01	0.618E-01	0.639E-01	0.666E-01
	0.698E-01	0.735E-01	0.775E-01	0.817E-01	
J= 9	0.669E-01	0.673E-01	0.684E-01	0.702E-01	0.725E-01
	0.754E-01	0.787E-01	0.823E-01	0.861E-01	0.900E-01
J= 10	0.735E-01	0.738E-01	0.748E-01	0.763E-01	0.784E-01
	0.809E-01	0.838E-01	0.871E-01	0.905E-01	0.941E-01
	0.977E-01				
J= 11	0.798E-01	0.801E-01	0.809E-01	0.823E-01	0.841E-01
	0.863E-01	0.889E-01	0.918E-01	0.949E-01	0.981E-01
	0.101E+00	0.105E+00			
J= 12	0.859E-01	0.861E-01	0.868E-01	0.880E-01	0.896E-01
	0.916E-01	0.939E-01	0.964E-01	0.991E-01	0.102E+00
	0.105E+00	0.108E+00	0.111E+00		
J= 13	0.916E-01	0.918E-01	0.924E-01	0.934E-01	0.949E-01
	0.966E-01	0.986E-01	0.101E+00	0.103E+00	0.106E+00
	0.108E+00	0.111E+00	0.114E+00	0.116E+00	
J= 14	0.970E-01	0.971E-01	0.977E-01	0.986E-01	0.998E-01
	0.101E+00	0.103E+00	0.105E+00	0.107E+00	0.110E+00
	0.112E+00	0.114E+00	0.117E+00	0.119E+00	0.121E+00
J= 15	0.102E+00	0.102E+00	0.103E+00	0.103E+00	0.105E+00
	0.106E+00	0.107E+00	0.109E+00	0.111E+00	0.113E+00
	0.115E+00	0.117E+00	0.119E+00	0.121E+00	0.123E+00
	0.125E+00				
J= 16	0.107E+00	0.107E+00	0.107E+00	0.108E+00	0.109E+00
	0.110E+00	0.111E+00	0.113E+00	0.115E+00	0.116E+00
	0.118E+00	0.120E+00	0.122E+00	0.123E+00	0.125E+00
	0.126E+00	0.128E+00			
J= 17	0.111E+00	0.111E+00	0.111E+00	0.112E+00	0.113E+00
	0.114E+00	0.115E+00	0.116E+00	0.118E+00	0.119E+00
	0.121E+00	0.122E+00	0.124E+00	0.125E+00	0.126E+00
	0.128E+00	0.129E+00	0.130E+00		
J= 18	0.115E+00	0.115E+00	0.115E+00	0.116E+00	0.117E+00
	0.117E+00	0.118E+00	0.119E+00	0.121E+00	0.122E+00
	0.123E+00	0.124E+00	0.126E+00	0.127E+00	0.128E+00
	0.129E+00	0.130E+00	0.130E+00	0.131E+00	
J= 19	0.118E+00	0.119E+00	0.119E+00	0.119E+00	0.120E+00
	0.120E+00	0.121E+00	0.122E+00	0.123E+00	0.124E+00
	0.125E+00	0.126E+00	0.127E+00	0.128E+00	0.129E+00
	0.130E+00	0.130E+00	0.131E+00	0.131E+00	0.131E+00
J= 20	0.122E+00	0.122E+00	0.122E+00	0.122E+00	0.123E+00
	0.123E+00	0.124E+00	0.125E+00	0.125E+00	0.126E+00
	0.127E+00	0.128E+00	0.129E+00	0.129E+00	0.130E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00				
J= 21	0.124E+00	0.124E+00	0.124E+00	0.125E+00	0.125E+00
	0.126E+00	0.126E+00	0.127E+00	0.127E+00	0.128E+00
	0.129E+00	0.129E+00	0.130E+00	0.130E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.130E+00	0.129E+00			
J= 22	0.126E+00	0.126E+00	0.127E+00	0.127E+00	0.127E+00
	0.128E+00	0.128E+00	0.128E+00	0.129E+00	0.129E+00
	0.130E+00	0.130E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.130E+00	0.130E+00
	0.129E+00	0.128E+00	0.127E+00		
J= 23	0.128E+00	0.128E+00	0.128E+00	0.129E+00	0.129E+00
	0.129E+00	0.129E+00	0.130E+00	0.130E+00	0.130E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.130E+00	0.130E+00	0.129E+00
	0.128E+00	0.127E+00	0.125E+00	0.124E+00	
J= 24	0.130E+00	0.130E+00	0.130E+00	0.130E+00	0.130E+00
	0.130E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.130E+00	0.129E+00	0.129E+00	0.128E+00
	0.127E+00	0.125E+00	0.124E+00	0.122E+00	0.120E+00
J= 25	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.130E+00
	0.130E+00	0.129E+00	0.128E+00	0.127E+00	0.126E+00
	0.125E+00	0.123E+00	0.122E+00	0.120E+00	0.118E+00
	0.115E+00				
J= 26	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.130E+00	0.130E+00	0.129E+00
	0.129E+00	0.128E+00	0.127E+00	0.126E+00	0.125E+00
	0.123E+00	0.121E+00	0.120E+00	0.118E+00	0.115E+00
	0.113E+00	0.110E+00			
J= 27	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.130E+00
	0.130E+00	0.130E+00	0.129E+00	0.129E+00	0.128E+00
	0.127E+00	0.126E+00	0.125E+00	0.124E+00	0.123E+00
	0.121E+00	0.119E+00	0.117E+00	0.115E+00	0.113E+00
	0.110E+00	0.107E+00	0.105E+00		
J= 28	0.131E+00	0.131E+00	0.131E+00	0.131E+00	0.131E+00
	0.130E+00	0.130E+00	0.130E+00	0.130E+00	0.129E+00
	0.129E+00	0.129E+00	0.128E+00	0.127E+00	0.126E+00
	0.126E+00	0.124E+00	0.123E+00	0.122E+00	0.120E+00
	0.119E+00	0.117E+00	0.115E+00	0.112E+00	0.110E+00
	0.107E+00	0.104E+00	0.101E+00	0.983E-01	
J= 29	0.130E+00	0.130E+00	0.130E+00	0.130E+00	0.130E+00
	0.129E+00	0.129E+00	0.129E+00	0.129E+00	0.128E+00
	0.128E+00	0.127E+00	0.126E+00	0.125E+00	0.125E+00
	0.123E+00	0.122E+00	0.121E+00	0.119E+00	0.118E+00
	0.116E+00	0.114E+00	0.112E+00	0.109E+00	0.107E+00
	0.104E+00	0.101E+00	0.982E-01	0.950E-01	0.916E-01
J= 30	0.129E+00	0.129E+00	0.129E+00	0.128E+00	0.128E+00
	0.128E+00	0.128E+00	0.127E+00	0.127E+00	0.126E+00
	0.126E+00	0.125E+00	0.124E+00	0.123E+00	0.122E+00
	0.121E+00	0.120E+00	0.118E+00	0.117E+00	0.115E+00
	0.113E+00	0.111E+00	0.109E+00	0.106E+00	0.104E+00
	0.101E+00	0.979E-01	0.948E-01	0.915E-01	0.881E-01
	0.846E-01				
J= 31	0.127E+00	0.127E+00	0.127E+00	0.127E+00	0.127E+00
	0.126E+00	0.126E+00	0.125E+00	0.125E+00	0.124E+00
	0.124E+00	0.123E+00	0.122E+00	0.121E+00	0.120E+00
	0.118E+00	0.117E+00	0.115E+00	0.114E+00	0.112E+00
	0.110E+00	0.108E+00	0.105E+00	0.103E+00	0.100E+00
	0.973E-01	0.943E-01	0.911E-01	0.879E-01	0.844E-01
	0.809E-01	0.772E-01			
J= 32	0.125E+00	0.125E+00	0.125E+00	0.125E+00	0.124E+00
	0.124E+00	0.124E+00	0.123E+00	0.123E+00	0.122E+00
	0.121E+00	0.120E+00	0.119E+00	0.118E+00	0.117E+00
	0.116E+00	0.114E+00	0.112E+00	0.111E+00	0.109E+00
	0.106E+00	0.104E+00	0.102E+00	0.992E-01	0.965E-01
	0.936E-01	0.906E-01	0.874E-01	0.841E-01	0.807E-01
	0.771E-01	0.735E-01	0.697E-01		
J= 33	0.123E+00	0.123E+00	0.122E+00	0.122E+00	0.122E+00
	0.122E+00	0.121E+00	0.121E+00	0.120E+00	0.119E+00
	0.118E+00	0.117E+00	0.116E+00	0.115E+00	0.114E+00
	0.112E+00	0.111E+00	0.109E+00	0.107E+00	0.105E+00
	0.103E+00	0.101E+00	0.980E-01	0.954E-01	0.926E-01
	0.897E-01	0.867E-01	0.835E-01	0.802E-01	0.767E-01
	0.732E-01	0.696E-01	0.659E-01	0.621E-01	
J= 34	0.120E+00	0.120E+00	0.120E+00	0.119E+00	0.119E+00
	0.119E+00	0.118E+00	0.118E+00	0.117E+00	0.116E+00
	0.115E+00	0.114E+00	0.113E+00	0.112E+00	0.110E+00
	0.109E+00	0.107E+00	0.105E+00	0.103E+00	0.101E+00
	0.990E-01	0.966E-01	0.941E-01	0.914E-01	0.886E-01
	0.857E-01	0.826E-01	0.794E-01	0.761E-01	0.727E-01
	0.692E-01	0.656E-01	0.620E-01	0.582E-01	0.545E-01
J= 35	0.117E+00	0.117E+00	0.116E+00	0.116E+00	0.116E+00
	0.115E+00	0.115E+00	0.114E+00	0.114E+00	0.113E+00
	0.112E+00	0.111E+00	0.109E+00	0.108E+00	0.107E+00

	0.105E+00	0.103E+00	0.101E+00	0.994E-01	0.973E-01
	0.950E-01	0.926E-01	0.900E-01	0.873E-01	0.845E-01
	0.816E-01	0.785E-01	0.753E-01	0.720E-01	0.686E-01
	0.652E-01	0.616E-01	0.580E-01	0.544E-01	0.507E-01
	0.470E-01				
J= 36	0.113E+00	0.113E+00	0.113E+00	0.113E+00	0.112E+00
	0.112E+00	0.111E+00	0.111E+00	0.110E+00	0.109E+00
	0.108E+00	0.107E+00	0.106E+00	0.104E+00	0.103E+00
	0.101E+00	0.992E-01	0.973E-01	0.953E-01	0.931E-01
	0.908E-01	0.883E-01	0.858E-01	0.831E-01	0.802E-01
	0.773E-01	0.742E-01	0.711E-01	0.678E-01	0.645E-01
	0.610E-01	0.576E-01	0.540E-01	0.505E-01	0.469E-01
	0.432E-01	0.397E-01			
J= 37	0.109E+00	0.109E+00	0.109E+00	0.109E+00	0.109E+00
	0.108E+00	0.107E+00	0.107E+00	0.106E+00	0.105E+00
	0.104E+00	0.103E+00	0.101E+00	0.100E+00	0.985E-01
	0.968E-01	0.950E-01	0.930E-01	0.910E-01	0.888E-01
	0.864E-01	0.840E-01	0.814E-01	0.787E-01	0.758E-01
	0.729E-01	0.699E-01	0.668E-01	0.635E-01	0.602E-01
	0.569E-01	0.535E-01	0.500E-01	0.465E-01	0.430E-01
	0.396E-01	0.361E-01	0.327E-01		
J= 38	0.105E+00	0.105E+00	0.105E+00	0.105E+00	0.104E+00
	0.104E+00	0.103E+00	0.103E+00	0.102E+00	0.101E+00
	0.997E-01	0.985E-01	0.972E-01	0.957E-01	0.941E-01
	0.924E-01	0.906E-01	0.886E-01	0.865E-01	0.843E-01
	0.819E-01	0.794E-01	0.769E-01	0.742E-01	0.714E-01
	0.685E-01	0.655E-01	0.624E-01	0.592E-01	0.560E-01
	0.527E-01	0.494E-01	0.460E-01	0.426E-01	0.393E-01
	0.359E-01	0.326E-01	0.293E-01	0.261E-01	
J= 39	0.101E+00	0.101E+00	0.101E+00	0.101E+00	0.100E+00
	0.996E-01	0.990E-01	0.982E-01	0.973E-01	0.963E-01
	0.952E-01	0.940E-01	0.926E-01	0.911E-01	0.895E-01
	0.878E-01	0.859E-01	0.840E-01	0.819E-01	0.796E-01
	0.773E-01	0.748E-01	0.723E-01	0.696E-01	0.668E-01
	0.639E-01	0.610E-01	0.580E-01	0.549E-01	0.517E-01
	0.485E-01	0.453E-01	0.420E-01	0.388E-01	0.355E-01
	0.323E-01	0.291E-01	0.260E-01	0.229E-01	0.200E-01
J= 40	0.965E-01	0.964E-01	0.962E-01	0.959E-01	0.955E-01
	0.950E-01	0.943E-01	0.936E-01	0.927E-01	0.917E-01
	0.906E-01	0.893E-01	0.879E-01	0.864E-01	0.848E-01
	0.831E-01	0.812E-01	0.792E-01	0.771E-01	0.749E-01
	0.726E-01	0.701E-01	0.676E-01	0.649E-01	0.622E-01
	0.594E-01	0.565E-01	0.535E-01	0.505E-01	0.474E-01
	0.443E-01	0.412E-01	0.381E-01	0.349E-01	0.318E-01
	0.288E-01	0.257E-01	0.228E-01	0.199E-01	0.172E-01
	0.145E-01				
J= 41	0.917E-01	0.916E-01	0.914E-01	0.911E-01	0.907E-01
	0.902E-01	0.895E-01	0.888E-01	0.879E-01	0.868E-01
	0.857E-01	0.844E-01	0.831E-01	0.816E-01	0.799E-01
	0.782E-01	0.763E-01	0.743E-01	0.723E-01	0.701E-01
	0.678E-01	0.653E-01	0.628E-01	0.602E-01	0.576E-01
	0.548E-01	0.520E-01	0.491E-01	0.462E-01	0.432E-01
	0.402E-01	0.372E-01	0.342E-01	0.312E-01	0.282E-01
	0.253E-01	0.225E-01	0.197E-01	0.170E-01	0.145E-01
	0.121E-01	0.981E-02			
J= 42	0.867E-01	0.867E-01	0.865E-01	0.862E-01	0.858E-01
	0.852E-01	0.846E-01	0.838E-01	0.829E-01	0.819E-01
	0.807E-01	0.794E-01	0.781E-01	0.766E-01	0.749E-01
	0.732E-01	0.714E-01	0.694E-01	0.673E-01	0.652E-01
	0.629E-01	0.605E-01	0.581E-01	0.555E-01	0.529E-01
	0.502E-01	0.475E-01	0.447E-01	0.419E-01	0.390E-01
	0.361E-01	0.333E-01	0.304E-01	0.275E-01	0.247E-01
	0.220E-01	0.193E-01	0.168E-01	0.143E-01	0.119E-01
	0.972E-02	0.773E-02	0.590E-02		
J= 43	0.816E-01	0.816E-01	0.814E-01	0.811E-01	0.807E-01
	0.801E-01	0.794E-01	0.787E-01	0.778E-01	0.767E-01
	0.756E-01	0.743E-01	0.730E-01	0.715E-01	0.699E-01
	0.682E-01	0.663E-01	0.644E-01	0.624E-01	0.602E-01
	0.580E-01	0.557E-01	0.533E-01	0.508E-01	0.483E-01
	0.457E-01	0.430E-01	0.404E-01	0.376E-01	0.349E-01
	0.321E-01	0.294E-01	0.267E-01	0.240E-01	0.214E-01
	0.188E-01	0.163E-01	0.140E-01	0.117E-01	0.960E-02
	0.764E-02	0.586E-02	0.427E-02	0.290E-02	
J= 44	0.764E-01	0.763E-01	0.761E-01	0.758E-01	0.754E-01
	0.749E-01	0.742E-01	0.735E-01	0.726E-01	0.715E-01
	0.704E-01	0.692E-01	0.678E-01	0.663E-01	0.648E-01
	0.631E-01	0.613E-01	0.594E-01	0.574E-01	0.553E-01
	0.531E-01	0.509E-01	0.486E-01	0.462E-01	0.437E-01
	0.412E-01	0.387E-01	0.361E-01	0.335E-01	0.309E-01
	0.283E-01	0.257E-01	0.231E-01	0.206E-01	0.182E-01
	0.158E-01	0.135E-01	0.114E-01	0.934E-02	0.745E-02
	0.573E-02	0.420E-02	0.288E-02	0.178E-02	0.922E-03
J= 45	0.711E-01	0.710E-01	0.708E-01	0.705E-01	0.701E-01
	0.696E-01	0.689E-01	0.682E-01	0.673E-01	0.663E-01
	0.652E-01	0.639E-01	0.626E-01	0.612E-01	0.596E-01
	0.580E-01	0.562E-01	0.544E-01	0.524E-01	0.504E-01
	0.483E-01	0.461E-01	0.439E-01	0.416E-01	0.392E-01
	0.368E-01	0.344E-01	0.319E-01	0.295E-01	0.270E-01
	0.245E-01	0.221E-01	0.197E-01	0.174E-01	0.152E-01
	0.130E-01	0.109E-01	0.898E-02	0.718E-02	0.553E-02
	0.406E-02	0.279E-02	0.173E-02	0.905E-03	0.335E-03
	0.389E-04				
J= 46	0.657E-01	0.656E-01	0.655E-01	0.652E-01	0.648E-01
	0.642E-01	0.636E-01	0.628E-01	0.620E-01	0.610E-01
	0.599E-01	0.587E-01	0.574E-01	0.560E-01	0.545E-01
	0.529E-01	0.512E-01	0.494E-01	0.475E-01	0.455E-01
	0.435E-01	0.414E-01	0.393E-01	0.370E-01	0.348E-01
	0.325E-01	0.302E-01	0.279E-01	0.256E-01	0.233E-01
	0.210E-01	0.187E-01	0.165E-01	0.144E-01	0.123E-01
	0.104E-01	0.853E-02	0.682E-02	0.526E-02	0.386E-02
	0.265E-02	0.164E-02	0.857E-03	0.315E-03	0.356E-04
	0.000E+00	0.000E+00			
J= 47	0.603E-01	0.602E-01	0.601E-01	0.598E-01	0.594E-01
	0.589E-01	0.582E-01	0.575E-01	0.567E-01	0.557E-01
	0.546E-01	0.535E-01	0.522E-01	0.508E-01	0.494E-01
	0.478E-01	0.462E-01	0.444E-01	0.426E-01	0.408E-01
	0.388E-01	0.368E-01	0.348E-01	0.327E-01	0.305E-01
	0.284E-01	0.262E-01	0.240E-01	0.218E-01	0.197E-01
	0.176E-01	0.155E-01	0.135E-01	0.116E-01	0.973E-02
	0.799E-02	0.638E-02	0.491E-02	0.360E-02	0.246E-02
	0.151E-02	0.780E-03	0.278E-03	0.265E-04	0.000E+00
	0.000E+00	0.000E+00	0.000E+00		
J= 48	0.549E-01	0.549E-01	0.547E-01	0.544E-01	0.540E-01
	0.535E-01	0.529E-01	0.522E-01	0.514E-01	0.505E-01
	0.494E-01	0.483E-01	0.471E-01	0.457E-01	0.443E-01
	0.428E-01	0.413E-01	0.396E-01	0.379E-01	0.361E-01
	0.342E-01	0.323E-01	0.304E-01	0.284E-01	0.264E-01
	0.244E-01	0.224E-01	0.203E-01	0.183E-01	0.163E-01
	0.144E-01	0.125E-01	0.107E-01	0.901E-02	0.738E-02
	0.588E-02	0.450E-02	0.328E-02	0.222E-02	0.135E-02
	0.677E-03	0.226E-03	0.144E-04	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
J= 49	0.496E-01	0.495E-01	0.494E-01	0.491E-01	0.487E-01
	0.482E-01	0.477E-01	0.470E-01	0.462E-01	0.453E-01
	0.443E-01	0.432E-01	0.420E-01	0.408E-01	0.394E-01
	0.380E-01	0.365E-01	0.349E-01	0.333E-01	0.316E-01
	0.298E-01	0.280E-01	0.262E-01	0.243E-01	0.225E-01
	0.206E-01	0.187E-01	0.169E-01	0.150E-01	0.132E-01
	0.115E-01	0.981E-02	0.821E-02	0.671E-02	0.531E-02
	0.405E-02	0.292E-02	0.195E-02	0.116E-02	0.556E-03
	0.166E-03	0.360E-05	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
J= 50	0.443E-01	0.443E-01	0.441E-01	0.439E-01	0.435E-01
	0.430E-01	0.425E-01	0.418E-01	0.411E-01	0.402E-01
	0.393E-01	0.382E-01	0.371E-01	0.359E-01	0.346E-01
	0.333E-01	0.318E-01	0.303E-01	0.288E-01	0.272E-01
	0.256E-01	0.239E-01	0.222E-01	0.205E-01	0.188E-01
	0.170E-01	0.153E-01	0.136E-01	0.120E-01	0.104E-01
	0.883E-02	0.736E-02	0.598E-02	0.470E-02	0.355E-02
	0.252E-02	0.165E-02	0.946E-03	0.425E-03	0.103E-03
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00				
J= 51	0.392E-01	0.392E-01	0.390E-01	0.388E-01	0.384E-01
	0.380E-01	0.374E-01	0.368E-01	0.361E-01	0.353E-01
	0.344E-01	0.334E-01	0.323E-01	0.312E-01	0.300E-01
	0.287E-01	0.274E-01	0.260E-01	0.245E-01	0.231E-01
	0.215E-01	0.200E-01	0.184E-01	0.169E-01	0.153E-01
	0.137E-01	0.122E-01	0.107E-01	0.921E-02	0.780E-02
	0.647E-02	0.522E-02	0.406E-02	0.302E-02	0.211E-02
	0.134E-02	0.728E-03	0.292E-03	0.478E-04	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00			
J= 52	0.342E-01	0.342E-01	0.340E-01	0.338E-01	0.335E-01
	0.331E-01	0.326E-01	0.320E-01	0.313E-01	0.305E-01
	0.297E-01	0.288E-01	0.278E-01	0.267E-01	0.256E-01
	0.244E-01	0.231E-01	0.218E-01	0.205E-01	0.191E-01
	0.178E-01	0.163E-01	0.149E-01	0.135E-01	0.121E-01
	0.107E-01	0.934E-02	0.802E-02	0.675E-02	0.555E-02
	0.443E-02	0.340E-02	0.248E-02	0.169E-02	0.102E-02
	0.512E-03	0.169E-03	0.972E-05	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00		
J= 53	0.295E-01	0.294E-01	0.293E-01	0.291E-01	0.288E-01
	0.284E-01	0.279E-01	0.273E-01	0.267E-01	0.260E-01
	0.252E-01	0.243E-01	0.234E-01	0.224E-01	0.214E-01
	0.203E-01	0.191E-01	0.180E-01	0.168E-01	0.155E-01
	0.143E-01	0.130E-01	0.117E-01	0.105E-01	0.921E-02
	0.799E-02	0.682E-02	0.569E-02	0.463E-02	0.364E-02
	0.275E-02	0.195E-02	0.127E-02	0.720E-03	0.315E-03
	0.707E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
J= 54	0.249E-01	0.249E-01	0.247E-01	0.245E-01	0.243E-01
	0.239E-01	0.235E-01	0.229E-01	0.224E-01	0.217E-01
	0.210E-01	0.202E-01	0.193E-01	0.184E-01	0.175E-01
	0.165E-01	0.154E-01	0.144E-01	0.133E-01	0.122E-01
	0.111E-01	0.994E-02	0.883E-02	0.773E-02	0.666E-02
	0.563E-02	0.465E-02	0.373E-02	0.288E-02	0.211E-02
	0.144E-02	0.881E-03	0.447E-03	0.152E-03	0.106E-04
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
J= 55	0.206E-01	0.206E-01	0.205E-01	0.203E-01	0.200E-01
	0.197E-01	0.193E-01	0.188E-01	0.183E-01	0.177E-01
	0.170E-01	0.163E-01	0.155E-01	0.147E-01	0.139E-01
	0.130E-01	0.121E-01	0.111E-01	0.102E-01	0.918E-02
	0.821E-02	0.725E-02	0.630E-02	0.537E-02	0.449E-02
	0.364E-02	0.286E-02	0.215E-02	0.151E-02	0.972E-03
	0.537E-03	0.222E-03	0.406E-04	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00				
J= 56	0.167E-01	0.166E-01	0.165E-01	0.163E-01	0.161E-01
	0.158E-01	0.154E-01	0.150E-01	0.145E-01	0.140E-01
	0.134E-01	0.128E-01	0.121E-01	0.114E-01	0.106E-01
	0.983E-02	0.903E-02	0.821E-02	0.738E-02	0.655E-02
	0.573E-02	0.493E-02	0.415E-02	0.340E-02	0.270E-02
	0.206E-02	0.148E-02	0.980E-03	0.569E-03	0.260E-03
	0.662E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00				
J= 57	0.130E-01	0.130E-01	0.129E-01	0.127E-01	0.125E-01
	0.123E-01	0.119E-01	0.116E-01	0.111E-01	0.107E-01
	0.102E-01	0.960E-02	0.901E-02	0.838E-02	0.773E-02
	0.706E-02	0.638E-02	0.569E-02	0.500E-02	0.432E-02
	0.366E-02	0.302E-02	0.242E-02	0.186E-02	0.135E-02
	0.905E-03	0.537E-03	0.256E-03	0.730E-04	0.662E-06
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
J= 58	0.976E-02	0.973E-02	0.965E-02	0.952E-02	0.934E-02
	0.911E-02	0.883E-02	0.850E-02	0.814E-02	0.773E-02
	0.729E-02	0.682E-02	0.632E-02	0.579E-02	0.526E-02
	0.470E-02	0.415E-02	0.360E-02	0.305E-02	0.252E-02
	0.202E-02	0.155E-02	0.113E-02	0.757E-03	0.447E-03
	0.210E-03	0.576E-04	0.165E-06	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
J= 59	0.691E-02	0.688E-02	0.682E-02	0.671E-02	0.655E-02
	0.636E-02	0.613E-02	0.586E-02	0.555E-02	0.522E-02
	0.485E-02	0.447E-02	0.406E-02	0.364E-02	0.322E-02
	0.279E-02	0.236E-02	0.195E-02	0.155E-02	0.118E-02
	0.849E-03	0.556E-03	0.315E-03	0.136E-03	0.280E-04
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00			
J= 60	0.450E-02	0.449E-02	0.443E-02	0.434E-02	0.422E-02
	0.406E-02	0.388E-02	0.366E-02	0.342E-02	0.316E-02
	0.288E-02	0.258E-02	0.227E-02	0.196E-02	0.165E-02
	0.135E-02	0.106E-02	0.787E-03	0.544E-03	0.335E-03
	0.169E-03	0.556E-04	0.265E-05	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00				
J= 61	0.258E-02	0.257E-02	0.252E-02	0.246E-02	0.236E-02
	0.225E-02	0.211E-02	0.195E-02	0.178E-02	0.159E-02
	0.139E-02	0.118E-02	0.980E-03	0.780E-03	0.589E-03
	0.413E-03	0.260E-03	0.136E-03	0.478E-04	0.360E-05
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

```
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00
J= 62     0.117E-02   0.116E-02   0.113E-02   0.108E-02   0.102E-02
          0.946E-03   0.857E-03   0.757E-03   0.649E-03   0.537E-03
          0.425E-03   0.315E-03   0.214E-03   0.127E-03   0.576E-04
          0.134E-04   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00
J= 63     0.296E-03   0.292E-03   0.278E-03   0.256E-03   0.226E-03
          0.191E-03   0.152E-03   0.112E-03   0.730E-04   0.389E-04
          0.134E-04   0.662E-06   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00
J= 64     0.944E-15   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
          0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
```

```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                   X          Y        A          B        PHI      DENS
      1   - ELLIPSE        0.00 ,     0.00    40.00 ,    40.00     0.00      5.00
                      (    0.00),(    0.00)(  40.00),(  40.00)            (   5.00)
      1   - ELLIPSE        0.00 ,   -10.00    10.00 ,    10.00     0.00     27.00
                      (    0.00),( -10.00)(  10.00),(  10.00)            (  27.00)
      1   - ELLIPSE       10.00 ,     0.00    14.00 ,    10.00     1.57     -4.00
                      (   10.00),(    0.00)(  14.00),(  10.00)            (  -4.00)
      1   - ELLIPSE      -10.00 ,     0.00    14.00 ,    10.00     1.57     -4.00
                      ( -10.00),(    0.00)(  14.00),(  10.00)            (  -4.00)
```

```
EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
E     NN  N D   D       P   P H   H A   A NN  N
EEE   N N N D   D       PPPP  HHHHH A   A N N N
E     N  NN D   D       P     H   H AAAAA N  NN
EEEEE N   N DDDD        P     H   H A   A N   N
```

XMIN =   0.00E+00   XMAX =   0.32E+02   XSUM =   0.7526E+04

```
******************************************************************
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                         --------------                         *
*                      --------------------                      *
*                   --------------------------                   *
*                  ----------------------------                  *
*                --------------------------------                *
*               ----------------------------------               *
*              ------------------------------------              *
*             --------------------------------------             *
*             ------      --------------      ------             *
*            ------        ------------        ------            *
*            -----          ----------          -----            *
*            -----          ----------          -----            *
*            -----          ----------          -----            *
*            -----          ----------          -----            *
*            ------        ------------        ------            *
*             ------      ---+Θ⊠██⊠Θ+---      ------             *
*             --------------X████████X--------------             *
*              -------------⊠████████⊠-------------              *
*               ------------⊠████████⊠------------               *
*                -----------Θ████████Θ-----------                *
*                  ----------A⊕⊠██⊠⊕A----------                  *
*                   --------------------------                   *
*                      --------------------                      *
*                         --------------                         *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
******************************************************************
```

```
                 -          =          +          )          1          Z
0.0000E+00 0.2400E+01 0.5920E+01 0.7520E+01 0.8640E+01 0.9920E+01 0.1120E+02
```

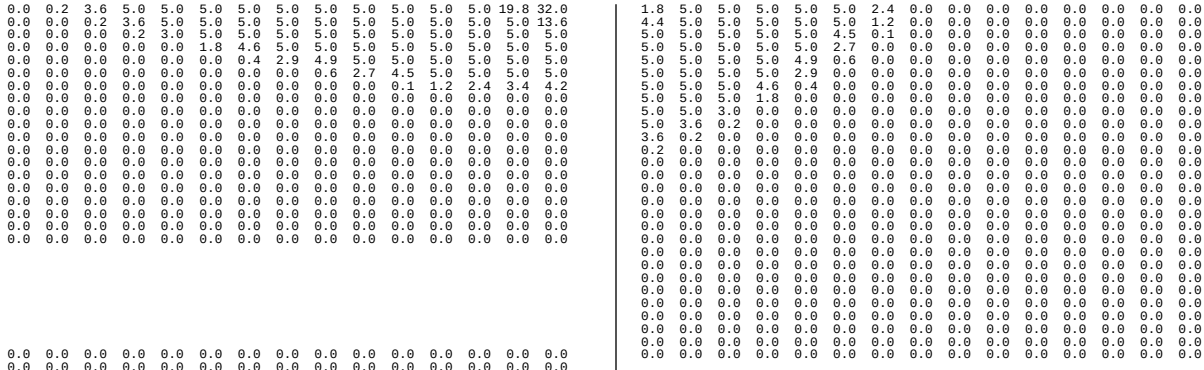
```
Z          X          A          M          Θ          Θ          ⊕          ⊕
0.1232E+02 0.1312E+02 0.1392E+02 0.1568E+02 0.1744E+02 0.1856E+02 0.1984E+02

⊕          ⊕          ⊕          ⊠          ⊠          █          █          █
0.2096E+02 0.2336E+02 0.2624E+02 0.2784E+02 0.2912E+02 0.3040E+02 0.3152E+02

█
0.3200E+02
```

```
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.4
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.9
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.6  4.9
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.7  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  4.5  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  1.2  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.4  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  3.4  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.2  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.7  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  5.0  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  5.0  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.7  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.2  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  3.4  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.4  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  1.2  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  4.5  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.7  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.6  4.9
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.9
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.4
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

```
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  1.2  2.4  3.4  4.2
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.6  2.7  4.5  5.0  5.0  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  0.0  0.4  2.9  4.9  5.0  5.0  5.0  5.0  5.0  5.0
 0.0  0.0  0.0  0.0  0.0  1.8  4.6  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 0.0  0.0  0.0  0.2  3.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 0.0  0.0  0.2  3.6  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 0.0  0.2  3.6  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 0.0  3.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 1.8  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 4.6  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  5.0  4.5  2.4  1.2  1.2  2.4  4.5  5.0  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  4.4  1.3  1.0  1.0  1.0  1.0  1.3  4.4  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  1.8  1.0  1.0  1.0  1.0  1.0  1.0  1.8  5.0  5.0  5.0  5.0
 5.0  5.0  3.7  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  3.7  5.0  5.0  5.0
 5.0  5.0  2.3  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  2.3  5.0  5.0  5.0
 5.0  5.0  1.5  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.5  5.0  5.0  5.0
 5.0  5.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  5.0  5.0  5.0
 5.0  5.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  5.0  5.0  5.0
 5.0  5.0  1.5  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.5  5.0  5.0  5.0
 5.0  5.0  2.3  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  2.3  5.0  5.0  5.0
 5.0  5.0  3.7  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  3.7  5.0  5.0  5.0
 5.0  5.0  5.0  1.8  1.0  1.0  1.0  1.0  1.0  1.0  1.8  5.0  5.0  5.0  5.0
 5.0  5.0  5.0  4.4  1.3  1.0  1.0  1.0  1.0  1.3  4.4  5.0  5.0  5.0 13.6
 5.0  5.0  5.0  5.0  4.5  2.4  1.2  1.2  2.4  4.5  5.0  5.0  5.0 19.8 32.0
 5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0 13.6 32.0 32.0
 5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0 25.5 32.0 32.0
 5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0 31.2 32.0 32.0
 4.6  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0 31.2 32.0 32.0
 1.8  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0 25.5 32.0 32.0
 0.0  3.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0  5.0 13.6 32.0 32.0
```



BLANK COMMON REQUIRED 17846 (42666)

BLANK COMMON REQUIRED 17814 (42626)

BLANK COMMON REQUIRED 1430 (2626)

BLANK COMMON REQUIRED 1248 (2340)

THE FINAL RECONSTRUCTION IS RETURNED WITH DIMENSION NDIMU.
NDIMU WILL NOW BE RETURNED TO ITS ORIGINAL VALUE.

BLANK COMMON REQUIRED 1184 (2240)

A TOTAL OF 92 (5 THRU 96) OF THE 129 USER PROJECTION BINS WILL BE USED

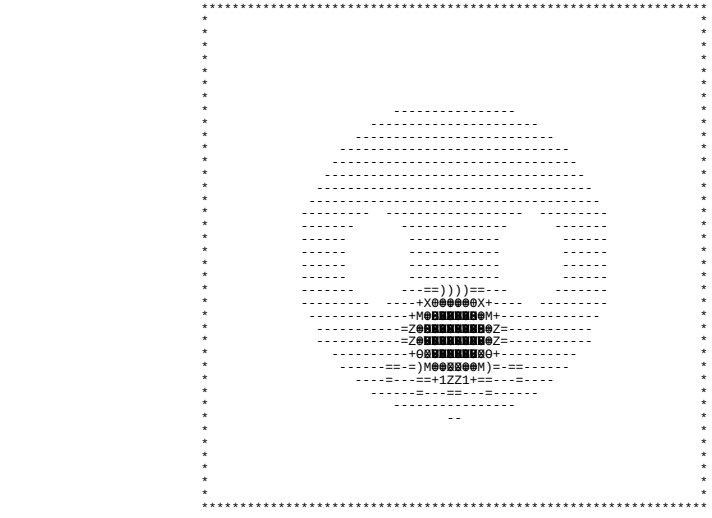
92 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17846 FLOATING POINT WORDS.

```
    EEEEE N   N DDDD        FFFFF  III  L     BBBB  K   K
    E     NN  N D   D       F       I   L     B   B K  K
    EEE   N N N D   D       FFF     I   L     BBBB  KKK
    E     N  NN D   D       F       I   L     B   B K  K
    EEEEE N   N DDDD        F      III  LLLLL BBBB  K   K
```

RECONSTRUCTION FOR PARALLEL BEAM GEOMETRY

XMIN = -0.12E+01 XMAX = 0.32E+02 XSUM = 0.6181E+04



```
                -          =          +          )          1          Z
-.1190E+01 0.1281E+01 0.4905E+01 0.6553E+01 0.7706E+01 0.9024E+01 0.1034E+02

Z          X          A          M          Θ          Θ          Θ          @
0.1150E+02 0.1232E+02 0.1314E+02 0.1495E+02 0.1677E+02 0.1792E+02 0.1924E+02

@          @          @          ▚          ▚          ▚          ▚          ▚
0.2039E+02 0.2286E+02 0.2583E+02 0.2748E+02 0.2879E+02 0.3011E+02 0.3126E+02

▚
0.3176E+02
```

```
 0.0 -0.2 -0.4 -0.3 -0.5 -0.8 -0.5  0.1  0.0 -0.5 -0.8 -0.7  0.1  0.0 -0.8
-0.4 -0.3 -0.3  0.0 -0.1 -0.6 -0.8 -0.3  0.1 -0.2 -0.8 -0.9 -0.1  0.3 -0.5
-0.6 -0.6 -0.5 -0.2  0.1 -0.2 -0.8 -0.7  0.0  0.1 -0.5 -1.1 -0.5  0.3 -0.1
-0.3 -0.5 -0.7 -0.6  0.0  0.0 -0.5 -0.9 -0.4  0.3  0.0 -1.0 -1.0  0.0  0.3
-0.1 -0.1 -0.5 -0.8 -0.3  0.2 -0.1 -0.8 -0.9 -0.1  0.3 -0.5 -1.2 -0.6  0.3
-0.2  0.0 -0.2 -0.8 -0.7 -0.1  0.2 -0.3 -0.9 -0.6  0.2  0.1 -0.9 -1.0 -0.1
-0.4  0.0  0.1 -0.3 -0.9 -0.7  0.0  0.2 -0.6 -1.0 -0.3  0.3 -0.3 -1.0 -0.5
-0.7 -0.4  0.1  0.2 -0.4 -0.9 -0.5  0.3  0.0 -0.8 -0.8 -0.1  0.1 -0.7 -0.8
-0.8 -0.9 -0.4  0.2  0.1 -0.6 -0.9 -0.2  0.2 -0.3 -0.9 -0.5  0.1 -0.3 -0.8
-0.1 -0.8 -0.8 -0.2  0.3  0.0 -0.7 -0.8 -0.1  0.0 -0.5 -0.6 -0.1 -0.1 -0.5
 0.2 -0.2 -0.8 -0.8 -0.2  0.3 -0.1 -0.7 -0.6 -0.1 -0.3 -0.6 -0.4 -0.1 -0.3
-0.4  0.1 -0.3 -0.9 -0.9 -0.2  0.1 -0.3 -0.6 -0.3 -0.2 -0.5 -0.5 -0.3 -0.4
-0.9 -0.2 -0.2 -0.2 -0.8 -0.8 -0.2  0.0 -0.3 -0.3 -0.2 -0.4 -0.4 -0.2 -0.4
-0.8 -0.8 -0.2  0.2 -0.2 -0.7 -0.6 -0.3 -0.3 -0.3 -0.2 -0.4 -0.5 -0.2 -0.2
-0.2 -0.8 -0.8 -0.2  0.2 -0.1 -0.5 -0.5 -0.4 -0.4 -0.1 -0.2 -0.5 -0.5 -0.1
 0.3 -0.2 -0.8 -0.8 -0.3  0.0 -0.2 -0.4 -0.4 -0.5 -0.3  0.0 -0.2 -0.6 -0.3
-0.1  0.2 -0.2 -0.6 -0.7 -0.3 -0.2 -0.2 -0.2 -0.4 -0.6 -0.3  0.0 -0.3 -0.5
-0.8 -0.3  0.1 -0.1 -0.5 -0.5 -0.3 -0.3 -0.2 -0.1 -0.5 -0.7 -0.3  0.0 -0.4
-0.7 -0.8 -0.4 -0.2 -0.3 -0.4 -0.3 -0.2 -0.3 -0.1 -0.1 -0.6 -0.6 -0.2 -0.3
-0.1 -0.5 -0.6 -0.5 -0.4 -0.5 -0.5 -0.2 -0.2 -0.2 -0.2 -0.3 -0.5 -0.5 -0.2
-0.1 -0.1 -0.3 -0.4 -0.3 -0.5 -0.7 -0.6 -0.1 -0.1 -0.2 -0.2 -0.3 -0.3  0.4
-0.4 -0.3 -0.2 -0.3 -0.2 -0.2 -0.5 -0.8 -0.6 -0.2 -0.1 -0.1 -0.2  0.1  1.4
-0.4 -0.4 -0.3 -0.4 -0.4 -0.3 -0.1 -0.4 -0.8 -0.8 -0.3 -0.1  0.0  0.8  2.5
-0.2 -0.3 -0.3 -0.2 -0.4 -0.5 -0.2  0.0 -0.3 -0.7 -0.7 -0.4  0.2  1.7  3.5
-0.2 -0.2 -0.3 -0.2 -0.1 -0.2 -0.4 -0.3 -0.1 -0.2 -0.6 -0.6  0.4  2.4  4.0
-0.4 -0.3 -0.3 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3 -0.2 -0.4 -0.4  0.8  3.0  4.3
-0.5 -0.4 -0.2 -0.3 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.2  0.0  1.5  3.6  4.5
-0.5 -0.6 -0.5 -0.2 -0.1 -0.3 -0.3 -0.3 -0.2 -0.2 -0.1  0.6  2.3  3.9  4.6
-0.3 -0.5 -0.7 -0.6 -0.4 -0.3 -0.2 -0.2 -0.3 -0.3 -0.2  0.8  2.8  4.2  4.5
-0.3 -0.2 -0.3 -0.5 -0.6 -0.6 -0.4 -0.3 -0.3 -0.4 -0.3  0.8  3.1  4.5  4.6
-0.4 -0.4 -0.3 -0.3 -0.3 -0.4 -0.4 -0.4 -0.4 -0.3 -0.2  0.9  3.1  4.5  4.7
-0.2 -0.3 -0.4 -0.4 -0.3 -0.3 -0.4 -0.5 -0.4 -0.3 -0.1  1.0  3.1  4.3  4.7
-0.2 -0.1 -0.1 -0.2 -0.3 -0.3 -0.4 -0.5 -0.5 -0.4 -0.2  1.2  3.4  4.4  4.6
-0.5 -0.5 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3  1.0  3.2  4.5  4.6
-0.2 -0.3 -0.3 -0.4 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3  0.7  2.9  4.5  4.9
-0.3 -0.2 -0.3 -0.3 -0.3 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2  0.7  2.7  4.2  4.7
-0.7 -0.7 -0.7 -0.6 -0.5 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2  0.5  2.3  4.0  4.4
-0.2 -0.3 -0.4 -0.5 -0.5 -0.5 -0.4 -0.4 -0.4 -0.3 -0.3  0.2  1.9  3.9  4.7
-0.2 -0.2 -0.1 -0.2 -0.3 -0.4 -0.5 -0.5 -0.5 -0.5 -0.4 -0.2  1.2  3.3  4.5
-0.4 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3 -0.4 -0.4 -0.5 -0.4  0.5  2.3  3.9
-0.1 -0.2 -0.3 -0.4 -0.4 -0.3 -0.2 -0.2 -0.3 -0.4 -0.4 -0.4 -0.1  1.2  3.2
-0.4 -0.4 -0.4 -0.4 -0.4 -0.3 -0.2 -0.2 -0.3 -0.3 -0.3 -0.4 -0.4  0.5  2.3
-0.4 -0.4 -0.3 -0.2 -0.2 -0.3 -0.4 -0.4 -0.3 -0.3 -0.4 -0.3 -0.3  0.2  1.5
-0.1 -0.1 -0.3 -0.3 -0.3 -0.4 -0.5 -0.5 -0.3 -0.2 -0.2 -0.2 -0.2 -0.1  0.6
-0.5 -0.6 -0.6 -0.6 -0.5 -0.4 -0.3 -0.3 -0.2 -0.1 -0.2 -0.3 -0.3 -0.3 -0.1
-0.5 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2 -0.3 -0.3 -0.2 -0.3
-0.2 -0.1 -0.1 -0.2 -0.2 -0.3 -0.4 -0.3 -0.3 -0.2 -0.1 -0.3 -0.4 -0.4 -0.4
-0.5 -0.5 -0.5 -0.5 -0.6 -0.5 -0.4 -0.3 -0.2 -0.2 -0.4 -0.5 -0.6 -0.5 -0.4
-0.3 -0.3 -0.3 -0.4 -0.4 -0.2 -0.1 -0.2 -0.3 -0.4 -0.5 -0.5 -0.3 -0.3 -0.2
-0.3 -0.4 -0.3 -0.2 -0.1 -0.1 -0.2 -0.4 -0.6 -0.6 -0.4 -0.3 -0.2 -0.2 -0.3
-0.5 -0.4 -0.2 -0.1 -0.2 -0.4 -0.5 -0.5 -0.5 -0.3 -0.2 -0.2 -0.3 -0.4 -0.5
-0.1  0.0 -0.1 -0.4 -0.5 -0.6 -0.4 -0.2 -0.1 -0.1 -0.2 -0.4 -0.4 -0.4 -0.3
-0.2 -0.4 -0.7 -0.7 -0.6 -0.5 -0.2 -0.2 -0.2 -0.3 -0.5 -0.5 -0.3 -0.3 -0.3
-0.6 -0.6 -0.5 -0.3 -0.2 -0.2 -0.2 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3 -0.3 -0.4
-0.4 -0.3 -0.2 -0.2 -0.2 -0.1 -0.2 -0.4 -0.5 -0.5 -0.5 -0.5 -0.5 -0.4 -0.3
-0.3 -0.3 -0.4 -0.3 -0.2 -0.1 -0.4 -0.5 -0.6 -0.6 -0.5 -0.4 -0.3 -0.2 -0.3
-0.3 -0.3 -0.2 -0.1 -0.2 -0.5 -0.8 -0.6 -0.4 -0.4 -0.3 -0.2 -0.2 -0.3 -0.4
-0.3 -0.3 -0.2 -0.5 -0.8 -0.8 -0.6 -0.3 -0.2 -0.2 -0.2 -0.3 -0.3 -0.4 -0.5
-0.5 -0.5 -0.6 -0.7 -0.5 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.4 -0.5 -0.4
-0.4 -0.5 -0.5 -0.4 -0.1 -0.1 -0.4 -0.4 -0.3 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3
```

```
-0.3 -0.4 -0.3 -0.3 -0.4 -0.5 -0.4 -0.2 -0.2 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3
-0.7 -0.5 -0.4 -0.4 -0.4 -0.3 -0.1 -0.2 -0.4 -0.4 -0.3 -0.5 -0.5 -0.3 -0.4
-0.6 -0.2 -0.3 -0.3 -0.1 -0.2 -0.4 -0.4 -0.4 -0.2 -0.4 -0.6 -0.4 -0.3 -0.3
 0.1  0.0 -0.4 -0.3 -0.3 -0.6 -0.5 -0.1 -0.2 -0.4 -0.6 -0.5 -0.3 -0.2 -0.3
```

```
-0.7  0.1 -0.1 -0.7 -0.6  0.1 -0.1 -0.9 -0.4  0.3 -0.5 -1.2 -0.1  0.3 -0.7
-0.9 -0.2  0.1 -0.5 -0.7 -0.1  0.1 -0.7 -0.6  0.2 -0.3 -1.2 -0.3  0.3 -0.5
-0.9 -0.6  0.1 -0.2 -0.7 -0.3  0.1 -0.4 -0.7  0.0 -0.2 -1.0 -0.5  0.3 -0.4
-0.6 -0.8 -0.1  0.0 -0.6 -0.6  0.0 -0.2 -0.6 -0.2 -0.2 -0.8 -0.5  0.2 -0.3
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 0.2 -0.5 -0.6 -0.2 -0.2 -0.4 -0.3 -0.2 -0.4 -0.3 -0.2 -0.5 -0.6 -0.2 -0.2
 0.1 -0.2 -0.6 -0.3 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.5 -0.5 -0.3 -0.3
-0.2 -0.1 -0.4 -0.4 -0.3 -0.2 -0.2 -0.4 -0.4 -0.3 -0.4 -0.4 -0.3 -0.4 -0.4
-0.5 -0.1 -0.2 -0.3 -0.4 -0.3 -0.2 -0.4 -0.5 -0.2 -0.3 -0.4 -0.2 -0.5 -0.5
-0.5 -0.3 -0.2 -0.2 -0.4 -0.4 -0.1 -0.3 -0.5 -0.1 -0.3 -0.4 -0.1 -0.6 -0.5
-0.5 -0.4 -0.4 -0.2 -0.3 -0.5 -0.2 -0.2 -0.5 -0.2 -0.3 -0.5 -0.1 -0.4 -0.5
-0.5 -0.4 -0.5 -0.3 -0.1 -0.4 -0.3 -0.2 -0.5 -0.2 -0.1 -0.1  0.6  0.6  0.5
-0.5 -0.3 -0.4 -0.5 -0.2 -0.3 -0.4 -0.1  0.0  0.6  1.1  1.5  2.5  2.7  2.6
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-0.4 -0.6 -0.3 -0.4 -0.3  0.5  1.4  2.5  3.5  4.2  4.4  4.3  4.7  4.7  4.5
-0.2 -0.5 -0.4  0.1  0.7  2.0  3.2  4.0  4.5  4.7  4.6  4.5  4.7  4.8  4.6
-0.2 -0.4 -0.1  1.2  2.5  3.5  4.3  4.7  4.8  4.8  4.7  4.5  4.7  4.8  4.7
-0.3  0.1  1.0  2.6  3.9  4.3  4.5  4.9  4.8  4.7  4.6  4.6  4.7  4.8  4.7
 0.0  1.2  2.6  3.8  4.5  4.6  4.6  4.8  4.8  4.7  4.6  4.7  4.7  4.6  4.7
 0.8  2.6  3.8  4.2  4.6  4.8  4.7  4.7  4.7  4.7  4.7  4.7  4.7  4.6  4.8
 1.9  3.7  4.5  4.4  4.5  4.8  4.8  4.7  4.6  4.8  4.8  4.7  4.8  4.7  4.8
 3.1  4.2  4.7  4.6  4.4  4.6  4.7  4.7  4.6  4.7  4.8  4.7  4.8  4.8  4.8
 4.0  4.4  4.5  4.6  4.5  4.6  4.7  4.7  4.7  4.7  4.6  4.6  4.8  4.8  4.8
 4.6  4.7  4.5  4.6  4.7  4.7  4.6  4.6  4.7  4.7  4.6  4.6  4.7  4.8  4.8
 4.7  4.9  4.7  4.5  4.3  4.0  3.8  3.8  4.1  4.5  4.6  4.5  4.7  4.8  4.7
 4.6  4.8  4.7  4.2  3.2  2.2  2.0  2.2  2.7  3.6  4.3  4.5  4.7  4.8  4.7
 4.6  4.6  4.4  3.4  2.1  1.0  0.6  0.8  1.3  2.2  3.4  4.2  4.7  4.8  4.7
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 0.8  2.5  4.0  4.6  4.8  4.7  4.7  4.7  4.5  4.7  4.6  6.9 15.4 25.2 30.4
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-0.2 -0.2 -0.3 -0.3 -0.4 -0.6 -0.5 -0.3 -0.2 -0.2 -0.4 -0.5 -0.2 -0.4 -0.5
```

```
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 0.1 -0.2 -0.2  0.1 -0.5 -0.4 -0.1 -0.5 -0.3 -0.2 -0.5 -0.2 -0.2 -0.5 -0.3
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 9.7 11.1 11.1  9.7  7.4  5.4  4.5  3.9  2.4  1.1  0.8  0.8  0.6  0.6  1.2
20.5 23.2 23.2 20.5 15.6  9.9  6.0  4.5  3.4  2.1  1.4  1.0  0.8  1.2  2.2
29.3 30.7 30.7 29.3 25.3 17.9  9.8  5.3  4.1  3.4  2.6  2.0  2.0  2.6  3.6
31.6 31.6 31.6 31.6 30.5 25.3 15.5  7.3  4.6  4.4  4.0  3.7  3.7  4.1  4.5
31.6 31.6 31.6 31.6 31.7 29.1 20.4  9.9  5.0  4.6  4.6  4.6  4.7  4.8  4.8
31.7 31.7 31.7 31.7 31.7 30.4 23.0 11.5  5.3  4.6  4.6  4.7  4.8  4.8  4.7
31.7 31.7 31.7 31.7 31.8 30.6 23.0 11.2  5.3  4.8  4.7  4.7  4.7  4.5  4.4
31.7 31.6 31.6 31.7 31.7 29.3 20.4  9.4  5.0  4.8  4.6  4.5  4.5  4.4  4.4
31.7 31.6 31.6 31.7 30.4 25.2 15.4  6.9  4.6  4.7  4.5  4.7  4.7  4.7  4.8
29.2 30.4 30.4 29.2 25.2 17.9 10.0  5.2  4.5  4.9  4.9  5.0  5.0  4.8  4.5
20.7 23.1 23.1 20.7 15.7 10.1  6.5  4.8  4.5  5.0  5.1  4.8  4.8  4.5  3.7
10.0 11.6 11.6 10.0  7.3  5.4  5.2  4.8  4.3  4.7  5.0  4.6  4.1  3.6  2.4
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 4.2  4.6  4.6  4.2  4.1  4.5  4.4  3.6  2.9  2.0  1.3  0.8  0.1 -0.3 -0.4
```

```
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 0.7  1.3  1.3  0.7  0.6  0.9  0.7  0.2 -0.3 -0.5 -0.4 -0.2 -0.1 -0.3 -0.5
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```

```
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 4.5  4.7  4.9  4.7  4.0  2.4  0.4 -0.6 -0.6 -0.2 -0.1 -0.3 -0.4 -0.2 -0.1
 4.2  4.7  4.8  4.6  4.3  3.0  0.8 -0.4 -0.4 -0.2 -0.3 -0.4 -0.3 -0.2 -0.3
 3.4  4.4  4.6  4.6  4.5  3.6  1.5  0.0 -0.2 -0.2 -0.3 -0.3 -0.3 -0.4 -0.4
 2.3  3.6  4.4  4.7  4.6  3.9  2.3  0.6 -0.1 -0.2 -0.2 -0.3 -0.3 -0.3 -0.1
 1.4  2.9  4.3  4.7  4.5  4.2  2.8  0.8 -0.2 -0.3 -0.3 -0.2 -0.2 -0.3 -0.4
 1.1  2.6  4.2  4.6  4.6  4.5  3.1  0.8 -0.3 -0.4 -0.3 -0.3 -0.4 -0.6 -0.6
 1.2  2.2  3.8  4.5  4.7  4.5  3.1  0.9 -0.2 -0.3 -0.4 -0.4 -0.4 -0.4 -0.3
 1.0  1.8  3.4  4.5  4.7  4.3  3.1  1.0 -0.1 -0.3 -0.4 -0.5 -0.4 -0.3 -0.3
 0.7  1.6  3.3  4.4  4.6  4.4  3.4  1.2 -0.2 -0.4 -0.5 -0.5 -0.4 -0.3 -0.3
 0.7  1.9  3.7  4.6  4.6  4.5  3.2  1.0 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2
 0.9  2.5  4.2  4.9  4.9  4.5  2.9  0.7 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2
 1.5  3.0  4.3  4.7  4.7  4.2  2.7  0.7 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.3
 2.3  3.7  4.5  4.5  4.4  4.0  2.3  0.5 -0.2 -0.2 -0.2 -0.3 -0.4 -0.5 -0.5
 3.5  4.4  4.7  4.7  4.7  3.9  1.9  0.2 -0.3 -0.3 -0.4 -0.4 -0.4 -0.5 -0.5
 4.3  4.6  4.7  4.8  4.5  3.3  1.2 -0.2 -0.4 -0.5 -0.5 -0.5 -0.5 -0.4 -0.3
 4.6  4.6  4.7  4.6  3.9  2.3  0.5 -0.4 -0.5 -0.4 -0.4 -0.3 -0.2 -0.2 -0.2
 4.7  4.6  4.5  4.3  3.2  1.2 -0.1 -0.4 -0.4 -0.4 -0.3 -0.2 -0.2 -0.3 -0.4
 4.6  4.5  4.3  3.7  2.3  0.5 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.4
 4.4  4.5  4.2  3.2  1.5  0.2 -0.3 -0.3 -0.4 -0.3 -0.3 -0.4 -0.4 -0.3 -0.2
 4.5  4.5  3.8  2.2  0.6 -0.1 -0.2 -0.2 -0.2 -0.2 -0.3 -0.5 -0.5 -0.4 -0.3
 4.6  4.0  2.5  0.8 -0.1 -0.3 -0.3 -0.3 -0.2 -0.1 -0.2 -0.3 -0.3 -0.4 -0.5
 4.1  2.9  1.2  0.0 -0.3 -0.2 -0.3 -0.3 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2
 2.6  1.3  0.2 -0.3 -0.4 -0.4 -0.4 -0.3 -0.1 -0.2 -0.3 -0.3 -0.4 -0.3 -0.2
 0.9 -0.1 -0.4 -0.4 -0.4 -0.5 -0.6 -0.5 -0.4 -0.2 -0.2 -0.3 -0.4 -0.5 -0.6
 0.1 -0.3 -0.4 -0.3 -0.2 -0.2 -0.3 -0.5 -0.5 -0.4 -0.3 -0.2 -0.1 -0.2 -0.4
-0.1 -0.1 -0.2 -0.4 -0.3 -0.2 -0.2 -0.3 -0.4 -0.6 -0.6 -0.4 -0.2 -0.1 -0.1
-0.3 -0.1 -0.1 -0.3 -0.5 -0.4 -0.3 -0.2 -0.2 -0.3 -0.5 -0.5 -0.5 -0.4 -0.2
-0.5 -0.3 -0.1 -0.1 -0.3 -0.4 -0.4 -0.4 -0.2 -0.1 -0.1 -0.2 -0.4 -0.6 -0.5
-0.6 -0.6 -0.4 -0.3 -0.3 -0.3 -0.3 -0.5 -0.5 -0.3 -0.2 -0.2 -0.2 -0.5 -0.6
-0.4 -0.5 -0.5 -0.4 -0.4 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2 -0.2 -0.2
-0.3 -0.3 -0.4 -0.4 -0.3 -0.4 -0.5 -0.5 -0.5 -0.5 -0.5 -0.4 -0.2 -0.1 -0.2
-0.2 -0.3 -0.4 -0.4 -0.3 -0.2 -0.3 -0.4 -0.5 -0.6 -0.6 -0.5 -0.4 -0.1 -0.2
-0.2 -0.2 -0.3 -0.5 -0.4 -0.3 -0.2 -0.2 -0.3 -0.4 -0.4 -0.6 -0.8 -0.5 -0.2
-0.4 -0.2 -0.1 -0.3 -0.5 -0.4 -0.3 -0.3 -0.2 -0.2 -0.2 -0.3 -0.6 -0.8 -0.8
-0.4 -0.4 -0.2 -0.2 -0.4 -0.5 -0.4 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.5
-0.3 -0.4 -0.4 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3 -0.3 -0.3 -0.4 -0.4 -0.1 -0.1
-0.2 -0.3 -0.4 -0.4 -0.3 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2 -0.2 -0.4 -0.5 -0.4
-0.2 -0.2 -0.3 -0.4 -0.4 -0.3 -0.5 -0.5 -0.3 -0.4 -0.4 -0.2 -0.1 -0.3 -0.4
-0.3 -0.2 -0.2 -0.3 -0.3 -0.3 -0.4 -0.6 -0.4 -0.2 -0.4 -0.4 -0.4 -0.2 -0.1
-0.3 -0.3 -0.2 -0.2 -0.3 -0.2 -0.3 -0.5 -0.6 -0.4 -0.2 -0.1 -0.5 -0.6 -0.3
```

```
-0.3 -0.4 -0.2  0.0
 0.0 -0.3 -0.3 -0.4
-0.2 -0.5 -0.6 -0.6
-0.6 -0.7 -0.5 -0.3
-0.8 -0.5 -0.1 -0.1
-0.8 -0.2  0.0 -0.2
-0.3  0.1  0.0 -0.4
 0.2  0.1 -0.4 -0.7
 0.2 -0.4 -0.9 -0.8
-0.2 -0.8 -0.8 -0.1
-0.8 -0.8 -0.2  0.2
-0.9 -0.3  0.1 -0.4
-0.2  0.2 -0.2 -0.9
 0.2 -0.2 -0.8 -0.8
-0.2 -0.8 -0.8 -0.2
-0.8 -0.8 -0.2  0.3
-0.6 -0.2  0.2 -0.1
-0.1  0.1 -0.3 -0.8
-0.2 -0.4 -0.8 -0.7
-0.5 -0.6 -0.5 -0.1
-0.4 -0.3 -0.1 -0.1
-0.3 -0.2 -0.3 -0.4
-0.4 -0.3 -0.4 -0.4
-0.2 -0.3 -0.3 -0.2
-0.2 -0.3 -0.2 -0.2
-0.4 -0.3 -0.3 -0.4
-0.3 -0.2 -0.4 -0.5
-0.2 -0.5 -0.6 -0.5
-0.6 -0.7 -0.5 -0.3
-0.5 -0.3 -0.2 -0.3
-0.3 -0.3 -0.4 -0.4
-0.4 -0.4 -0.3 -0.2
-0.2 -0.1 -0.1 -0.2
-0.2 -0.3 -0.5 -0.5
-0.4 -0.3 -0.3 -0.2
-0.3 -0.3 -0.2 -0.3
-0.6 -0.7 -0.7 -0.7
-0.5 -0.4 -0.3 -0.2
-0.2 -0.1 -0.2 -0.2
-0.2 -0.3 -0.3 -0.4
-0.4 -0.3 -0.2 -0.1
-0.4 -0.4 -0.4 -0.4
```

```
-0.2 -0.3 -0.4 -0.4
-0.3 -0.3 -0.1 -0.1
-0.6 -0.6 -0.6 -0.5
-0.2 -0.2 -0.3 -0.5
-0.2 -0.1 -0.1 -0.2
-0.5 -0.5 -0.5 -0.5
-0.4 -0.3 -0.3 -0.3
-0.2 -0.3 -0.4 -0.3
-0.1 -0.2 -0.4 -0.5
-0.4 -0.1  0.0 -0.1
-0.7 -0.7 -0.4 -0.2
-0.3 -0.5 -0.6 -0.6
-0.2 -0.2 -0.3 -0.4
-0.3 -0.4 -0.3 -0.3
-0.1 -0.2 -0.3 -0.3
-0.5 -0.2 -0.3 -0.3
-0.7 -0.6 -0.5 -0.5
-0.4 -0.5 -0.5 -0.4
-0.3 -0.3 -0.4 -0.3
-0.4 -0.4 -0.5 -0.7
-0.3 -0.3 -0.2 -0.6
-0.3 -0.4  0.0  0.1
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	1	GEOMETRY FLAG
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	129	NUMBER OF RAYS FOR EACH PROJECTION
7	1	TRANSMISSION DATA
8	18500	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.330		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	125.000		DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED       72    (   110)

BLANK COMMON REQUIRED      144    (   220)

BLANK COMMON REQUIRED      216    (   330)

BLANK COMMON REQUIRED      474    (   732)

BLANK COMMON REQUIRED      538    (  1032)

A TOTAL OF 114 (  1 THRU 114) OF THE 129 USER PROJECTION BINS WILL BE USED

128 PROJECTION BINS WILL BE USED OF WHICH  14 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=  17846 FLOATING POINT WORDS.
```

```
    EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
    E     NN  N D   D       S     E       T   U   U P   P
    EEE   N N N D   D        SSS  EEE     T   U   U PPPP
    E     N  NN D   D           S E       T   U   U P
    EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


        FFFFF  III  L     BBBB  K   K
        F       I   L     B   B K  K
        FFF     I   L     BBBB  KKK
        F       I   L     B   B K  K
        F      III  LLLLL BBBB  K   K
```

PARAMETERS FOR SUBROUTINE FILBK

	DESCRIPTION
ORDERX - 0.0	FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX - 0.500	FREQUENCY PARAMETER FOR THE FILTER

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	YES
FIL	FILTER	N/A	NO	N/A

FILTERED BACK-PROJECTION RECONSTRUCTIONS MUST BE EXECUTED IN AN ARRAY WITH DIMENSIONS AT LEAST TWICE AS LARGE AS THE FINAL IMAGE.

```
         THUS, THE EFFECTIVE SIZE OF THE RECONSTRUCTION ARRAY WILL NOW
         BE INCREASED.

FOR FAN BEAM RECONSTRUCTIONS THE FAN SOURCE MUST BE OUTSIDE THIS LARGE ARRAY.


BLANK COMMON REQUIRED       602    (  1132)


A TOTAL OF 129 (  1 THRU 129) OF THE 129 USER PROJECTION BINS WILL BE USED


328 PROJECTION BINS WILL BE USED OF WHICH 199 HAVE BEEN ZEROED BY THE PROGRAM


BLANK COMMON REQUIRED     16986    ( 41132)

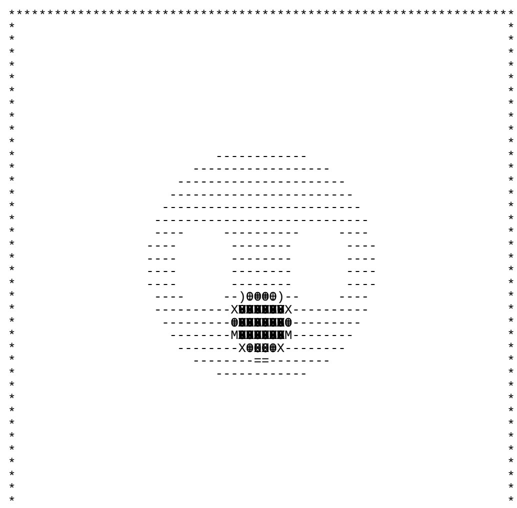

BLANK COMMON REQUIRED     17314    ( 41642)
```

```
                            PPPP  H   H  AAA  N   N
                            P   P H   H A   A NN  N
                            PPPP  HHHHH A   A N N N
                            P     H   H AAAAA N  NN
                            P     H   H A   A N   N
```

```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                X          Y          A          B        PHI      DENS
      1   - ELLIPSE       0.00 ,    0.00    40.00 ,   40.00      0.00      5.00
                     (   0.00),(   0.00)(  30.08),(  30.08)           (    6.65)
      1   - ELLIPSE       0.00 ,  -10.00    10.00 ,   10.00      0.00     27.00
                     (   0.00),(  -7.52)(   7.52),(   7.52)           (   35.91)
      1   - ELLIPSE      10.00 ,    0.00    14.00 ,   10.00      1.57     -4.00
                     (   7.52),(   0.00)(  10.53),(   7.52)           (   -5.32)
      1   - ELLIPSE     -10.00 ,    0.00    14.00 ,   10.00      1.57     -4.00
                     (  -7.52),(   0.00)(  10.53),(   7.52)           (   -5.32)
```

```
                EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
                E     NN  N D   D       P   P H   H A   A NN  N
                EEE   N N N D   D       PPPP  HHHHH A   A N N N
                E     N  NN D   D       P     H   H AAAAA N  NN
                EEEEE N   N DDDD        P     H   H A   A N   N
```

```
XMIN =   0.00E+00     XMAX =   0.43E+02     XSUM =   0.5656E+04
```



```
                       -          =          +          )          1          Z
0.0000E+00 0.3192E+01 0.7874E+01 0.1000E+02 0.1149E+02 0.1319E+02 0.1490E+02

Z          X          A          M          θ          θ          ⊕          ⊕
0.1639E+02 0.1745E+02 0.1851E+02 0.2085E+02 0.2320E+02 0.2468E+02 0.2639E+02

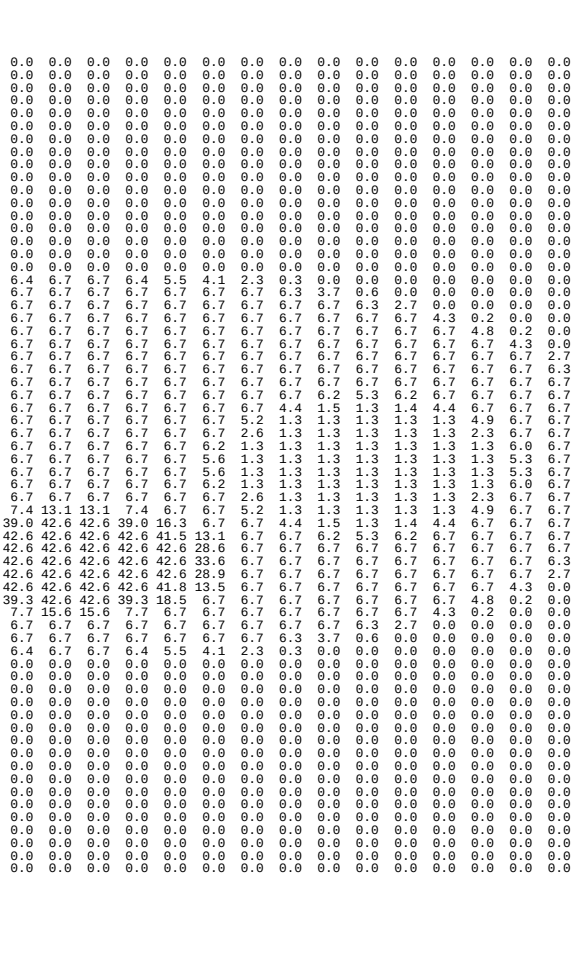
⊕          ⊕          ⊕          ⊠          ▣          ▣          ▣          ■
0.2788E+02 0.3107E+02 0.3490E+02 0.3703E+02 0.3873E+02 0.4043E+02 0.4192E+02

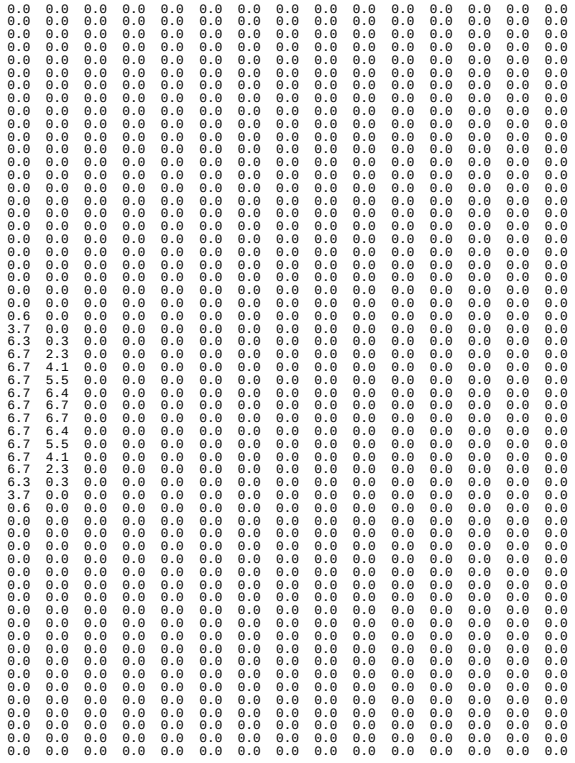
■
0.4256E+02
```

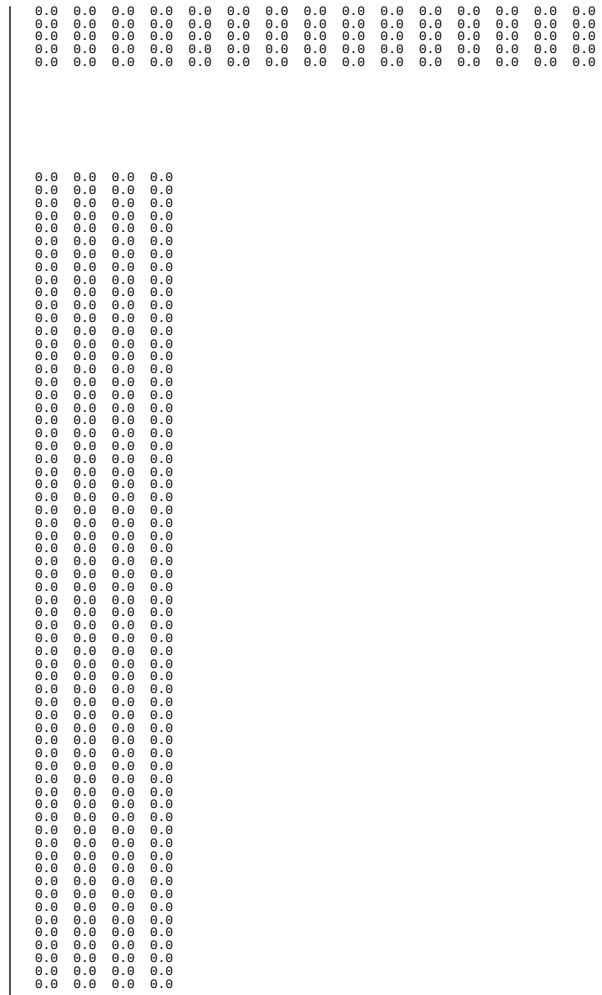
```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3  2.3  4.1  5.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.6  3.7  6.3  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.7  6.3  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.2  4.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.2  4.8  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  4.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  2.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.6  6.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  3.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.3  6.3  6.7  6.7  6.7  6.7  6.2  5.3  6.2  6.7  6.7  6.7  6.7
  0.0  0.0  2.3  6.7  6.7  6.7  6.7  4.4  1.4  1.3  1.5  4.4  6.7  6.7  6.7
  0.0  0.0  4.1  6.7  6.7  6.7  4.9  1.3  1.3  1.3  1.3  1.3  5.2  6.7  6.7
  0.0  0.0  5.5  6.7  6.7  6.7  2.3  1.3  1.3  1.3  1.3  1.3  2.6  6.7  6.7
  0.0  0.0  6.4  6.7  6.7  6.0  1.3  1.3  1.3  1.3  1.3  1.3  1.3  6.2  6.7
  0.0  0.0  6.7  6.7  6.7  5.3  1.3  1.3  1.3  1.3  1.3  1.3  1.3  5.6  6.7
  0.0  0.0  6.7  6.7  6.7  5.3  1.3  1.3  1.3  1.3  1.3  1.3  1.3  5.6  6.7
  0.0  0.0  6.4  6.7  6.7  6.0  1.3  1.3  1.3  1.3  1.3  1.3  1.3  6.2  6.7
  0.0  0.0  5.5  6.7  6.7  6.7  2.3  1.3  1.3  1.3  1.3  1.3  2.6  6.7  6.7
  0.0  0.0  4.1  6.7  6.7  6.7  4.9  1.3  1.3  1.3  1.3  1.3  5.2  6.7  6.7
  0.0  0.0  2.3  6.7  6.7  6.7  6.7  4.4  1.4  1.3  1.5  4.4  6.7  6.7 16.3
  0.0  0.0  0.3  6.3  6.7  6.7  6.7  6.7  6.2  5.3  6.2  6.7  6.7 13.1 41.5
  0.0  0.0  0.0  3.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7 28.6 42.6
  0.0  0.0  0.0  0.6  6.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7 33.6 42.6
  0.0  0.0  0.0  0.0  2.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7 28.9 42.6
  0.0  0.0  0.0  0.0  0.0  4.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7 13.5 41.8
  0.0  0.0  0.0  0.0  0.0  0.2  4.8  6.7  6.7  6.7  6.7  6.7  6.7  6.7 18.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.2  4.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.7  6.3  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.6  3.7  6.3  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.3  2.3  4.1  5.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```







```
BLANK COMMON REQUIRED     17346    ( 41702)

BLANK COMMON REQUIRED     17314    ( 41642)

BLANK COMMON REQUIRED       930    (  1642)

BLANK COMMON REQUIRED       602    (  1132)

        THE FINAL RECONSTRUCTION IS RETURNED WITH DIMENSION NDIMU.
        NDIMU WILL NOW BE RETURNED TO ITS ORIGINAL VALUE.

BLANK COMMON REQUIRED       538    (  1032)

A TOTAL OF 114 (  1 THRU 114) OF THE 129 USER PROJECTION BINS WILL BE USED

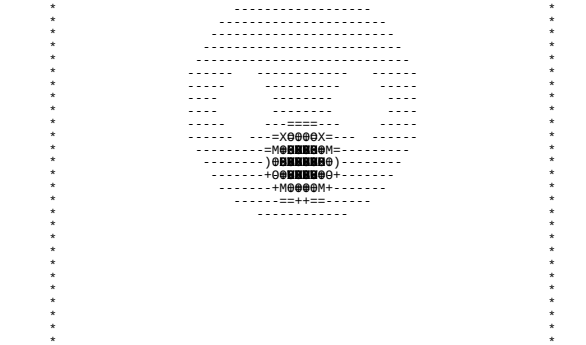
128 PROJECTION BINS WILL BE USED OF WHICH  14 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=  17846 FLOATING POINT WORDS.


           EEEEE N   N DDDD       FFFFF  III  L     BBBB  K   K
           E     NN  N D   D      F        I   L     B   B K  K
           EEE   N N N D   D      FFF      I   L     BBBB  KKK
           E     N  NN D   D      F        I   L     B   B K  K
           EEEEE N   N DDDD       F      III  LLLLL BBBB  K   K


RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH CURVED DETECTOR

XMIN =  -0.88E+00     XMAX =   0.43E+02     XSUM =   0.4635E+04
```



```
                    -           =           +           )           1           Z
-.8832E+00 0.2377E+01 0.7159E+01 0.9333E+01 0.1085E+02 0.1259E+02 0.1433E+02

Z           X           A           M           Θ           Θ           Θ           Θ
0.1585E+02 0.1694E+02 0.1803E+02 0.2042E+02 0.2281E+02 0.2433E+02 0.2607E+02

Θ           Θ           Θ           Θ           Θ           Θ           Θ           Θ
0.2759E+02 0.3085E+02 0.3476E+02 0.3694E+02 0.3868E+02 0.4042E+02 0.4194E+02

Θ
0.4259E+02
```

```
 -0.5  0.3  0.2 -0.6 -0.9 -0.3  0.2  0.1 -0.5 -0.8 -0.5  0.1  0.1 -0.4 -0.7
 -0.9 -0.2  0.3 -0.1 -0.8 -0.7 -0.1  0.2 -0.1 -0.6 -0.7 -0.3  0.1 -0.1 -0.5
 -0.8 -0.7  0.1  0.3 -0.3 -0.8 -0.5  0.0  0.1 -0.2 -0.6 -0.6 -0.1  0.0 -0.2
 -0.3 -0.8 -0.4  0.2  0.2 -0.5 -0.7 -0.4  0.0  0.0 -0.3 -0.6 -0.4 -0.1 -0.1
  0.2 -0.5 -0.8 -0.3  0.2 -0.1 -0.5 -0.5 -0.2  0.0 -0.2 -0.4 -0.4 -0.3  0.0
  0.3  0.1 -0.5 -0.6 -0.1  0.0 -0.3 -0.5 -0.4 -0.1 -0.1 -0.2 -0.4 -0.5 -0.2
 -0.2  0.2 -0.1 -0.5 -0.4  0.0  0.0 -0.4 -0.5 -0.3 -0.2 -0.2 -0.2 -0.4 -0.5
 -0.7 -0.1  0.1 -0.3 -0.5 -0.2  0.0 -0.1 -0.4 -0.4 -0.3 -0.4 -0.2 -0.1 -0.4
 -0.8 -0.5  0.0 -0.1 -0.4 -0.4 -0.2 -0.1 -0.3 -0.3 -0.2 -0.4 -0.4 -0.1 -0.2
 -0.5 -0.8 -0.3  0.0 -0.1 -0.3 -0.3 -0.1 -0.2 -0.4 -0.2 -0.1 -0.5 -0.3  0.0
 -0.2 -0.7 -0.8 -0.3 -0.1 -0.2 -0.3 -0.1  0.0 -0.4 -0.4 -0.1 -0.3 -0.5 -0.2
  0.3 -0.1 -0.7 -0.7 -0.3 -0.2 -0.4 -0.3  0.0 -0.1 -0.4 -0.3 -0.1 -0.4 -0.4
  0.1  0.3 -0.1 -0.6 -0.5 -0.2 -0.2 -0.4 -0.3  0.1 -0.2 -0.4 -0.1 -0.2 -0.5
 -0.6  0.0  0.2 -0.2 -0.6 -0.5 -0.1 -0.2 -0.5 -0.2  0.0 -0.3 -0.4 -0.1 -0.3
 -0.6 -0.5 -0.1  0.1 -0.2 -0.6 -0.4 -0.1 -0.3 -0.4 -0.1 -0.1 -0.4 -0.2 -0.1
 -0.2 -0.5 -0.5 -0.1  0.1 -0.2 -0.6 -0.4 -0.1 -0.3 -0.3  0.0 -0.1 -0.3 -0.2
  0.0 -0.2 -0.5 -0.5 -0.1  0.1 -0.3 -0.5 -0.3 -0.2 -0.4 -0.3 -0.1 -0.2 -0.2
 -0.3  0.0 -0.1 -0.4 -0.4 -0.1  0.0 -0.3 -0.4 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2
 -0.6 -0.4 -0.2 -0.2 -0.4 -0.4 -0.2 -0.1 -0.3 -0.4 -0.2 -0.2 -0.3 -0.3 -0.3
 -0.2 -0.5 -0.4 -0.2 -0.2 -0.3 -0.4 -0.2 -0.2 -0.4 -0.3 -0.1 -0.1 -0.2 -0.3
  0.1  0.0 -0.3 -0.4 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.4 -0.3 -0.1 -0.1 -0.2
 -0.4 -0.1  0.0 -0.2 -0.3 -0.3 -0.3 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3 -0.1 -0.1
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  0.0 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.4 -0.5 -0.3
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 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.2 -0.2 -0.5 -0.5  0.0 -0.1 -0.5 -0.2
```

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```

```
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 0.0  1.0  3.6  5.8  6.4  5.9  4.3  2.4  1.4  1.3  1.7  2.6  4.2  6.5 10.2
-0.3  0.5  2.8  5.4  6.5  6.3  5.5  4.1  2.8  2.4  2.9  4.2  5.9 10.9 20.2
-0.4 -0.1  1.6  4.5  6.2  6.5  6.2  5.7  5.0  4.5  4.8  5.6  8.5 18.2 31.5
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```

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 6.5  6.4  6.4  6.4  6.6  6.5  6.0  5.5  5.0  4.7  5.0  5.6  6.2  6.5  6.2
 6.5  6.3  6.3  6.5  6.6  6.3  5.3  3.9  2.8  2.4  2.8  4.0  5.5  6.3  6.4
 6.5  6.4  6.4  6.5  6.5  5.8  4.2  2.3  1.4  1.2  1.5  2.4  4.2  5.8  6.4
 6.5  6.5  6.5  6.5  6.3  5.2  3.1  1.5  1.1  1.1  1.1  1.5  3.2  5.3  6.4
 6.5  6.5  6.5  6.5  6.3  4.7  2.4  1.2  1.1  1.1  1.1  1.4  2.7  4.8  6.1
 6.5  6.4  6.4  6.5  6.3  4.4  2.0  1.2  1.2  1.2  1.2  1.3  2.2  4.2  5.8
 6.5  6.5  6.5  6.5  6.2  4.4  2.1  1.3  1.2  1.1  1.1  1.0  1.9  4.1  5.9
 6.4  6.4  6.4  6.4  6.2  4.7  2.4  1.2  1.0  1.0  1.0  1.1  2.3  4.6  6.2
 7.3  8.0  8.0  7.3  6.5  5.0  3.0  1.4  1.1  1.1  1.1  1.5  3.1  5.3  6.4
14.8 18.0 18.0 14.8 10.2  6.5  4.2  2.6  1.7  1.3  1.4  2.4  4.3  5.9  6.4
29.1 33.7 33.7 29.1 20.2 10.9  5.9  4.2  2.9  2.4  2.8  4.1  5.5  6.3  6.5
39.5 41.8 41.8 39.5 31.5 18.2  8.5  5.6  4.8  4.5  5.0  5.7  6.2  6.5  6.2
42.4 42.4 42.4 42.4 37.8 24.6 11.2  6.4  6.1  6.1  6.2  6.3  6.3  6.2  5.3
42.6 42.3 42.3 42.6 39.5 26.9 12.4  6.6  6.5  6.5  6.4  6.3  6.3  5.8  4.2
42.3 42.4 42.4 42.3 37.8 24.7 11.3  6.5  6.3  6.3  6.3  6.4  6.2  5.2  3.0
39.6 41.6 41.6 39.6 31.7 18.5  8.9  6.5  6.4  6.4  6.5  6.3  5.5  3.6  1.4
29.9 34.2 34.2 29.9 20.8 11.3  7.1  6.7  6.6  6.5  6.3  5.4  3.6  1.5  0.1
15.8 19.1 19.1 15.8 10.6  6.9  6.4  6.7  6.5  6.1  5.0  3.4  1.5  0.2 -0.2
 7.6  8.4  8.4  7.6  6.6  6.0  6.3  6.2  5.7  4.5  2.8  1.2  0.2 -0.2 -0.2
 6.1  6.1  6.1  6.1  5.9  5.5  5.2  4.5  3.3  2.0  0.7  0.0 -0.2 -0.2 -0.3
 4.5  4.7  4.7  4.5  3.9  3.2  2.7  1.8  0.7  0.1 -0.2 -0.4 -0.3 -0.2 -0.2
 1.5  1.8  1.8  1.5  1.0  0.6  0.5  0.1 -0.3 -0.3 -0.1 -0.3 -0.4 -0.3 -0.2
 0.0  0.0  0.0  0.0 -0.3 -0.5 -0.2 -0.1 -0.3 -0.3 -0.1 -0.1 -0.3 -0.4 -0.3
-0.1 -0.2 -0.2 -0.2 -0.3 -0.6 -0.3 -0.1 -0.2  0.0 -0.2 -0.1 -0.2 -0.3 -0.3
-0.1 -0.2 -0.2 -0.2 -0.1 -0.2 -0.5 -0.4 -0.2 -0.1 -0.3 -0.3 -0.2 -0.1 -0.2 -0.3
-0.2 -0.1 -0.1 -0.2 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.2 -0.1 -0.2 -0.3
-0.3  0.0  0.0 -0.3 -0.4 -0.4 -0.2 -0.2 -0.3 -0.3 -0.3 -0.2 -0.1 -0.1 -0.2
-0.2 -0.1 -0.1 -0.2 -0.4 -0.4 -0.2 -0.1 -0.3 -0.3 -0.3 -0.3 -0.2 -0.1 -0.2
-0.2 -0.1 -0.1 -0.2 -0.4 -0.5 -0.2  0.0 -0.2 -0.4 -0.4 -0.3 -0.2 -0.1 -0.2
-0.2 -0.1 -0.1 -0.2 -0.4 -0.5 -0.3  0.0 -0.1 -0.3 -0.4 -0.4 -0.3 -0.1 -0.1
-0.3 -0.2 -0.2 -0.3 -0.3 -0.4 -0.3 -0.1 -0.1 -0.1 -0.3 -0.4 -0.4 -0.2 -0.1
-0.3 -0.2 -0.2 -0.3 -0.3 -0.4 -0.3 -0.2 -0.2 -0.1 -0.1 -0.4 -0.5 -0.3 -0.1
-0.3 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.2 -0.1 -0.1 -0.2 -0.4 -0.5 -0.2
-0.3 -0.2 -0.2 -0.3 -0.3 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.1 -0.3 -0.5 -0.4
-0.4 -0.2 -0.2 -0.4 -0.3 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.1 -0.2 -0.4 -0.4
-0.3 -0.2 -0.2 -0.3 -0.3 -0.2 -0.3 -0.3 -0.2 -0.3 -0.2 -0.1 -0.2 -0.3 -0.4
-0.3 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.3 -0.2 -0.3 -0.3 -0.2 -0.1 -0.2 -0.4
-0.3 -0.3 -0.3 -0.3 -0.4 -0.2 -0.1 -0.3 -0.3 -0.3 -0.3 -0.3 -0.1 -0.2 -0.3
```

```
-0.6 -0.1  0.1 -0.2 -0.7 -0.4  0.1  0.1 -0.5 -0.8 -0.5  0.1  0.2 -0.3 -0.9
-0.4  0.1 -0.1 -0.5 -0.5 -0.1  0.1 -0.3 -0.7 -0.6 -0.1  0.2 -0.1 -0.7 -0.8
```

```
-0.2  0.1 -0.3 -0.6 -0.2  0.0 -0.1 -0.6 -0.6 -0.2  0.1  0.0 -0.5 -0.8 -0.3
 0.0  0.0 -0.5 -0.4 -0.1 -0.1 -0.4 -0.6 -0.3  0.0  0.0 -0.4 -0.7 -0.5  0.2
 0.1 -0.3 -0.5 -0.1  0.0 -0.3 -0.4 -0.4 -0.2  0.0 -0.2 -0.5 -0.5 -0.1  0.2
 0.0 -0.5 -0.3  0.0 -0.2 -0.5 -0.4 -0.2 -0.1 -0.1 -0.4 -0.5 -0.3  0.0 -0.1
-0.2 -0.4 -0.1 -0.1 -0.5 -0.4 -0.2 -0.2 -0.2 -0.3 -0.5 -0.4  0.0  0.0 -0.4
-0.4 -0.2  0.0 -0.4 -0.4 -0.1 -0.2 -0.4 -0.3 -0.4 -0.4 -0.1  0.0 -0.2 -0.5
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-0.1 -0.4 -0.5 -0.1 -0.2 -0.5 -0.3 -0.1 -0.4 -0.4  0.0 -0.1 -0.3 -0.2 -0.1
-0.3 -0.5 -0.2  0.0 -0.4 -0.4 -0.1 -0.3 -0.4 -0.1  0.0 -0.3 -0.4 -0.2 -0.3
-0.5 -0.4  0.0 -0.3 -0.5 -0.2 -0.1 -0.4 -0.2  0.1 -0.3 -0.4 -0.2 -0.2 -0.5
-0.4 -0.1 -0.1 -0.5 -0.3 -0.1 -0.4 -0.3  0.0 -0.2 -0.5 -0.2 -0.1 -0.5 -0.6
-0.2 -0.1 -0.4 -0.4 -0.1 -0.2 -0.4 -0.1 -0.1 -0.4 -0.3 -0.1 -0.4 -0.6 -0.2
-0.1 -0.2 -0.5 -0.3 -0.2 -0.3 -0.1  0.0 -0.3 -0.3 -0.1 -0.4 -0.6 -0.2  0.1
-0.2 -0.4 -0.4 -0.2 -0.2 -0.2 -0.1 -0.3 -0.4 -0.2 -0.3 -0.5 -0.3  0.1 -0.1
-0.2 -0.4 -0.3 -0.1 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2 -0.4 -0.3  0.0 -0.1 -0.4
-0.3 -0.3 -0.1 -0.2 -0.3 -0.3 -0.3 -0.2 -0.2 -0.4 -0.3 -0.1 -0.2 -0.4 -0.4
-0.3 -0.2 -0.2 -0.3 -0.3 -0.2 -0.1 -0.1 -0.3 -0.4 -0.2 -0.2 -0.4 -0.3 -0.2
-0.2 -0.2 -0.3 -0.3 -0.2 -0.1 -0.1 -0.3 -0.4 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3
-0.2 -0.3 -0.3 -0.2 -0.1 -0.1 -0.3 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3 -0.3 -0.3
-0.1 -0.3 -0.2 -0.1 -0.1 -0.3 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3 -0.2 -0.2 -0.1
 0.6 -0.2 -0.1 -0.1 -0.3 -0.5 -0.4 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2
 1.9  0.3 -0.1 -0.3 -0.5 -0.4 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2
 3.4  0.9 -0.3 -0.5 -0.4 -0.2 -0.2 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.3
 4.5  1.6 -0.2 -0.4 -0.2 -0.1 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.5
 5.2  2.5  0.3 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.3 -0.4 -0.5 -0.5 -0.4 -0.2
 5.7  3.5  0.9 -0.1 -0.1 -0.2 -0.2 -0.2 -0.4 -0.5 -0.4 -0.4 -0.3 -0.2 -0.2
 6.1  4.1  1.2 -0.2 -0.3 -0.3 -0.4 -0.4 -0.4 -0.4 -0.3 -0.2 -0.2 -0.3 -0.3
 6.1  4.4  1.3 -0.3 -0.3 -0.3 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.1 -0.1 -0.2
 6.1  4.6  1.6 -0.1 -0.3 -0.4 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3
 6.2  4.7  1.7  0.0 -0.2 -0.3 -0.2 -0.2 -0.1 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3
 6.3  4.4  1.4 -0.2 -0.2 -0.2 -0.1 -0.1 -0.2 -0.2 -0.3 -0.3 -0.3 -0.2 -0.2
 6.1  4.1  1.2 -0.1 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3
 5.8  3.6  1.0  0.0 -0.1 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3
 5.4  2.8  0.5 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2
 4.5  1.6 -0.1 -0.4 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2
 3.0  0.6 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.1 -0.1 -0.2 -0.2 -0.2 -0.2 -0.2
 1.7  0.1 -0.2 -0.2 -0.2 -0.2 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2
 0.8 -0.2 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3
 0.1 -0.2 -0.2 -0.3 -0.3 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.3 -0.3
-0.2 -0.1 -0.1 -0.2 -0.2 -0.3 -0.4 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2
-0.2 -0.2 -0.2 -0.2 -0.1 -0.1 -0.1 -0.2 -0.2 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3
-0.2 -0.3 -0.4 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.4 -0.5
-0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2
-0.2 -0.2 -0.1 -0.2 -0.2 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1
-0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2
-0.3 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2
-0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3
-0.3 -0.2 -0.2 -0.3 -0.4 -0.4 -0.3 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.1
-0.3 -0.2 -0.1 -0.2 -0.3 -0.3 -0.4 -0.4 -0.2 -0.2 -0.2 -0.3 -0.4 -0.4 -0.2
-0.3 -0.3 -0.2 -0.2 -0.1 -0.2 -0.3 -0.4 -0.4 -0.3 -0.2 -0.1 -0.2 -0.5 -0.6
-0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.1 -0.2 -0.4 -0.4 -0.4 -0.3 -0.1  0.0 -0.3
-0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.2 -0.1 -0.2 -0.3 -0.3 -0.5 -0.4 -0.2  0.0
-0.2 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.2 -0.2 -0.2 -0.1 -0.2 -0.4 -0.5 -0.4
-0.1 -0.2 -0.3 -0.4 -0.3 -0.2 -0.2 -0.3 -0.2 -0.3 -0.3 -0.2 -0.1 -0.2 -0.4
-0.1 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.1
-0.1 -0.1 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.3 -0.2 -0.1 -0.2 -0.4 -0.4 -0.2
-0.2 -0.1 -0.2 -0.2 -0.2 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3  0.0 -0.2 -0.4 -0.4
-0.3 -0.2 -0.1 -0.2 -0.2 -0.3 -0.4 -0.3 -0.1 -0.2 -0.5 -0.3  0.0 -0.2 -0.3
-0.4 -0.3 -0.1 -0.2 -0.3 -0.1 -0.3 -0.6 -0.3  0.0 -0.3 -0.5 -0.2 -0.2 -0.3
-0.3 -0.4 -0.3 -0.1 -0.3 -0.2  0.0 -0.4 -0.6 -0.2 -0.1 -0.3 -0.3 -0.2 -0.3
-0.2 -0.4 -0.5 -0.1 -0.2 -0.5 -0.1  0.0 -0.5 -0.5 -0.2 -0.2 -0.3 -0.2 -0.2
```

```
-0.6  0.2  0.3 -0.5
-0.1  0.3 -0.2 -0.9
 0.3  0.1 -0.7 -0.8
 0.2 -0.4 -0.8 -0.3
-0.3 -0.8 -0.5  0.2
-0.6 -0.5  0.1  0.3
-0.5 -0.1  0.2 -0.2
-0.3  0.1 -0.1 -0.7
-0.1  0.0 -0.5 -0.8
 0.0 -0.3 -0.8 -0.5
-0.3 -0.8 -0.7 -0.2
-0.7 -0.7 -0.1  0.3
-0.6 -0.1  0.3  0.1
-0.2  0.2  0.0 -0.6
 0.1 -0.1 -0.5 -0.6
-0.1 -0.5 -0.5 -0.2
-0.5 -0.5 -0.2  0.0
-0.4 -0.1  0.0 -0.3
-0.2 -0.2 -0.4 -0.6
-0.2 -0.4 -0.5 -0.2
-0.4 -0.3  0.0  0.1
-0.2  0.0 -0.1 -0.4
-0.1 -0.2 -0.4 -0.4
-0.3 -0.3 -0.2  0.0
-0.2 -0.2 -0.2 -0.3
-0.3 -0.4 -0.5 -0.5
-0.5 -0.4 -0.3 -0.1
-0.1 -0.1 -0.1 -0.2
-0.2 -0.3 -0.4 -0.4
-0.3 -0.2 -0.2 -0.1
-0.2 -0.2 -0.2 -0.3
-0.4 -0.5 -0.5 -0.5
-0.3 -0.2 -0.1 -0.1
-0.2 -0.2 -0.3 -0.3
-0.3 -0.3 -0.4 -0.3
-0.2 -0.1 -0.1  0.0
-0.3 -0.3 -0.3 -0.4
-0.2 -0.2 -0.2 -0.2
-0.1 -0.1 -0.1  0.0
-0.3 -0.4 -0.5 -0.5
-0.2 -0.2 -0.1 -0.1
-0.3 -0.2 -0.2 -0.2
-0.3 -0.4 -0.4 -0.6
-0.2 -0.1  0.0  0.1
-0.5 -0.5 -0.4 -0.3
-0.3 -0.4 -0.5 -0.7
-0.1 -0.1  0.0 -0.1
-0.3 -0.4 -0.3 -0.2
-0.1 -0.1 -0.2 -0.3
-0.3 -0.2 -0.1  0.0
-0.3 -0.4 -0.4 -0.4
-0.1  0.0 -0.1 -0.4
-0.5 -0.2  0.0  0.1
-0.5 -0.7 -0.6 -0.2
 0.0 -0.3 -0.6 -0.6
-0.2  0.0 -0.2 -0.4
-0.4 -0.3 -0.1 -0.2
-0.3 -0.3 -0.2 -0.2
-0.2 -0.3 -0.2 -0.1
-0.3 -0.4 -0.3 -0.2
-0.2 -0.3 -0.5 -0.4
-0.2 -0.2 -0.4 -0.4
-0.3 -0.2 -0.3 -0.4
-0.3 -0.3 -0.3 -0.3
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	2	GEOMETRY FLAG FAN BEAM GEOMETRY (FLAT DETECTOR)
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	129	NUMBER OF RAYS FOR EACH PROJECTION
7	1	TRANSMISSION DATA
8	18500	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.330		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	125.000		DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 144 (220)

BLANK COMMON REQUIRED 216 (330)

BLANK COMMON REQUIRED 474 (732)

BLANK COMMON REQUIRED 538 (1032)

A TOTAL OF 120 (1 THRU 120) OF THE 129 USER PROJECTION BINS WILL BE USED

140 PROJECTION BINS WILL BE USED OF WHICH 20 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17846 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

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FFFFF  III  L     BBBB  K   K
F       I   L     B   B K  K
FFF     I   L     BBBB  KKK
F       I   L     B   B K  K
F      III  LLLLL BBBB  K   K
```

PARAMETERS FOR SUBROUTINE FILBK

DESCRIPTION

ORDERX - 0.0 FILTER PARAMETER USED ONLY BY THE FILTER BUTER
FREQX - 0.500 FREQUENCY PARAMETER FOR THE FILTER

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	YES
FIL	FILTER	N/A	NO	N/A

FILTERED BACK-PROJECTION RECONSTRUCTIONS MUST BE EXECUTED IN AN ARRAY WITH DIMENSIONS AT LEAST TWICE AS LARGE AS THE FINAL IMAGE. THUS, THE EFFECTIVE SIZE OF THE RECONSTRUCTION ARRAY WILL NOW BE INCREASED.

FOR FAN BEAM RECONSTRUCTIONS THE FAN SOURCE MUST BE OUTSIDE THIS LARGE ARRAY.

BLANK COMMON REQUIRED 602 (1132)

A TOTAL OF 129 (1 THRU 129) OF THE 129 USER PROJECTION BINS WILL BE USED

896 PROJECTION BINS WILL BE USED OF WHICH 767 HAVE BEEN ZEROED BY THE PROGRAM

BLANK COMMON REQUIRED 16986 (41132)

BLANK COMMON REQUIRED 17882 (42732)

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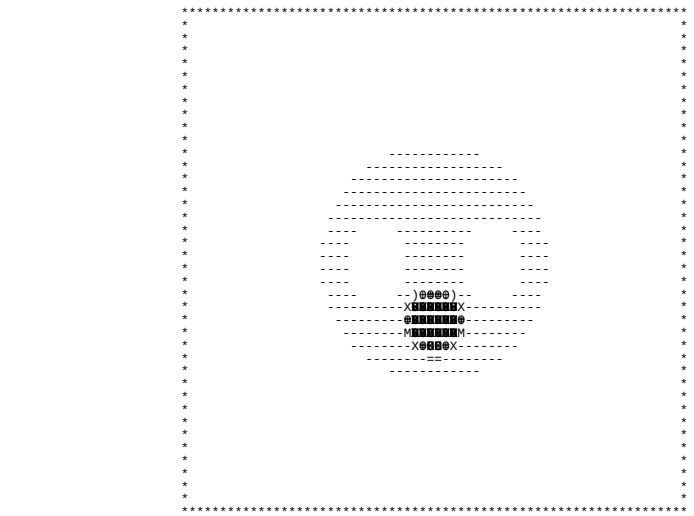
                    PPPP  H   H  AAA  N   N
                    P   P H   H A   A NN  N
                    PPPP  HHHHH A   A N N N
                    P     H   H AAAAA N  NN
                    P     H   H A   A N   N



PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE              X         Y         A         B       PHI      DENS
      1   - ELLIPSE       0.00 ,    0.00    40.00 ,   40.00     0.00     5.00
                    (   0.00),(   0.00)(  30.08),(  30.08)         (   6.65)
      1   - ELLIPSE       0.00 ,  -10.00    10.00 ,   10.00     0.00    27.00
                    (   0.00),(  -7.52)(   7.52),(   7.52)         (  35.91)
      1   - ELLIPSE      10.00 ,    0.00    14.00 ,   10.00     1.57    -4.00
                    (   7.52),(   0.00)(  10.53),(   7.52)         (  -5.32)
      1   - ELLIPSE     -10.00 ,    0.00    14.00 ,   10.00     1.57    -4.00
                    (  -7.52),(   0.00)(  10.53),(   7.52)         (  -5.32)


            EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
            E     NN  N D   D       P   P H   H A   A NN  N
            EEE   N N N D   D       PPPP  HHHHH A   A N N N
            E     N  NN D   D       P     H   H AAAAA N  NN
            EEEEE N   N DDDD        P     H   H A   A N   N


XMIN =   0.00E+00     XMAX =   0.43E+02     XSUM =   0.5656E+04
```



```
                -           =           +           )           1           Z
0.0000E+00 0.3192E+01 0.7874E+01 0.1000E+02 0.1149E+02 0.1319E+02 0.1490E+02

Z           X           A           M           0           @           @           @
0.1639E+02 0.1745E+02 0.1851E+02 0.2085E+02 0.2320E+02 0.2468E+02 0.2639E+02

@           @           @           X           X           X           X           X
0.2788E+02 0.3107E+02 0.3490E+02 0.3703E+02 0.3873E+02 0.4043E+02 0.4192E+02

X
0.4256E+02
```

6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.3	3.7	0.6	0.0	0.0	0.0	0.0	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.3	2.7	0.0	0.0	0.0	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.3	0.2	0.0	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.8	0.2	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.3	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	2.7
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.3
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.2	5.3	6.2	6.7	6.7	6.7	6.7
6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.4	1.5	1.3	1.4	4.4	6.7	6.7	6.7
6.7	6.7	6.7	6.7	6.7	6.7	5.2	1.3	1.3	1.3	1.3	1.3	4.9	6.7	6.7
6.7	6.7	6.7	6.7	6.7	6.7	2.6	1.3	1.3	1.3	1.3	1.3	2.3	6.7	6.7
6.7	6.7	6.7	6.7	6.7	6.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	6.0	6.7
6.7	6.7	6.7	6.7	6.7	5.6	1.3	1.3	1.3	1.3	1.3	1.3	1.3	5.3	6.7
6.7	6.7	6.7	6.7	6.7	5.6	1.3	1.3	1.3	1.3	1.3	1.3	1.3	5.3	6.7
6.7	6.7	6.7	6.7	6.7	6.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	6.0	6.7
6.7	6.7	6.7	6.7	6.7	6.7	2.6	1.3	1.3	1.3	1.3	1.3	2.3	6.7	6.7
7.4	13.1	13.1	7.4	6.7	6.7	5.2	1.3	1.3	1.3	1.3	1.3	4.9	6.7	6.7
39.0	42.6	42.6	39.0	16.3	6.7	6.7	4.4	1.5	1.3	1.4	4.4	6.7	6.7	6.7
42.6	42.6	42.6	42.6	41.5	13.1	6.7	6.7	6.2	5.3	6.2	6.7	6.7	6.7	6.7
42.6	42.6	42.6	42.6	42.6	28.6	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
42.6	42.6	42.6	42.6	42.6	33.6	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.3
42.6	42.6	42.6	42.6	42.6	28.9	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	2.7
42.6	42.6	42.6	42.6	41.8	13.5	6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.3	0.0
39.3	42.6	42.6	39.3	18.5	6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.8	0.2	0.0
7.7	15.6	15.6	7.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	4.3	0.2	0.0	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.3	2.7	0.0	0.0	0.0	0.0
6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.3	3.7	0.6	0.0	0.0	0.0	0.0	0.0
6.4	6.7	6.7	6.4	5.5	4.1	2.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
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0.0	0.0	0.0	0.0
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0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0

BLANK COMMON REQUIRED 17914 (42772)

BLANK COMMON REQUIRED 17882 (42732)

BLANK COMMON REQUIRED 1498 (2732)

BLANK COMMON REQUIRED 602 (1132)

THE FINAL RECONSTRUCTION IS RETURNED WITH DIMENSION NDIMU.
NDIMU WILL NOW BE RETURNED TO ITS ORIGINAL VALUE.

BLANK COMMON REQUIRED 538 (1032)

A TOTAL OF 120 (1 THRU 120) OF THE 129 USER PROJECTION BINS WILL BE USED

140 PROJECTION BINS WILL BE USED OF WHICH 20 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17914 FLOATING POINT WORDS.

```
EEEEE N   N DDDD        FFFFF  III  L     BBBB  K   K
E     NN  N D   D       F       I   L     B   B K  K
EEE   N N N D   D       FFF     I   L     BBBB  KKK
E     N  NN D   D       F       I   L     B   B K  K
EEEEE N   N DDDD        F      III  LLLLL BBBB  K   K
```

RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH FLAT DETECTOR

XMIN = -0.88E+00   XMAX = 0.43E+02   XSUM = 0.4643E+04

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******************************************************************
*                                                                *
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*                                                                *
*                          ------------                          *
*                       ------------------                       *
*                     ----------------------                     *
*                    ------------------------                    *
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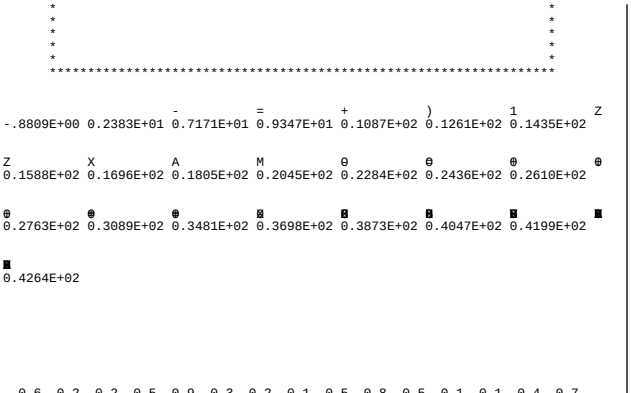
*                  ----------------------------                  *
*                 ------   ------------   ------                 *
*                 -----     ----------     -----                 *
*                 ----       --------       ----                 *
*                 ----       --------       ----                 *
*                 -----     ---====---     -----                 *
*                 ------  ---=Xθ⊕⊕θX=---  ------                 *
*                  ---------=M⊕█████⊕M=---------                 *
*                   --------)⊕███████⊕)--------                  *
*                    -------+θ⊕█████⊕θ+-------                   *
*                     -------+M⊕⊕⊕⊕M+-------                     *
*                       ------==++==------                       *
*                          ------------                          *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
*                                                                *
```



-0.2 1.2 4.4 6.4 6.4 4.7 2.3 1.1 1.0 1.0 1.0 1.2 2.4 4.7 6.2
-0.2 1.1 4.0 6.2 6.5 5.4 3.2 1.5 1.1 1.1 1.1 1.4 3.0 5.0 6.4
-0.1 0.9 3.6 5.9 6.6 6.0 4.3 2.4 1.5 1.3 1.7 2.6 4.2 6.4 10.2
-0.3 0.3 2.7 5.5 6.6 6.5 5.6 4.1 2.9 2.4 2.9 4.2 5.9 10.9 20.2
-0.4 -0.2 1.5 4.5 6.4 6.6 6.3 5.7 5.0 4.5 4.9 5.6 8.5 18.2 31.5
-0.1 -0.2 0.6 2.9 5.4 6.3 6.4 6.3 6.2 6.1 6.2 6.4 11.2 24.6 37.9
-0.1 -0.2 0.0 1.6 4.3 6.0 6.4 6.4 6.4 6.5 6.5 6.7 12.4 27.0 39.5
-0.3 -0.4 -0.2 0.7 2.9 5.3 6.5 6.5 6.4 6.4 6.4 6.5 11.4 24.8 37.9
-0.3 -0.2 -0.2 0.0 1.2 3.5 5.6 6.5 6.6 6.5 6.5 6.6 9.0 18.6 31.9
-0.1 -0.1 -0.2 -0.3 0.0 1.3 3.6 5.5 6.4 6.6 6.7 6.8 7.1 11.3 20.9
-0.2 -0.2 -0.2 -0.3 -0.3 0.1 1.4 3.3 5.1 6.2 6.6 6.8 6.5 6.9 10.6
-0.4 -0.4 -0.3 -0.2 -0.2 -0.2 0.1 1.1 2.7 4.5 5.8 6.4 6.4 6.1 6.6
-0.3 -0.3 -0.2 -0.2 -0.3 -0.2 -0.2 0.0 0.6 1.9 3.2 4.5 5.3 5.6 6.0
-0.2 -0.1 -0.1 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 0.1 0.6 1.6 2.6 3.2 3.9
-0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.3 -0.3 0.0 0.4 0.5 0.9
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-0.3 -0.3 -0.3 -0.3 -0.1 -0.1 -0.2 -0.4 -0.4 -0.3 -0.1 0.0 -0.2 -0.5 -0.4
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-0.4 -0.3 -0.2 -0.1 -0.1 -0.2 -0.4 -0.4 -0.3 -0.2 -0.1 -0.1 -0.3 -0.4 -0.3
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-0.2 -0.2 -0.2 -0.2 -0.4 -0.5 -0.3 -0.1 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.3
-0.2 -0.1 -0.2 -0.3 -0.4 -0.4 -0.2 -0.1 -0.2 -0.2 -0.3 -0.3 -0.3 -0.2 -0.3
-0.2 -0.1 -0.3 -0.4 -0.4 -0.3 -0.2 -0.1 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3
-0.1 -0.2 -0.4 -0.3 -0.3 -0.2 -0.1 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.1 -0.2
-0.1 -0.4 -0.4 -0.2 -0.3 -0.2 -0.1 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.1 -0.2 -0.4

-0.6 0.2 0.2 -0.5 -0.9 -0.3 0.2 0.1 -0.5 -0.8 -0.5 0.1 0.1 -0.4 -0.7
-0.9 -0.2 0.3 -0.1 -0.8 -0.7 -0.1 0.2 -0.1 -0.6 -0.7 -0.3 0.2 -0.1 -0.5
-0.8 -0.7 0.1 0.3 -0.3 -0.8 -0.5 0.0 0.1 -0.2 -0.6 -0.6 -0.1 0.0 -0.2
-0.3 -0.8 -0.4 0.2 0.2 -0.5 -0.7 -0.4 0.0 0.0 -0.3 -0.6 -0.4 -0.1 -0.1
0.2 -0.5 -0.8 -0.3 0.2 -0.1 -0.5 -0.6 -0.2 0.0 -0.1 -0.4 -0.5 -0.3 0.0
0.3 0.1 -0.6 -0.6 -0.1 0.1 -0.2 -0.5 -0.4 -0.1 -0.1 -0.2 -0.4 -0.5 -0.2
-0.2 0.2 -0.1 -0.5 -0.4 0.0 0.0 -0.4 -0.5 -0.3 -0.2 -0.2 -0.2 -0.4 -0.5
-0.7 -0.1 0.1 -0.3 -0.5 -0.2 0.0 -0.1 -0.4 -0.4 -0.3 -0.4 -0.2 -0.1 -0.4
-0.8 -0.5 0.0 -0.1 -0.4 -0.4 -0.2 -0.1 -0.2 -0.3 -0.2 -0.3 -0.4 -0.1 -0.2
-0.5 -0.7 -0.3 0.0 -0.1 -0.3 -0.3 -0.1 -0.2 -0.4 -0.2 -0.1 -0.5 -0.3 0.0
-0.2 -0.7 -0.7 -0.3 -0.1 -0.2 -0.3 -0.1 0.0 -0.4 -0.4 -0.1 -0.3 -0.5 -0.2
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-0.6 -0.1 0.1 -0.2 -0.5 -0.4 -0.1 -0.2 -0.5 -0.2 0.0 -0.3 -0.4 -0.1 -0.3
-0.6 -0.5 -0.1 0.1 -0.2 -0.6 -0.4 -0.1 -0.3 -0.4 -0.1 -0.1 -0.4 -0.3 -0.1
-0.1 -0.5 -0.5 -0.1 0.1 -0.2 -0.5 -0.3 -0.1 -0.3 -0.3 0.0 -0.1 -0.3 -0.2
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-0.3 0.0 -0.1 -0.4 -0.5 -0.2 0.0 -0.3 -0.4 -0.2 -0.2 -0.3 -0.3 -0.2 -0.2
-0.6 -0.4 -0.1 -0.1 -0.4 -0.4 -0.2 -0.1 -0.3 -0.3 -0.2 -0.2 -0.3 -0.3 -0.3
-0.2 -0.5 -0.4 -0.2 -0.2 -0.3 -0.4 -0.2 -0.2 -0.3 -0.3 -0.2 -0.1 -0.2 -0.3
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-0.4 -0.1 0.0 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3 -0.1 -0.1
-0.5 -0.4 -0.2 -0.1 -0.1 -0.2 -0.2 -0.2 -0.4 -0.3 -0.2 -0.3 -0.4 -0.3 -0.1
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-0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.1 -0.2 -0.3 -0.3 -0.3 -0.4 -0.5
-0.5 -0.5 -0.4 -0.3 -0.3 -0.2 -0.1 -0.1 -0.1 -0.1 -0.1 -0.2 -0.2 -0.2 -0.4
-0.1 -0.3 -0.4 -0.5 -0.5 -0.5 -0.4 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.2 -0.2
-0.2 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.5 -0.4 -0.3 -0.2 -0.1 -0.1 -0.1 -0.1
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-0.1 -0.2 -0.2 -0.3 -0.3 -0.3 -0.2 -0.2 -0.3 -0.4 -0.5 -0.4 -0.4 -0.3 -0.2
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-0.5 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.4 -0.4
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-0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2
-0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.4 -0.4 -0.3
-0.6 -0.4 -0.3 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2
0.1 0.0 -0.1 -0.2 -0.2 -0.4 -0.4 -0.4 -0.3 -0.3 -0.3 -0.2 -0.1 -0.1 -0.1
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-0.4 -0.5 -0.4 -0.3 -0.1 -0.2 -0.3 -0.4 -0.3 -0.1 -0.1 -0.2 -0.3 -0.4 -0.4
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0.1 0.0 -0.2 -0.4 -0.5 -0.5 -0.2 -0.1 -0.2 -0.3 -0.4 -0.4 -0.3 -0.2 -0.2
-0.2 -0.5 -0.6 -0.5 -0.3 -0.1 -0.1 -0.3 -0.4 -0.4 -0.4 -0.2 -0.2 -0.2 -0.2
-0.6 -0.6 -0.3 -0.1 -0.1 -0.2 -0.4 -0.5 -0.3 -0.3 -0.2 -0.1 -0.2 -0.2 -0.2
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-0.3 -0.2 -0.3 -0.4 -0.4 -0.2 -0.1 -0.2 -0.3 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3
-0.2 -0.2 -0.3 -0.3 -0.1 -0.2 -0.2 -0.4 -0.3 -0.2 -0.3 -0.3 -0.2 -0.3 -0.4
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-0.4 -0.3 -0.2 -0.2 -0.3 -0.2 -0.2 -0.5 -0.3 0.0 -0.3 -0.6 -0.2 -0.1 -0.3
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-0.3 -0.2 -0.2 -0.3 -0.5 -0.1 0.1 -0.7 -0.5 0.2 -0.2 -0.8 -0.2 0.2 -0.4
-0.3 -0.2 -0.2 -0.3 -0.5 -0.1 0.0 -0.7 -0.4 0.2 -0.4 -0.7 0.0 0.0 -0.6
-0.3 -0.3 -0.3 -0.3 -0.4 -0.1 0.0 -0.7 -0.4 0.2 -0.5 -0.5 0.1 -0.2 -0.6
-0.2 -0.3 -0.3 -0.2 -0.4 -0.1 0.0 -0.7 -0.3 0.1 -0.6 -0.4 0.1 -0.3 -0.6
-0.2 -0.3 -0.3 -0.2 -0.4 -0.1 -0.1 -0.7 -0.2 0.0 -0.6 -0.2 0.1 -0.5 -0.4
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-0.2 -0.2 -0.2 -0.2 -0.4 -0.1 -0.2 -0.6 -0.1 -0.2 -0.5 -0.1 -0.2 -0.4 -0.1
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-0.3 -0.3 -0.3 -0.3 -0.2 -0.2 -0.2 -0.1 -0.2 -0.3 -0.3 -0.5 -0.4 -0.2 -0.1 -0.1
-0.2 -0.3 -0.4 -0.3 -0.2 -0.2 -0.3 -0.2 -0.2 -0.2 -0.1 -0.2 -0.4 -0.5 -0.4 -0.4
-0.1 -0.2 -0.3 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.1 -0.2 -0.4 -0.4
-0.1 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.3 -0.2 -0.2 -0.3 -0.4 -0.3 -0.2 -0.1 -0.1
-0.2 -0.2 -0.2 -0.2 -0.3 -0.4 -0.3 -0.3 -0.3 -0.2 -0.1 -0.2 -0.4 -0.4 -0.2 -0.2
-0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.2 -0.3 -0.4 -0.3  0.0 -0.1 -0.4 -0.3 -0.3
-0.3 -0.2 -0.1 -0.2 -0.2 -0.2 -0.4 -0.3  0.0 -0.3 -0.5 -0.3  0.0 -0.2 -0.3 -0.4
-0.4 -0.3 -0.1 -0.2 -0.3 -0.1 -0.2 -0.6 -0.3  0.0 -0.3 -0.5 -0.2 -0.2 -0.3 -0.3
-0.3 -0.4 -0.2 -0.1 -0.4 -0.2  0.0 -0.4 -0.6 -0.2 -0.1 -0.3 -0.3 -0.2 -0.3 -0.2
-0.2 -0.4 -0.4 -0.1 -0.2 -0.5 -0.1  0.0 -0.4 -0.4 -0.2 -0.2 -0.3 -0.2 -0.2 -0.3
```

```
-0.5  0.2  0.2 -0.6
-0.1  0.3 -0.2 -0.9
 0.3  0.1 -0.7 -0.8
 0.2 -0.4 -0.8 -0.3
-0.3 -0.8 -0.5  0.2
-0.6 -0.6  0.1  0.3
-0.5 -0.1  0.2 -0.2
-0.3  0.1 -0.1 -0.7
-0.1  0.0 -0.5 -0.8
 0.0 -0.3 -0.7 -0.5
-0.3 -0.7 -0.7 -0.2
-0.7 -0.6 -0.1  0.2
-0.5 -0.1  0.3  0.0
-0.2  0.1 -0.1 -0.6
 0.1 -0.1 -0.5 -0.6
-0.1 -0.5 -0.5 -0.1
-0.5 -0.5 -0.2  0.0
-0.4 -0.1  0.0 -0.3
-0.2 -0.1 -0.4 -0.6
-0.2 -0.4 -0.5 -0.2
-0.3 -0.3  0.0  0.1
-0.2  0.0 -0.1 -0.4
-0.1 -0.2 -0.4 -0.5
-0.3 -0.4 -0.2  0.0
-0.2 -0.2 -0.2 -0.3
-0.3 -0.4 -0.5 -0.5
-0.5 -0.4 -0.3 -0.1
-0.1 -0.1 -0.1 -0.2
-0.2 -0.3 -0.4 -0.4
-0.3 -0.2 -0.2 -0.1
-0.2 -0.2 -0.2 -0.3
-0.4 -0.5 -0.5 -0.5
-0.3 -0.2 -0.1 -0.1
-0.2 -0.2 -0.2 -0.3
-0.2 -0.3 -0.4 -0.3
-0.2 -0.1 -0.1  0.0
-0.3 -0.3 -0.4 -0.4
-0.2 -0.2 -0.2 -0.2
-0.2 -0.1 -0.1 -0.1
-0.3 -0.4 -0.5 -0.5
-0.2 -0.2 -0.1 -0.1
-0.3 -0.2 -0.2 -0.2
-0.2 -0.3 -0.4 -0.6
-0.2 -0.1  0.0  0.1
-0.5 -0.5 -0.4 -0.3
-0.3 -0.4 -0.5 -0.7
-0.1 -0.1  0.0 -0.1
-0.3 -0.4 -0.3 -0.2
-0.1 -0.1 -0.2 -0.3
-0.3 -0.2 -0.1  0.0
-0.3 -0.4 -0.5 -0.4
-0.1  0.0 -0.1 -0.4
-0.4 -0.2  0.0  0.1
-0.5 -0.6 -0.5 -0.2
-0.1 -0.3 -0.6 -0.6
-0.2  0.0 -0.2 -0.5
-0.4 -0.3 -0.2 -0.3
-0.3 -0.3 -0.2 -0.2
-0.2 -0.3 -0.2 -0.1
-0.3 -0.4 -0.4 -0.2
-0.2 -0.3 -0.4 -0.3
-0.2 -0.2 -0.3 -0.4
-0.3 -0.2 -0.3 -0.3
-0.3 -0.3 -0.3 -0.3
```

EX05

```
      PROGRAM XCONGR
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 5
C
C             THE PROGRAM XCONGR USES THE ITERATIVE CONJUGATE GRADIENT
C        ALGORITHM TO RECONSTRUCT PARALLEL BEAM PROJECTION DATA.
C
      DIMENSION B(4096),AG(180)
      COMMON/BLANK/WORK(15000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,PRF
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=0
      IGEOM=0
      NANG=72
      MODANG=4
      KDIMU=100
      IMIT=1
      NWORK=15000
      NFLOAT=2
      ISTORE=0
      IPRINT=7
      LUNATN=0
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E05.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
C
      CALL CONGR (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,14)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,16) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   14 FORMAT(1X///////)
   16 FORMAT(1X,15F5.1)
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 5
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A PIE PHANTOM.
C
      DIMENSION B(4096),DATA(*),ERR(*)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL PLL
C
      DATA R,X1,Y1,Z,INTFR,NSLIPI,ISTART/30.,0.,0.,1.,10,10,1/
C
      IF (M.EQ.1) THEN
          CALL PIE (B,NDIMU,R,X1,Y1,Z,INTFR,NSLIPI,ISTART)
          CALL ARRAY (B,NDIMU)
      ENDIF
C
      CALL PJECT (B,DATA,M,PLL)
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0		RECONSTRUCT IN A CIRCULAR ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	4		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	1		TRANSMISSION DATA
8	15000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	7		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT PROJECTION DATA AND UNCERTAINTIES PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED        72    (   110)


BLANK COMMON REQUIRED       144    (   220)


BLANK COMMON REQUIRED       216    (   330)


BLANK COMMON REQUIRED       416    (   640)


BLANK COMMON REQUIRED       480    (   740)

A TOTAL OF  68 ( 17 THRU  84) OF THE 100 USER PROJECTION BINS WILL BE USED

 68 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=    480 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
 CCC  OOOOO N   N  GGG  RRRR
C   C O   O NN  N G   G R   R
C     O   O N N N G     RRRR
C   C O   O N  NN G  GG R  R
 CCC  OOOOO N   N  GGGG R   R
```

PARAMETERS FOR SUBROUTINE CONGR

		DESCRIPTION
ISTP -	15	NUMBER OF ITERATION STEPS
IRLX -	1	ITERATIVE RELAXATION METHOD
IERR -	0	DO NOT USE ERROR ARRAY
IZER -	0	INITIAL SOLUTION IS ZERO

```
BLANK COMMON REQUIRED       516    (  1004)


BLANK COMMON REQUIRED      1675    (  3213)


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS
```

```
ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      UNIFORM SQUARE          NO                  NO
PRJ     PROJECTION          UNIFORM SQUARE          NO                  NO


BLANK COMMON REQUIRED      1811    (  3423)


BLANK COMMON REQUIRED      5039    ( 11657)


BLANK COMMON REQUIRED      8267    ( 20113)


BLANK COMMON REQUIRED     11495    ( 26347)


BLANK COMMON REQUIRED     14723    ( 34603)

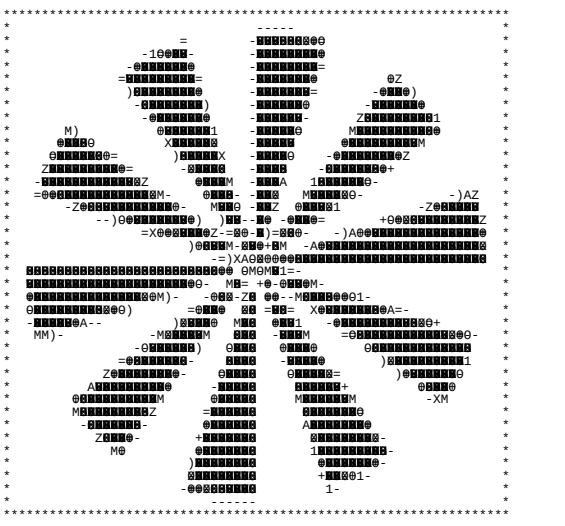

                              PPPP   III  EEEEE
                              P   P   I   E
                              PPPP    I   EEE
                              P       I   E
                              P      III  EEEEE

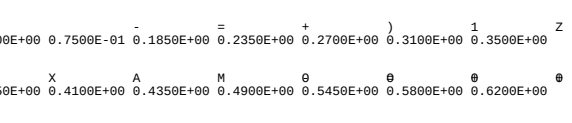


PIE PHANTOM GENERATED
ARRAY SIZE   64X 64
CIRCLE RADIUS   30.00  AT  ( 0., 0.)
INT FACTOR   10
SECTOR WIDTH   0.314


                     EEEEE N   N DDDD        PPPP   III  EEEEE
                     E     NN  N D   D       P   P   I   E
                     EEE   N N N D   D       PPPP    I   EEE
                     E     N  NN D   D       P       I   E
                     EEEEE N   N DDDD        P      III  EEEEE


XMIN =   0.00E+00     XMAX =   0.10E+01     XSUM =   0.1414E+04
```



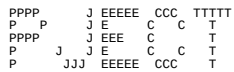


```
0.0000E+00 0.7500E-01 0.1850E+00 0.2350E+00 0.2700E+00 0.3100E+00 0.3500E+00


Z          X          A          M          Θ          Θ          Θ          Θ
0.3850E+00 0.4100E+00 0.4350E+00 0.4900E+00 0.5450E+00 0.5800E+00 0.6200E+00


Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.6550E+00 0.7300E+00 0.8200E+00 0.8700E+00 0.9100E+00 0.9500E+00 0.9850E+00


Θ
0.1000E+01
```



```
BLANK COMMON REQUIRED     14791    ( 34707)

PROJECTION DATA FOR ANGLE NO.   1     0.000 RADIANS     0.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.541E+01
     0.943E+01   0.120E+02   0.141E+02   0.158E+02   0.173E+02
     0.187E+02   0.198E+02   0.210E+02   0.219E+02   0.228E+02
     0.236E+02   0.244E+02   0.250E+02   0.257E+02   0.262E+02
     0.268E+02   0.272E+02   0.277E+02   0.281E+02   0.284E+02
     0.287E+02   0.290E+02   0.292E+02   0.295E+02   0.296E+02
     0.298E+02   0.291E+02   0.299E+02   0.300E+02   0.305E+02
     0.300E+02   0.307E+02   0.298E+02   0.297E+02   0.295E+02
     0.293E+02   0.291E+02   0.288E+02   0.285E+02   0.281E+02
     0.277E+02   0.273E+02   0.268E+02   0.263E+02   0.257E+02
     0.251E+02   0.244E+02   0.236E+02   0.228E+02   0.219E+02
     0.209E+02   0.198E+02   0.186E+02   0.173E+02   0.158E+02
     0.140E+02   0.119E+02   0.922E+01   0.475E+01   0.000E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   2     0.044 RADIANS     2.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.542E+01
     0.972E+01   0.138E+02   0.158E+02   0.172E+02   0.170E+02
     0.164E+02   0.172E+02   0.184E+02   0.195E+02   0.205E+02
     0.219E+02   0.247E+02   0.275E+02   0.283E+02   0.293E+02
     0.300E+02   0.305E+02   0.308E+02   0.310E+02   0.284E+02
     0.246E+02   0.231E+02   0.229E+02   0.231E+02   0.244E+02
     0.273E+02   0.289E+02   0.317E+02   0.484E+02   0.472E+02
     0.300E+02   0.304E+02   0.272E+02   0.242E+02   0.232E+02
     0.230E+02   0.232E+02   0.250E+02   0.290E+02   0.312E+02
     0.309E+02   0.305E+02   0.301E+02   0.294E+02   0.283E+02
     0.274E+02   0.245E+02   0.217E+02   0.205E+02   0.195E+02
     0.184E+02   0.172E+02   0.165E+02   0.172E+02   0.172E+02
     0.158E+02   0.136E+02   0.945E+01   0.475E+01   0.000E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   3     0.087 RADIANS     5.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.457E+01
     0.893E+01   0.145E+02   0.166E+02   0.180E+02   0.177E+02
     0.170E+02   0.163E+02   0.171E+02   0.186E+02   0.205E+02
     0.233E+02   0.262E+02   0.290E+02   0.311E+02   0.308E+02
     0.305E+02   0.309E+02   0.310E+02   0.279E+02   0.244E+02
     0.218E+02   0.200E+02   0.214E+02   0.223E+02   0.219E+02
     0.236E+02   0.265E+02   0.417E+02   0.541E+02   0.535E+02
     0.394E+02   0.266E+02   0.235E+02   0.221E+02   0.225E+02
     0.214E+02   0.201E+02   0.221E+02   0.248E+02   0.283E+02
     0.312E+02   0.309E+02   0.306E+02   0.310E+02   0.311E+02
     0.288E+02   0.260E+02   0.232E+02   0.204E+02   0.186E+02
     0.171E+02   0.165E+02   0.171E+02   0.179E+02   0.180E+02
     0.165E+02   0.142E+02   0.848E+01   0.413E+01   0.000E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   4     0.131 RADIANS     7.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.233E+01
     0.951E+01   0.162E+02   0.181E+02   0.178E+02   0.170E+02
     0.163E+02   0.157E+02   0.155E+02   0.170E+02   0.204E+02
     0.238E+02   0.266E+02   0.285E+02   0.310E+02   0.332E+02
     0.339E+02   0.332E+02   0.318E+02   0.273E+02   0.233E+02
     0.222E+02   0.197E+02   0.161E+02   0.146E+02   0.189E+02
     0.246E+02   0.330E+02   0.453E+02   0.552E+02   0.548E+02
     0.435E+02   0.330E+02   0.237E+02   0.185E+02   0.144E+02
     0.164E+02   0.201E+02   0.223E+02   0.236E+02   0.279E+02
     0.322E+02   0.334E+02   0.341E+02   0.332E+02   0.309E+02
     0.285E+02   0.265E+02   0.236E+02   0.201E+02   0.168E+02
     0.156E+02   0.158E+02   0.165E+02   0.172E+02   0.180E+02
     0.181E+02   0.160E+02   0.870E+01   0.218E+01   0.000E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   5     0.175 RADIANS    10.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.177E+01
     0.104E+02   0.145E+02   0.179E+02   0.178E+02   0.173E+02
     0.168E+02   0.160E+02   0.159E+02   0.180E+02   0.201E+02
     0.224E+02   0.255E+02   0.285E+02   0.317E+02   0.347E+02
     0.343E+02   0.328E+02   0.298E+02   0.273E+02   0.254E+02
     0.222E+02   0.190E+02   0.169E+02   0.142E+02   0.166E+02
     0.255E+02   0.339E+02   0.454E+02   0.553E+02   0.549E+02
     0.438E+02   0.345E+02   0.243E+02   0.156E+02   0.141E+02
     0.172E+02   0.192E+02   0.228E+02   0.257E+02   0.275E+02
     0.302E+02   0.331E+02   0.346E+02   0.347E+02   0.314E+02
     0.284E+02   0.254E+02   0.223E+02   0.200E+02   0.179E+02
     0.159E+02   0.162E+02   0.169E+02   0.174E+02   0.179E+02
     0.179E+02   0.170E+02   0.969E+01   0.159E+01   0.000E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   6     0.218 RADIANS    12.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.128E+00   0.264E+01
     0.101E+02   0.146E+02   0.174E+02   0.177E+02   0.171E+02
     0.163E+02   0.160E+02   0.173E+02   0.180E+02   0.202E+02
     0.231E+02   0.263E+02   0.287E+02   0.310E+02   0.317E+02
     0.325E+02   0.316E+02   0.306E+02   0.284E+02   0.249E+02
     0.233E+02   0.196E+02   0.173E+02   0.197E+02   0.211E+02
     0.246E+02   0.296E+02   0.426E+02   0.540E+02   0.532E+02
     0.408E+02   0.302E+02   0.238E+02   0.204E+02   0.192E+02
     0.170E+02   0.202E+02   0.235E+02   0.253E+02   0.289E+02
     0.308E+02   0.318E+02   0.326E+02   0.316E+02   0.311E+02
     0.287E+02   0.261E+02   0.230E+02   0.201E+02   0.180E+02
     0.173E+02   0.160E+02   0.164E+02   0.172E+02   0.178E+02
     0.176E+02   0.142E+02   0.966E+01   0.237E+01   0.824E-01
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   7     0.262 RADIANS    15.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.309E+00   0.379E+01
     0.942E+01   0.137E+02   0.152E+02   0.177E+02   0.175E+02
     0.171E+02   0.176E+02   0.184E+02   0.197E+02   0.212E+02
     0.230E+02   0.250E+02   0.279E+02   0.291E+02   0.301E+02
     0.287E+02   0.290E+02   0.302E+02   0.296E+02   0.262E+02
     0.234E+02   0.231E+02   0.228E+02   0.244E+02   0.255E+02
     0.269E+02   0.275E+02   0.332E+02   0.499E+02   0.485E+02
     0.313E+02   0.289E+02   0.262E+02   0.252E+02   0.240E+02
     0.226E+02   0.230E+02   0.235E+02   0.268E+02   0.297E+02
     0.303E+02   0.298E+02   0.290E+02   0.303E+02   0.291E+02
     0.278E+02   0.248E+02   0.231E+02   0.211E+02   0.196E+02
     0.184E+02   0.177E+02   0.172E+02   0.176E+02   0.176E+02
     0.151E+02   0.135E+02   0.930E+01   0.349E+01   0.209E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   8     0.305 RADIANS    17.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.501E+00   0.491E+01
     0.895E+01   0.125E+02   0.142E+02   0.155E+02   0.173E+02
     0.181E+02   0.196E+02   0.209E+02   0.214E+02   0.221E+02
     0.233E+02   0.251E+02   0.249E+02   0.265E+02   0.270E+02
     0.279E+02   0.265E+02   0.281E+02   0.284E+02   0.288E+02
     0.273E+02   0.280E+02   0.288E+02   0.284E+02   0.288E+02
     0.294E+02   0.297E+02   0.301E+02   0.344E+02   0.335E+02
     0.290E+02   0.310E+02   0.289E+02   0.287E+02   0.281E+02
     0.288E+02   0.275E+02   0.274E+02   0.288E+02   0.285E+02
     0.279E+02   0.269E+02   0.281E+02   0.270E+02   0.265E+02
     0.249E+02   0.252E+02   0.232E+02   0.222E+02   0.216E+02
     0.209E+02   0.196E+02   0.182E+02   0.172E+02   0.157E+02
     0.141E+02   0.124E+02   0.894E+01   0.461E+01   0.356E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   9     0.349 RADIANS    20.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.610E+00   0.601E+01
     0.875E+01   0.110E+02   0.133E+02   0.145E+02   0.168E+02
     0.200E+02   0.212E+02   0.221E+02   0.236E+02   0.243E+02
     0.244E+02   0.229E+02   0.233E+02   0.231E+02   0.246E+02
     0.252E+02   0.257E+02   0.253E+02   0.269E+02   0.297E+02
     0.332E+02   0.331E+02   0.336E+02   0.326E+02   0.323E+02
     0.317E+02   0.315E+02   0.305E+02   0.150E+02   0.158E+02
     0.298E+02   0.328E+02   0.313E+02   0.322E+02   0.325E+02
     0.335E+02   0.329E+02   0.330E+02   0.293E+02   0.267E+02
     0.254E+02   0.260E+02   0.253E+02   0.246E+02   0.231E+02
     0.234E+02   0.230E+02   0.246E+02   0.244E+02   0.235E+02
     0.221E+02   0.213E+02   0.199E+02   0.169E+02   0.144E+02
     0.132E+02   0.109E+02   0.872E+01   0.572E+01   0.444E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  10     0.393 RADIANS    22.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.737E+00   0.689E+01
     0.880E+01   0.914E+01   0.117E+02   0.142E+02   0.172E+02
     0.205E+02   0.228E+02   0.242E+02   0.247E+02   0.255E+02
     0.245E+02   0.231E+02   0.213E+02   0.212E+02   0.216E+02
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0.227E+02	0.234E+02	0.241E+02	0.275E+02	0.312E+02
0.347E+02	0.373E+02	0.385E+02	0.373E+02	0.359E+02
0.344E+02	0.322E+02	0.212E+02	0.762E+01	0.789E+01
0.211E+02	0.337E+02	0.342E+02	0.358E+02	0.373E+02
0.383E+02	0.373E+02	0.343E+02	0.309E+02	0.269E+02
0.242E+02	0.234E+02	0.229E+02	0.215E+02	0.213E+02
0.213E+02	0.234E+02	0.247E+02	0.256E+02	0.248E+02
0.242E+02	0.228E+02	0.206E+02	0.172E+02	0.140E+02
0.116E+02	0.925E+01	0.883E+01	0.663E+01	0.562E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 11 0.436 RADIANS 25.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.759E+00	0.756E+01
0.895E+01	0.852E+01	0.103E+02	0.136E+02	0.176E+02
0.208E+02	0.239E+02	0.257E+02	0.264E+02	0.251E+02
0.241E+02	0.229E+02	0.212E+02	0.199E+02	0.193E+02
0.204E+02	0.215E+02	0.253E+02	0.279E+02	0.321E+02
0.352E+02	0.383E+02	0.412E+02	0.430E+02	0.408E+02
0.358E+02	0.266E+02	0.163E+02	0.574E+01	0.582E+01
0.161E+02	0.281E+02	0.361E+02	0.408E+02	0.430E+02
0.408E+02	0.383E+02	0.347E+02	0.318E+02	0.277E+02
0.250E+02	0.215E+02	0.203E+02	0.195E+02	0.199E+02
0.217E+02	0.230E+02	0.242E+02	0.253E+02	0.265E+02
0.256E+02	0.240E+02	0.208E+02	0.174E+02	0.134E+02
0.103E+02	0.859E+01	0.901E+01	0.728E+01	0.597E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 12 0.480 RADIANS 27.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.729E+00	0.764E+01
0.910E+01	0.870E+01	0.941E+01	0.139E+02	0.176E+02
0.208E+02	0.239E+02	0.265E+02	0.263E+02	0.255E+02
0.239E+02	0.227E+02	0.217E+02	0.193E+02	0.189E+02
0.187E+02	0.220E+02	0.253E+02	0.287E+02	0.320E+02
0.355E+02	0.386E+02	0.413E+02	0.448E+02	0.435E+02
0.343E+02	0.251E+02	0.151E+02	0.540E+01	0.535E+01
0.150E+02	0.264E+02	0.347E+02	0.437E+02	0.446E+02
0.410E+02	0.385E+02	0.351E+02	0.317E+02	0.286E+02
0.249E+02	0.219E+02	0.185E+02	0.190E+02	0.196E+02
0.219E+02	0.229E+02	0.240E+02	0.258E+02	0.263E+02
0.266E+02	0.241E+02	0.206E+02	0.175E+02	0.138E+02
0.943E+01	0.876E+01	0.910E+01	0.736E+01	0.586E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 13 0.524 RADIANS 30.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.717E+00	0.723E+01
0.922E+01	0.922E+01	0.107E+02	0.134E+02	0.174E+02
0.208E+02	0.238E+02	0.249E+02	0.257E+02	0.256E+02
0.241E+02	0.229E+02	0.217E+02	0.201E+02	0.199E+02
0.213E+02	0.222E+02	0.248E+02	0.283E+02	0.313E+02
0.348E+02	0.385E+02	0.405E+02	0.408E+02	0.387E+02
0.361E+02	0.286E+02	0.175E+02	0.631E+01	0.639E+01
0.175E+02	0.298E+02	0.363E+02	0.387E+02	0.407E+02
0.404E+02	0.382E+02	0.344E+02	0.311E+02	0.282E+02
0.245E+02	0.222E+02	0.211E+02	0.197E+02	0.204E+02
0.217E+02	0.230E+02	0.243E+02	0.256E+02	0.259E+02
0.251E+02	0.238E+02	0.207E+02	0.174E+02	0.134E+02
0.107E+02	0.922E+01	0.920E+01	0.695E+01	0.619E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 14 0.567 RADIANS 32.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.605E+00	0.642E+01
0.934E+01	0.979E+01	0.122E+02	0.138E+02	0.169E+02
0.209E+02	0.224E+02	0.232E+02	0.241E+02	0.247E+02
0.246E+02	0.231E+02	0.219E+02	0.221E+02	0.223E+02
0.238E+02	0.244E+02	0.249E+02	0.274E+02	0.300E+02
0.342E+02	0.368E+02	0.360E+02	0.358E+02	0.345E+02
0.335E+02	0.325E+02	0.253E+02	0.949E+01	0.975E+01
0.253E+02	0.333E+02	0.336E+02	0.345E+02	0.356E+02
0.362E+02	0.365E+02	0.339E+02	0.299E+02	0.273E+02
0.248E+02	0.244E+02	0.236E+02	0.223E+02	0.222E+02
0.220E+02	0.233E+02	0.247E+02	0.248E+02	0.244E+02
0.233E+02	0.224E+02	0.208E+02	0.169E+02	0.140E+02
0.121E+02	0.971E+01	0.934E+01	0.617E+01	0.553E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 15 0.611 RADIANS 35.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.446E+00	0.533E+01
0.943E+01	0.114E+02	0.136E+02	0.154E+02	0.167E+02
0.196E+02	0.205E+02	0.217E+02	0.225E+02	0.230E+02
0.245E+02	0.237E+02	0.240E+02	0.248E+02	0.251E+02
0.259E+02	0.264E+02	0.267E+02	0.275E+02	0.287E+02
0.309E+02	0.316E+02	0.312E+02	0.310E+02	0.312E+02
0.309E+02	0.305E+02	0.304E+02	0.227E+02	0.230E+02
0.301E+02	0.312E+02	0.309E+02	0.312E+02	0.308E+02
0.313E+02	0.314E+02	0.306E+02	0.288E+02	0.273E+02
0.268E+02	0.263E+02	0.257E+02	0.252E+02	0.246E+02
0.240E+02	0.238E+02	0.244E+02	0.233E+02	0.225E+02
0.217E+02	0.206E+02	0.195E+02	0.168E+02	0.153E+02
0.135E+02	0.114E+02	0.935E+01	0.516E+01	0.423E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 16 0.654 RADIANS 37.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.311E+00	0.422E+01
0.947E+01	0.128E+02	0.147E+02	0.168E+02	0.173E+02
0.174E+02	0.189E+02	0.200E+02	0.208E+02	0.218E+02
0.226E+02	0.252E+02	0.269E+02	0.272E+02	0.277E+02
0.283E+02	0.285E+02	0.291E+02	0.292E+02	0.278E+02
0.255E+02	0.257E+02	0.266E+02	0.270E+02	0.277E+02
0.279E+02	0.287E+02	0.296E+02	0.420E+02	0.416E+02
0.293E+02	0.292E+02	0.279E+02	0.277E+02	0.268E+02
0.267E+02	0.255E+02	0.254E+02	0.280E+02	0.291E+02
0.291E+02	0.284E+02	0.281E+02	0.278E+02	0.272E+02
0.269E+02	0.252E+02	0.225E+02	0.220E+02	0.208E+02
0.201E+02	0.191E+02	0.174E+02	0.174E+02	0.167E+02
0.147E+02	0.129E+02	0.927E+01	0.410E+01	0.305E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 17 0.698 RADIANS 40.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.205E+00	0.344E+01
0.964E+01	0.143E+02	0.161E+02	0.177E+02	0.174E+02
0.165E+02	0.170E+02	0.180E+02	0.191E+02	0.206E+02
0.227E+02	0.256E+02	0.286E+02	0.299E+02	0.304E+02
0.304E+02	0.310E+02	0.308E+02	0.287E+02	0.262E+02
0.233E+02	0.208E+02	0.214E+02	0.224E+02	0.242E+02
0.257E+02	0.276E+02	0.367E+02	0.520E+02	0.519E+02
0.363E+02	0.279E+02	0.257E+02	0.242E+02	0.223E+02
0.215E+02	0.207E+02	0.232E+02	0.264E+02	0.287E+02
0.309E+02	0.309E+02	0.302E+02	0.305E+02	0.299E+02
0.285E+02	0.256E+02	0.226E+02	0.205E+02	0.192E+02
0.183E+02	0.171E+02	0.165E+02	0.174E+02	0.176E+02
0.163E+02	0.143E+02	0.948E+01	0.335E+01	0.205E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 18 0.742 RADIANS 42.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.873E-01	0.259E+01
0.954E+01	0.150E+02	0.176E+02	0.179E+02	0.173E+02
0.167E+02	0.159E+02	0.162E+02	0.175E+02	0.202E+02
0.233E+02	0.260E+02	0.285E+02	0.311E+02	0.329E+02
0.330E+02	0.328E+02	0.307E+02	0.275E+02	0.254E+02
0.225E+02	0.199E+02	0.178E+02	0.170E+02	0.195E+02
0.230E+02	0.322E+02	0.426E+02	0.542E+02	0.541E+02
0.424E+02	0.324E+02	0.229E+02	0.195E+02	0.171E+02
0.178E+02	0.198E+02	0.225E+02	0.255E+02	0.275E+02
0.308E+02	0.328E+02	0.329E+02	0.329E+02	0.311E+02
0.285E+02	0.259E+02	0.232E+02	0.201E+02	0.175E+02
0.165E+02	0.158E+02	0.167E+02	0.173E+02	0.177E+02
0.178E+02	0.149E+02	0.945E+01	0.257E+01	0.867E-01
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 19 0.785 RADIANS 45.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.241E+01
0.958E+01	0.150E+02	0.183E+02	0.174E+02	0.173E+02
0.168E+02	0.155E+02	0.153E+02	0.170E+02	0.203E+02
0.234E+02	0.261E+02	0.286E+02	0.309E+02	0.340E+02
0.348E+02	0.330E+02	0.303E+02	0.273E+02	0.252E+02
0.220E+02	0.197E+02	0.175E+02	0.142E+02	0.157E+02
0.248E+02	0.351E+02	0.440E+02	0.548E+02	0.548E+02
0.440E+02	0.351E+02	0.248E+02	0.157E+02	0.142E+02
0.175E+02	0.197E+02	0.220E+02	0.252E+02	0.273E+02
0.303E+02	0.330E+02	0.348E+02	0.340E+02	0.309E+02
0.286E+02	0.261E+02	0.234E+02	0.203E+02	0.170E+02
0.153E+02	0.155E+02	0.168E+02	0.173E+02	0.174E+02
0.183E+02	0.150E+02	0.958E+01	0.241E+01	0.000E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 20 0.829 RADIANS 47.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.867E-01	0.257E+01
0.945E+01	0.149E+02	0.178E+02	0.177E+02	0.173E+02
0.167E+02	0.158E+02	0.165E+02	0.175E+02	0.201E+02
0.232E+02	0.259E+02	0.285E+02	0.311E+02	0.329E+02
0.329E+02	0.328E+02	0.308E+02	0.275E+02	0.255E+02
0.225E+02	0.198E+02	0.178E+02	0.171E+02	0.195E+02
0.229E+02	0.324E+02	0.424E+02	0.541E+02	0.542E+02
0.426E+02	0.322E+02	0.230E+02	0.195E+02	0.170E+02
0.178E+02	0.199E+02	0.225E+02	0.254E+02	0.275E+02
0.307E+02	0.328E+02	0.330E+02	0.329E+02	0.311E+02
0.285E+02	0.260E+02	0.233E+02	0.202E+02	0.175E+02
0.162E+02	0.159E+02	0.167E+02	0.173E+02	0.179E+02
0.176E+02	0.150E+02	0.954E+01	0.259E+01	0.873E-01
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 21 0.873 RADIANS 50.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.205E+00	0.335E+01
0.948E+01	0.143E+02	0.163E+02	0.176E+02	0.174E+02
0.165E+02	0.171E+02	0.183E+02	0.192E+02	0.205E+02
0.226E+02	0.256E+02	0.285E+02	0.299E+02	0.305E+02
0.302E+02	0.309E+02	0.309E+02	0.287E+02	0.264E+02
0.232E+02	0.207E+02	0.215E+02	0.223E+02	0.242E+02
0.257E+02	0.279E+02	0.363E+02	0.519E+02	0.520E+02
0.367E+02	0.276E+02	0.257E+02	0.242E+02	0.224E+02
0.214E+02	0.208E+02	0.233E+02	0.262E+02	0.287E+02
0.308E+02	0.310E+02	0.304E+02	0.304E+02	0.299E+02
0.286E+02	0.256E+02	0.227E+02	0.206E+02	0.191E+02
0.180E+02	0.170E+02	0.165E+02	0.174E+02	0.177E+02
0.161E+02	0.143E+02	0.964E+01	0.344E+01	0.205E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 22 0.916 RADIANS 52.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.306E+00	0.410E+01
0.927E+01	0.129E+02	0.147E+02	0.167E+02	0.174E+02
0.174E+02	0.191E+02	0.201E+02	0.208E+02	0.220E+02
0.225E+02	0.252E+02	0.269E+02	0.272E+02	0.278E+02
0.281E+02	0.284E+02	0.291E+02	0.291E+02	0.280E+02
0.254E+02	0.255E+02	0.267E+02	0.268E+02	0.277E+02
0.279E+02	0.292E+02	0.293E+02	0.416E+02	0.420E+02
0.296E+02	0.287E+02	0.279E+02	0.277E+02	0.270E+02
0.266E+02	0.257E+02	0.255E+02	0.278E+02	0.292E+02
0.291E+02	0.285E+02	0.283E+02	0.277E+02	0.272E+02
0.259E+02	0.252E+02	0.226E+02	0.218E+02	0.208E+02
0.200E+02	0.189E+02	0.174E+02	0.173E+02	0.168E+02
0.147E+02	0.128E+02	0.947E+01	0.422E+01	0.311E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 23 0.960 RADIANS 55.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.423E+00	0.516E+01
0.935E+01	0.114E+02	0.135E+02	0.153E+02	0.168E+02
0.195E+02	0.206E+02	0.217E+02	0.225E+02	0.233E+02
0.244E+02	0.238E+02	0.240E+02	0.246E+02	0.252E+02
0.257E+02	0.263E+02	0.268E+02	0.273E+02	0.288E+02
0.306E+02	0.314E+02	0.313E+02	0.308E+02	0.312E+02
0.309E+02	0.312E+02	0.301E+02	0.230E+02	0.227E+02
0.304E+02	0.305E+02	0.309E+02	0.312E+02	0.310E+02
0.312E+02	0.316E+02	0.309E+02	0.287E+02	0.275E+02
0.267E+02	0.264E+02	0.259E+02	0.251E+02	0.248E+02
0.240E+02	0.237E+02	0.245E+02	0.230E+02	0.225E+02
0.217E+02	0.205E+02	0.196E+02	0.167E+02	0.154E+02
0.136E+02	0.114E+02	0.943E+01	0.533E+01	0.446E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 24 1.004 RADIANS 57.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.553E+00	0.617E+01
0.934E+01	0.971E+01	0.121E+02	0.140E+02	0.169E+02
0.208E+02	0.224E+02	0.233E+02	0.244E+02	0.248E+02
0.247E+02	0.233E+02	0.220E+02	0.222E+02	0.223E+02
0.236E+02	0.244E+02	0.248E+02	0.273E+02	0.299E+02
0.339E+02	0.365E+02	0.362E+02	0.356E+02	0.345E+02
0.336E+02	0.333E+02	0.253E+02	0.975E+01	0.949E+01
0.253E+02	0.325E+02	0.335E+02	0.345E+02	0.358E+02
0.360E+02	0.368E+02	0.342E+02	0.300E+02	0.274E+02
0.249E+02	0.244E+02	0.238E+02	0.223E+02	0.221E+02
0.219E+02	0.231E+02	0.246E+02	0.247E+02	0.241E+02
0.232E+02	0.224E+02	0.209E+02	0.169E+02	0.138E+02
0.122E+02	0.979E+01	0.934E+01	0.642E+01	0.605E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 25 1.047 RADIANS 60.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.619E+00	0.695E+01
0.920E+01	0.922E+01	0.107E+02	0.134E+02	0.174E+02
0.207E+02	0.238E+02	0.251E+02	0.259E+02	0.256E+02
0.243E+02	0.230E+02	0.217E+02	0.204E+02	0.197E+02
0.211E+02	0.222E+02	0.245E+02	0.282E+02	0.311E+02
0.344E+02	0.382E+02	0.404E+02	0.407E+02	0.387E+02
0.363E+02	0.298E+02	0.175E+02	0.639E+01	0.631E+01
0.175E+02	0.286E+02	0.361E+02	0.387E+02	0.408E+02
0.405E+02	0.385E+02	0.348E+02	0.313E+02	0.283E+02
0.248E+02	0.222E+02	0.213E+02	0.199E+02	0.201E+02
0.217E+02	0.229E+02	0.241E+02	0.256E+02	0.257E+02
0.249E+02	0.238E+02	0.208E+02	0.174E+02	0.134E+02
0.107E+02	0.922E+01	0.922E+01	0.723E+01	0.717E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 26 1.091 RADIANS 62.500 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.586E+00	0.736E+01
0.910E+01	0.876E+01	0.943E+01	0.138E+02	0.175E+02
0.206E+02	0.241E+02	0.266E+02	0.263E+02	0.258E+02
0.240E+02	0.229E+02	0.219E+02	0.196E+02	0.190E+02
0.185E+02	0.210E+02	0.249E+02	0.286E+02	0.317E+02
0.351E+02	0.385E+02	0.410E+02	0.446E+02	0.437E+02
0.347E+02	0.264E+02	0.150E+02	0.535E+01	0.540E+01
0.151E+02	0.251E+02	0.343E+02	0.435E+02	0.448E+02
0.413E+02	0.386E+02	0.355E+02	0.320E+02	0.287E+02
0.253E+02	0.220E+02	0.187E+02	0.189E+02	0.193E+02
0.217E+02	0.227E+02	0.239E+02	0.255E+02	0.263E+02
0.265E+02	0.239E+02	0.208E+02	0.176E+02	0.139E+02
0.941E+01	0.870E+01	0.910E+01	0.764E+01	0.729E+00
0.000E+00	0.000E+00	0.000E+00		

PROJECTION DATA FOR ANGLE NO. 27 1.134 RADIANS 65.000 DEGREES

0.000E+00	0.000E+00	0.000E+00	0.597E+00	0.728E+01
0.901E+01	0.859E+01	0.103E+02	0.134E+02	0.174E+02

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  0.208E+02   0.240E+02   0.256E+02   0.265E+02   0.253E+02
  0.242E+02   0.230E+02   0.217E+02   0.199E+02   0.195E+02
  0.203E+02   0.215E+02   0.250E+02   0.277E+02   0.318E+02
  0.347E+02   0.383E+02   0.408E+02   0.430E+02   0.408E+02
  0.361E+02   0.281E+02   0.161E+02   0.582E+01   0.574E+01
  0.163E+02   0.266E+02   0.358E+02   0.408E+02   0.430E+02
  0.412E+02   0.383E+02   0.352E+02   0.321E+02   0.279E+02
  0.253E+02   0.215E+02   0.204E+02   0.193E+02   0.199E+02
  0.212E+02   0.229E+02   0.241E+02   0.251E+02   0.264E+02
  0.257E+02   0.239E+02   0.208E+02   0.176E+02   0.136E+02
  0.103E+02   0.852E+01   0.895E+01   0.756E+01   0.759E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  28     1.178 RADIANS    67.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.562E+00   0.663E+01
  0.883E+01   0.925E+01   0.116E+02   0.140E+02   0.172E+02
  0.206E+02   0.228E+02   0.242E+02   0.248E+02   0.256E+02
  0.247E+02   0.234E+02   0.213E+02   0.213E+02   0.215E+02
  0.229E+02   0.234E+02   0.242E+02   0.269E+02   0.309E+02
  0.343E+02   0.373E+02   0.383E+02   0.373E+02   0.358E+02
  0.342E+02   0.337E+02   0.211E+02   0.789E+01   0.762E+01
  0.212E+02   0.322E+02   0.344E+02   0.359E+02   0.373E+02
  0.385E+02   0.373E+02   0.347E+02   0.312E+02   0.275E+02
  0.241E+02   0.234E+02   0.227E+02   0.216E+02   0.212E+02
  0.213E+02   0.231E+02   0.245E+02   0.255E+02   0.247E+02
  0.242E+02   0.228E+02   0.205E+02   0.172E+02   0.142E+02
  0.117E+02   0.914E+01   0.880E+01   0.689E+01   0.737E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  29     1.222 RADIANS    70.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.444E+00   0.572E+01
  0.872E+01   0.109E+02   0.132E+02   0.144E+02   0.169E+02
  0.199E+02   0.213E+02   0.221E+02   0.235E+02   0.244E+02
  0.246E+02   0.230E+02   0.234E+02   0.231E+02   0.246E+02
  0.253E+02   0.260E+02   0.254E+02   0.267E+02   0.293E+02
  0.330E+02   0.329E+02   0.335E+02   0.325E+02   0.322E+02
  0.313E+02   0.328E+02   0.298E+02   0.158E+02   0.150E+02
  0.305E+02   0.315E+02   0.317E+02   0.323E+02   0.326E+02
  0.336E+02   0.331E+02   0.332E+02   0.297E+02   0.269E+02
  0.253E+02   0.257E+02   0.252E+02   0.246E+02   0.231E+02
  0.233E+02   0.229E+02   0.244E+02   0.243E+02   0.236E+02
  0.221E+02   0.212E+02   0.200E+02   0.168E+02   0.145E+02
  0.133E+02   0.110E+02   0.875E+01   0.601E+01   0.610E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  30     1.265 RADIANS    72.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.356E+00   0.461E+01
  0.894E+01   0.124E+02   0.141E+02   0.157E+02   0.172E+02
  0.182E+02   0.196E+02   0.209E+02   0.216E+02   0.222E+02
  0.232E+02   0.252E+02   0.249E+02   0.265E+02   0.270E+02
  0.281E+02   0.269E+02   0.279E+02   0.285E+02   0.288E+02
  0.274E+02   0.275E+02   0.288E+02   0.281E+02   0.287E+02
  0.289E+02   0.310E+02   0.290E+02   0.335E+02   0.344E+02
  0.301E+02   0.297E+02   0.294E+02   0.288E+02   0.284E+02
  0.288E+02   0.280E+02   0.273E+02   0.288E+02   0.284E+02
  0.281E+02   0.265E+02   0.279E+02   0.270E+02   0.265E+02
  0.249E+02   0.251E+02   0.233E+02   0.221E+02   0.214E+02
  0.209E+02   0.196E+02   0.181E+02   0.173E+02   0.155E+02
  0.142E+02   0.125E+02   0.895E+01   0.491E+01   0.501E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  31     1.309 RADIANS    75.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.209E+00   0.349E+01
  0.930E+01   0.135E+02   0.151E+02   0.176E+02   0.176E+02
  0.172E+02   0.177E+02   0.184E+02   0.196E+02   0.211E+02
  0.231E+02   0.248E+02   0.278E+02   0.291E+02   0.303E+02
  0.290E+02   0.298E+02   0.303E+02   0.297E+02   0.268E+02
  0.235E+02   0.230E+02   0.226E+02   0.240E+02   0.252E+02
  0.262E+02   0.289E+02   0.313E+02   0.485E+02   0.499E+02
  0.332E+02   0.275E+02   0.269E+02   0.255E+02   0.244E+02
  0.228E+02   0.231E+02   0.234E+02   0.262E+02   0.296E+02
  0.302E+02   0.298E+02   0.287E+02   0.301E+02   0.291E+02
  0.279E+02   0.250E+02   0.230E+02   0.212E+02   0.197E+02
  0.184E+02   0.176E+02   0.171E+02   0.175E+02   0.177E+02
  0.152E+02   0.137E+02   0.942E+01   0.379E+01   0.309E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  32     1.353 RADIANS    77.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.824E-01   0.237E+01
  0.966E+01   0.142E+02   0.176E+02   0.178E+02   0.172E+02
  0.164E+02   0.160E+02   0.173E+02   0.180E+02   0.201E+02
  0.230E+02   0.261E+02   0.287E+02   0.311E+02   0.316E+02
  0.326E+02   0.318E+02   0.308E+02   0.289E+02   0.253E+02
  0.235E+02   0.202E+02   0.170E+02   0.192E+02   0.204E+02
  0.238E+02   0.302E+02   0.408E+02   0.532E+02   0.540E+02
  0.426E+02   0.296E+02   0.246E+02   0.211E+02   0.197E+02
  0.173E+02   0.196E+02   0.233E+02   0.249E+02   0.284E+02
  0.306E+02   0.316E+02   0.325E+02   0.317E+02   0.310E+02
  0.287E+02   0.263E+02   0.231E+02   0.202E+02   0.180E+02
  0.173E+02   0.160E+02   0.163E+02   0.171E+02   0.177E+02
  0.174E+02   0.146E+02   0.101E+02   0.264E+01   0.128E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  33     1.396 RADIANS    80.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.159E+01
  0.969E+01   0.144E+02   0.179E+02   0.179E+02   0.174E+02
  0.169E+02   0.162E+02   0.159E+02   0.179E+02   0.200E+02
  0.223E+02   0.254E+02   0.284E+02   0.314E+02   0.347E+02
  0.346E+02   0.331E+02   0.302E+02   0.275E+02   0.257E+02
  0.228E+02   0.192E+02   0.172E+02   0.141E+02   0.156E+02
  0.243E+02   0.345E+02   0.438E+02   0.549E+02   0.553E+02
  0.454E+02   0.339E+02   0.255E+02   0.166E+02   0.142E+02
  0.169E+02   0.190E+02   0.222E+02   0.254E+02   0.273E+02
  0.298E+02   0.328E+02   0.343E+02   0.347E+02   0.317E+02
  0.285E+02   0.255E+02   0.224E+02   0.201E+02   0.180E+02
  0.159E+02   0.160E+02   0.168E+02   0.173E+02   0.178E+02
  0.179E+02   0.145E+02   0.104E+02   0.177E+01   0.000E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  34     1.440 RADIANS    82.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.218E+01
  0.870E+01   0.160E+02   0.181E+02   0.180E+02   0.172E+02
  0.165E+02   0.158E+02   0.156E+02   0.168E+02   0.201E+02
  0.236E+02   0.265E+02   0.285E+02   0.309E+02   0.332E+02
  0.341E+02   0.334E+02   0.322E+02   0.279E+02   0.236E+02
  0.223E+02   0.201E+02   0.164E+02   0.144E+02   0.185E+02
  0.237E+02   0.330E+02   0.435E+02   0.548E+02   0.552E+02
  0.453E+02   0.330E+02   0.246E+02   0.189E+02   0.146E+02
  0.161E+02   0.197E+02   0.222E+02   0.233E+02   0.273E+02
  0.318E+02   0.332E+02   0.339E+02   0.332E+02   0.310E+02
  0.285E+02   0.266E+02   0.238E+02   0.204E+02   0.170E+02
  0.155E+02   0.157E+02   0.163E+02   0.170E+02   0.178E+02
  0.181E+02   0.162E+02   0.951E+01   0.233E+01   0.000E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  35     1.484 RADIANS    85.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.413E+01
  0.848E+01   0.142E+02   0.165E+02   0.180E+02   0.179E+02
  0.171E+02   0.165E+02   0.171E+02   0.186E+02   0.204E+02
  0.232E+02   0.260E+02   0.288E+02   0.311E+02   0.310E+02
  0.306E+02   0.309E+02   0.312E+02   0.283E+02   0.248E+02
  0.221E+02   0.201E+02   0.214E+02   0.225E+02   0.221E+02
  0.235E+02   0.266E+02   0.394E+02   0.535E+02   0.541E+02
  0.417E+02   0.265E+02   0.236E+02   0.219E+02   0.223E+02
  0.214E+02   0.200E+02   0.218E+02   0.244E+02   0.279E+02
  0.310E+02   0.309E+02   0.305E+02   0.308E+02   0.311E+02
  0.290E+02   0.262E+02   0.233E+02   0.205E+02   0.186E+02
  0.171E+02   0.163E+02   0.170E+02   0.177E+02   0.180E+02
  0.166E+02   0.145E+02   0.893E+01   0.457E+01   0.000E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  36     1.527 RADIANS    87.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.475E+01
  0.945E+01   0.136E+02   0.158E+02   0.172E+02   0.172E+02
  0.165E+02   0.172E+02   0.184E+02   0.195E+02   0.205E+02
  0.217E+02   0.245E+02   0.274E+02   0.283E+02   0.294E+02
  0.301E+02   0.305E+02   0.309E+02   0.312E+02   0.290E+02
  0.250E+02   0.232E+02   0.230E+02   0.232E+02   0.242E+02
  0.272E+02   0.304E+02   0.300E+02   0.472E+02   0.484E+02
  0.317E+02   0.289E+02   0.273E+02   0.244E+02   0.231E+02
  0.229E+02   0.231E+02   0.246E+02   0.284E+02   0.310E+02
  0.308E+02   0.305E+02   0.300E+02   0.293E+02   0.283E+02
  0.275E+02   0.247E+02   0.219E+02   0.205E+02   0.195E+02
  0.184E+02   0.172E+02   0.164E+02   0.170E+02   0.172E+02
  0.158E+02   0.138E+02   0.972E+01   0.542E+01   0.000E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  37     1.571 RADIANS    90.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.475E+01
  0.922E+01   0.119E+02   0.140E+02   0.158E+02   0.173E+02
  0.186E+02   0.198E+02   0.209E+02   0.219E+02   0.228E+02
  0.236E+02   0.244E+02   0.251E+02   0.257E+02   0.263E+02
  0.268E+02   0.273E+02   0.277E+02   0.281E+02   0.285E+02
  0.288E+02   0.291E+02   0.293E+02   0.295E+02   0.297E+02
  0.298E+02   0.307E+02   0.300E+02   0.305E+02   0.300E+02
  0.299E+02   0.291E+02   0.298E+02   0.296E+02   0.295E+02
  0.292E+02   0.290E+02   0.287E+02   0.284E+02   0.281E+02
  0.277E+02   0.272E+02   0.268E+02   0.262E+02   0.257E+02
  0.250E+02   0.244E+02   0.236E+02   0.228E+02   0.219E+02
  0.210E+02   0.198E+02   0.187E+02   0.173E+02   0.158E+02
  0.141E+02   0.120E+02   0.943E+01   0.541E+01   0.000E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  38     1.614 RADIANS    92.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.475E+01
  0.921E+01   0.119E+02   0.119E+02   0.141E+02   0.173E+02
  0.206E+02   0.224E+02   0.234E+02   0.243E+02   0.251E+02
  0.255E+02   0.242E+02   0.227E+02   0.231E+02   0.233E+02
  0.235E+02   0.241E+02   0.246E+02   0.251E+02   0.281E+02
  0.326E+02   0.349E+02   0.357E+02   0.359E+02   0.352E+02
  0.326E+02   0.311E+02   0.300E+02   0.139E+02   0.114E+02
  0.281E+02   0.293E+02   0.322E+02   0.350E+02   0.358E+02
  0.356E+02   0.350E+02   0.329E+02   0.284E+02   0.251E+02
  0.245E+02   0.240E+02   0.235E+02   0.231E+02   0.230E+02
  0.226E+02   0.240E+02   0.253E+02   0.251E+02   0.243E+02
  0.234E+02   0.224E+02   0.208E+02   0.175E+02   0.142E+02
  0.120E+02   0.109E+02   0.942E+01   0.542E+01   0.000E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  39     1.658 RADIANS    95.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.191E-01   0.649E+01
  0.904E+01   0.909E+01   0.113E+02   0.138E+02   0.177E+02
  0.201E+02   0.229E+02   0.245E+02   0.251E+02   0.251E+02
  0.240E+02   0.227E+02   0.213E+02   0.203E+02   0.216E+02
  0.230E+02   0.237E+02   0.243E+02   0.279E+02   0.324E+02
  0.356E+02   0.380E+02   0.373E+02   0.366E+02   0.374E+02
  0.360E+02   0.348E+02   0.207E+02   0.757E+01   0.575E+01
  0.179E+02   0.316E+02   0.358E+02   0.371E+02   0.366E+02
  0.370E+02   0.381E+02   0.359E+02   0.328E+02   0.284E+02
  0.244E+02   0.236E+02   0.230E+02   0.217E+02   0.202E+02
  0.210E+02   0.224E+02   0.238E+02   0.250E+02   0.249E+02
  0.244E+02   0.230E+02   0.204E+02   0.179E+02   0.141E+02
  0.114E+02   0.913E+01   0.891E+01   0.732E+01   0.957E-01
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  40     1.702 RADIANS    97.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.330E+00   0.747E+01
  0.909E+01   0.893E+01   0.933E+01   0.128E+02   0.172E+02
  0.214E+02   0.245E+02   0.261E+02   0.266E+02   0.251E+02
  0.234E+02   0.221E+02   0.217E+02   0.207E+02   0.196E+02
  0.200E+02   0.215E+02   0.233E+02   0.281E+02   0.332E+02
  0.350E+02   0.380E+02   0.420E+02   0.445E+02   0.409E+02
  0.362E+02   0.285E+02   0.165E+02   0.634E+01   0.463E+01
  0.145E+02   0.251E+02   0.345E+02   0.402E+02   0.443E+02
  0.425E+02   0.383E+02   0.353E+02   0.334E+02   0.286E+02
  0.237E+02   0.215E+02   0.199E+02   0.195E+02   0.204E+02
  0.214E+02   0.219E+02   0.232E+02   0.249E+02   0.264E+02
  0.261E+02   0.246E+02   0.217E+02   0.176E+02   0.132E+02
  0.947E+01   0.887E+01   0.896E+01   0.814E+01   0.556E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  41     1.745 RADIANS   100.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.460E+00   0.762E+01
  0.915E+01   0.886E+01   0.103E+02   0.140E+02   0.163E+02
  0.202E+02   0.238E+02   0.264E+02   0.259E+02   0.251E+02
  0.246E+02   0.234E+02   0.220E+02   0.203E+02   0.182E+02
  0.192E+02   0.214E+02   0.251E+02   0.285E+02   0.312E+02
  0.348E+02   0.388E+02   0.414E+02   0.449E+02   0.437E+02
  0.357E+02   0.274E+02   0.164E+02   0.636E+01   0.454E+01
  0.145E+02   0.240E+02   0.338E+02   0.427E+02   0.448E+02
  0.416E+02   0.391E+02   0.351E+02   0.313E+02   0.288E+02
  0.254E+02   0.216E+02   0.193E+02   0.181E+02   0.200E+02
  0.218E+02   0.232E+02   0.243E+02   0.249E+02   0.257E+02
  0.264E+02   0.240E+02   0.206E+02   0.166E+02   0.142E+02
  0.106E+02   0.879E+01   0.902E+01   0.834E+01   0.724E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  42     1.789 RADIANS   102.500 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.424E+00   0.672E+01
  0.914E+01   0.906E+01   0.109E+02   0.132E+02   0.174E+02
  0.210E+02   0.234E+02   0.245E+02   0.260E+02   0.254E+02
  0.241E+02   0.226E+02   0.217E+02   0.207E+02   0.211E+02
  0.210E+02   0.226E+02   0.244E+02   0.273E+02   0.316E+02
  0.340E+02   0.379E+02   0.417E+02   0.398E+02   0.391E+02
  0.359E+02   0.317E+02   0.195E+02   0.802E+01   0.562E+01
  0.170E+02   0.284E+02   0.350E+02   0.383E+02   0.393E+02
  0.412E+02   0.384E+02   0.342E+02   0.319E+02   0.275E+02
  0.245E+02   0.227E+02   0.210E+02   0.212E+02   0.204E+02
  0.215E+02   0.224E+02   0.238E+02   0.252E+02   0.260E+02
  0.246E+02   0.235E+02   0.212E+02   0.178E+02   0.135E+02
  0.111E+02   0.907E+01   0.909E+01   0.748E+01   0.678E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  43     1.833 RADIANS   105.000 DEGREES
  0.000E+00   0.000E+00   0.000E+00   0.329E+00   0.563E+01
  0.918E+01   0.105E+02   0.124E+02   0.143E+02   0.165E+02
  0.201E+02   0.224E+02   0.230E+02   0.239E+02   0.248E+02
  0.244E+02   0.237E+02   0.222E+02   0.224E+02   0.225E+02
  0.247E+02   0.246E+02   0.250E+02   0.263E+02   0.303E+02
  0.342E+02   0.353E+02   0.363E+02   0.351E+02   0.342E+02
  0.333E+02   0.325E+02   0.289E+02   0.129E+02   0.950E+01
  0.262E+02   0.304E+02   0.327E+02   0.336E+02   0.344E+02
  0.357E+02   0.350E+02   0.342E+02   0.306E+02   0.266E+02
  0.250E+02   0.244E+02   0.247E+02   0.225E+02   0.223E+02
  0.220E+02   0.234E+02   0.242E+02   0.248E+02   0.239E+02
  0.230E+02   0.224E+02   0.204E+02   0.167E+02   0.145E+02
  0.126E+02   0.106E+02   0.929E+01   0.630E+01   0.579E+00
  0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  44     1.876 RADIANS   107.500 DEGREES
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 0.000E+00   0.000E+00   0.000E+00   0.227E+00   0.461E+01
 0.929E+01   0.117E+02   0.138E+02   0.157E+02   0.174E+02
 0.192E+02   0.199E+02   0.211E+02   0.221E+02   0.235E+02
 0.243E+02   0.235E+02   0.248E+02   0.249E+02   0.258E+02
 0.258E+02   0.277E+02   0.273E+02   0.277E+02   0.282E+02
 0.304E+02   0.307E+02   0.300E+02   0.308E+02   0.307E+02
 0.306E+02   0.304E+02   0.310E+02   0.279E+02   0.253E+02
 0.298E+02   0.284E+02   0.301E+02   0.303E+02   0.304E+02
 0.296E+02   0.302E+02   0.302E+02   0.281E+02   0.277E+02
 0.272E+02   0.276E+02   0.257E+02   0.258E+02   0.248E+02
 0.249E+02   0.234E+02   0.243E+02   0.235E+02   0.221E+02
 0.212E+02   0.199E+02   0.192E+02   0.176E+02   0.158E+02
 0.140E+02   0.118E+02   0.966E+01   0.523E+01   0.442E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  45     1.920 RADIANS   110.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.117E+00   0.364E+01
 0.924E+01   0.130E+02   0.150E+02   0.168E+02   0.178E+02
 0.174E+02   0.185E+02   0.195E+02   0.206E+02   0.211E+02
 0.225E+02   0.258E+02   0.267E+02   0.281E+02   0.281E+02
 0.286E+02   0.286E+02   0.299E+02   0.295E+02   0.278E+02
 0.248E+02   0.253E+02   0.250E+02   0.266E+02   0.271E+02
 0.282E+02   0.287E+02   0.303E+02   0.448E+02   0.456E+02
 0.297E+02   0.269E+02   0.279E+02   0.269E+02   0.262E+02
 0.247E+02   0.251E+02   0.242E+02   0.271E+02   0.292E+02
 0.299E+02   0.285E+02   0.286E+02   0.280E+02   0.281E+02
 0.268E+02   0.261E+02   0.227E+02   0.210E+02   0.207E+02
 0.195E+02   0.185E+02   0.174E+02   0.177E+02   0.169E+02
 0.151E+02   0.133E+02   0.989E+01   0.425E+01   0.271E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  46     1.963 RADIANS   112.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.393E-01   0.276E+01
 0.918E+01   0.145E+02   0.166E+02   0.177E+02   0.172E+02
 0.170E+02   0.166E+02   0.179E+02   0.188E+02   0.201E+02
 0.223E+02   0.254E+02   0.290E+02   0.299E+02   0.309E+02
 0.310E+02   0.312E+02   0.312E+02   0.293E+02   0.264E+02
 0.235E+02   0.210E+02   0.201E+02   0.216E+02   0.235E+02
 0.255E+02   0.274E+02   0.384E+02   0.529E+02   0.527E+02
 0.390E+02   0.265E+02   0.254E+02   0.233E+02   0.215E+02
 0.198E+02   0.205E+02   0.228E+02   0.257E+02   0.286E+02
 0.309E+02   0.310E+02   0.309E+02   0.308E+02   0.300E+02
 0.292E+02   0.257E+02   0.225E+02   0.203E+02   0.189E+02
 0.179E+02   0.167E+02   0.169E+02   0.170E+02   0.175E+02
 0.167E+02   0.149E+02   0.996E+01   0.341E+01   0.126E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  47     2.007 RADIANS   115.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.533E-02   0.223E+01
 0.911E+01   0.150E+02   0.177E+02   0.183E+02   0.172E+02
 0.164E+02   0.161E+02   0.159E+02   0.175E+02   0.199E+02
 0.224E+02   0.255E+02   0.285E+02   0.315E+02   0.328E+02
 0.333E+02   0.334E+02   0.303E+02   0.287E+02   0.254E+02
 0.231E+02   0.199E+02   0.179E+02   0.160E+02   0.186E+02
 0.234E+02   0.326E+02   0.436E+02   0.548E+02   0.543E+02
 0.437E+02   0.324E+02   0.242E+02   0.185E+02   0.159E+02
 0.170E+02   0.193E+02   0.223E+02   0.247E+02   0.280E+02
 0.297E+02   0.330E+02   0.331E+02   0.329E+02   0.316E+02
 0.288E+02   0.257E+02   0.235E+02   0.203E+02   0.176E+02
 0.160E+02   0.159E+02   0.162E+02   0.170E+02   0.181E+02
 0.178E+02   0.156E+02   0.987E+01   0.299E+01   0.265E-01
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  48     2.051 RADIANS   117.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.567E-03   0.208E+01
 0.903E+01   0.147E+02   0.184E+02   0.180E+02   0.173E+02
 0.166E+02   0.156E+02   0.155E+02   0.171E+02   0.200E+02
 0.229E+02   0.260E+02   0.279E+02   0.319E+02   0.335E+02
 0.349E+02   0.332E+02   0.306E+02   0.278E+02   0.255E+02
 0.228E+02   0.197E+02   0.177E+02   0.147E+02   0.156E+02
 0.247E+02   0.341E+02   0.449E+02   0.552E+02   0.546E+02
 0.448E+02   0.340E+02   0.258E+02   0.161E+02   0.141E+02
 0.170E+02   0.190E+02   0.222E+02   0.248E+02   0.271E+02
 0.299E+02   0.324E+02   0.345E+02   0.336E+02   0.321E+02
 0.281E+02   0.263E+02   0.232E+02   0.204E+02   0.174E+02
 0.154E+02   0.153E+02   0.164E+02   0.171E+02   0.178E+02
 0.186E+02   0.154E+02   0.983E+01   0.291E+01   0.144E-01
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  49     2.094 RADIANS   120.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.240E-01   0.237E+01
 0.892E+01   0.143E+02   0.172E+02   0.181E+02   0.173E+02
 0.166E+02   0.159E+02   0.166E+02   0.182E+02   0.197E+02
 0.231E+02   0.254E+02   0.285E+02   0.308E+02   0.330E+02
 0.324E+02   0.325E+02   0.313E+02   0.281E+02   0.260E+02
 0.233E+02   0.202E+02   0.182E+02   0.182E+02   0.208E+02
 0.234E+02   0.305E+02   0.425E+02   0.542E+02   0.540E+02
 0.424E+02   0.307E+02   0.235E+02   0.209E+02   0.181E+02
 0.179E+02   0.194E+02   0.228E+02   0.252E+02   0.275E+02
 0.306E+02   0.321E+02   0.322E+02   0.328E+02   0.309E+02
 0.286E+02   0.257E+02   0.233E+02   0.199E+02   0.183E+02
 0.167E+02   0.157E+02   0.165E+02   0.171E+02   0.180E+02
 0.174E+02   0.148E+02   0.975E+01   0.315E+01   0.858E-01
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  50     2.138 RADIANS   122.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.510E-01   0.318E+01
 0.886E+01   0.139E+02   0.156E+02   0.176E+02   0.178E+02
 0.167E+02   0.174E+02   0.186E+02   0.195E+02   0.218E+02
 0.222E+02   0.255E+02   0.279E+02   0.294E+02   0.302E+02
 0.302E+02   0.301E+02   0.308E+02   0.291E+02   0.271E+02
 0.240E+02   0.216E+02   0.223E+02   0.233E+02   0.250E+02
 0.261E+02   0.274E+02   0.345E+02   0.506E+02   0.513E+02
 0.346E+02   0.265E+02   0.258E+02   0.249E+02   0.232E+02
 0.221E+02   0.213E+02   0.233E+02   0.264E+02   0.285E+02
 0.305E+02   0.298E+02   0.299E+02   0.300E+02   0.291E+02
 0.281E+02   0.257E+02   0.225E+02   0.210E+02   0.195E+02
 0.186E+02   0.174E+02   0.165E+02   0.176E+02   0.177E+02
 0.159E+02   0.141E+02   0.972E+01   0.391E+01   0.173E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  51     2.182 RADIANS   125.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.151E+00   0.430E+01
 0.873E+01   0.125E+02   0.144E+02   0.161E+02   0.179E+02
 0.178E+02   0.192E+02   0.202E+02   0.212E+02   0.224E+02
 0.229E+02   0.247E+02   0.263E+02   0.268E+02   0.276E+02
 0.278E+02   0.284E+02   0.286E+02   0.291E+02   0.284E+02
 0.269E+02   0.268E+02   0.272E+02   0.280E+02   0.285E+02
 0.286E+02   0.295E+02   0.306E+02   0.371E+02   0.385E+02
 0.286E+02   0.282E+02   0.285E+02   0.281E+02   0.279E+02
 0.271E+02   0.265E+02   0.266E+02   0.279E+02   0.287E+02
 0.284E+02   0.281E+02   0.276E+02   0.273E+02   0.266E+02
 0.261E+02   0.249E+02   0.229E+02   0.224E+02   0.212E+02
 0.202E+02   0.193E+02   0.178E+02   0.179E+02   0.163E+02
 0.146E+02   0.128E+02   0.940E+01   0.502E+01   0.360E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  52     2.225 RADIANS   127.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.244E+00   0.547E+01
 0.882E+01   0.107E+02   0.132E+02   0.146E+02   0.170E+02
 0.198E+02   0.207E+02   0.218E+02   0.230E+02   0.236E+02
 0.246E+02   0.239E+02   0.232E+02   0.244E+02   0.248E+02
 0.255E+02   0.261E+02   0.265E+02   0.272E+02   0.291E+02
 0.321E+02   0.329E+02   0.321E+02   0.322E+02   0.318E+02
 0.319E+02   0.313E+02   0.317E+02   0.206E+02   0.169E+02
 0.293E+02   0.297E+02   0.317E+02   0.316E+02   0.319E+02
 0.316E+02   0.326E+02   0.320E+02   0.293E+02   0.270E+02
 0.262E+02   0.260E+02   0.252E+02   0.247E+02   0.241E+02
 0.230E+02   0.234E+02   0.244E+02   0.236E+02   0.230E+02
 0.218E+02   0.208E+02   0.200E+02   0.173E+02   0.148E+02
 0.134E+02   0.110E+02   0.903E+01   0.627E+01   0.550E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  53     2.269 RADIANS   130.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.265E+00   0.634E+01
 0.914E+01   0.952E+01   0.118E+02   0.137E+02   0.168E+02
 0.205E+02   0.225E+02   0.237E+02   0.247E+02   0.251E+02
 0.247E+02   0.233E+02   0.220E+02   0.215E+02   0.222E+02
 0.233E+02   0.237E+02   0.246E+02   0.273E+02   0.306E+02
 0.342E+02   0.372E+02   0.375E+02   0.369E+02   0.355E+02
 0.342E+02   0.327E+02   0.255E+02   0.981E+01   0.750E+01
 0.213E+02   0.309E+02   0.338E+02   0.350E+02   0.362E+02
 0.370E+02   0.372E+02   0.344E+02   0.308E+02   0.274E+02
 0.246E+02   0.234E+02   0.231E+02   0.220E+02   0.214E+02
 0.215E+02   0.228E+02   0.242E+02   0.249E+02   0.247E+02
 0.237E+02   0.226E+02   0.209E+02   0.173E+02   0.140E+02
 0.121E+02   0.977E+01   0.913E+01   0.727E+01   0.656E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  54     2.313 RADIANS   132.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.205E+00   0.670E+01
 0.899E+01   0.889E+01   0.102E+02   0.135E+02   0.170E+02
 0.203E+02   0.236E+02   0.254E+02   0.263E+02   0.257E+02
 0.242E+02   0.231E+02   0.218E+02   0.206E+02   0.196E+02
 0.207E+02   0.218E+02   0.244E+02   0.288E+02   0.311E+02
 0.351E+02   0.380E+02   0.408E+02   0.423E+02   0.402E+02
 0.373E+02   0.289E+02   0.192E+02   0.738E+01   0.547E+01
 0.154E+02   0.260E+02   0.362E+02   0.395E+02   0.416E+02
 0.409E+02   0.382E+02   0.352E+02   0.314E+02   0.290E+02
 0.245E+02   0.219E+02   0.206E+02   0.194E+02   0.201E+02
 0.213E+02   0.225E+02   0.238E+02   0.252E+02   0.262E+02
 0.254E+02   0.239E+02   0.207E+02   0.175E+02   0.140E+02
 0.106E+02   0.894E+01   0.895E+01   0.771E+01   0.629E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  55     2.356 RADIANS   135.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.172E+00   0.683E+01
 0.893E+01   0.891E+01   0.950E+01   0.140E+02   0.170E+02
 0.202E+02   0.239E+02   0.263E+02   0.270E+02   0.256E+02
 0.241E+02   0.229E+02   0.217E+02   0.205E+02   0.190E+02
 0.187E+02   0.213E+02   0.252E+02   0.286E+02   0.317E+02
 0.352E+02   0.384E+02   0.407E+02   0.450E+02   0.441E+02
 0.358E+02   0.260E+02   0.175E+02   0.672E+01   0.498E+01
 0.138E+02   0.233E+02   0.340E+02   0.430E+02   0.450E+02
 0.409E+02   0.386E+02   0.354E+02   0.319E+02   0.289E+02
 0.253E+02   0.215E+02   0.189E+02   0.185E+02   0.201E+02
 0.212E+02   0.224E+02   0.237E+02   0.252E+02   0.265E+02
 0.265E+02   0.243E+02   0.206E+02   0.175E+02   0.146E+02
 0.990E+01   0.888E+01   0.889E+01   0.779E+01   0.600E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  56     2.400 RADIANS   137.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.205E+00   0.670E+01
 0.899E+01   0.889E+01   0.102E+02   0.135E+02   0.170E+02
 0.203E+02   0.236E+02   0.254E+02   0.263E+02   0.257E+02
 0.242E+02   0.231E+02   0.218E+02   0.206E+02   0.196E+02
 0.207E+02   0.218E+02   0.244E+02   0.288E+02   0.311E+02
 0.351E+02   0.380E+02   0.408E+02   0.423E+02   0.402E+02
 0.373E+02   0.289E+02   0.192E+02   0.738E+01   0.547E+01
 0.154E+02   0.260E+02   0.362E+02   0.395E+02   0.416E+02
 0.409E+02   0.382E+02   0.352E+02   0.314E+02   0.290E+02
 0.245E+02   0.219E+02   0.206E+02   0.194E+02   0.201E+02
 0.213E+02   0.225E+02   0.238E+02   0.252E+02   0.262E+02
 0.254E+02   0.239E+02   0.207E+02   0.175E+02   0.140E+02
 0.106E+02   0.894E+01   0.895E+01   0.771E+01   0.629E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  57     2.443 RADIANS   140.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.265E+00   0.634E+01
 0.914E+01   0.952E+01   0.118E+02   0.137E+02   0.168E+02
 0.205E+02   0.225E+02   0.237E+02   0.247E+02   0.251E+02
 0.247E+02   0.233E+02   0.220E+02   0.215E+02   0.222E+02
 0.233E+02   0.237E+02   0.246E+02   0.273E+02   0.306E+02
 0.342E+02   0.372E+02   0.375E+02   0.369E+02   0.355E+02
 0.342E+02   0.327E+02   0.255E+02   0.981E+01   0.750E+01
 0.213E+02   0.309E+02   0.338E+02   0.350E+02   0.362E+02
 0.370E+02   0.372E+02   0.344E+02   0.308E+02   0.274E+02
 0.246E+02   0.234E+02   0.231E+02   0.220E+02   0.214E+02
 0.215E+02   0.228E+02   0.242E+02   0.249E+02   0.247E+02
 0.237E+02   0.226E+02   0.209E+02   0.173E+02   0.140E+02
 0.121E+02   0.977E+01   0.913E+01   0.727E+01   0.656E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  58     2.487 RADIANS   142.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.244E+00   0.547E+01
 0.882E+01   0.107E+02   0.132E+02   0.146E+02   0.170E+02
 0.198E+02   0.207E+02   0.218E+02   0.230E+02   0.236E+02
 0.246E+02   0.239E+02   0.232E+02   0.244E+02   0.248E+02
 0.255E+02   0.261E+02   0.265E+02   0.272E+02   0.291E+02
 0.321E+02   0.329E+02   0.321E+02   0.322E+02   0.318E+02
 0.319E+02   0.313E+02   0.317E+02   0.206E+02   0.169E+02
 0.293E+02   0.297E+02   0.317E+02   0.316E+02   0.319E+02
 0.316E+02   0.326E+02   0.320E+02   0.293E+02   0.270E+02
 0.262E+02   0.260E+02   0.252E+02   0.247E+02   0.241E+02
 0.230E+02   0.234E+02   0.244E+02   0.236E+02   0.230E+02
 0.218E+02   0.208E+02   0.200E+02   0.173E+02   0.148E+02
 0.134E+02   0.110E+02   0.903E+01   0.627E+01   0.550E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  59     2.531 RADIANS   145.000 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.151E+00   0.430E+01
 0.873E+01   0.125E+02   0.144E+02   0.161E+02   0.179E+02
 0.178E+02   0.192E+02   0.202E+02   0.212E+02   0.224E+02
 0.229E+02   0.247E+02   0.263E+02   0.268E+02   0.276E+02
 0.278E+02   0.284E+02   0.286E+02   0.291E+02   0.284E+02
 0.269E+02   0.268E+02   0.272E+02   0.280E+02   0.285E+02
 0.286E+02   0.295E+02   0.306E+02   0.371E+02   0.385E+02
 0.286E+02   0.282E+02   0.285E+02   0.281E+02   0.279E+02
 0.271E+02   0.265E+02   0.266E+02   0.279E+02   0.287E+02
 0.284E+02   0.281E+02   0.276E+02   0.273E+02   0.266E+02
 0.261E+02   0.249E+02   0.229E+02   0.224E+02   0.212E+02
 0.202E+02   0.193E+02   0.178E+02   0.179E+02   0.163E+02
 0.146E+02   0.128E+02   0.940E+01   0.502E+01   0.360E+00
 0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  60     2.574 RADIANS   147.500 DEGREES
 0.000E+00   0.000E+00   0.000E+00   0.510E-01   0.318E+01
 0.886E+01   0.139E+02   0.156E+02   0.176E+02   0.178E+02
 0.167E+02   0.174E+02   0.186E+02   0.195E+02   0.210E+02
 0.222E+02   0.255E+02   0.279E+02   0.294E+02   0.302E+02
 0.302E+02   0.301E+02   0.308E+02   0.291E+02   0.271E+02
 0.240E+02   0.216E+02   0.223E+02   0.233E+02   0.250E+02
 0.261E+02   0.274E+02   0.345E+02   0.506E+02   0.513E+02
 0.346E+02   0.265E+02   0.258E+02   0.249E+02   0.232E+02
 0.221E+02   0.213E+02   0.233E+02   0.264E+02   0.285E+02
 0.305E+02   0.298E+02   0.299E+02   0.300E+02   0.291E+02
 0.281E+02   0.257E+02   0.225E+02   0.210E+02   0.195E+02
 0.186E+02   0.174E+02   0.165E+02   0.176E+02   0.177E+02
 0.159E+02   0.141E+02   0.972E+01   0.391E+01   0.173E+00
 0.000E+00   0.000E+00   0.000E+00
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PROJECTION DATA FOR ANGLE NO.  61     2.618 RADIANS   150.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.240E-01   0.237E+01
     0.892E+01   0.143E+02   0.172E+02   0.181E+02   0.173E+02
     0.166E+02   0.159E+02   0.166E+02   0.182E+02   0.197E+02
     0.231E+02   0.254E+02   0.285E+02   0.308E+02   0.330E+02
     0.324E+02   0.325E+02   0.313E+02   0.281E+02   0.260E+02
     0.233E+02   0.202E+02   0.182E+02   0.182E+02   0.208E+02
     0.234E+02   0.305E+02   0.425E+02   0.542E+02   0.540E+02
     0.424E+02   0.307E+02   0.235E+02   0.209E+02   0.181E+02
     0.179E+02   0.194E+02   0.228E+02   0.252E+02   0.275E+02
     0.306E+02   0.321E+02   0.322E+02   0.328E+02   0.309E+02
     0.286E+02   0.257E+02   0.233E+02   0.199E+02   0.183E+02
     0.167E+02   0.157E+02   0.165E+02   0.171E+02   0.180E+02
     0.174E+02   0.148E+02   0.975E+01   0.315E+01   0.858E-01
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  62     2.662 RADIANS   152.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.567E-03   0.208E+01
     0.903E+01   0.147E+02   0.184E+02   0.180E+02   0.173E+02
     0.166E+02   0.156E+02   0.155E+02   0.171E+02   0.200E+02
     0.229E+02   0.260E+02   0.279E+02   0.319E+02   0.335E+02
     0.349E+02   0.332E+02   0.306E+02   0.278E+02   0.255E+02
     0.228E+02   0.197E+02   0.177E+02   0.147E+02   0.156E+02
     0.247E+02   0.341E+02   0.449E+02   0.552E+02   0.546E+02
     0.448E+02   0.340E+02   0.258E+02   0.161E+02   0.141E+02
     0.170E+02   0.190E+02   0.222E+02   0.248E+02   0.271E+02
     0.299E+02   0.324E+02   0.345E+02   0.336E+02   0.321E+02
     0.281E+02   0.263E+02   0.232E+02   0.204E+02   0.174E+02
     0.154E+02   0.153E+02   0.164E+02   0.171E+02   0.178E+02
     0.186E+02   0.154E+02   0.983E+01   0.291E+01   0.144E-01
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  63     2.705 RADIANS   155.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.533E-02   0.223E+01
     0.911E+01   0.150E+02   0.177E+02   0.183E+02   0.172E+02
     0.164E+02   0.161E+02   0.159E+02   0.175E+02   0.199E+02
     0.232E+02   0.255E+02   0.285E+02   0.315E+02   0.328E+02
     0.333E+02   0.334E+02   0.303E+02   0.287E+02   0.254E+02
     0.231E+02   0.199E+02   0.179E+02   0.160E+02   0.186E+02
     0.234E+02   0.326E+02   0.436E+02   0.548E+02   0.543E+02
     0.437E+02   0.324E+02   0.242E+02   0.185E+02   0.159E+02
     0.170E+02   0.193E+02   0.223E+02   0.247E+02   0.280E+02
     0.297E+02   0.330E+02   0.331E+02   0.329E+02   0.316E+02
     0.288E+02   0.257E+02   0.235E+02   0.203E+02   0.176E+02
     0.160E+02   0.159E+02   0.162E+02   0.170E+02   0.181E+02
     0.178E+02   0.156E+02   0.987E+01   0.299E+01   0.265E-01
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  64     2.749 RADIANS   157.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.393E-01   0.276E+01
     0.918E+01   0.145E+02   0.166E+02   0.177E+02   0.172E+02
     0.170E+02   0.166E+02   0.179E+02   0.188E+02   0.201E+02
     0.223E+02   0.254E+02   0.290E+02   0.299E+02   0.309E+02
     0.310E+02   0.312E+02   0.312E+02   0.293E+02   0.264E+02
     0.235E+02   0.210E+02   0.201E+02   0.216E+02   0.235E+02
     0.255E+02   0.274E+02   0.384E+02   0.529E+02   0.527E+02
     0.390E+02   0.265E+02   0.254E+02   0.233E+02   0.215E+02
     0.198E+02   0.205E+02   0.228E+02   0.257E+02   0.286E+02
     0.309E+02   0.310E+02   0.309E+02   0.308E+02   0.300E+02
     0.292E+02   0.257E+02   0.225E+02   0.203E+02   0.189E+02
     0.179E+02   0.167E+02   0.169E+02   0.170E+02   0.175E+02
     0.167E+02   0.149E+02   0.996E+01   0.341E+01   0.126E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  65     2.793 RADIANS   160.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.117E+00   0.364E+01
     0.924E+01   0.130E+02   0.150E+02   0.168E+02   0.178E+02
     0.174E+02   0.185E+02   0.195E+02   0.206E+02   0.211E+02
     0.225E+02   0.258E+02   0.267E+02   0.281E+02   0.281E+02
     0.286E+02   0.286E+02   0.299E+02   0.295E+02   0.278E+02
     0.248E+02   0.253E+02   0.250E+02   0.266E+02   0.271E+02
     0.282E+02   0.287E+02   0.303E+02   0.448E+02   0.456E+02
     0.297E+02   0.269E+02   0.279E+02   0.269E+02   0.262E+02
     0.247E+02   0.251E+02   0.242E+02   0.271E+02   0.292E+02
     0.299E+02   0.285E+02   0.286E+02   0.280E+02   0.261E+02
     0.268E+02   0.261E+02   0.227E+02   0.210E+02   0.207E+02
     0.195E+02   0.185E+02   0.174E+02   0.177E+02   0.169E+02
     0.151E+02   0.133E+02   0.989E+01   0.425E+01   0.271E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  66     2.836 RADIANS   162.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.227E+00   0.461E+01
     0.929E+01   0.117E+02   0.138E+02   0.157E+02   0.174E+02
     0.192E+02   0.199E+02   0.211E+02   0.221E+02   0.235E+02
     0.243E+02   0.235E+02   0.248E+02   0.249E+02   0.258E+02
     0.258E+02   0.277E+02   0.273E+02   0.277E+02   0.282E+02
     0.304E+02   0.307E+02   0.300E+02   0.308E+02   0.307E+02
     0.306E+02   0.304E+02   0.310E+02   0.279E+02   0.253E+02
     0.298E+02   0.284E+02   0.301E+02   0.303E+02   0.304E+02
     0.296E+02   0.302E+02   0.302E+02   0.281E+02   0.277E+02
     0.272E+02   0.276E+02   0.257E+02   0.258E+02   0.248E+02
     0.249E+02   0.234E+02   0.243E+02   0.235E+02   0.221E+02
     0.212E+02   0.199E+02   0.192E+02   0.176E+02   0.158E+02
     0.140E+02   0.118E+02   0.966E+01   0.523E+01   0.442E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  67     2.880 RADIANS   165.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.329E+00   0.563E+01
     0.918E+01   0.105E+02   0.124E+02   0.143E+02   0.165E+02
     0.201E+02   0.224E+02   0.230E+02   0.239E+02   0.248E+02
     0.244E+02   0.237E+02   0.222E+02   0.224E+02   0.225E+02
     0.247E+02   0.246E+02   0.250E+02   0.263E+02   0.303E+02
     0.342E+02   0.353E+02   0.363E+02   0.351E+02   0.342E+02
     0.333E+02   0.325E+02   0.289E+02   0.129E+02   0.950E+01
     0.262E+02   0.304E+02   0.327E+02   0.336E+02   0.344E+02
     0.357E+02   0.350E+02   0.342E+02   0.306E+02   0.266E+02
     0.250E+02   0.244E+02   0.247E+02   0.225E+02   0.223E+02
     0.220E+02   0.234E+02   0.242E+02   0.248E+02   0.239E+02
     0.230E+02   0.224E+02   0.204E+02   0.167E+02   0.145E+02
     0.126E+02   0.106E+02   0.929E+01   0.630E+01   0.579E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  68     2.923 RADIANS   167.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.424E+00   0.672E+01
     0.914E+01   0.906E+01   0.109E+02   0.132E+02   0.174E+02
     0.210E+02   0.234E+02   0.245E+02   0.260E+02   0.254E+02
     0.241E+02   0.226E+02   0.217E+02   0.207E+02   0.211E+02
     0.210E+02   0.226E+02   0.244E+02   0.273E+02   0.316E+02
     0.340E+02   0.379E+02   0.417E+02   0.398E+02   0.391E+02
     0.359E+02   0.317E+02   0.195E+02   0.802E+01   0.562E+01
     0.170E+02   0.284E+02   0.350E+02   0.383E+02   0.393E+02
     0.412E+02   0.384E+02   0.342E+02   0.319E+02   0.275E+02
     0.245E+02   0.227E+02   0.210E+02   0.212E+02   0.204E+02
     0.215E+02   0.224E+02   0.238E+02   0.252E+02   0.260E+02
     0.246E+02   0.235E+02   0.212E+02   0.178E+02   0.135E+02
     0.111E+02   0.907E+01   0.909E+01   0.748E+01   0.678E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  69     2.967 RADIANS   170.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.460E+00   0.762E+01
     0.915E+01   0.886E+01   0.103E+02   0.140E+02   0.163E+02
     0.202E+02   0.238E+02   0.264E+02   0.259E+02   0.251E+02
     0.246E+02   0.234E+02   0.220E+02   0.203E+02   0.182E+02
     0.192E+02   0.214E+02   0.251E+02   0.285E+02   0.312E+02
     0.348E+02   0.388E+02   0.414E+02   0.449E+02   0.437E+02
     0.357E+02   0.274E+02   0.164E+02   0.636E+01   0.454E+01
     0.145E+02   0.240E+02   0.338E+02   0.427E+02   0.448E+02
     0.416E+02   0.391E+02   0.351E+02   0.313E+02   0.288E+02
     0.254E+02   0.216E+02   0.193E+02   0.181E+02   0.200E+02
     0.218E+02   0.232E+02   0.243E+02   0.249E+02   0.257E+02
     0.264E+02   0.240E+02   0.206E+02   0.166E+02   0.142E+02
     0.106E+02   0.879E+01   0.902E+01   0.834E+01   0.724E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  70     3.011 RADIANS   172.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.330E+00   0.747E+01
     0.909E+01   0.893E+01   0.933E+01   0.128E+02   0.172E+02
     0.214E+02   0.245E+02   0.261E+02   0.266E+02   0.251E+02
     0.234E+02   0.221E+02   0.217E+02   0.207E+02   0.196E+02
     0.200E+02   0.215E+02   0.233E+02   0.281E+02   0.332E+02
     0.350E+02   0.380E+02   0.420E+02   0.445E+02   0.409E+02
     0.362E+02   0.285E+02   0.165E+02   0.634E+01   0.463E+01
     0.145E+02   0.251E+02   0.345E+02   0.402E+02   0.443E+02
     0.425E+02   0.383E+02   0.353E+02   0.334E+02   0.286E+02
     0.237E+02   0.215E+02   0.199E+02   0.195E+02   0.204E+02
     0.214E+02   0.219E+02   0.232E+02   0.249E+02   0.264E+02
     0.261E+02   0.246E+02   0.217E+02   0.176E+02   0.132E+02
     0.947E+01   0.887E+01   0.896E+01   0.814E+01   0.556E+00
     0.000E+00   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.  71     3.054 RADIANS   175.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.191E-01   0.649E+01
     0.904E+01   0.909E+01   0.113E+02   0.138E+02   0.177E+02
     0.201E+02   0.229E+02   0.245E+02   0.251E+02   0.251E+02
     0.240E+02   0.227E+02   0.213E+02   0.203E+02   0.216E+02
     0.230E+02   0.237E+02   0.243E+02   0.279E+02   0.324E+02
     0.356E+02   0.380E+02   0.373E+02   0.366E+02   0.374E+02
     0.360E+02   0.348E+02   0.207E+02   0.757E+01   0.575E+01
     0.179E+02   0.316E+02   0.358E+02   0.371E+02   0.366E+02
     0.370E+02   0.381E+02   0.359E+02   0.328E+02   0.284E+02
     0.244E+02   0.236E+02   0.230E+02   0.217E+02   0.202E+02
     0.210E+02   0.224E+02   0.238E+02   0.250E+02   0.249E+02
     0.244E+02   0.230E+02   0.204E+02   0.179E+02   0.141E+02
     0.114E+02   0.913E+01   0.891E+01   0.732E+01   0.957E-01
     0.000E+00   0.000E+00   0.000E+00


BLANK COMMON REQUIRED     14723    ( 34603)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  14791 FLOATING POINT WORDS.


              EEEEE N   N DDDD        PPPP      J EEEEE  CCC  TTTTT
              E     NN  N D   D       P   P     J E     C   C   T
              EEE   N N N D   D       PPPP      J EEE   C       T
              E     N  NN D   D       P     J   J E     C   C   T
              EEEEE N   N DDDD        P      JJJ  EEEEE  CCC    T


PROJECTION DATA FOR ANGLE NO.  72     3.098 RADIANS   177.500 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.475E+01
     0.921E+01   0.109E+02   0.119E+02   0.141E+02   0.173E+02
     0.206E+02   0.224E+02   0.234E+02   0.243E+02   0.251E+02
     0.255E+02   0.242E+02   0.227E+02   0.231E+02   0.233E+02
     0.235E+02   0.241E+02   0.246E+02   0.251E+02   0.281E+02
     0.326E+02   0.349E+02   0.357E+02   0.359E+02   0.352E+02
     0.326E+02   0.311E+02   0.300E+02   0.139E+02   0.114E+02
     0.281E+02   0.293E+02   0.322E+02   0.350E+02   0.358E+02
     0.356E+02   0.350E+02   0.329E+02   0.284E+02   0.251E+02
     0.245E+02   0.240E+02   0.235E+02   0.231E+02   0.230E+02
     0.226E+02   0.240E+02   0.253E+02   0.251E+02   0.243E+02
     0.234E+02   0.224E+02   0.208E+02   0.175E+02   0.142E+02
     0.120E+02   0.109E+02   0.942E+01   0.542E+01   0.000E+00
     0.000E+00   0.000E+00   0.000E+00

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.274E+07
ITER  1     FCN   0.139E+06
ITER  2     FCN   0.148E+05
ITER  3     FCN   0.829E+04
ITER  4     FCN   0.335E+04
ITER  5     FCN   0.232E+04
ITER  6     FCN   0.155E+04
ITER  7     FCN   0.935E+03
ITER  8     FCN   0.761E+03
ITER  9     FCN   0.622E+03
ITER 10     FCN   0.556E+03
ITER 11     FCN   0.518E+03
ITER 12     FCN   0.479E+03
ITER 13     FCN   0.465E+03
ITER 14     FCN   0.463E+03
ITER 15     FCN   0.443E+03


BLANK COMMON REQUIRED     14587    ( 34373)


BLANK COMMON REQUIRED     11359    ( 26137)


BLANK COMMON REQUIRED      8131    ( 17703)


BLANK COMMON REQUIRED      4903    ( 11447)


BLANK COMMON REQUIRED      1675    (  3213)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  14791 FLOATING POINT WORDS.


              EEEEE N   N DDDD         CCC  OOOOO N   N  GGG  RRRR
              E     NN  N D   D       C   C O   O NN  N G   G R   R
              EEE   N N N D   D       C     O   O N N N G     RRRR
              E     N  NN D   D       C   C O   O N  NN G  GG R  R
              EEEEE N   N DDDD         CCC  OOOOO N   N  GGGG R   R


XMIN =  -0.37E+00     XMAX =   0.14E+01     XSUM =   0.1414E+04
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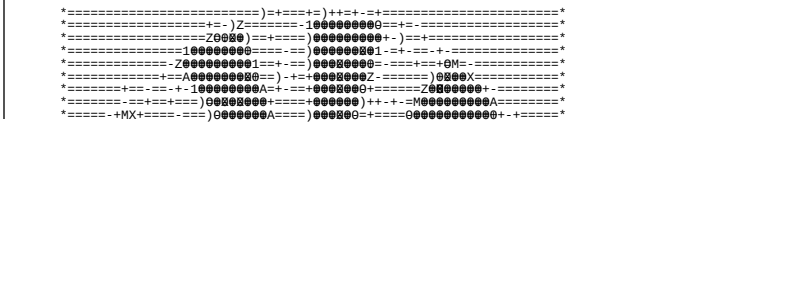

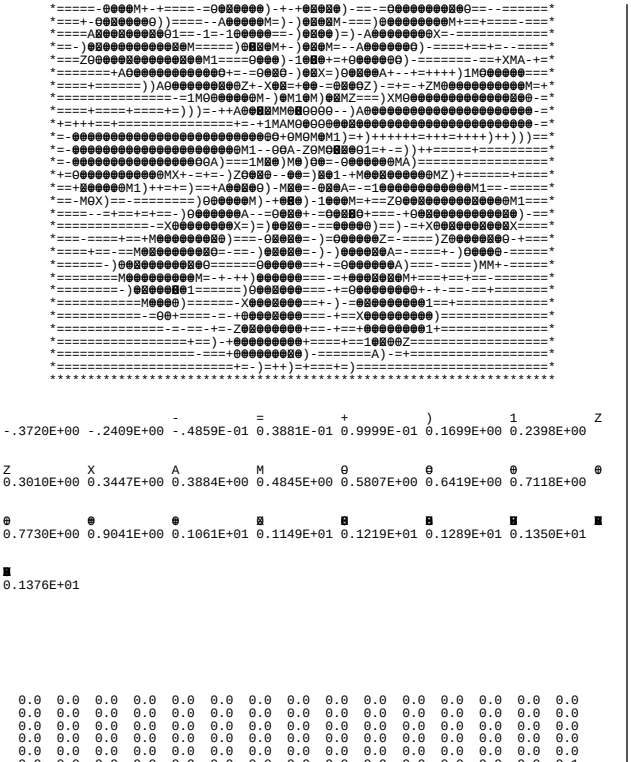

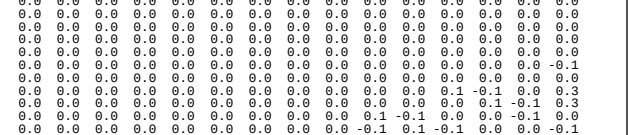
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0.3010E+00 0.3447E+00 0.3884E+00 0.4845E+00 0.5807E+00 0.6419E+00 0.7118E+00
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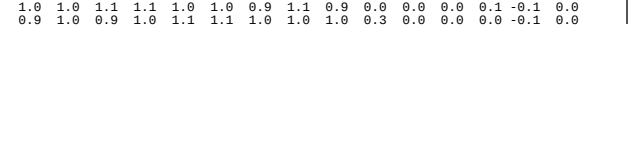
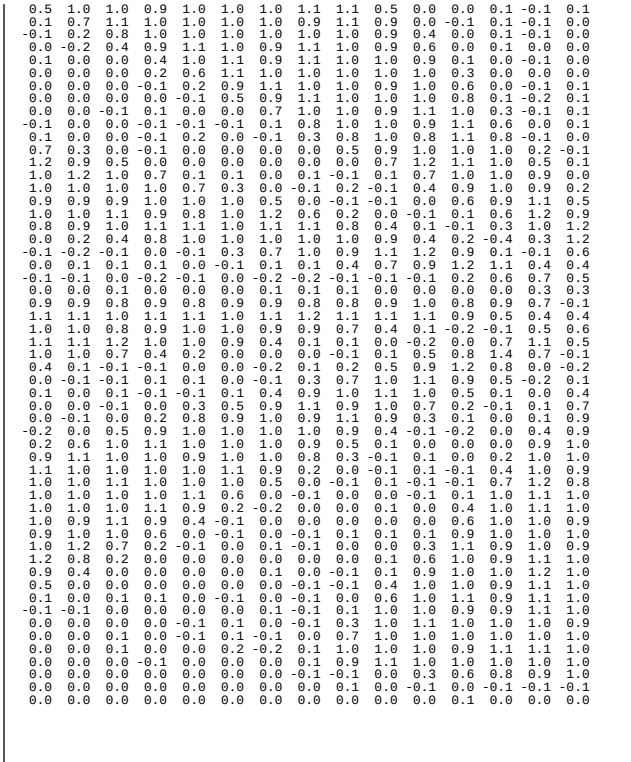
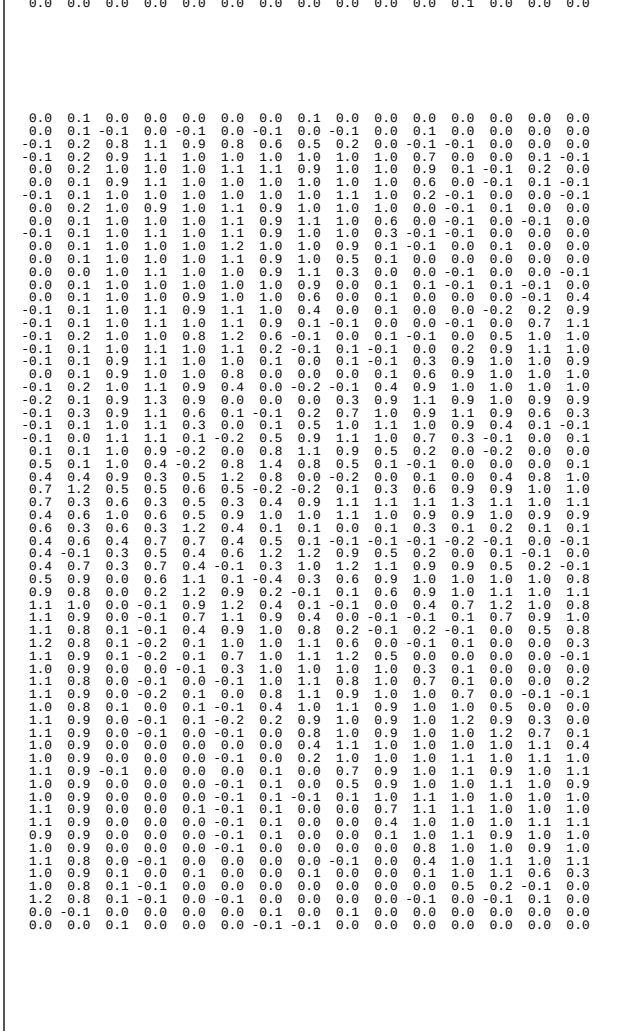






0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	-0.1	-0.1	0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.0	0.0	0.2	0.8	0.6	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	-0.1	0.5	1.0	1.0	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.5	0.9	1.1	1.0	0.9	0.8	-0.1	0.0	0.1	0.0	0.0	0.0	0.0
0.0	0.3	0.8	1.2	1.0	1.0	1.0	1.0	0.8	0.1	-0.1	0.0	0.0	0.0	0.0
0.2	0.7	1.1	1.0	1.0	1.0	0.9	1.0	0.9	0.7	-0.1	0.1	0.0	0.0	0.0
0.6	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	0.6	-0.1	0.0	0.0	0.0
0.9	1.1	0.9	1.0	1.1	1.0	1.0	1.0	1.1	1.0	0.8	0.1	-0.1	0.1	0.0
1.1	1.0	1.0	1.0	1.0	0.9	1.0	1.2	0.9	0.5	0.2	-0.1	0.1	0.0	0.0
1.0	1.0	1.0	1.0	0.9	1.0	1.1	0.8	0.5	-0.1	0.0	-0.1	-0.1	0.0	0.0
1.0	1.1	1.0	1.0	1.1	1.0	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.1
1.0	1.0	1.0	1.1	0.9	0.6	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
1.0	1.0	1.1	0.9	0.4	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1.1	1.0	0.7	0.2	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.2
0.9	0.5	0.0	-0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	-0.1	-0.1
0.2	0.0	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.1
0.0	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	0.2	0.6	0.9
-0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.3	0.6	1.0	1.0	1.0	1.0
0.1	0.0	-0.1	0.0	0.0	0.0	0.3	0.5	0.9	1.0	1.0	1.0	1.1	1.0	1.0
-0.1	-0.1	0.1	0.4	0.6	0.9	1.1	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.9
0.2	0.6	0.9	1.0	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.9	1.0	1.0	1.1
1.1	1.2	1.1	1.1	1.0	1.0	1.0	1.1	1.2	1.1	1.1	1.1	1.0	1.0	1.1
1.0	0.8	1.0	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.1	1.0	1.1	1.1	1.0	1.0	1.1	1.0	1.0	1.1	1.0	0.9	1.0	1.1	1.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0
0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2
-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	0.0	0.0
0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
0.0	-0.1	-0.2	-0.1	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0.0	0.0
0.6	0.3	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
1.1	1.0	0.8	0.6	0.3	0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1
0.9	1.1	1.0	1.0	1.0	0.9	0.6	0.4	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1.0	0.9	1.0	0.9	1.0	1.0	0.9	0.9	0.9	0.5	0.3	0.0	0.0	-0.1	0.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.0	0.9	0.7	0.3	0.0
0.8	1.0	1.1	1.0	1.0	1.1	1.1	1.0	0.9	1.1	1.0	1.1	1.0	1.0	0.9
0.1	0.7	0.9	1.1	1.0	0.9	0.9	1.0	1.0	1.0	1.0	0.9	1.0	1.1	1.1
-0.1	0.0	0.5	0.9	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.0	0.9	0.9	0.6
-0.1	0.0	-0.1	0.2	0.6	1.0	1.1	1.0	1.0	1.0	1.1	1.0	1.0	1.1	0.2
-0.1	0.1	0.0	-0.1	0.2	0.4	0.9	1.0	1.0	0.9	1.0	1.1	0.9	0.8	-0.1
0.0	-0.1	0.0	0.0	0.0	0.0	0.4	0.8	1.1	1.0	0.9	1.1	0.9	0.2	-0.1
0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.2	0.7	1.0	1.0	1.0	0.8	-0.1	0.0
-0.1	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.1	0.5	0.9	1.0	0.2	0.0	0.0
0.2	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	-0.1	0.0	0.3	0.3	0.0	-0.1	0.0
0.2	0.0	0.1	0.1	0.0	0.1	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
0.8	0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.1	0.0	0.0	0.0
1.0	0.7	0.1	-0.1	0.1	-0.1	0.0	0.0	-0.1	0.0	0.0	0.1	0.0	0.0	0.0
1.0	1.1	0.5	0.0	-0.1	0.0	0.0	-0.1	0.1	-0.1	0.0	0.0	0.0	0.0	0.0
1.0	1.0	1.0	0.4	0.0	-0.1	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
1.0	0.9	1.1	0.8	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.1	1.1	1.0	1.0	0.2	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.9	1.0	0.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.9	0.3	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
-0.1	0.0	0.0	0.0
-0.1	0.0	0.0	0.0
0.1	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	-0.1	0.0	0.0
0.7	-0.1	0.1	0.0
1.0	0.0	0.0	0.0
1.0	0.2	-0.1	0.0
1.0	0.5	0.0	0.1
1.0	0.6	-0.1	0.0
1.0	0.8	0.0	0.0
1.0	0.9	-0.1	0.0
1.1	1.1	0.0	0.0
0.9	0.8	-0.1	0.0
0.2	0.2	0.1	0.1
-0.1	-0.1	0.0	0.0
0.0	0.0	0.0	0.0
0.0	-0.1	0.0	0.0
0.0	0.0	0.1	0.0
0.0	0.0	0.0	-0.1
0.0	0.0	0.1	0.0
0.0	0.0	0.0	0.0
0.0	-0.1	0.0	0.0
0.3	0.0	0.0	0.0
0.2	-0.1	0.0	0.0
-0.1	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.1	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0

EX06

```
      PROGRAM XGRADY
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 6
C
C             THE PROGRAM XGRADY USES THE ITERATIVE GRADIENT ALGORITHM
C        TO RECONSTRUCT PARALLEL BEAM PROJECTION DATA.
C
      DIMENSION B(4096),AG(180)
      COMMON/BLANK/WORK(12000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,PRF
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=0
      IGEOM=0
      NANG=72
      MODANG=4
      KDIMU=100
      IMIT=1
      NWORK=12000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=0
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E06.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
C
      CALL GRADY (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,14)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,16) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   14 FORMAT(1X///////)
   16 FORMAT(1X,15F5.1)
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 6
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A PIE PHANTOM.
C
      DIMENSION B(4096),DATA(*),ERR(*)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL PLL
C
      DATA R,X1,Y1,Z,INTFR,NSLIPI,ISTART/30.,0.,0.,1.,10,10,1/
C
      IF (M.EQ.1) THEN
          CALL PIE (B,NDIMU,R,X1,Y1,Z,INTFR,NSLIPI,ISTART)
          CALL ARRAY (B,NDIMU)
      ENDIF
C
      CALL PJECT (B,DATA,M,PLL)
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0		RECONSTRUCT IN A CIRCULAR ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	4		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	1		TRANSMISSION DATA
8	12000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 144 (220)

BLANK COMMON REQUIRED 216 (330)

BLANK COMMON REQUIRED 416 (640)

BLANK COMMON REQUIRED 480 (740)

A TOTAL OF 68 (17 THRU 84) OF THE 100 USER PROJECTION BINS WILL BE USED

68 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 480 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
 GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G  GG R  R  AAAAA D   D   Y
 GGGG R   R A   A DDDD    Y
```

PARAMETERS FOR SUBROUTINE GRADY

		DESCRIPTION
ISTP -	15	NUMBER OF ITERATION STEPS
IRLX -	1	ITERATIVE RELAXATION METHOD
IERR -	0	DO NOT USE ERROR ARRAY
IZER -	0	INITIAL SOLUTION IS ZERO

BLANK COMMON REQUIRED 516 (1004)

BLANK COMMON REQUIRED 1675 (3213)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

```
ARG     FUNCTION             RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION       UNIFORM SQUARE           NO                  NO
PRJ     PROJECTION           UNIFORM SQUARE           NO                  NO


BLANK COMMON REQUIRED      1811    (  3423)


BLANK COMMON REQUIRED      5039    ( 11657)


BLANK COMMON REQUIRED      8267    ( 20113)

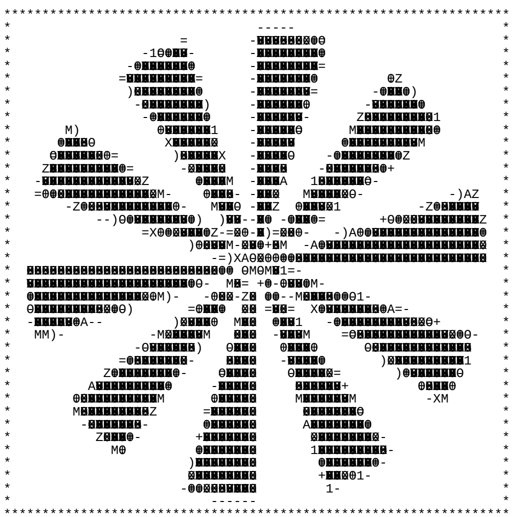

BLANK COMMON REQUIRED     11495    ( 26347)
```

```
PPPP   III  EEEEE
P   P   I   E
PPPP    I   EEE
P       I   E
P      III  EEEEE
```

```
PIE PHANTOM GENERATED
ARRAY SIZE   64X 64
CIRCLE RADIUS   30.00  AT  ( 0., 0.)
INT FACTOR   10
SECTOR WIDTH   0.314
```

```
EEEEE N   N DDDD        PPPP   III  EEEEE
E     NN  N D   D       P   P   I   E
EEE   N N N D   D       PPPP    I   EEE
E     N  NN D   D       P       I   E
EEEEE N   N DDDD        P      III  EEEEE
```

XMIN =   0.00E+00   XMAX =   0.10E+01   XSUM =   0.1414E+04



```
                -           =           +           )           1           Z
0.0000E+00 0.7500E-01 0.1850E+00 0.2350E+00 0.2700E+00 0.3100E+00 0.3500E+00

Z          X          A          M          θ          θ          ⊕          ⊕
0.3850E+00 0.4100E+00 0.4350E+00 0.4900E+00 0.5450E+00 0.5800E+00 0.6200E+00

⊕          ⊕          ⊕          ■          ■          ■          ■          ■
0.6550E+00 0.7300E+00 0.8200E+00 0.8700E+00 0.9100E+00 0.9500E+00 0.9850E+00

■
0.1000E+01
```

```
PPPP      J EEEEE  CCC  TTTTT
P   P     J E     C   C   T
PPPP      J EEE   C       T
P     J   J E     C   C   T
P      JJJ  EEEEE  CCC    T
```

```
BLANK COMMON REQUIRED     11563    ( 26453)


BLANK COMMON REQUIRED     11495    ( 26347)


         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  11563 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD        PPPP      J EEEEE  CCC  TTTTT
E     NN  N D   D       P   P     J E     C   C   T
EEE   N N N D   D       PPPP      J EEE   C       T
E     N  NN D   D       P     J   J E     C   C   T
EEEEE N   N DDDD        P      JJJ  EEEEE  CCC    T
```

```
FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.274E+07
ITER  1     FCN   0.139E+06
ITER  2     FCN   0.205E+05
ITER  3     FCN   0.131E+05
ITER  4     FCN   0.101E+05
ITER  5     FCN   0.860E+04
ITER  6     FCN   0.739E+04
ITER  7     FCN   0.642E+04
ITER  8     FCN   0.562E+04
ITER  9     FCN   0.496E+04
ITER 10     FCN   0.441E+04
ITER 11     FCN   0.395E+04
ITER 12     FCN   0.355E+04
ITER 13     FCN   0.321E+04
ITER 14     FCN   0.292E+04
ITER 15     FCN   0.268E+04


BLANK COMMON REQUIRED     11359    ( 26137)


BLANK COMMON REQUIRED      8131    ( 17703)

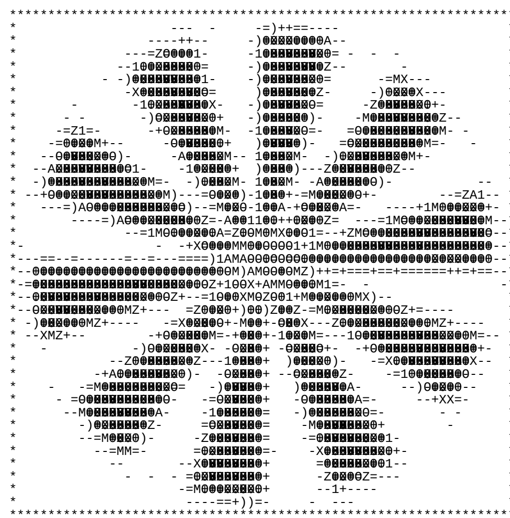

BLANK COMMON REQUIRED      4903    ( 11447)


BLANK COMMON REQUIRED      1675    (  3213)


         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  11563 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD        GGG  RRRR   AAA  DDDD  Y   Y
E     NN  N D   D      G   G R   R A   A D   D  Y Y
EEE   N N N D   D      G     RRRR  A   A D   D   Y
E     N  NN D   D      G  GG R  R  AAAAA D   D   Y
EEEEE N   N DDDD        GGGG R   R A   A DDDD    Y
```

XMIN = -0.84E-01   XMAX =   0.11E+01   XSUM =   0.1418E+04



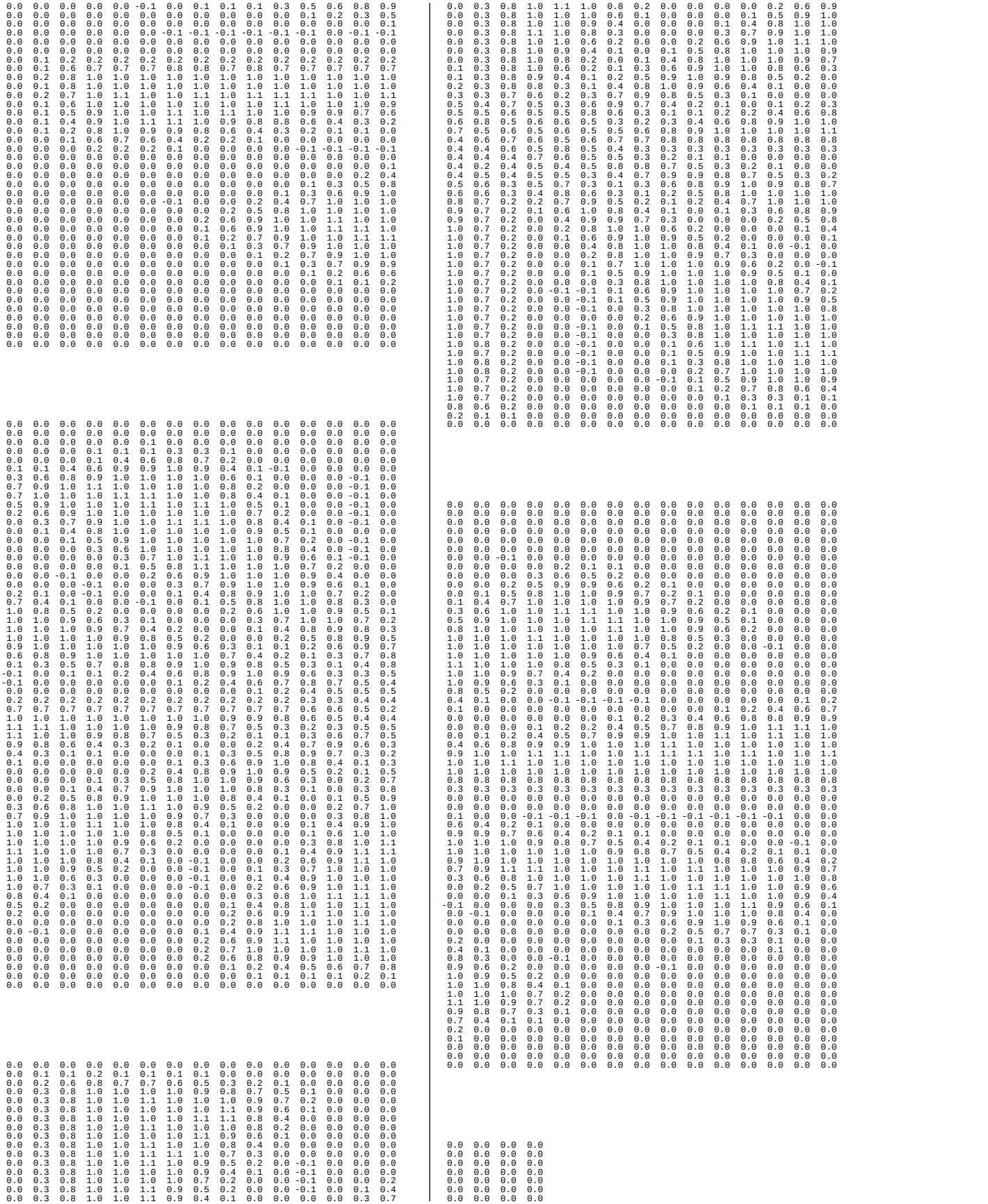
```
                -           =           +           )           1           Z
-.8383E-01 0.5166E-02 0.1357E+00 0.1950E+00 0.2366E+00 0.2840E+00 0.3315E+00

Z          X          A          M          θ          θ          ⊕          ⊕
0.3730E+00 0.4027E+00 0.4324E+00 0.4976E+00 0.5629E+00 0.6044E+00 0.6519E+00

⊕          ⊕          ⊕          ■          ■          ■          ■          ■
0.6934E+00 0.7824E+00 0.8892E+00 0.9486E+00 0.9960E+00 0.1043E+01 0.1085E+01

■
0.1103E+01
```

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.0	-0.1	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.7	0.7	0.4	0.2	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.1	0.7	0.9	1.0	0.8	0.5	0.2	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.4	0.8	1.0	1.0	1.0	0.9	0.6	0.3	0.1	0.0
0.0	0.0	0.0	0.1	0.2	0.7	0.9	1.1	1.0	1.0	1.0	0.9	0.8	0.4	0.2
0.0	0.0	0.0	0.1	0.4	0.9	1.0	1.0	1.1	1.0	1.0	1.0	1.0	0.8	0.5
0.0	0.0	0.1	0.1	0.6	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.0	0.9
0.0	0.0	0.1	0.3	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0
0.0	0.0	0.1	0.3	0.7	0.9	1.0	1.0	1.0	1.1	1.0	1.1	1.0	1.0	1.0
0.0	0.0	0.0	0.1	0.2	0.5	0.7	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0
0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	0.8	0.9	1.0	1.0



0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.1 0.0 0.0 0.0
0.5 0.1 0.0 0.0
0.7 0.2 0.0 0.0
0.8 0.3 0.0 0.0
0.9 0.5 0.1 0.0
1.0 0.6 0.1 0.0
1.0 0.7 0.1 0.0
1.0 0.7 0.1 0.0
1.0 0.8 0.2 0.0
0.8 0.6 0.1 0.0
0.3 0.2 0.1 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.1 0.0 0.0 0.0
0.3 0.0 0.0 0.0
0.3 0.0 0.0 0.0
0.1 0.1 0.0 0.0
0.1 0.0 0.0 0.0
0.1 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0

EX07

```
      PROGRAM XITRFN
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 7
C
C             THE PROGRAM XITRFN USES THE ITERATIVE CONJUGATE GRADIENT
C        ALGORITHM TO RECONSTRUCT FAN BEAM PROJECTION DATA COLLECTED
C        USING BOTH A CURVED DETECTOR AND A FLAT DETECTOR.
C
      DIMENSION B(1024),AG(36)
      COMMON/BLANK/WORK(5000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                   (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BCDF,PCDF
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=32
      ICIR=0
      IGEOM=1
      NANG=36
      MODANG=5
      KDIMU=67
      IMIT=1
      NWORK=5000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=0
      PWID=1.33
      AXISU=33.
      RFAN=65.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E07.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR FAN BEAM GEOMETRY
C          WITH CURVED DETECTOR
C
      ISTEP=5
      IRLX=1
      IERR=0
      IZER=0
C
      CALL CONGR (B,PCDF,BCDF,ISTEP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,22)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      IGEOM=2
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR FAN BEAM GEOMETRY
C          WITH FLAT DETECTOR
C
      ISTEP=5
      IRLX=1
      IERR=0
      IZER=0
C
      CALL CONGR (B,PCDF,BCDF,ISTEP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   18 FORMAT(1X///////)
   20 FORMAT(1X,15F5.1)
   22 FORMAT(1X///' RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH CURVED DE',
     1    'TECTOR')
   24 FORMAT(1X///' RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH FLAT DETE',
     1    'CTOR')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 7
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A CHEST PHANTOM CONSISTING OF A HEART, LUNGS AND SURROUNDING
C        TISSUE.
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                   (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DIMENSION DATA(*),ERR(*),B(1024)
      DIMENSION ITYPE(4),X1(4),Y1(4),A1(4),B1(4),Z(4),PHI(4)
      DATA ITYPE/1,1,1,1/
      DATA A1/26.6,6.65,9.31,9.31/
      DATA B1/26.6,6.65,6.65,6.65/
      DATA X1/0.,0.,6.65,-6.65/
      DATA Y1/0.,-6.65,0.,0./
      DATA PHI/0.,0.,1.57079633,1.57079633/
      DATA Z/5.,27.,-4.,-4./
C
      IF (M.EQ.1) THEN
C
          CALL PHAN (4,10,ITYPE,Z,X1,Y1,A1,B1,PHI,B,NDIMU,PWID)
C
          WRITE (LUNOUT,16)
          CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE PHANTOM
C
          NMAT=NDIMU**2
          KK1=1
          KU=NDIMU/15+1
          DO 12 K=1,KU
              WRITE (LUNOUT,18)
              KK2=MIN(15*K,NDIMU)
              DO 10 J=1,NDIMU
                  ISUB1=NMAT-J*NDIMU+KK1
                  ISUB2=NMAT-J*NDIMU+KK2
   10             WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12         KK1=KK2+1
C
      ENDIF
C
      CALL PHANL (4,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      RETURN
C
C
C
   16 FORMAT('1')
   18 FORMAT('1')
   20 FORMAT(1X,15F5.1)
      END
      SUBROUTINE USER (ITER,X,CHISQ)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 7
C
C             THE SUBROUTINE USER PRINTS OUT THE CHI-SQUARE FOR EACH
C        ITERATION ALONG WITH A GRAY LEVEL PLOT OF THE IMAGE AND A CROSS
C        SECTIONAL PLOT THROUGH THE IMAGE.
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                   (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DIMENSION X(*)
C
      IF (ITER.EQ.0) WRITE (LUNOUT,10)
      WRITE (LUNOUT,12) ITER,CHISQ
C
      IF (ITER.EQ.0) RETURN
C
      CALL ARRAY (X,NDIMU)
C
C        CROSS SECTIONAL PLOT PARALLEL TO THE X AXIS AT J = 15
C
      NI=1
      BMAX=999999.
      BMIN=999999.
      IXY=0
      ICOR=15
      IL=1
      IU=32
```

```
      CALL XYGRF (X,NDIMU,NI,BMAX,BMIN,IXY,ICOR,IL,IU)
C
      RETURN
C
C
C
   10 FORMAT(1X//)
   12 FORMAT(' ITER',I3,'   CHISQ',E12.3)
      END
```

```
                     SSS  EEEEE TTTTT U   U PPPP
                    S     E       T   U   U P   P
                     SSS  EEE     T   U   U PPPP
                        S E       T   U   U P
                     SSS  EEEEE   T    UUU  P
```

```
          INTEGER PARAMETER ARRAY  (IPAR)

 I   IPAR(I)      DESCRIPTION

 1       32       LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
 2        0       RECONSTRUCT IN A CIRCULAR ARRAY
 3        1       GEOMETRY FLAG
 4       36       NUMBER OF PROJECTION ANGLES
 5        5       MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND 2*PI
                  STARTING AT ZERO
 6       67       NUMBER OF RAYS FOR EACH PROJECTION
 7        1       TRANSMISSION DATA
 8     5000       DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9        2       NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10        0       EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11        5       PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12        0       LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE
```

```
          FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.330      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF
                  ROTATION
 2    33.000      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3    65.000      DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN
                  UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED        36    (    44)

BLANK COMMON REQUIRED        72    (   110)

BLANK COMMON REQUIRED       108    (   154)

BLANK COMMON REQUIRED       242    (   362)

BLANK COMMON REQUIRED       274    (   422)

A TOTAL OF  47 ( 10 THRU  56) OF THE  67 USER PROJECTION BINS WILL BE USED

 47 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=    274 FLOATING POINT WORDS.
```

```
             EEEEE N   N DDDD        SSS  EEEEE TTTTT U   U PPPP
             E     NN  N D   D      S     E       T   U   U P   P
             EEE   N N N D   D       SSS  EEE     T   U   U PPPP
             E     N  NN D   D          S E       T   U   U P
             EEEEE N   N DDDD        SSS  EEEEE   T    UUU  P
```

```
                     CCC  OOOOO N   N  GGG  RRRR
                    C   C O   O NN  N G   G R   R
                    C     O   O N N N G     RRRR
                    C   C O   O N  NN G  GG R  R
                     CCC  OOOOO N   N  GGGG R   R
```

```
          PARAMETERS FOR SUBROUTINE CONGR

                  DESCRIPTION

ISTP -       5    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG    FUNCTION             RAY WEIGHTING        ATTENUATION          FAN BEAM
BCK    BACKPROJECTION       CONCAVE DISK             NO                    YES
PRJ    PROJECTION           CONCAVE DISK             NO                    YES

BLANK COMMON REQUIRED       368    (   560)

BLANK COMMON REQUIRED      1180    (  2234)

BLANK COMMON REQUIRED      1992    (  3710)

BLANK COMMON REQUIRED      2804    (  5364)

BLANK COMMON REQUIRED      3616    (  7040)
```

```
                             PPPP  H   H  AAA  N   N
                             P   P H   H A   A NN  N
                             PPPP  HHHHH A   A N N N
                             P     H   H AAAAA N  NN
                             P     H   H A   A N   N
```

```
PHANTOM GENERATED
  ARRAY SIZE   32 X  32   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                  X          Y          A          B       PHI      DENS
      1   - EL@:@:     0.00 ,    5.00
                       (   0.00),(   0.00)(  20.00),(  20.00)         (   6.65)
      1   - EL  @ @      0.00 ,   27.00
                       (   0.00),(  -5.00)(   5.00),(   5.00)         (  35.91)
      1   - EL@ @"@      1.57 ,   -4.00
                       (   5.00),(   0.00)(   7.00),(   5.00)         (  -5.32)
      1   - EL  @"@      1.57 ,   -4.00
                       (  -5.00),(   0.00)(   7.00),(   5.00)         (  -5.32)
```

```
                EEEEE N   N DDDD       PPPP  H   H  AAA  N   N
                E     NN  N D   D      P   P H   H A   A NN  N
                EEE   N N N D   D      PPPP  HHHHH A   A N N N
                E     N  NN D   D      P     H   H AAAAA N  NN
                EEEEE N   N DDDD       P     H   H A   A N   N
```

```
XMIN =   0.00E+00     XMAX =   0.43E+02     XSUM =   0.2507E+04
```

```
                      **********************************
                      *                                *
                      *                                *
                      *                                *
                      *           ------               *
                      *        ------------            *
                      *      ----------------          *
                      *     ------------------         *
                      *     ------------------         *
                      *    ---    ------    ---        *
                      *    ---    ------    ---        *
                      *    ---    --==--    ---        *
                      *     ------=⊕⊠⊠⊕=------         *
                      *     ------θ████θ------         *
                      *      -----+████+-----          *
                      *        ----=11=----            *
                      *           ------               *
                      *                                *
                      *                                *
                      *                                *
                      **********************************
```

```
                          -           =           +           )           1           Z
0.0000E+00 0.3192E+01 0.7874E+01 0.1000E+02 0.1149E+02 0.1319E+02 0.1490E+02

Z          X          A          M          θ          θ          ⊕          ⊕
0.1639E+02 0.1745E+02 0.1851E+02 0.2085E+02 0.2320E+02 0.2468E+02 0.2639E+02

⊕          ⊕          ⊕          ⊠          █          █          █          █
0.2788E+02 0.3107E+02 0.3490E+02 0.3703E+02 0.3873E+02 0.4043E+02 0.4192E+02

█
0.4256E+02
```

```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2  2.4  4.5  5.8
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.0  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  4.0  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.0  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.2  6.0  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  2.4  6.7  6.7  6.5  4.5  4.5  6.5  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  4.5  6.7  6.7  2.8  1.3  1.3  2.8  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  5.8  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  6.6  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  6.6  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  5.8  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  4.5  6.7  6.7  2.8  1.3  1.3  2.8  6.7  9.5
  0.0  0.0  0.0  0.0  0.0  0.0  2.4  6.7  6.7  6.5  4.5  4.5  6.5  9.5 39.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.2  6.0  6.7  6.7  6.7  6.7  6.7 22.5 42.6
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.7  6.7  6.7  6.7  6.7 22.5 42.6
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.0  6.7  6.7  6.7  6.7  9.5 39.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  4.0  6.7  6.7  6.7  6.7  9.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.0  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2  2.4  4.5  5.8
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0

  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.6  6.6  5.8  4.5  2.4  0.2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.0  2.3  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  4.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  4.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  2.3  0.0  0.0  0.0  0.0  0.0
```

```
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.0  0.2  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.5  4.5  4.5  6.5  6.7  6.7  2.4  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  2.8  1.3  1.3  2.8  6.7  6.7  4.5  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7  5.8  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7  6.6  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7  6.6  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7  5.8  0.0  0.0  0.0  0.0
 22.5 22.5  9.5  6.7  2.8  1.3  1.3  2.8  6.7  6.7  4.5  0.0  0.0  0.0  0.0
 42.6 42.6 39.0  9.5  6.5  4.5  4.5  6.5  6.7  6.7  2.4  0.0  0.0  0.0  0.0
 42.6 42.6 42.6 22.5  6.7  6.7  6.7  6.7  6.7  6.0  0.2  0.0  0.0  0.0  0.0
 42.6 42.6 42.6 22.5  6.7  6.7  6.7  6.7  6.7  2.3  0.0  0.0  0.0  0.0  0.0
 42.6 42.6 39.0  9.5  6.7  6.7  6.7  6.7  4.0  0.0  0.0  0.0  0.0  0.0  0.0
 22.5 22.5  9.5  6.7  6.7  6.7  6.7  4.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.0  2.3  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.6  6.6  5.8  4.5  2.4  0.2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0

  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
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  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0

BLANK COMMON REQUIRED      3648    (  7100)

BLANK COMMON REQUIRED      3616    (  7040)

ITER  0   CHISQ   0.208E+08
ITER  1   CHISQ   0.449E+07

XMIN =   0.00E+00     XMAX =   0.11E+02     XSUM =   0.2966E+04

                      **********************************
                      *         ----=-==-=----         *
                      *      ---==============---      *
                      *     -=====+++++++++++=====-     *
                      *   -=====++)11111111)++=====-   *
                      *  --===++)1ZZXXXXXXZZ1)++===--  *
                      * -====+)11ZXXAAMMAAXXZ11)+====- *
                      * -===+)1ZXAMMAMMMMAMMAXZ1)+===- *
                      *-====)1ZZXXAMMMΘΘMMMAXXZZ1)====-*
                      *-===+)1ZZXXXMMΘΘΘΘMMXXXZZ1)+===-*
                      *-===+)ZZXXAMMΘΘΘΘΘΘMMAXXZZ)+===-*
                      *-===+)1ZXXAMΘΘ⊕⊕⊕⊕⊕⊕ΘΘMAXXZ1)+===-*
                      *-===+)1ZAMMΘ⊕⊕⊕⊕⊗⊗⊕⊕⊕ΘMMAZ1)+===-*
                      * -==++)ZXMΘΘ⊕⊕████⊕⊕ΘΘMXZ)++==- *
                      * -===+)1ZXMΘΘ⊕⊗███⊗⊕ΘΘMXZ1)+===- *
                      *  -===+))ZXMMΘ⊕⊕⊕⊕⊕ΘMMXZ))+===-  *
                      *   -==+++)11XAMMMMAX11)+++==-   *
                      *     ===+++))111111))+++===     *
                      *      -===++++))))++++===-      *
                      *         ==============         *
                      **********************************

                      -          =          +          )          1          Z
0.0000E+00 0.8412E+00 0.2075E+01 0.2636E+01 0.3028E+01 0.3477E+01 0.3926E+01

Z          X          A          M          Θ          Θ          ⊕          ⊕
0.4318E+01 0.4599E+01 0.4879E+01 0.5496E+01 0.6113E+01 0.6505E+01 0.6954E+01

⊕          ⊕          ⊕          ⊗          █          █          █          █
0.7347E+01 0.8188E+01 0.9197E+01 0.9758E+01 0.1021E+02 0.1066E+02 0.1105E+02

█
0.1122E+02

XYGRF PRINTOUT

SYMBOL            MINIMUM        MAXIMUM            INTERCEPT
    X           0.201E+01      0.702E+01     THE Y-INTERCEPT =  15.
PLOT RANGE      0.201E+01      0.702E+01

  1  IX                                                                         I
  2  IXXX                                                                       I
  3  IXXXXX                                                                     I
  4  IXXXXXXXX                                                                  I
  5  IXXXXXXXXXXXXX                                                             I
  6  IXXXXXXXXXXXXXXXXXX                                                        I
  7  IXXXXXXXXXXXXXXXXXXXXXXXXXX                                                I
  8  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                          I
  9  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                      I
 10  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                     I
 11  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                   I
 12  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                              I
 13  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                        I
 14  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX            I
 15  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX   I
 16  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXI
 17  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXI
 18  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX   I
 19  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX          I
 20  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                      I
 21  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                            I
 22  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                 I
 23  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                   I
 24  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                    I
 25  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                        I
 26  IXXXXXXXXXXXXXXXXXXXXXXXXXX                                              I
 27  IXXXXXXXXXXXXXXXXXX                                                      I
 28  IXXXXXXXXXXXXX                                                           I
 29  IXXXXXXXX                                                                I
 30  IXXXXX                                                                   I
 31  IXXX                                                                     I
 32  IX                                                                       I

ITER  2   CHISQ   0.893E+06

XMIN =  -0.15E+01     XMAX =   0.32E+02     XSUM =   0.2449E+04

                      **********************************
                      *                                *
                      *                                *
                      *                                *
                      *           ----------           *
                      *         ----======----         *
                      *        ---====++====---        *
                      *       --=====++++=====--       *
                      *      -----==++++++==-----      *
                      *      ------=+))))+=------      *
                      *     -------=+1111+=-------     *
                      *      --=--=+1AMMA1+=--=--      *
                      *      --===)ZΘ⊕⊗⊗⊕ΘZ)===--      *
                      *      --=+)1AΘ⊕⊗███⊗ΘA1)+=--      *
                      *       --=+1ZΘ⊕⊕██⊕ΘZ1+=--       *
                      *        --=+)ZAΘΘAZ)+=--        *
                      *         ----=+))+=----         *
                      *           ----------           *
                      *                                *
                      *                                *
                      **********************************

                      -          =          +          )          1          Z
-.1489E+01 0.1032E+01 0.4730E+01 0.6410E+01 0.7587E+01 0.8931E+01 0.1028E+02

Z          X          A          M          Θ          Θ          ⊕          ⊕
0.1145E+02 0.1229E+02 0.1313E+02 0.1498E+02 0.1683E+02 0.1801E+02 0.1935E+02

⊕          ⊕          ⊕          ⊗          █          █          █          █
0.2053E+02 0.2305E+02 0.2607E+02 0.2775E+02 0.2910E+02 0.3044E+02 0.3162E+02

█
0.3212E+02

XYGRF PRINTOUT

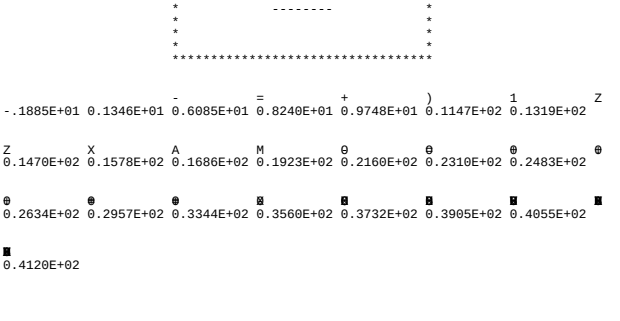
SYMBOL            MINIMUM        MAXIMUM            INTERCEPT
    X          -0.773E+00      0.130E+02     THE Y-INTERCEPT =  15.
PLOT RANGE     -0.773E+00      0.130E+02

  1  IXX                                                                      I
  2  IX                                                                       I
  3  IX                                                                       I
  4  IX                                                                       I
  5  IXXXX                                                                    I
  6  IXXXXXXXXX                                                               I
  7  IXXXXXXXXXXXXXXXXXXXX                                                    I
  8  IXXXXXXXXXXXXXXXXXXXXXXXXXXX                                             I
  9  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                           I
 10  IXXXXXXXXXXXXXXXXXXXXXXXXXX                                              I
 11  IXXXXXXXXXXXXXXXXXXXXXXXXXXX                                             I
 12  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                        I
 13  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                I
 14  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                 I
 15  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX     I
 16  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXI
 17  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXI
 18  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX     I
 19  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                 I
 20  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                I
 21  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                        I
 22  IXXXXXXXXXXXXXXXXXXXXXXXXXXX                                             I
 23  IXXXXXXXXXXXXXXXXXXXXXXXXXX                                              I
 24  IXXXXXXXXXXXXXXXXXXXXXXXXXXXXX                                           I
 25  IXXXXXXXXXXXXXXXXXXXXXXXXXXX                                             I
 26  IXXXXXXXXXXXXXXXXXXXX                                                    I
 27  IXXXXXXXXX                                                               I
 28  IXXXX                                                                    I
 29  IX                                                                       I
 30  IX                                                                       I
 31  IX                                                                       I
 32  IXX                                                                      I

ITER  3   CHISQ   0.323E+06

XMIN =  -0.19E+01     XMAX =   0.41E+02     XSUM =   0.2469E+04

                      **********************************
                      *                                *
                      *                                *
                      *              -  -              *
                      *           ----------           *
                      *        ----========----        *
                      *       ---============---       *
                      *      ---==============---      *
                      *      -------======-------      *
                      *     ---------====---------     *
                      *     ---------====---------     *
                      *      -------=)11)=-------      *
                      *      ------+XΘ⊕⊕⊕ΘX+------      *
                      *       ---==1Θ⊗███⊗Θ1==---       *
                      *        ---=+M⊕⊗█⊗⊕M+=---        *
                      *         ---=+1AA1+=---         *
```



```
-.1885E+01 0.1346E+01 0.6085E+01 0.8240E+01 0.9748E+01 0.1147E+02 0.1319E+02

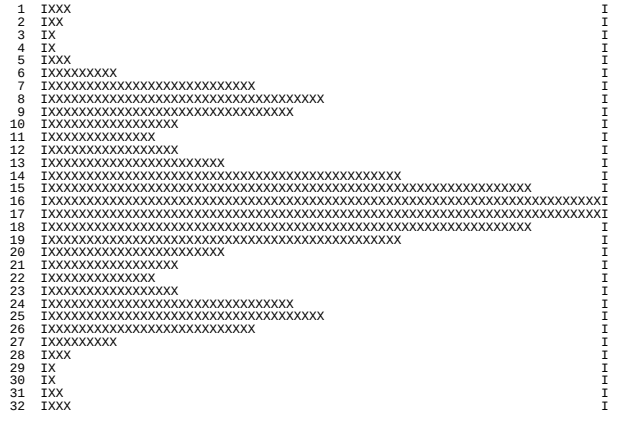
0.1470E+02 0.1578E+02 0.1686E+02 0.1923E+02 0.2160E+02 0.2310E+02 0.2483E+02

0.2634E+02 0.2957E+02 0.3344E+02 0.3560E+02 0.3732E+02 0.3905E+02 0.4055E+02

0.4120E+02
```

XYGRF PRINTOUT

```
SYMBOL           MINIMUM        MAXIMUM            INTERCEPT
   X          -0.543E+00      0.110E+02     THE Y-INTERCEPT =  15.
PLOT RANGE    -0.543E+00      0.110E+02
```



```
-.2615E+01 0.1107E+01 0.6568E+01 0.9050E+01 0.1079E+02 0.1277E+02 0.1476E+02

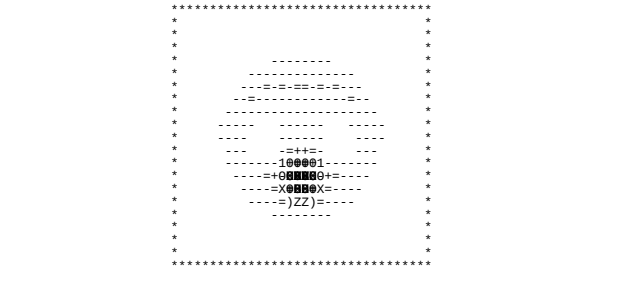
0.1650E+02 0.1774E+02 0.1898E+02 0.2171E+02 0.2444E+02 0.2618E+02 0.2816E+02

0.2990E+02 0.3362E+02 0.3809E+02 0.4057E+02 0.4256E+02 0.4454E+02 0.4628E+02

0.4702E+02
```

ITER 4 CHISQ 0.137E+06

XMIN = -0.20E+01 XMAX = 0.46E+02 XSUM = 0.2510E+04



```
-.2020E+01 0.1600E+01 0.6910E+01 0.9323E+01 0.1101E+02 0.1294E+02 0.1487E+02

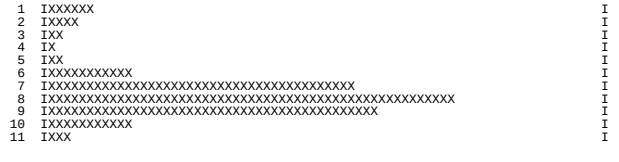
0.1656E+02 0.1777E+02 0.1898E+02 0.2163E+02 0.2429E+02 0.2598E+02 0.2791E+02

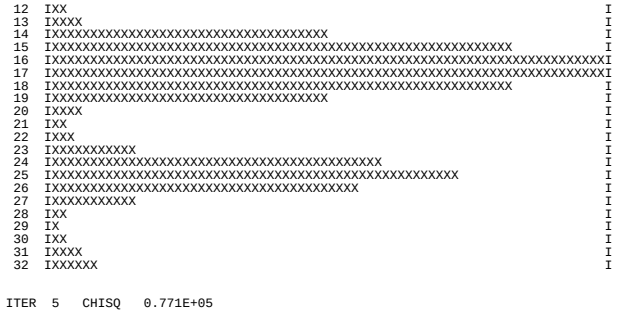
0.2960E+02 0.3322E+02 0.3756E+02 0.3997E+02 0.4190E+02 0.4383E+02 0.4552E+02

0.4625E+02
```

XYGRF PRINTOUT

```
SYMBOL           MINIMUM        MAXIMUM            INTERCEPT
   X          -0.142E+00      0.858E+01     THE Y-INTERCEPT =  15.
PLOT RANGE    -0.142E+00      0.858E+01
```





```
-.2615E+01 0.1107E+01 0.6568E+01 0.9050E+01 0.1079E+02 0.1277E+02 0.1476E+02

0.1650E+02 0.1774E+02 0.1898E+02 0.2171E+02 0.2444E+02 0.2618E+02 0.2816E+02

0.2990E+02 0.3362E+02 0.3809E+02 0.4057E+02 0.4256E+02 0.4454E+02 0.4628E+02

0.4702E+02
```

XYGRF PRINTOUT

```
SYMBOL           MINIMUM        MAXIMUM            INTERCEPT
   X          -0.801E+00      0.711E+01     THE Y-INTERCEPT =  15.
PLOT RANGE    -0.801E+00      0.711E+01
```

```
BLANK COMMON REQUIRED      3522    (  6702)

BLANK COMMON REQUIRED      2710    (  5226)

BLANK COMMON REQUIRED      1898    (  3552)

BLANK COMMON REQUIRED      1086    (  2076)

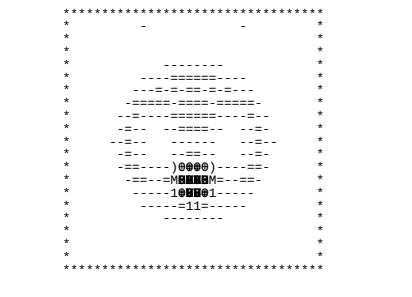
BLANK COMMON REQUIRED       274    (   422)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   3648 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD         CCC  OOOOO N   N  GGG  RRRR
E     NN  N D   D       C   C O   O NN  N G   G R   R
EEE   N N N D   D       C     O   O N N N G     RRRR
E     N  NN D   D       C   C O   O N  NN G  GG R  R
EEEEE N   N DDDD         CCC  OOOOO N   N  GGGG R   R
```

RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH CURVED DETECTOR

XMIN = -0.26E+01 XMAX = 0.47E+02 XSUM = 0.2502E+04



```
-.2615E+01 0.1107E+01 0.6568E+01 0.9050E+01 0.1079E+02 0.1277E+02 0.1476E+02
```

```
Z          X          A          M          0          0          0          0
0.1650E+02 0.1774E+02 0.1898E+02 0.2171E+02 0.2444E+02 0.2618E+02 0.2816E+02
```

```
0          0          0          0          0          0          0          0
0.2990E+02 0.3362E+02 0.3809E+02 0.4057E+02 0.4256E+02 0.4454E+02 0.4628E+02
```

```
0
0.4702E+02
```

```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2  1.0 -1.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  1.3  0.8 -1.5  0.0  0.9 -1.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.1 -2.6  0.7  1.0 -1.0  0.0  0.3 -0.4
  0.0  0.0  0.0  0.0  0.0  0.0  1.0  0.9 -1.7 -0.3  0.9 -0.3 -0.4 -0.1 -0.1
  0.0  0.0  0.0  0.0  0.0 -1.1  0.4  0.6 -0.1 -1.7  0.5  0.1 -0.8 -0.2  0.0
  0.0  0.0  0.0  0.0  0.8 -0.7 -0.2  0.2  0.3 -1.3 -0.4  0.1 -0.3  0.1  1.3
  0.0  0.0  0.0 -0.8  0.7 -0.2 -0.9 -0.1 -0.4  0.1 -1.0  1.0  3.9  3.7  5.5
  0.0  0.0  0.3 -0.4  0.0  0.1 -0.1 -0.3 -0.5  0.2  3.6  4.3  6.8  6.6  7.1
  0.0  0.0  0.3 -0.3 -0.6  0.3 -0.8  0.2  1.2  3.1  7.1  6.1  6.3  7.7  6.6
  0.0 -0.5 -0.1  0.0 -0.7 -0.3  0.0 -0.1  5.1  5.8  6.4  8.2  5.4  8.2  6.3
  0.0  0.2 -0.6  0.1 -0.5 -0.7  0.3  3.0  6.2  8.3  5.9  7.9  6.4  7.2  6.9
  0.0  0.1  0.1 -0.7  0.3 -0.8  0.4  6.1  7.0  7.8  6.9  7.0  7.4  6.2  7.5
  0.1  0.2 -0.1 -0.2 -0.8  0.6  3.1  6.2  7.0  6.7  4.8  4.7  6.0  7.2  7.2
 -0.6 -0.4  0.1  0.4 -0.2  0.0  5.1  7.5  6.7  3.1  1.9  1.4  3.6  7.4  6.3
 -0.4 -0.9 -0.7 -0.8  0.2  1.2  5.3  7.6  6.0  1.8  0.8  0.6  2.3  5.0  6.9
  0.1  0.2 -0.4 -0.7 -1.0  1.1  5.6  6.6  5.5  1.6  1.6  0.6  0.3  4.6  6.4
 -0.2 -0.4 -0.2 -0.1  0.1  1.3  6.1  6.9  4.1  1.4  0.6  0.6  0.7  3.5  6.3
  0.3  0.0 -0.3 -0.7 -0.8  0.3  4.9  7.1  6.0  1.0  0.5  0.1 -0.5  3.5  6.0
 -0.3  0.2  0.8  0.7  0.7  1.0  4.8  6.9  7.0  3.6  0.8  0.5  2.4  5.6 11.0
  0.5 -0.3 -1.0 -0.9 -0.9  0.3  3.5  6.9  6.9  5.6  3.7  3.1  5.4 13.3 34.2
  0.0  0.3  0.7  0.6  0.6 -0.1  1.1  5.4  6.8  7.2  5.8  5.7  8.2 20.3 44.3
  0.0 -1.0 -0.9 -0.9 -1.0 -1.0 -0.2  3.6  6.6  7.3  7.1  6.4  6.2 21.2 44.1
  0.0  0.2  0.0  0.3  0.3  0.5 -0.3  0.3  4.0  5.8  6.1  5.1  4.7 12.9 35.5
  0.0  0.0  0.1 -0.2 -0.6 -0.3 -0.1  0.1  0.8  4.3  5.7  4.7  4.3  5.8 11.5
  0.0  0.0  0.2  0.2  0.7  1.0  0.6  0.0  0.3  0.1  2.1  4.1  5.1  5.7  6.3
  0.0  0.0  0.0  0.1  0.4 -0.9 -0.6  0.0 -0.4  0.5 -0.5  1.1  2.4  3.3  4.1
  0.0  0.0  0.0  0.0 -0.3  0.8  1.6  0.1  0.5 -0.7  0.1 -0.1 -0.6 -0.2  0.1
  0.0  0.0  0.0  0.0  0.0  1.0 -0.5 -0.2  0.9 -0.4  0.2  0.2 -0.1 -0.8  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.3  1.6 -1.1  0.4  0.4  0.4  0.4 -0.6  0.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.8 -0.1  1.2  0.6 -0.3  1.1 -0.5  1.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.6  0.1  0.6  0.3  0.6
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  1.2 -0.1  1.0
```

```
  0.4  0.4 -1.1  1.0  0.2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.3  0.3 -1.0  0.9  0.0 -1.5  0.8  1.3  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.1  0.1 -0.4  0.3  0.0 -1.0  1.0  0.7 -2.6 -0.1  0.0  0.0  0.0  0.0  0.0
 -0.3 -0.3 -0.1 -0.1 -0.4 -0.3  0.9 -0.3 -1.7  0.9  1.0  0.0  0.0  0.0  0.0
 -0.6 -0.6  0.0 -0.2 -0.8  0.1  0.5 -1.7 -0.1  0.6  0.4 -1.1  0.0  0.0  0.0
  0.9  0.9  1.3  0.1 -0.3  0.1 -0.4 -1.3  0.3  0.2 -0.2 -0.7  0.8  0.0  0.0
  5.6  5.6  5.5  3.7  3.9  1.0 -1.0  0.1 -0.4 -0.1 -0.9 -0.2  0.7 -0.8  0.0
  7.0  7.0  7.1  6.6  6.8  4.3  3.6  0.2 -0.5 -0.3 -0.1  0.1  0.0 -0.4  0.3
  7.2  7.2  6.6  7.7  6.3  6.1  7.1  3.1  1.2  0.2 -0.8  0.3 -0.6 -0.3  0.3
  7.4  7.4  6.3  8.2  5.4  8.2  6.4  5.8  5.1 -0.1  0.0 -0.3 -0.7  0.0 -0.1
  7.0  7.0  6.9  7.2  6.4  7.9  5.9  8.3  6.2  3.0  0.3 -0.7 -0.5  0.1 -0.6
  6.6  6.6  7.5  6.2  7.4  7.0  6.9  7.8  7.0  6.1  0.4 -0.8  0.3 -0.7  0.1
  6.7  6.7  7.2  7.2  6.0  4.7  4.8  6.7  7.0  6.2  3.1  0.6 -0.8 -0.2 -0.1
  7.3  7.3  6.3  7.4  3.6  1.4  1.9  3.1  6.7  7.5  5.1  0.0 -0.2  0.4  0.1
  6.6  6.6  6.9  5.0  2.3  0.6  0.8  1.8  6.0  7.6  5.3  1.2  0.2 -0.8 -0.7
  6.3  6.3  6.4  4.6  0.3  0.6  1.6  1.6  5.5  6.6  5.6  1.1 -1.0 -0.7 -0.4
  5.4  5.4  6.3  3.5  0.7  0.6  0.6  1.4  4.1  6.9  6.1  1.3  0.1 -0.1 -0.2
  6.9  6.9  6.0  3.5 -0.5  0.1  0.5  1.0  6.0  7.1  4.9  0.3 -0.8 -0.7 -0.3
 21.8 21.8 11.0  5.6  2.4  0.5  0.8  3.6  7.0  6.9  4.8  1.0  0.7  0.7  0.8
 44.6 44.6 34.2 13.3  5.4  3.1  3.7  5.6  6.9  6.9  3.5  0.3 -0.9 -0.9 -1.0
 47.0 47.0 44.3 20.3  8.2  5.7  5.8  7.2  6.8  5.4  1.1 -0.1  0.6  0.6  0.7
 47.0 47.0 44.1 21.2  6.2  6.4  7.1  7.3  6.6  3.6 -0.2 -1.0 -1.0 -0.9 -0.9
 45.3 45.3 35.5 12.9  4.7  5.1  6.1  5.8  4.0  0.3 -0.3  0.5  0.3  0.3  0.0
 20.9 20.9 11.5  5.8  4.3  4.7  5.7  4.3  0.8  0.1 -0.1 -0.3 -0.6 -0.2  0.1
  6.5  6.5  6.3  5.7  5.1  4.1  2.1  0.1  0.3  0.0  0.6  1.0  0.7  0.2  0.2
  4.7  4.7  4.1  3.3  2.4  1.1 -0.5  0.5 -0.4  0.0 -0.6 -0.9  0.4  0.1  0.0
  1.0  1.0  0.1 -0.2 -0.6 -0.1  0.1 -0.7  0.5  0.1  1.6  0.8 -0.3  0.0  0.0
 -0.2 -0.2  0.0 -0.8 -0.1  0.2  0.2 -0.4  0.9 -0.2 -0.5  1.0  0.0  0.0  0.0
 -0.1 -0.1  0.7 -0.6  0.4  0.4  0.4  0.4 -1.1  1.6  0.3  0.0  0.0  0.0  0.0
  0.2  0.2  1.0 -0.5  1.1 -0.3  0.6  1.2 -0.1 -0.8  0.0  0.0  0.0  0.0  0.0
  0.3  0.3  0.6  0.3  0.6  0.1  0.6  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.1  0.1  1.0 -0.1  1.2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

```
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
 -0.5  0.0
  0.2  0.0
  0.1  0.0
  0.2  0.1
 -0.4 -0.6
 -0.9 -0.4
  0.2  0.1
 -0.4 -0.2
  0.0  0.3
  0.2 -0.3
 -0.3  0.5
  0.3  0.0
 -1.0  0.0
  0.2  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	32	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0	RECONSTRUCT IN A CIRCULAR ARRAY
3	2	GEOMETRY FLAG FAN BEAM GEOMETRY (FLAT DETECTOR)
4	36	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	67	NUMBER OF RAYS FOR EACH PROJECTION
7	1	TRANSMISSION DATA
8	5000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.330		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
2	33.000		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	65.000		DISTANCE FROM SOURCE TO CENTER OF ROTATION FOR FAN BEAM IN UNITS OF PROJECTION BIN WIDTH AT CENTER OF ROTATION
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 36 (44)

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 108 (154)

BLANK COMMON REQUIRED 242 (362)

BLANK COMMON REQUIRED 274 (422)

A TOTAL OF 49 (9 THRU 57) OF THE 67 USER PROJECTION BINS WILL BE USED

49 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 3648 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D          S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
 CCC  OOOOO N   N  GGG  RRRR
C   C O   O NN  N G   G R   R
C     O   O N N N G     RRRR
C   C O   O N  NN G  GG R  R
 CCC  OOOOO N   N  GGGG R   R
```

PARAMETERS FOR SUBROUTINE CONGR

```
                  DESCRIPTION

ISTP -       5    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      CONCAVE DISK            NO                  YES
PRJ     PROJECTION          CONCAVE DISK            NO                  YES


BLANK COMMON REQUIRED       372    (   564)


BLANK COMMON REQUIRED      1184    (  2240)


BLANK COMMON REQUIRED      1996    (  3714)


BLANK COMMON REQUIRED      2808    (  5370)


BLANK COMMON REQUIRED      3620    (  7044)


                            PPPP  H   H  AAA  N   N
                            P   P H   H A   A NN  N
                            PPPP  HHHHH A   A N N N
                            P     H   H AAAAA N  NN
                            P     H   H A   A N   N



PHANTOM GENERATED
  ARRAY SIZE   32 X  32   INTEGRATION FACTOR =  10   SCALING FACTOR =    0.752
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                  X         Y         A         B        PHI       DENS
      1   - EL@:@:     0.00 ,    5.00
                       (   0.00),(   0.00)(  20.00),(  20.00)           (   6.65)
      1   - EL  @ @      0.00 ,   27.00
                       (   0.00),(  -5.00)(   5.00),(   5.00)           (  35.91)
      1   - EL@ @"@      1.57 ,   -4.00
                       (   5.00),(   0.00)(   7.00),(   5.00)           (  -5.32)
      1   - EL  @"@      1.57 ,   -4.00
                       (  -5.00),(   0.00)(   7.00),(   5.00)           (  -5.32)


                EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
                E     NN  N D   D       P   P H   H A   A NN  N
                EEE   N N N D   D       PPPP  HHHHH A   A N N N
                E     N  NN D   D       P     H   H AAAAA N  NN
                EEEEE N   N DDDD        P     H   H A   A N   N



XMIN =   0.00E+00     XMAX =   0.43E+02     XSUM =   0.2507E+04


                      **********************************
                      *                                *
                      *                                *
                      *                                *
                      *              ------            *
                      *           ------------         *
                      *         ----------------       *
                      *        ------------------      *
                      *        ------------------      *
                      *       ---    ------    ---     *
                      *       ---    ------    ---     *
                      *       ---    --==--    ---     *
                      *        ------=⊕⊠⊠⊕=------      *
                      *        ------θ████θ------      *
                      *         -----+⊠██⊠+-----       *
                      *           ----=11=----         *
                      *              ------            *
                      *                                *
                      *                                *
                      *                                *
                      **********************************


                      -          =          +          )          1          Z
0.0000E+00 0.3192E+01 0.7874E+01 0.1000E+02 0.1149E+02 0.1319E+02 0.1490E+02


Z          X          A          M          θ          θ          ⊕          ⊕
0.1639E+02 0.1745E+02 0.1851E+02 0.2085E+02 0.2320E+02 0.2468E+02 0.2639E+02


⊕          ⊕          ⊕          ⊠          ⊠          ⊠          ▓          █
0.2788E+02 0.3107E+02 0.3490E+02 0.3703E+02 0.3873E+02 0.4043E+02 0.4192E+02


█
0.4256E+02

  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2  2.4  4.5  5.8
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.0  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  4.0  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.0  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.2  6.0  6.7  6.7  6.7  6.7  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  2.4  6.7  6.7  6.5  4.5  4.5  6.5  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  4.5  6.7  6.7  2.8  1.3  1.3  2.8  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  5.8  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  6.6  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  6.6  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  5.8  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  4.5  6.7  6.7  2.8  1.3  1.3  2.8  6.7  9.5
  0.0  0.0  0.0  0.0  0.0  0.0  2.4  6.7  6.7  6.5  4.5  4.5  6.5  9.5 39.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.2  6.0  6.7  6.7  6.7  6.7  6.7 22.5 42.6
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.7  6.7  6.7  6.7  6.7 22.5 42.6
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.0  6.7  6.7  6.7  6.7  9.5 39.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  4.0  6.7  6.7  6.7  6.7  9.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  2.3  6.0  6.7  6.7  6.7
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2  2.4  4.5  5.8
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0

  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.6  6.6  5.8  4.5  2.4  0.2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.0  2.3  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  4.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  4.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  2.3  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.7  6.0  0.2  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.5  4.5  4.5  6.5  6.7  6.7  2.4  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  2.8  1.3  1.3  2.8  6.7  6.7  4.5  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7  5.8  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7  6.6  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  4.1  1.3  1.3  1.3  1.3  4.1  6.7  6.6  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  5.3  1.3  1.3  1.3  1.3  5.3  6.7  5.8  0.0  0.0  0.0  0.0
 22.5 22.5  9.5  6.7  2.8  1.3  1.3  2.8  6.7  6.7  4.5  0.0  0.0  0.0  0.0
 42.6 42.6 39.0  9.5  6.5  4.5  4.5  6.5  6.7  6.7  2.4  0.0  0.0  0.0  0.0
 42.6 42.6 42.6 22.5  6.7  6.7  6.7  6.7  6.7  6.0  0.2  0.0  0.0  0.0  0.0
 42.6 42.6 42.6 22.5  6.7  6.7  6.7  6.7  6.7  2.3  0.0  0.0  0.0  0.0  0.0
 42.6 42.6 39.0  9.5  6.7  6.7  6.7  6.7  4.0  0.0  0.0  0.0  0.0  0.0  0.0
 22.5 22.5  9.5  6.7  6.7  6.7  6.7  4.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  6.7  6.7  6.7  6.7  6.0  2.3  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  6.6  6.6  5.8  4.5  2.4  0.2  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0

  0.0  0.0
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  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0
  0.0  0.0


BLANK COMMON REQUIRED      3652    (  7104)


BLANK COMMON REQUIRED      3620    (  7044)


ITER  0   CHISQ   0.210E+08
ITER  1   CHISQ   0.450E+07


XMIN =   0.00E+00     XMAX =   0.11E+02     XSUM =   0.2976E+04



                      **********************************
                      *         ----=----=----         *
                      *      ---==============---      *
                      *     --=====++++++++=====--     *
                      *   --====++))111111))++====--   *
                      *  --===++)1ZZXXXXXXZZ1)++===--  *
                      * --===+)1ZZXXAAMMAAXXZZ1)+===-- *
                      * -===++1ZXAMMAMMMMAMMAXZ1++===- *
                      *-====)1ZZXXAMMMθθMMMAXXZZ1)====-*
                      *-===+)1ZZXXXMMθθθθMMXXXZZ1)+===-*
                      *-===+)ZXXXAMMθθθθθθMMAXXXZ)+===-*
                      *-===+)1ZXXAMθθ⊕⊕⊕⊕θθMAXXZ1)+===-*
                      *-===+)1ZAMMθ⊕⊕⊕⊠⊠⊕⊕⊕θMMAZ1)+===-*
                      * ===++)ZXMθθ⊕⊕████⊕⊕θθMXZ)++=== *
                      * -===+)1ZAMθθ⊕⊠██⊠⊕θθMAZ1)+===- *
                      *  -===+))ZXMMθ⊕⊕⊕⊕θMMXZ))+===-  *
                      *   -===++))1XAMMMMAX1))++===-   *
                      *     ===+++))111111))+++===     *
                      *      -====+++))))+++====-      *
                      *         ==============         *
                      **********************************


                      -          =          +          )          1          Z
0.0000E+00 0.8473E+00 0.2090E+01 0.2655E+01 0.3050E+01 0.3502E+01 0.3954E+01

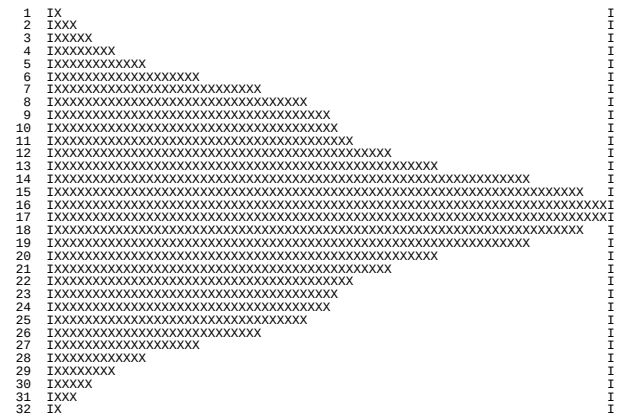

Z          X          A          M          θ          θ          ⊕          ⊕
0.4349E+01 0.4632E+01 0.4914E+01 0.5536E+01 0.6157E+01 0.6552E+01 0.7004E+01


⊕          ⊕          ⊕          ⊠          ⊠          ⊠          ▓          █
0.7400E+01 0.8247E+01 0.9264E+01 0.9828E+01 0.1028E+02 0.1073E+02 0.1113E+02


█
0.1130E+02
```

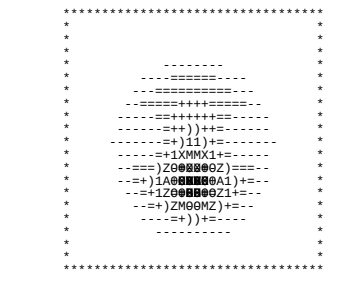
XYGRF PRINTOUT

```
SYMBOL           MINIMUM        MAXIMUM           INTERCEPT
   X          0.203E+01      0.707E+01     THE Y-INTERCEPT =  15.
PLOT RANGE    0.203E+01      0.707E+01
```



ITER 2 CHISQ 0.895E+06

XMIN = -0.15E+01 XMAX = 0.32E+02 XSUM = 0.2458E+04



```
-.1503E+01 0.1037E+01 0.4762E+01 0.6455E+01 0.7641E+01 0.8995E+01 0.1035E+02

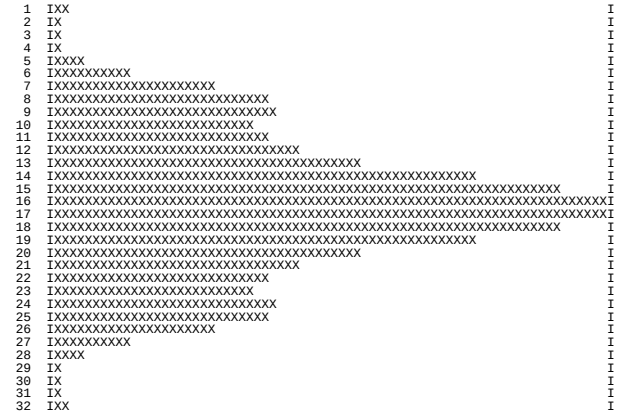
Z          X          A          M          Θ          Θ          Θ          Θ
0.1154E+02 0.1238E+02 0.1323E+02 0.1509E+02 0.1695E+02 0.1814E+02 0.1949E+02

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.2068E+02 0.2322E+02 0.2627E+02 0.2796E+02 0.2931E+02 0.3067E+02 0.3185E+02

Θ
0.3236E+02
```

XYGRF PRINTOUT

```
SYMBOL           MINIMUM        MAXIMUM           INTERCEPT
   X          -0.777E+00     0.130E+02     THE Y-INTERCEPT =  15.
PLOT RANGE    -0.777E+00     0.130E+02
```



ITER 3 CHISQ 0.322E+06

XMIN = -0.17E+01 XMAX = 0.41E+02 XSUM = 0.2477E+04


```
-.1750E+01 0.1488E+01 0.6237E+01 0.8396E+01 0.9907E+01 0.1163E+02 0.1336E+02

Z          X          A          M          Θ          Θ          Θ          Θ
0.1487E+02 0.1595E+02 0.1703E+02 0.1940E+02 0.2178E+02 0.2329E+02 0.2502E+02

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.2653E+02 0.2977E+02 0.3365E+02 0.3581E+02 0.3754E+02 0.3926E+02 0.4077E+02

Θ
0.4142E+02
```

XYGRF PRINTOUT

```
SYMBOL           MINIMUM        MAXIMUM           INTERCEPT
   X          -0.547E+00     0.109E+02     THE Y-INTERCEPT =  15.
PLOT RANGE    -0.547E+00     0.109E+02
```

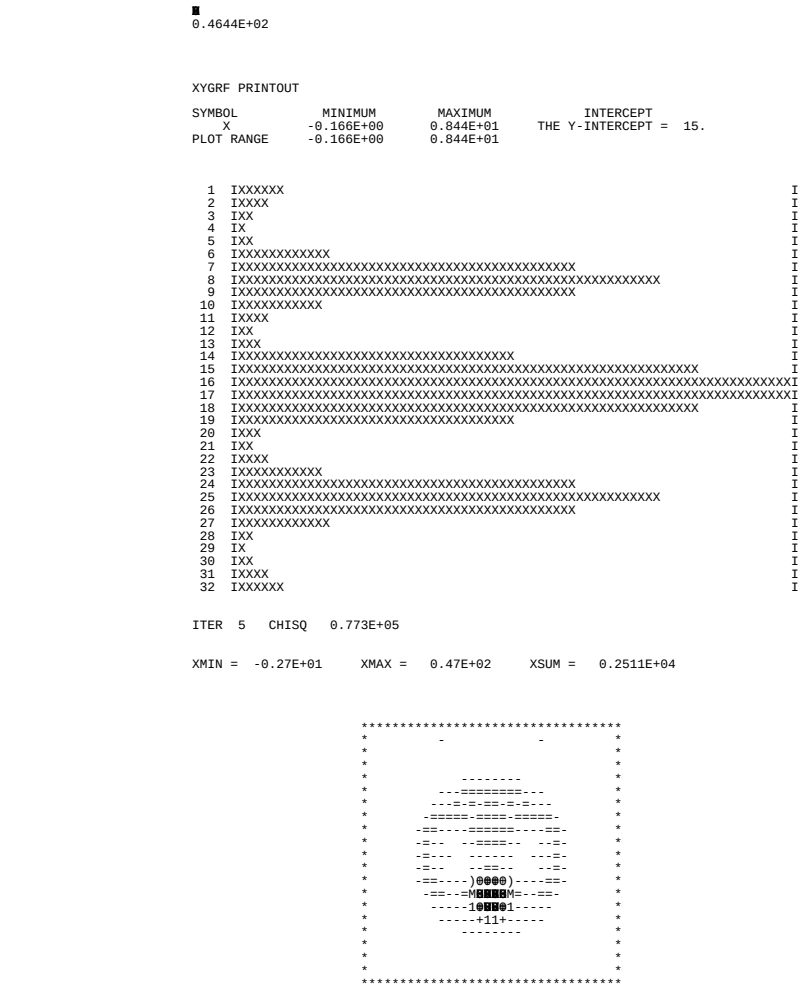

ITER 4 CHISQ 0.137E+06

XMIN = -0.21E+01 XMAX = 0.46E+02 XSUM = 0.2519E+04


```
-.2071E+01 0.1567E+01 0.6903E+01 0.9328E+01 0.1103E+02 0.1297E+02 0.1491E+02

Z          X          A          M          Θ          Θ          Θ          Θ
0.1660E+02 0.1782E+02 0.1903E+02 0.2170E+02 0.2436E+02 0.2606E+02 0.2800E+02

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.2970E+02 0.3334E+02 0.3770E+02 0.4013E+02 0.4207E+02 0.4401E+02 0.4571E+02
```



0.4644E+02

XYGRF PRINTOUT

SYMBOL	MINIMUM	MAXIMUM	INTERCEPT
X	-0.166E+00	0.844E+01	THE Y-INTERCEPT = 15.
PLOT RANGE	-0.166E+00	0.844E+01	

ITER 5 CHISQ 0.773E+05

XMIN = -0.27E+01 XMAX = 0.47E+02 XSUM = 0.2511E+04

-.2687E+01 0.1056E+01 0.6547E+01 0.9043E+01 0.1079E+02 0.1279E+02 0.1478E+02

Z X A M Θ Θ Θ Θ

0.1653E+02 0.1778E+02 0.1903E+02 0.2177E+02 0.2452E+02 0.2626E+02 0.2826E+02

Θ Θ Θ Θ Θ Θ Θ

0.3001E+02 0.3375E+02 0.3824E+02 0.4074E+02 0.4274E+02 0.4473E+02 0.4648E+02

0.4723E+02

XYGRF PRINTOUT

SYMBOL	MINIMUM	MAXIMUM	INTERCEPT
X	-0.802E+00	0.725E+01	THE Y-INTERCEPT = 15.
PLOT RANGE	-0.802E+00	0.725E+01	

BLANK COMMON REQUIRED 3522 (6702)

BLANK COMMON REQUIRED 2710 (5226)

BLANK COMMON REQUIRED 1898 (3552)

BLANK COMMON REQUIRED 1086 (2076)

BLANK COMMON REQUIRED 274 (422)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 3652 FLOATING POINT WORDS.

RECONSTRUCTION FOR FAN BEAM GEOMETRY WITH FLAT DETECTOR

XMIN = -0.27E+01 XMAX = 0.47E+02 XSUM = 0.2511E+04

-.2687E+01 0.1056E+01 0.6547E+01 0.9043E+01 0.1079E+02 0.1279E+02 0.1478E+02

Z X A M Θ Θ Θ Θ

0.1653E+02 0.1778E+02 0.1903E+02 0.2177E+02 0.2452E+02 0.2626E+02 0.2826E+02

Θ Θ Θ Θ Θ Θ Θ

0.3001E+02 0.3375E+02 0.3824E+02 0.4074E+02 0.4274E+02 0.4473E+02 0.4648E+02

0.4723E+02

7.3	7.3	6.3	8.3	5.4	8.2	6.6	6.1	5.1	-0.4	-0.1	-0.2	-0.8	0.0	-0.2
7.0	7.0	6.9	7.1	6.5	8.0	6.1	8.4	6.5	2.7	0.3	-0.6	-0.5	0.1	-0.5
6.5	6.5	7.5	6.2	7.5	7.0	7.0	7.9	7.1	6.3	0.2	-0.9	0.4	-0.8	0.2
6.7	6.7	7.2	7.1	6.0	4.7	4.8	6.8	7.0	6.5	2.9	0.5	-0.8	-0.1	-0.1
7.3	7.3	6.2	7.4	3.5	1.3	1.9	3.3	6.6	7.6	5.1	-0.3	-0.1	0.4	0.0
6.5	6.5	6.8	5.0	2.2	0.6	0.8	1.9	5.9	7.8	5.5	1.0	0.1	-0.9	-0.7
6.2	6.2	6.4	4.5	0.2	0.5	1.6	1.7	5.3	6.8	6.1	0.7	-1.1	-0.6	-0.1
5.3	5.3	6.2	3.5	0.7	0.6	0.6	1.5	3.9	7.2	6.4	0.9	0.3	0.1	-0.3
6.8	6.8	5.9	3.5	-0.5	0.1	0.5	1.0	5.9	7.3	5.4	0.4	-0.8	-0.8	-0.3
21.8	21.8	10.9	5.5	2.3	0.6	0.7	3.7	6.8	7.3	5.0	0.7	0.7	0.8	0.7
44.5	44.5	34.1	13.1	5.4	3.1	3.5	5.8	7.3	7.2	3.2	0.1	-1.0	-0.9	-1.0
46.9	46.9	44.3	20.4	8.2	5.6	6.3	7.5	6.7	5.4	0.7	-0.2	0.6	0.4	0.5
47.2	47.2	44.1	21.3	6.5	6.6	7.0	6.9	6.6	3.1	-0.4	-1.1	-0.9	-0.8	-0.6
45.1	45.1	35.4	13.1	4.3	4.8	6.1	6.1	4.0	0.1	-0.3	0.6	0.2	0.2	-0.1
21.8	21.8	12.4	6.4	5.1	5.5	6.5	4.8	1.0	0.6	0.4	0.2	-0.1	0.3	0.6
6.7	6.7	6.4	5.4	5.1	4.2	1.9	-0.3	0.0	-0.2	0.5	0.8	0.5	0.0	0.0
5.0	5.0	4.2	3.7	2.1	0.5	-0.9	0.4	-0.4	0.1	-0.6	-0.8	0.5	0.2	0.0
0.7	0.7	-0.3	-0.6	-0.4	0.3	0.0	-0.8	0.2	-0.1	1.5	0.7	-0.3	0.0	0.0
-0.4	-0.4	0.0	-1.0	-0.1	0.3	0.4	-0.3	0.9	-0.3	-0.6	0.9	0.0	0.0	0.0
-0.1	-0.1	0.7	-0.5	0.3	0.3	0.3	0.6	-0.9	1.6	0.3	0.0	0.0	0.0	0.0
0.1	0.1	1.0	-0.5	1.1	-0.4	0.6	1.0	-0.3	-0.6	0.0	0.0	0.0	0.0	0.0
0.3	0.3	0.5	0.4	0.6	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	1.1	-0.1	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
-0.5	0.0
0.3	0.0
0.1	0.0
0.2	0.0
-0.5	-0.6
-0.7	0.1
0.4	0.0
-0.5	-0.3
-0.1	0.4
0.2	-0.4
-0.3	0.4
0.2	0.0
-0.9	0.0
0.3	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
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0.0	0.0

EX08

```
      PROGRAM XATEN
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLES 8, 9, AND 10
C
C             THE PROGRAM XATEN RECONSTRUCTS ATTENUATED DATA USING
C        ATTENUATION FACTORS WHICH ARE EVALUATED FROM THE RECONSTRUCTION
C        OF THE ATTENUATION COEFFICIENTS FROM PROJECTIONS OBTAINED FROM
C        A TRANSMISSION SCAN.
C
      DIMENSION B(4096),AG(72)
      COMMON/TYPE/LTYPE
      COMMON/BLANK/WORK(18000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,PRF,BRFA,PRFA
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=4
      KDIMU=100
      NWORK=18000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=3
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE AND SCRATCH FILE FOR ATTENUATION FACTORS
C
      OPEN (LUNOUT,FILE='E08.OUT',FORM='FORMATTED')
      OPEN (LUNATN,FILE='E08.TMP',FORM='UNFORMATTED',STATUS='SCRATCH')
C
      IMIT=1
      LTYPE=1
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR A
C          TRANSMISSION SCAN
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
      CALL GRADY (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE ATTENUATION COEFFICIENTS
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      MODANG=5
      IMIT=0
      LTYPE=2
      CALL SETUP (IPAR,PAR,AG)
C
C        EVALUATE THE ATTENUATION FACTORS
C
      CALL EVATN (B)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR AN EMISSION SCAN
C          WHICH IS CORRECTED FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
      CALL GRADY (B,PRFA,BRFA,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,26)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE TRANSVERSE SECTION FOR THE
C          EMISSION SCAN
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,22) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      CLOSE (LUNOUT)
      CLOSE (LUNATN)
C
C
C
   18 FORMAT(1X//////)
   20 FORMAT(1X,15F5.3)
   22 FORMAT(1X,15F5.1)
   24 FORMAT(1X///' RECONSTRUCTION FOR THE TRANSMISSION SCAN')
   26 FORMAT(1X///' RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ',
     1    'ATTENUATION')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C
C        EXAMPLE 8
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        AN ELIPICAL SOURCE PHANTOM AND ELIPICAL ATTENUATOR OF THE SAME
C        SIZE.
C             IF
C                  LTYPE = 1  GETUM RETURNS TRANSMISSION DATA OF THE
C                                ATTENUATOR
C                  LTYPE = 2  GETUM RETURNS ATTENUATED PROJECTION DATA
C                               OF THE SOURCE
C
      DIMENSION DATA(*),ERR(*)
      COMMON/TYPE/LTYPE
      DIMENSION ITYPE(2),Z(2),X1(2),Y1(2),A1(2),B1(2),PHI(2)
      DATA Z/.075,30./
      DATA X1/0.,0./
      DATA Y1/0.,0./
      DATA A1/40.,40./
      DATA B1/60.,60./
      DATA PHI/0.,0./
C
      IF (LTYPE.EQ.1) THEN
C
          ITYPE(1)=1
          CALL PHANL (1,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      ELSE
C
          ITYPE(1)=-1
          ITYPE(2)=1
          CALL PHANL (2,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      ENDIF
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

```
          INTEGER PARAMETER ARRAY  (IPAR)

 I   IPAR(I)      DESCRIPTION

 1        64      LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
 2         1      RECONSTRUCT IN A SQUARE ARRAY
 3         0      GEOMETRY FLAG
                  PARALLEL BEAM GEOMETRY
 4        72      NUMBER OF PROJECTION ANGLES
 5         4      MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND PI
                  STARTING AT ZERO
 6       100      NUMBER OF RAYS FOR EACH PROJECTION
 7         1      TRANSMISSION DATA
 8     18000      DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9         2      NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10         0      EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11         5      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12         3      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE



          FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.000      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
 2    50.500      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3     0.000  NA  NOT APPLICABLE  (NOT FAN BEAM GEOMETRY)
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


BLANK COMMON REQUIRED        72    (   110)


BLANK COMMON REQUIRED       144    (   220)


BLANK COMMON REQUIRED       216    (   330)


BLANK COMMON REQUIRED       416    (   640)


BLANK COMMON REQUIRED       480    (   740)
```

A TOTAL OF 92 (5 THRU 96) OF THE 100 USER PROJECTION BINS WILL BE USED

 92 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   480 FLOATING POINT WORDS.

```
    EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
    E     NN  N D   D       S     E       T   U   U P   P
    EEE   N N N D   D        SSS  EEE     T   U   U PPPP
    E     N  NN D   D           S E       T   U   U P
    EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
     GGG  RRRR   AAA  DDDD  Y   Y
    G   G R   R A   A D   D  Y Y
    G     RRRR  A   A D   D   Y
    G  GG R  R  AAAAA D   D   Y
     GGGG R   R A   A DDDD    Y
```

 PARAMETERS FOR SUBROUTINE GRADY

        DESCRIPTION

```
ISTP -      15    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO
```

BLANK COMMON REQUIRED   516   (1004)

BLANK COMMON REQUIRED   1675   (3213)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
PRJ	PROJECTION	UNIFORM SQUARE	NO	NO

BLANK COMMON REQUIRED   1859   (3503)

BLANK COMMON REQUIRED   5955   (13503)

BLANK COMMON REQUIRED   10051   (23503)

BLANK COMMON REQUIRED   14147   (33503)

BLANK COMMON REQUIRED   14155   (33513)

BLANK COMMON REQUIRED   14147   (33503)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC

```
ITER  0     FCN   0.314E+05
ITER  1     FCN   0.230E+04
ITER  2     FCN   0.320E+03
ITER  3     FCN   0.158E+03
ITER  4     FCN   0.897E+02
ITER  5     FCN   0.593E+02
ITER  6     FCN   0.418E+02
ITER  7     FCN   0.314E+02
ITER  8     FCN   0.245E+02
ITER  9     FCN   0.198E+02
ITER 10     FCN   0.164E+02
ITER 11     FCN   0.139E+02
ITER 12     FCN   0.120E+02
ITER 13     FCN   0.105E+02
ITER 14     FCN   0.935E+01
ITER 15     FCN   0.840E+01
```

BLANK COMMON REQUIRED   13963   (33213)

BLANK COMMON REQUIRED   9867   (23213)

BLANK COMMON REQUIRED   5771   (13213)

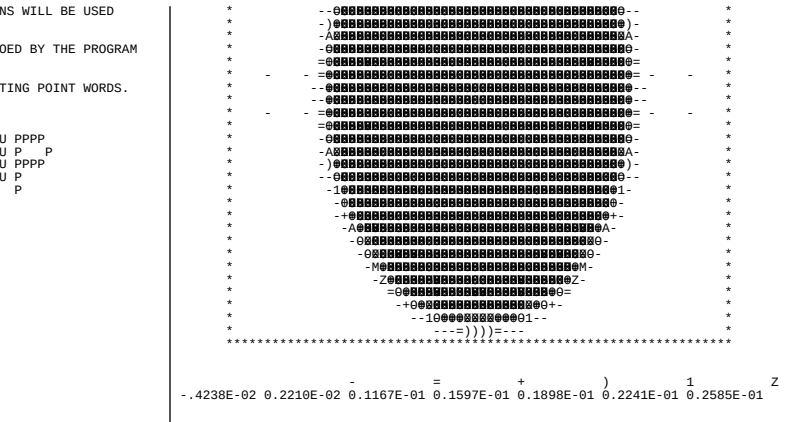
BLANK COMMON REQUIRED   1675   (3213)

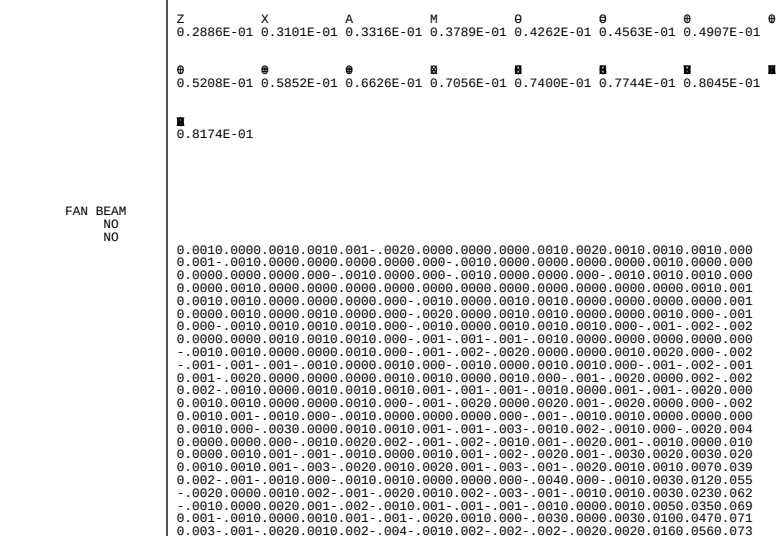
        MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14155 FLOATING POINT WORDS.

```
    EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
    E     NN  N D   D       G   G R   R A   A D   D  Y Y
    EEE   N N N D   D       G     RRRR  A   A D   D   Y
    E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
    EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y
```

RECONSTRUCTION FOR THE TRANSMISSION SCAN

XMIN = -0.42E-02   XMAX =   0.82E-01   XSUM =   0.1416E+03





```
                    -           =           +           )           1           Z
-.4238E-02 0.2210E-02 0.1167E-01 0.1597E-01 0.1898E-01 0.2241E-01 0.2585E-01

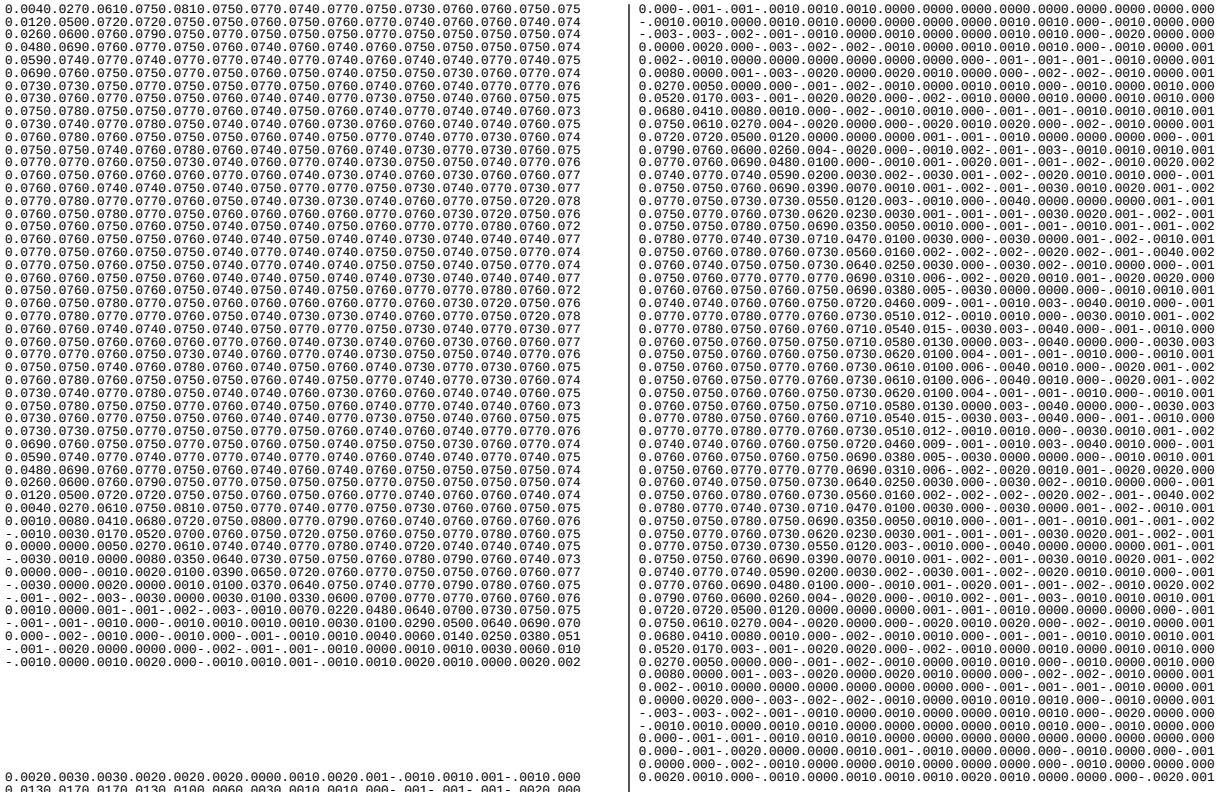
Z           X           A           M           Θ           ϴ           ⊛           ⊛
0.2886E-01 0.3101E-01 0.3316E-01 0.3789E-01 0.4262E-01 0.4563E-01 0.4907E-01

⊛           ⊛           ⊛           ⊠           ⊠           ⊠           ⊠           ■
0.5208E-01 0.5852E-01 0.6626E-01 0.7056E-01 0.7400E-01 0.7744E-01 0.8045E-01

■
0.8174E-01
```

```
0.0010.0000.0010.0010.001-.0020.0000.0000.0000.0010.0020.0010.0010.0010.000
0.001-.0010.0000.0000.0000.0000.000-.0010.0000.0000.0000.0000.0010.0000.000
0.0000.0000.0000.000-.0010.0000.000-.0010.0000.0000.000-.0010.0010.0010.000
0.0000.0010.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0010.001
0.0010.0010.0000.0000.0000.000-.0010.0000.0010.0010.0000.0000.0000.0000.001
0.0000.0010.0000.0010.0000.000-.0020.0000.0010.0010.0000.0000.0010.000-.001
0.000-.0010.0010.0010.0010.000-.0010.0000.0010.0010.0010.000-.001-.002-.002
0.0000.0000.0010.0010.0010.000-.001-.001-.001-.0010.0000.0000.0000.0000.000
-.0010.0010.0000.0000.0010.000-.001-.002-.0020.0000.0000.0010.0020.000-.002
-.001-.001-.001-.0010.0000.0010.000-.0010.0000.0010.0010.000-.001-.002-.001
0.001-.0020.0000.0000.0000.0010.0000.0010.000-.001-.0020.0000.002-.002
0.002-.0010.0000.0010.0010.0010.001-.001-.001-.0010.0000.001-.001-.0020.000
0.0010.0010.0000.0000.0010.000-.001-.0020.0000.0020.001-.0020.0000.000-.002
0.0010.001-.0010.000-.0010.0000.0000.0000.000-.001-.0010.0010.0000.0000.000
0.0010.000-.0030.0000.0010.0010.001-.001-.003-.0010.002-.0010.000-.0020.004
0.0000.0000.000-.0010.0020.002-.001-.002-.0010.001-.0020.001-.0010.0000.010
0.0000.0010.001-.001-.0010.0000.0010.001-.002-.0020.001-.0030.0020.0030.020
0.0010.0010.001-.003-.0020.0010.0020.001-.003-.001-.0020.0010.0010.0070.039
0.002-.001-.0010.000-.0010.0010.0000.0000.000-.0040.000-.0010.0030.0120.055
-.0020.0000.0010.002-.001-.0020.0010.002-.003-.001-.0010.0010.0030.0230.062
-.0010.0000.0020.001-.002-.0010.001-.001-.001-.0010.0000.0010.0050.0350.069
0.001-.0010.0000.0010.001-.001-.0020.0010.000-.0030.0000.0030.0100.0470.071
0.003-.001-.0020.0010.002-.004-.0010.002-.002-.002-.0020.0020.0160.0560.073
0.0000.000-.0010.000-.0010.0000.000-.0010.002-.0030.0000.0030.0250.0640.073
0.0000.0020.000-.0030.0000.002-.0020.0010.001-.002-.0020.0060.0310.0690.077
0.0020.001-.001-.0020.0010.001-.0010.0000.0000.000-.0030.0050.0380.0690.075
0.000-.0010.0010.000-.0010.0000.001-.0040.003-.001-.0010.0090.0460.0720.075
-.001-.0020.0020.002-.0020.0010.001-.0030.0000.001-.0010.0120.0510.0730.076
0.0010.0000.0000.0010.000-.001-.0010.000-.0040.003-.0030.0150.0540.0710.076
0.0020.002-.002-.0010.003-.0030.0000.000-.0040.0030.0000.0130.0580.0710.075
0.0010.001-.0010.0000.001-.0010.000-.001-.001-.0010.0040.0100.0620.0730.075
0.001-.0010.0010.000-.0020.001-.0020.0000.001-.0040.0060.0100.0610.0730.076
0.001-.0010.0010.000-.0020.001-.0020.0000.001-.0040.0060.0100.0610.0730.076
0.0010.001-.0010.0000.001-.0010.000-.001-.001-.0010.0040.0100.0620.0730.075
0.0020.002-.002-.0010.003-.0030.0000.000-.0040.0030.0000.0130.0580.0710.075
0.0010.0000.0000.0010.000-.001-.0010.000-.0040.003-.0030.0150.0540.0710.076
-.001-.0020.0020.002-.0020.0010.001-.0030.0000.001-.0010.0120.0510.0730.076
0.000-.0010.0010.000-.0010.0000.001-.0040.003-.001-.0010.0090.0460.0720.075
0.0020.001-.001-.0020.0010.001-.0010.0000.0000.000-.0030.0050.0380.0690.075
0.0000.0020.000-.0030.0000.002-.0020.0010.001-.002-.0020.0060.0310.0690.077
0.0000.000-.0010.000-.0010.0000.000-.0010.002-.0030.0000.0030.0250.0640.073
0.003-.001-.0020.0010.002-.004-.0010.002-.002-.002-.0020.0020.0160.0560.073
0.001-.0010.0000.0010.001-.001-.0020.0010.000-.0030.0000.0030.0100.0470.071
-.0010.0000.0020.001-.002-.0010.001-.001-.001-.0010.0000.0010.0050.0350.069
-.0020.0000.0010.002-.001-.0020.0010.002-.003-.001-.0010.0010.0030.0230.062
0.002-.001-.0010.000-.0010.0010.0000.0000.000-.0040.000-.0010.0030.0120.055
0.0010.0010.001-.003-.0020.0010.0020.001-.003-.001-.0020.0010.0010.0070.039
0.0000.0010.001-.001-.0010.0000.0010.001-.002-.0020.001-.0030.0020.0030.020
0.0000.0000.000-.0010.0020.002-.001-.002-.0010.001-.0020.001-.0010.0000.010
0.0010.000-.0030.0000.0010.0010.001-.001-.003-.0010.002-.0010.000-.0020.004
0.0010.001-.0010.000-.0010.0000.0000.0000.000-.001-.0010.0010.0000.0000.000
0.0010.0010.0000.0000.0010.000-.001-.0020.0000.0020.001-.0020.0000.000-.002
0.002-.0010.0000.0010.0010.0010.001-.001-.001-.0010.0000.001-.001-.0020.000
0.001-.0020.0000.0000.0000.0010.0010.0000.0010.000-.001-.0020.0000.002-.002
-.001-.001-.001-.0010.0000.0010.000-.0010.0000.0010.0010.000-.001-.002-.001
-.0010.0010.0000.0000.0010.000-.001-.002-.0020.0000.0000.0010.0020.000-.002
0.0000.0000.0010.0010.0010.000-.001-.001-.001-.0010.0000.0000.0000.0000.000
0.000-.0010.0010.0010.0010.000-.0010.0000.0010.0010.0010.000-.001-.002-.002
0.0000.0010.0000.0010.0000.000-.0020.0000.0010.0010.0000.0000.0010.000-.001
0.0010.0010.0000.0000.0000.000-.0010.0000.0010.0010.0000.0000.0000.0000.001
0.0000.0010.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0000.0010.001
0.0000.0000.0000.000-.0010.0000.000-.0010.0000.0000.000-.0010.0010.0010.000
0.001-.0010.0000.0000.0000.0000.000-.0010.0000.0000.0000.0000.0010.0000.000
0.0010.0000.0010.0010.001-.0020.0000.0000.0000.0010.0020.0010.0010.0010.000
```

```
-.0010.0000.0010.0020.000-.0010.0010.001-.0010.0010.0020.0010.0000.0020.002
-.001-.0020.0000.0000.000-.002-.001-.001-.0010.0000.0010.0010.0030.0060.010
0.000-.002-.0010.000-.0010.000-.001-.0010.0010.0040.0060.0140.0250.0380.051
-.001-.001-.0010.000-.0010.0010.0010.0010.0030.0100.0290.0500.0640.0690.070
0.0010.0000.001-.001-.002-.003-.0010.0070.0220.0480.0640.0700.0730.0750.075
-.001-.002-.003-.0030.0000.0030.0100.0330.0600.0700.0770.0770.0760.0760.076
-.0030.0000.0020.0000.0010.0100.0370.0640.0750.0740.0770.0790.0780.0760.075
0.0000.000-.0010.0020.0100.0390.0650.0720.0760.0770.0750.0750.0760.0760.077
-.0030.0010.0000.0080.0350.0640.0730.0750.0750.0760.0780.0790.0760.0740.073
0.0000.0000.0050.0270.0610.0740.0740.0770.0780.0740.0720.0740.0740.0740.075
-.0010.0030.0170.0520.0700.0760.0750.0720.0750.0760.0750.0770.0780.0760.075
0.0010.0080.0410.0680.0720.0750.0800.0770.0790.0760.0740.0760.0760.0760.076
```



```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	0	GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	0	EMISSION DATA
8	18000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	3	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 144 (220)

BLANK COMMON REQUIRED 216 (330)

BLANK COMMON REQUIRED 416 (640)

BLANK COMMON REQUIRED 480 (740)

A TOTAL OF 92 (5 THRU 96) OF THE 100 USER PROJECTION BINS WILL BE USED

92 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14155 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
EEEEE V   V  AAA  TTTTT N   N
E     V   V A   A   T   NN  N
EEE    V V  A   A   T   N N N
E      V V  AAAAA   T   N  NN
EEEEE   V   A   A   T   N   N
```

BLANK COMMON REQUIRED 4576 (10740)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14155 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         EEEEE V   V  AAA  TTTTT N   N
E     NN  N D   D        E     V   V A   A   T   NN  N
EEE   N N N D   D        EEE    V V  A   A   T   N N N
E     N  NN D   D        E      V V  AAAAA   T   N  NN
EEEEE N   N DDDD         EEEEE   V   A   A   T   N   N
```

```
 GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G   GG R  R  AAAAA D   D   Y
 GGGG R   R A   A DDDD    Y
```

PARAMETERS FOR SUBROUTINE GRADY

DESCRIPTION

```
ISTP -      15    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO
```

BLANK COMMON REQUIRED 4612 (11004)

BLANK COMMON REQUIRED 5222 (12146)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	YES	NO
PRJ	PROJECTION	UNIFORM SQUARE	YES	NO

BLANK COMMON REQUIRED 5406 (12436)

BLANK COMMON REQUIRED 9502 (22436)

BLANK COMMON REQUIRED 13598 (32436)

BLANK COMMON REQUIRED 17694 (42436)

BLANK COMMON REQUIRED 17710 (42456)

BLANK COMMON REQUIRED 17694 (42436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC

```
ITER  0     FCN   0.484E+09
ITER  1     FCN   0.609E+08
ITER  2     FCN   0.180E+08
ITER  3     FCN   0.108E+08
ITER  4     FCN   0.685E+07
ITER  5     FCN   0.460E+07
ITER  6     FCN   0.322E+07
ITER  7     FCN   0.236E+07
ITER  8     FCN   0.180E+07
ITER  9     FCN   0.141E+07
ITER 10     FCN   0.114E+07
ITER 11     FCN   0.949E+06
ITER 12     FCN   0.803E+06
ITER 13     FCN   0.691E+06
ITER 14     FCN   0.603E+06
ITER 15     FCN   0.532E+06
```

BLANK COMMON REQUIRED 17510 (42146)

BLANK COMMON REQUIRED 13414 (32146)

BLANK COMMON REQUIRED 9318 (22146)

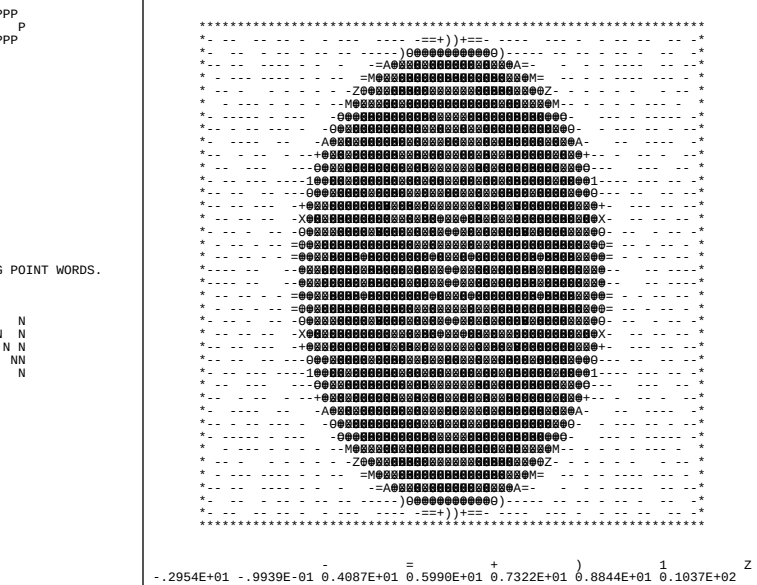
BLANK COMMON REQUIRED 5222 (12146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17710 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
E     NN  N D   D       G   G R   R A   A D   D  Y Y
EEE   N N N D   D       G     RRRR  A   A D   D   Y
E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y
```

RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ATTENUATION

XMIN = -0.30E+01 XMAX = 0.35E+02 XSUM = 0.5690E+05



```
      -          =          +          )          1          Z
-.2954E+01 -.9939E-01 0.4087E+01 0.5990E+01 0.7322E+01 0.8844E+01 0.1037E+02

Z          X          A          M          Θ          Θ          Θ          Θ
0.1170E+02 0.1265E+02 0.1360E+02 0.1569E+02 0.1779E+02 0.1912E+02 0.2064E+02

Θ          Θ          Θ          Θ          Θ          Θ          Θ          Θ
0.2197E+02 0.2483E+02 0.2825E+02 0.3016E+02 0.3168E+02 0.3320E+02 0.3453E+02

Θ
0.3510E+02
```

```
 0.3 -0.2  1.0  0.8  0.0 -1.2  1.1  0.6 -0.7  1.2  0.9 -0.3  1.0  0.1 -0.3
-0.1 -1.3  0.0  0.1 -0.5 -1.5  0.2  0.1 -1.2  0.4  0.1 -0.9  0.8 -0.5 -0.4
 1.1 -0.1  0.6  1.0  0.4 -0.6  0.5  1.7 -0.5  0.8  0.8 -0.6  1.2  0.1  0.1
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 0.6  0.1 -0.8  0.7  0.5 -0.2 -0.6  1.4  0.0  0.5  0.7 -0.7  0.7 -0.5  0.9
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 0.6  0.5 -0.2 -0.9  1.2 -0.4  0.7  0.8 -1.4 -0.3  0.5 -1.5  0.4  0.7  7.6
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 0.2  0.8  0.4 -1.2 -0.4  1.0 -0.3  0.6 -0.5 -1.4  0.2 -0.1  0.7  4.0 21.4
 0.1 -1.1  0.9  0.8 -1.4 -0.1 -0.1  1.0 -1.7  0.0 -0.1  0.3  0.7  8.4 24.0
-0.4 -0.4  1.1  0.7 -1.8  0.5 -0.1 -0.6  0.1  0.1  0.2  0.4  1.4 13.8 26.7
 1.3  0.3 -1.1  0.4  0.5 -1.1 -0.7  0.5  0.8 -1.0  0.1  1.0  2.9 18.3 27.4
 0.9 -0.2 -1.6  1.3  0.5 -2.6  0.5  0.7  0.5 -0.6 -0.3  0.4  5.4 21.8 28.3
-1.0  0.4  0.6 -0.9 -0.3 -0.3  0.3 -0.1  1.5 -1.0 -0.2  0.5  9.1 24.8 29.0
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 0.8 -0.5 -0.6  0.1 -0.4  1.1 -1.1  0.7  0.7  0.4 -1.6  0.2 15.3 27.3 29.4
 0.1 -1.9  1.1  0.5 -0.7  1.1 -0.1 -0.7  1.1  0.0 -1.4  2.4 18.3 28.1 28.0
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 0.9  0.4 -0.3  0.8  0.3 -0.3  0.5 -0.5 -0.6  1.3 -3.0  5.3 22.4 27.4 29.1
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 0.0  0.2  0.8 -0.3  0.5  0.4 -0.2  0.5 -0.9 -0.8  1.0  2.9 25.0 29.2 28.2
 1.0  0.1 -0.3  0.8 -0.7  0.4  0.5 -0.4  0.2 -2.0  1.9  2.9 24.4 28.4 29.5
 1.0  0.1 -0.3  0.8 -0.7  0.4  0.5 -0.4  0.2 -2.0  1.9  2.9 24.4 28.4 29.5
 0.0  0.2  0.8 -0.3  0.5  0.4 -0.2  0.5 -0.9 -0.8  1.0  2.9 25.0 29.2 28.2
-0.3  0.7  0.8 -0.9  1.3  0.1 -0.4  0.6 -1.6  1.1 -1.1  4.2 22.3 27.4 29.4
 0.9  0.4 -0.3  0.8  0.3 -0.3  0.5 -0.5 -0.6  1.3 -3.0  5.3 22.4 27.4 29.1
-0.9  0.5 -0.4  1.1  0.1  0.0  0.9 -1.7  0.7  0.7 -2.2  4.1 20.6 28.2 28.9
 0.1 -1.9  1.1  0.5 -0.7  1.1 -0.1 -0.7  1.1  0.0 -1.4  2.4 18.3 28.1 28.0
 0.8 -0.5 -0.6  0.1 -0.4  1.1 -1.1  0.7  0.7  0.4 -1.6  0.2 15.3 27.3 29.4
-0.6  1.3  0.2 -2.2  0.9  0.5 -0.8  0.5  1.5 -0.5 -1.1  0.8 11.9 26.6 30.4
-1.0  0.4  0.6 -0.9 -0.3 -0.3  0.3 -0.1  1.5 -1.0 -0.2  0.5  9.1 24.8 29.0
 0.9 -0.2 -1.6  1.3  0.5 -2.6  0.5  0.7  0.5 -0.6 -0.3  0.4  5.4 21.8 28.3
 1.3  0.3 -1.1  0.4  0.5 -1.1 -0.7  0.5  0.8 -1.0  0.1  1.0  2.9 18.3 27.4
-0.4 -0.4  1.1  0.7 -1.8  0.5 -0.1 -0.6  0.1  0.1  0.2  0.4  1.4 13.8 26.7
 0.1 -1.1  0.9  0.8 -1.4 -0.1 -0.1  1.0 -1.7  0.0 -0.1  0.3  0.7  8.4 24.0
 0.2  0.8  0.4 -1.2 -0.4  1.0 -0.3  0.6 -0.5 -1.4  0.2 -0.1  0.7  4.0 21.4
-0.8  1.4  0.8 -1.1 -0.6  0.0  1.4  0.2 -1.7  0.5 -1.2  0.3  0.1  2.1 14.8
 0.6  0.5 -0.2 -0.9  1.2 -0.4  0.7  0.8 -1.4 -0.3  0.5 -1.5  0.4  0.7  7.6
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 0.4 -1.0 -2.5  0.7  0.5  0.1  1.3 -0.1 -0.6 -0.2  1.3 -0.7  0.0 -1.3  0.3
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 0.3 -0.1  0.7  0.9 -0.5  0.1 -0.6 -1.6  0.7  0.0  1.5 -0.6  0.5 -0.2 -2.6
 0.3 -1.7  0.3  0.4  0.4  1.4  0.5 -1.8 -0.1 -1.3  0.9  0.2  1.0 -0.2 -0.5
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-0.6  1.2  0.4  0.2  1.2  0.5 -1.2 -0.1 -0.6 -1.4  0.4 -0.6  0.7 -0.8  1.4
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 1.0  1.0 -0.4  0.7  0.5 -0.4 -1.7  0.8  0.0  0.4  1.1 -0.3  1.2 -0.3  0.4
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 1.1 -0.1  0.6  1.0  0.4 -0.6  0.5  1.1 -0.5  0.8  0.8 -0.6  1.2  0.1  0.1
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 0.3 -0.2  1.0  0.8  0.0 -1.2  1.1  0.6 -0.7  1.2  0.9 -0.3  1.0  0.1 -0.3
```

```
 0.1 -0.4  0.2  0.9 -0.9  0.4  0.9  1.0  0.9  0.2 10.8 20.8 26.0 27.5 28.7
 0.3 -1.2  0.0  0.5 -0.6 -0.5 -0.1  0.3  0.7  1.3 -0.4  3.8 10.1 14.4 20.3
 0.2 -1.7  0.2  0.6  0.3 -1.0 -0.5  0.0  0.3  0.5  0.3 -1.6 -0.6  2.6  3.0
 0.5 -1.1  0.7  0.5  0.4 -1.3 -0.4  0.1  0.4  0.9  1.0 -0.1 -2.1 -2.0 -0.3
```

```
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 3.4  4.9  4.9  3.4  3.0  2.6 -0.6 -1.6  0.3  0.5  0.3  0.0 -0.5 -1.0  0.3
23.6 23.6 23.6 23.6 20.3 14.4 10.1  3.8 -0.4  1.3  0.7  0.3 -0.1 -0.5 -0.6
29.3 29.1 29.1 29.3 28.7 27.5 26.0 20.8 10.8  0.2  0.9  1.0  0.9  0.4 -0.9
29.9 31.1 31.1 29.9 30.9 29.6 30.2 27.9 26.7 19.2  5.3  2.5 -0.5 -1.5 -1.7
30.8 30.1 30.1 30.8 32.0 29.9 30.5 31.5 31.0 28.5 24.3 10.6  3.9  0.4 -1.2
31.2 32.6 32.6 31.2 31.1 30.6 31.2 32.9 30.9 29.2 30.2 25.3 12.9  5.3 -1.3
30.8 31.8 31.8 30.8 31.3 31.1 30.3 30.7 30.8 30.4 30.0 28.6 25.3 14.1  4.8
29.6 29.4 29.4 29.6 29.4 29.9 30.5 32.4 32.2 30.4 29.5 29.8 29.1 25.2 14.1
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28.1 28.6 28.6 28.1 30.3 32.2 30.0 30.4 30.0 30.1 30.3 30.9 31.4 31.2 30.3
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28.3 30.7 30.7 28.3 30.2 29.7 28.6 29.3 32.0 32.9 31.6 31.6 31.2 29.3 30.2
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31.0 28.7 28.7 31.0 27.9 30.3 30.4 30.6 31.6 31.4 31.3 31.5 31.9 28.0 32.1
28.3 30.7 30.7 28.3 30.2 29.7 28.6 29.3 32.0 32.9 31.6 31.6 31.2 29.3 30.2
29.3 28.2 28.2 29.3 30.7 27.9 30.0 31.1 30.8 31.0 30.8 31.5 29.6 30.9 30.1
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29.4 28.7 28.7 29.4 29.5 30.3 28.9 31.0 29.2 29.7 35.1 31.2 30.3 31.6 31.3
30.1 29.2 29.2 30.1 29.4 30.3 29.6 32.3 31.9 30.4 32.0 30.0 30.5 30.8 30.6
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29.5 29.1 29.1 29.5 28.7 31.7 31.8 29.5 30.6 31.8 30.6 30.6 31.9 30.7 31.0
30.9 28.7 28.7 30.9 30.9 28.5 31.8 29.3 29.7 31.9 30.9 31.5 30.3 31.7 31.1
29.3 30.8 30.8 29.3 29.8 29.5 31.5 30.1 30.8 31.5 30.4 30.5 30.0 30.9 30.1
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29.9 31.1 31.1 29.9 30.9 29.6 30.2 27.9 26.7 19.2  5.3  2.5 -0.5 -1.5 -1.7
29.3 29.1 29.1 29.3 28.7 27.5 26.0 20.8 10.8  0.2  0.9  1.0  0.9  0.4 -0.9
23.6 23.6 23.6 23.6 20.3 14.4 10.1  3.8 -0.4  1.3  0.7  0.3 -0.1 -0.5 -0.6
 3.4  4.9  4.9  3.4  3.0  2.6 -0.6 -1.6  0.3  0.5  0.3  0.0 -0.5 -1.0  0.3
 0.5 -1.3 -1.3  0.5 -0.3 -2.0 -2.1 -0.1  1.0  0.9  0.4  0.1 -0.4 -1.3  0.4
```

```
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 0.6  0.2 -1.7  0.2 -0.4 -0.5  0.8 -0.9  0.1  0.4 -1.2  0.1  0.2 -1.5 -0.5
 0.9  0.0 -1.2  0.3  0.1  0.1  1.2 -0.6  0.8  0.8 -0.5  1.1  0.5 -0.6  0.4
 0.9  0.2 -0.4  0.1  0.8 -0.2  0.8 -0.8  0.4 -0.1 -1.0  0.5 -0.7 -1.2  0.0
 0.1  0.9  0.1  0.3  0.9 -0.5  0.7 -0.7  0.7  0.5  0.0  1.4 -0.6 -0.2  0.5
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 1.9 -0.9  1.1 -2.5 -0.2 -0.6  1.6  0.0  0.9 -0.5  0.2 -0.6 -1.6 -0.4  0.1
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21.4  5.4 -0.2 -0.9  0.1  0.8  0.6 -1.2  0.0 -1.2  1.3 -0.3  0.6  0.8 -0.2
26.6 18.1  0.4 -0.3 -0.5 -0.2  1.0  0.2  0.9 -1.3 -0.1 -1.8  0.5  1.4  0.4
29.1 24.8 10.4  0.5 -2.6 -0.2  0.5 -0.6  1.5  0.0  0.7 -1.6 -0.6  0.1 -0.5
28.2 28.1 21.3  4.4 -2.6 -0.5  0.1  0.2  0.4  0.2  0.8 -0.8  0.7  0.5 -1.6
30.7 29.3 23.8 10.2  0.3 -1.3  0.0 -0.7  1.3 -0.2 -0.6 -0.1  1.3  0.1  0.5
30.3 29.6 27.4 19.7  3.5  0.1 -1.3  0.1 -0.7  0.6 -0.9 -0.8  1.1  0.5  1.1
29.3 30.2 29.2 23.8  7.6  0.7  0.4 -1.5  0.5 -0.3 -1.4  0.8  0.7 -0.4  1.2
29.9 29.8 29.8 27.1 14.8  2.1  0.1  0.3 -1.2  0.5 -1.7  0.2  1.4  0.0 -0.6
30.5 29.8 28.8 28.1 21.4  4.0  0.7 -0.1  0.2 -1.4 -0.5  0.6 -0.3  1.0 -0.4
30.0 30.8 30.6 28.1 24.0  8.4  0.7  0.3 -0.1  0.0 -1.7  1.0 -0.1 -0.1 -1.4
30.6 30.5 31.2 28.9 26.7 13.8  1.4  0.4  0.2  0.1  0.1 -0.6 -0.1  0.5 -1.8
31.7 31.4 29.9 28.0 27.4 18.3  2.9  1.0  0.1 -1.0  0.8  0.5 -0.7 -1.1  0.5
30.7 30.9 31.3 28.7 28.3 21.8  5.4  0.4 -0.3 -0.6  0.5  0.7  0.5 -2.6  0.5
31.0 30.7 30.5 28.8 29.0 24.8  9.1  0.5 -0.2 -1.0  1.5 -0.1  0.3 -0.3 -0.3
31.1 32.0 31.2 30.0 30.4 26.6 11.9  0.8 -1.1 -0.5  1.5  0.5 -0.8  0.5  0.9
30.5 31.6 29.9 30.1 29.4 27.3 15.3  0.2 -1.6  0.4  0.7  0.7 -1.1  1.1 -0.4
30.9 31.1 29.5 30.0 28.0 28.1 18.3  2.4 -1.4  0.0  1.1 -0.7 -0.1  1.1 -0.7
31.4 32.9 31.2 31.4 28.9 28.2 20.6  4.1 -2.2  0.7  0.7 -1.7  0.9  0.0  0.1
33.4 32.7 29.3 29.6 29.1 27.4 22.4  5.3 -3.0  1.3 -0.6 -0.5  0.5 -0.3  0.3
32.0 30.2 31.8 29.8 29.4 27.4 22.3  4.2 -1.1  1.1 -1.6  0.6 -0.4  0.1  1.3
31.2 30.6 32.0 29.2 28.2 29.2 25.0  2.9  1.0 -0.8 -0.9  0.5 -0.2  0.4  0.5
32.8 30.3 29.8 31.2 29.5 28.4 24.4  2.9  1.9 -2.0  0.2 -0.4  0.5  0.4 -0.7
32.8 30.3 29.8 31.2 29.5 28.4 24.4  2.9  1.9 -2.0  0.2 -0.4  0.5  0.4 -0.7
31.2 30.6 32.0 29.2 28.2 29.2 25.0  2.9  1.0 -0.8 -0.9  0.5 -0.2  0.4  0.5
32.0 30.2 31.8 29.8 29.4 27.4 22.3  4.2 -1.1  1.1 -1.6  0.6 -0.4  0.1  1.3
33.4 32.7 29.3 29.6 29.1 27.4 22.4  5.3 -3.0  1.3 -0.6 -0.5  0.5 -0.3  0.3
31.4 32.9 31.2 31.4 28.9 28.2 20.6  4.1 -2.2  0.7  0.7 -1.7  0.9  0.0  0.1
30.9 31.1 29.5 30.0 28.0 28.1 18.3  2.4 -1.4  0.0  1.1 -0.7 -0.1  1.1 -0.7
30.5 31.6 29.9 30.1 29.4 27.3 15.3  0.2 -1.6  0.4  0.7  0.7 -1.1  1.1 -0.4
31.1 32.0 31.2 30.0 30.4 26.6 11.9  0.8 -1.1 -0.5  1.5  0.5 -0.8  0.5  0.9
30.7 30.9 31.3 28.7 28.3 21.8  5.4  0.4 -0.3 -0.6  0.5  0.7  0.5 -2.6  0.5
31.7 31.4 29.9 28.0 27.4 18.3  2.9  1.0  0.1 -1.0  0.8  0.5 -0.7 -1.1  0.5
30.6 30.5 31.2 28.9 26.7 13.8  1.4  0.4  0.2  0.1  0.1 -0.6 -0.1  0.5 -1.8
30.0 30.8 30.6 28.1 24.0  8.4  0.7  0.3 -0.1  0.0 -1.7  1.0 -0.1 -0.1 -1.4
30.5 29.8 28.8 28.1 21.4  4.0  0.7 -0.1  0.2 -1.4 -0.5  0.6 -0.3  1.0 -0.4
29.9 29.8 29.8 27.1 14.8  2.1  0.1  0.3 -1.2  0.5 -1.7  0.2  1.4  0.0 -0.6
29.3 30.2 29.2 23.8  7.6  0.7  0.4 -1.5  0.5 -0.3 -1.4  0.8  0.7 -0.4  1.2
30.3 29.6 27.4 19.7  3.5  0.1 -1.3  0.1 -0.7  0.6 -0.9 -0.8  1.1  0.5  1.1
30.7 30.9 31.3 28.7 28.3 21.8  5.4  0.4 -0.3 -0.6  0.5  0.7  0.5 -2.6  0.5
31.0 30.7 30.5 28.8 29.0 24.8  9.1  0.5 -0.2 -1.0  1.5 -0.1  0.3 -0.3 -0.3
31.1 32.0 31.2 30.0 30.4 26.6 11.9  0.8 -1.1 -0.5  1.5  0.5 -0.8  0.5  0.9
30.5 31.6 29.9 30.1 29.4 27.3 15.3  0.2 -1.6  0.4  0.7  0.7 -1.1  1.1 -0.4
30.9 31.1 29.5 30.0 28.0 28.1 18.3  2.4 -1.4  0.0  1.1 -0.7 -0.1  1.1 -0.7
31.4 32.9 31.2 31.4 28.9 28.2 20.6  4.1 -2.2  0.7  0.7 -1.7  0.9  0.0  0.1
33.4 32.7 29.3 29.6 29.1 27.4 22.4  5.3 -3.0  1.3 -0.6 -0.5  0.5 -0.3  0.3
32.0 30.2 31.8 29.8 29.4 27.4 22.3  4.2 -1.1  1.1 -1.6  0.6 -0.4  0.1  1.3
31.2 30.6 32.0 29.2 28.2 29.2 25.0  2.9  1.0 -0.8 -0.9  0.5 -0.2  0.4  0.5
32.8 30.3 29.8 31.2 29.5 28.4 24.4  2.9  1.9 -2.0  0.2 -0.4  0.5  0.4 -0.7
32.8 30.3 29.8 31.2 29.5 28.4 24.4  2.9  1.9 -2.0  0.2 -0.4  0.5  0.4 -0.7
31.2 30.6 32.0 29.2 28.2 29.2 25.0  2.9  1.0 -0.8 -0.9  0.5 -0.2  0.4  0.5
32.0 30.2 31.8 29.8 29.4 27.4 22.3  4.2 -1.1  1.1 -1.6  0.6 -0.4  0.1  1.3
33.4 32.7 29.3 29.6 29.1 27.4 22.4  5.3 -3.0  1.3 -0.6 -0.5  0.5 -0.3  0.3
31.4 32.9 31.2 31.4 28.9 28.2 20.6  4.1 -2.2  0.7  0.7 -1.7  0.9  0.0  0.1
30.9 31.1 29.5 30.0 28.0 28.1 18.3  2.4 -1.4  0.0  1.1 -0.7 -0.1  1.1 -0.7
30.5 31.6 29.9 30.1 29.4 27.3 15.3  0.2 -1.6  0.4  0.7  0.7 -1.1  1.1 -0.4
31.1 32.0 31.2 30.0 30.4 26.6 11.9  0.8 -1.1 -0.5  1.5  0.5 -0.8  0.5  0.9
30.7 30.9 31.3 28.7 28.3 21.8  5.4  0.4 -0.3 -0.6  0.5  0.7  0.5 -2.6  0.5
31.0 30.7 30.5 28.8 29.0 24.8  9.1  0.5 -0.2 -1.0  1.5 -0.1  0.3 -0.3 -0.3
30.7 30.9 31.3 28.7 28.3 21.8  5.4  0.4 -0.3 -0.6  0.5  0.7  0.5 -2.6  0.5
31.7 31.4 29.9 28.0 27.4 18.3  2.9  1.0  0.1 -1.0  0.8  0.5 -0.7 -1.1  0.5
30.6 30.5 31.2 28.9 26.7 13.8  1.4  0.4  0.2  0.1  0.1 -0.6 -0.1  0.5 -1.8
30.0 30.8 30.6 28.1 24.0  8.4  0.7  0.3 -0.1  0.0 -1.7  1.0 -0.1 -0.1 -1.4
30.5 29.8 28.8 28.1 21.4  4.0  0.7 -0.1  0.2 -1.4 -0.5  0.6 -0.3  1.0 -0.4
29.9 29.8 29.8 27.1 14.8  2.1  0.1  0.3 -1.2  0.5 -1.7  0.2  1.4  0.0 -0.6
29.3 30.2 29.2 23.8  7.6  0.7  0.4 -1.5  0.5 -0.3 -1.4  0.8  0.7 -0.4  1.2
30.3 29.6 27.4 19.7  3.5  0.1 -1.3  0.1 -0.7  0.6 -0.9 -0.8  1.1  0.5  1.1
28.2 28.1 21.3  4.4 -2.6 -0.5  0.1  0.2  0.4  0.2  0.8 -0.8  0.7  0.5 -1.6
```

```
29.1 24.8 10.4  0.5 -2.6 -0.2  0.5 -0.6  1.5  0.0  0.7 -1.6 -0.6  0.1 -0.5
26.6 18.1  0.4 -0.3 -0.5 -0.2  1.0  0.2  0.9 -1.3 -0.1 -1.8  0.5  1.4  0.4
21.4  5.4 -0.2 -0.9  0.1  0.8  0.6 -1.2  0.0 -1.2  1.3 -0.3  0.6  0.8 -0.2
11.9 -1.6  0.9 -0.4  0.4 -1.4  0.0 -0.4  1.8 -0.4  0.6 -0.8 -0.3  1.2  0.6
 1.9 -0.9  1.1 -2.5 -0.2 -0.6  1.6  0.0  0.9 -0.5  0.2 -0.6 -1.6 -0.4  0.1
-1.1 -0.9  0.0 -0.8  1.4 -0.8  0.7 -0.6  0.4 -1.4 -0.6 -0.1 -1.2  0.5  1.2
-1.7  1.5  0.1 -1.6  0.0 -1.7  0.0 -0.8  1.0  0.2  0.2  0.9 -1.1  0.3  0.8
-1.8 -0.5 -1.0 -0.9  0.4 -0.3  1.2 -0.3  1.1  0.4  0.0  0.8 -1.7 -0.4  0.5
 0.1  0.9  0.1  0.3  0.9 -0.5  0.7 -0.7  0.7  0.5  0.0  1.4 -0.6 -0.2  0.5
 0.9  0.2 -0.4  0.1  0.8 -0.2  0.8 -0.8  0.4 -0.1 -1.0  0.5 -0.7 -1.2  0.0
 0.5  0.0 -1.2  0.3  0.1  0.1  1.2 -0.6  0.8  0.8 -0.5  1.1  0.5 -0.6  0.4
 0.6  0.2 -1.7  0.2 -0.4 -0.5  0.8 -0.9  0.1  0.4 -1.2  0.1  0.2 -1.5 -0.5
 0.5  0.7 -1.1  0.5 -0.3  0.1  1.0 -0.3  0.9  1.2 -0.7  0.6  1.1 -1.2  0.0
```

```
 0.8  1.0 -0.2  0.3
 0.1  0.0 -1.3 -0.1
 1.0  0.6 -0.1  1.1
 0.4 -0.4 -0.3  0.7
 0.7 -0.8  0.1  0.6
 0.7 -0.4  1.0  1.0
 0.3 -0.4  0.4 -0.4
 0.2  0.4  1.2 -0.6
-1.1  0.3  1.0 -1.2
-1.1 -0.3 -1.0 -1.9
-0.3  1.5 -0.6 -0.4
 0.4  0.3 -1.7  0.3
 0.9  0.7 -0.1  0.3
 0.2 -1.2  0.0  1.1
 0.7 -2.5 -1.0  0.4
-0.8 -0.3  0.6 -0.1
-0.9 -0.2  0.5  0.6
-1.1  0.8  1.4 -0.8
-1.2  0.4  0.8  0.2
 0.8  0.9 -1.1  0.1
 0.7  1.1 -0.4 -0.4
 0.4 -1.1  0.3  1.3
 1.3 -1.6 -0.2  0.9
-0.9  0.6  0.4 -1.0
-2.2  0.2  1.3 -0.6
 0.1 -0.6 -0.5  0.8
 0.5  1.1 -1.9  0.1
 1.1 -0.4  0.5 -0.9
 0.8 -0.3  0.4  0.9
-0.9  0.8  0.7 -0.3
-0.3  0.8  0.2  0.0
 0.8 -0.3  0.1  1.0
 0.8 -0.3  0.1  1.0
-0.3  0.8  0.2  0.0
-0.9  0.8  0.7 -0.3
 0.8 -0.3  0.4  0.9
 1.1 -0.4  0.5 -0.9
 0.5  1.1 -1.9  0.1
 0.1 -0.6 -0.5  0.8
-2.2  0.2  1.3 -0.6
-0.9  0.6  0.4 -1.0
 1.3 -1.6 -0.2  0.9
 0.4 -1.1  0.3  1.3
 0.7  1.1 -0.4 -0.4
 0.8  0.9 -1.1  0.1
-1.2  0.4  0.8  0.2
-1.1  0.8  1.4 -0.8
-0.9 -0.2  0.5  0.6
-0.8 -0.3  0.6 -0.1
 0.7 -2.5 -1.0  0.4
 0.2 -1.2  0.0  1.1
 0.9  0.7 -0.1  0.3
 0.4  0.3 -1.7  0.3
-0.3  1.5 -0.6 -0.4
-1.1 -0.3 -1.0 -1.9
-1.1  0.3  1.0 -1.2
 0.2  0.4  1.2 -0.6
 0.3 -0.4  0.4 -0.4
 0.7 -0.4  1.0  1.0
 0.7 -0.8  0.1  0.6
 0.4 -0.4 -0.3  0.7
 1.0  0.6 -0.1  1.1
 0.1  0.0 -1.3 -0.1
 0.8  1.0 -0.2  0.3
```

EX09

```
      PROGRAM XATEN
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLES 8, 9, AND 10
C
C             THE PROGRAM XATEN RECONSTRUCTS ATTENUATED DATA USING
C        ATTENUATION FACTORS WHICH ARE EVALUATED FROM THE RECONSTRUCTION
C        OF THE ATTENUATION COEFFICIENTS FROM PROJECTIONS OBTAINED FROM
C        A TRANSMISSION SCAN.
C
      DIMENSION B(4096),AG(72)
      COMMON/TYPE/LTYPE
      COMMON/BLANK/WORK(18000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,PRF,BRFA,PRFA
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=4
      KDIMU=100
      NWORK=18000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=3
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE AND SCRATCH FILE FOR ATTENUATION FACTORS
C
      OPEN (LUNOUT,FILE='E09.OUT',FORM='FORMATTED')
      OPEN (LUNATN,FILE='E09.TMP',FORM='UNFORMATTED',STATUS='SCRATCH')
C
      IMIT=1
      LTYPE=1
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR A
C          TRANSMISSION SCAN
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
      CALL GRADY (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE ATTENUATION COEFFICIENTS
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      MODANG=5
      IMIT=0
      LTYPE=2
      CALL SETUP (IPAR,PAR,AG)
C
C        EVALUATE THE ATTENUATION FACTORS
C
      CALL EVATN (B)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR AN EMISSION SCAN
C          WHICH IS CORRECTED FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
      CALL GRADY (B,PRFA,BRFA,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,26)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE TRANSVERSE SECTION FOR THE
C          EMISSION SCAN
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,22) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      CLOSE (LUNOUT)
      CLOSE (LUNATN)
C
C
C
   18 FORMAT(1X///////)
   20 FORMAT(1X,15F5.3)
   22 FORMAT(1X,15F5.1)
   24 FORMAT(1X///' RECONSTRUCTION FOR THE TRANSMISSION SCAN')
   26 FORMAT(1X//' RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ',
     1    'ATTENUATION')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C
C        EXAMPLE 9
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A HEART PHANTOM WHICH IS ATTENUATED BY AN ATTENUATOR CONSISTING
C        OF CHEST TISSUE AND LUNGS.
C             IF
C                  LTYPE = 1  GETUM RETURNS TRANSMISSION DATA OF THE
C                               ATTENUATOR
C                  LTYPE = 2  GETUM RETURNS ATTENUATED PROJECTION DATA
C                               OF THE SOURCE
C
      DIMENSION DATA(*),ERR(*)
      COMMON/TYPE/LTYPE
      DIMENSION A1(4),B1(4),XMU(4),X1(4),Y1(4),PHI(4),ITYPE(4)
      DATA A1/40.,10.,10.,10./
      DATA B1/40.,14.,14.,10./
      DATA XMU/.10,-.07,-.07,30./
      DATA X1/0.,10.,-10.,0./
      DATA Y1/0.,0.,0.,-10./
      DATA PHI/0.,0.,0.,0./
C
      IF (LTYPE.EQ.1) THEN
C
          ITYPE(1)=1
          ITYPE(2)=1
          ITYPE(3)=1
          CALL PHANL (3,ITYPE,XMU,X1,Y1,A1,B1,PHI,DATA,M)
C
      ELSE
C
          ITYPE(1)=-1
          ITYPE(2)=-1
          ITYPE(3)=-1
          ITYPE(4)=1
          CALL PHANL (4,ITYPE,XMU,X1,Y1,A1,B1,PHI,DATA,M)
C
      ENDIF
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1		RECONSTRUCT IN A SQUARE ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	4		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	1		TRANSMISSION DATA
8	18000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	3		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED        72    (   110)

BLANK COMMON REQUIRED       144    (   220)

BLANK COMMON REQUIRED       216    (   330)

BLANK COMMON REQUIRED       416    (   640)
```

```
BLANK COMMON REQUIRED       480    (   740)

A TOTAL OF  92 (  5 THRU  96) OF THE 100 USER PROJECTION BINS WILL BE USED

 92 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=    480 FLOATING POINT WORDS.


             EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
             E     NN  N D   D       S     E       T   U   U P   P
             EEE   N N N D   D        SSS  EEE     T   U   U PPPP
             E     N  NN D   D           S E       T   U   U P
             EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


                          GGG  RRRR   AAA  DDDD  Y   Y
                         G   G R   R A   A D   D  Y Y
                         G     RRRR  A   A D   D   Y
                         G  GG R  R  AAAAA D   D   Y
                          GGGG R   R A   A DDDD    Y


          PARAMETERS FOR SUBROUTINE GRADY

                  DESCRIPTION

ISTP -      15    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO

BLANK COMMON REQUIRED       516    (  1004)

BLANK COMMON REQUIRED      1675    (  3213)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      UNIFORM SQUARE           NO                  NO
PRJ     PROJECTION          UNIFORM SQUARE           NO                  NO

BLANK COMMON REQUIRED      1859    (  3503)

BLANK COMMON REQUIRED      5955    ( 13503)

BLANK COMMON REQUIRED     10051    ( 23503)

BLANK COMMON REQUIRED     14147    ( 33503)

BLANK COMMON REQUIRED     14171    ( 33533)

BLANK COMMON REQUIRED     14147    ( 33503)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.235E+05
ITER  1     FCN   0.307E+04
ITER  2     FCN   0.655E+03
ITER  3     FCN   0.324E+03
ITER  4     FCN   0.184E+03
ITER  5     FCN   0.119E+03
ITER  6     FCN   0.817E+02
ITER  7     FCN   0.591E+02
ITER  8     FCN   0.444E+02
ITER  9     FCN   0.346E+02
ITER 10     FCN   0.277E+02
ITER 11     FCN   0.228E+02
ITER 12     FCN   0.192E+02
ITER 13     FCN   0.165E+02
ITER 14     FCN   0.143E+02
ITER 15     FCN   0.126E+02

BLANK COMMON REQUIRED     13963    ( 33213)

BLANK COMMON REQUIRED      9867    ( 23213)

BLANK COMMON REQUIRED      5771    ( 13213)

BLANK COMMON REQUIRED      1675    (  3213)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  14171 FLOATING POINT WORDS.


             EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
             E     NN  N D   D       G   G R   R A   A D   D  Y Y
             EEE   N N N D   D       G     RRRR  A   A D   D   Y
             E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
             EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y


RECONSTRUCTION FOR THE TRANSMISSION SCAN

XMIN =  -0.22E-02     XMAX =   0.11E+00     XSUM =   0.1106E+03


      ****************************************************************
      *                                                              *
      *                                                              *
      *                                                              *
      *                                                              *
      *                                                              *
      *                                                              *
      *                          ---=++=---                          *
      *                     -=Xθ⊕⊕⊕⊕⊕⊠⊠⊕⊕⊕⊕⊕θX=-                     *
```

```
      *                 -=Zθ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θZ=-                 *
      *               =θ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θ=               *
      *             -M⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕M-              *
      *            =θ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θ=             *
      *           +θ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠θ+           *
      *          =θ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠θ=          *
      *         -θ⊠⊠⊠⊠⊠⊠⊕⊕⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕⊕⊕⊠⊠⊠⊠⊠⊠θ-         *
      *         Z⊕⊠⊠⊠⊠⊕θXZZXθ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θXZZXθ⊕⊠⊠⊠⊠⊕Z         *
      *        -θ⊠⊠⊠⊠⊕M1))))1M⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕M1))))1M⊕⊠⊠⊠⊠θ-        *
      *        =⊕⊠⊠⊠⊠θ1)+)++)1θ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠θ1)++)+)1θ⊠⊠⊠⊠⊕=        *
      *        +⊕⊠⊠⊠⊠⊕M1)))++))A⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕A))++)))1M⊕⊠⊠⊠⊠⊕+        *
      *        +⊕⊠⊠⊠⊠⊕M1)))++))A⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕A))++)))1M⊕⊠⊠⊠⊠⊕+        *
      *        =⊕⊠⊠⊠⊠θ1)+)++)1θ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠θ1)++)+)1θ⊠⊠⊠⊠⊕=        *
      *        -θ⊠⊠⊠⊠⊕M1))))1M⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕M1))))1M⊕⊠⊠⊠⊠θ-        *
      *         Z⊕⊠⊠⊠⊠⊕θXZZXθ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θXZZXθ⊕⊠⊠⊠⊠⊕Z         *
      *         -θ⊠⊠⊠⊠⊠⊠⊕⊕⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕⊕⊕⊠⊠⊠⊠⊠⊠θ-         *
      *          =θ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠θ=          *
      *           +θ⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠θ+           *
      *            =θ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θ=             *
      *             -M⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕M-              *
      *               =θ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θ=               *
      *                 -=Zθ⊕⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊠⊕θZ=-                 *
      *                     -=Xθ⊕⊕⊕⊕⊕⊠⊠⊕⊕⊕⊕⊕θX=-                     *
      *                          ---=++=---                          *
      *                                                              *
      *                                                              *
      *                                                              *
      *                                                              *
      *                                                              *
      *                                                              *
      ****************************************************************


                        -          =          +          )          1          Z
-.2158E-02 0.6188E-02 0.1843E-01 0.2399E-01 0.2789E-01 0.3234E-01 0.3679E-01

Z          X          A          M          θ          θ          ⊕          ⊕
0.4068E-01 0.4347E-01 0.4625E-01 0.5237E-01 0.5849E-01 0.6238E-01 0.6683E-01

⊕          ⊕          ⊕          ⊠          ⊠          ⊠          ⊠          ■
0.7073E-01 0.7907E-01 0.8909E-01 0.9465E-01 0.9910E-01 0.1036E+00 0.1075E+00

■
0.1091E+00
```

```
-.0010.002-.0010.0020.000-.0010.0000.0010.0000.0000.0010.0010.0000.0010.000
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-.0020.0010.0010.0010.0000.000-.001-.0010.0010.0010.0000.000-.0010.000-.001
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0.0000.0000.000-.0010.0000.0000.0000.0000.0000.0010.0000.0000.0000.000-.002
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```

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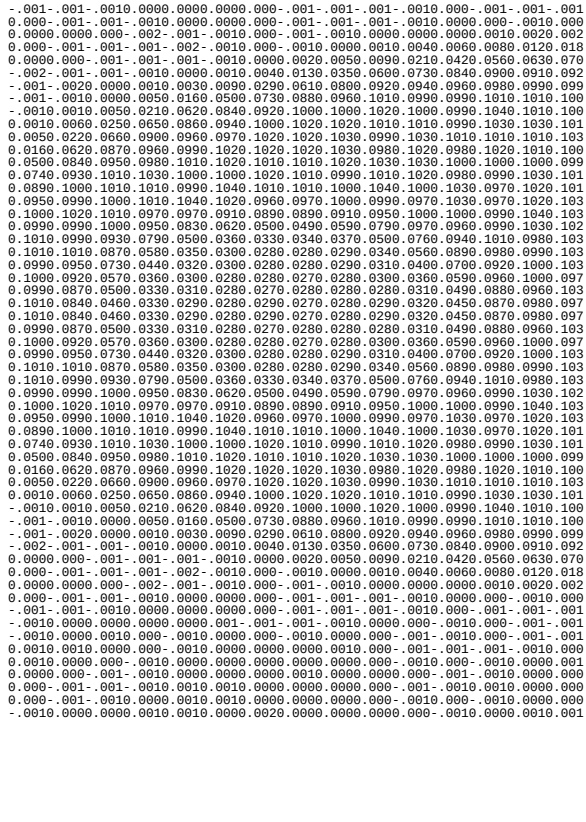
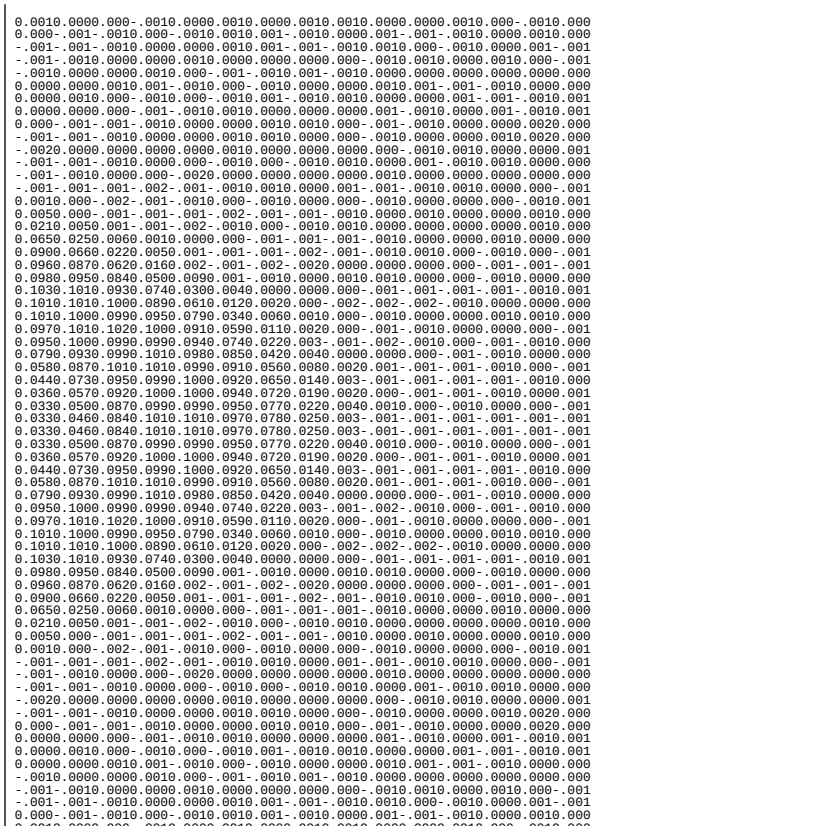
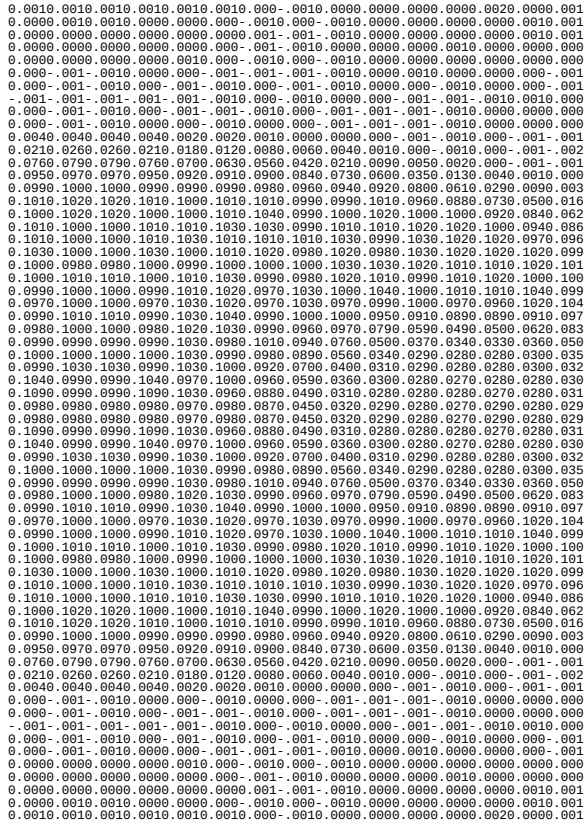
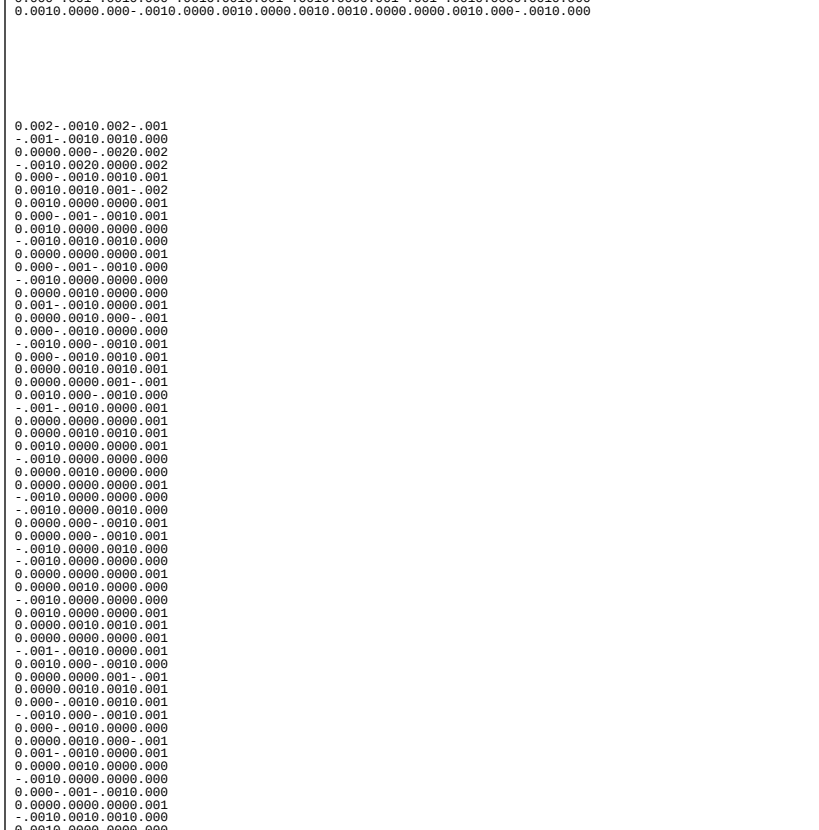
```









```
-.001-.0010.0010.000
0.002-.0010.002-.001
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	0	GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	0	EMISSION DATA
8	18000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	3	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 144 (220)

BLANK COMMON REQUIRED 216 (330)

BLANK COMMON REQUIRED 416 (640)

BLANK COMMON REQUIRED 480 (740)

A TOTAL OF 92 (5 THRU 96) OF THE 100 USER PROJECTION BINS WILL BE USED

92 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14171 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
EEEEE V   V  AAA  TTTTT N   N
E     V   V A   A   T   NN  N
EEE    V V  A   A   T   N N N
E      V V  AAAAA   T   N  NN
EEEEE   V   A   A   T   N   N
```

BLANK COMMON REQUIRED 4576 (10740)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14171 FLOATING POINT WORDS.

```
EEEEE N   N DDDD        EEEEE V   V  AAA  TTTTT N   N
E     NN  N D   D       E     V   V A   A   T   NN  N
EEE   N N N D   D       EEE    V V  A   A   T   N N N
E     N  NN D   D       E      V V  AAAAA   T   N  NN
EEEEE N   N DDDD        EEEEE   V   A   A   T   N   N
```

```
 GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G  GG R  R  AAAAA D   D   Y
 GGGG R   R A   A DDDD    Y
```

PARAMETERS FOR SUBROUTINE GRADY

DESCRIPTION

ISTP - 15 NUMBER OF ITERATION STEPS
IRLX - 1 ITERATIVE RELAXATION METHOD
IERR - 0 DO NOT USE ERROR ARRAY
IZER - 0 INITIAL SOLUTION IS ZERO

BLANK COMMON REQUIRED 4612 (11004)

BLANK COMMON REQUIRED 5222 (12146)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	YES	NO
PRJ	PROJECTION	UNIFORM SQUARE	YES	NO

BLANK COMMON REQUIRED 5406 (12436)

BLANK COMMON REQUIRED 9502 (22436)

BLANK COMMON REQUIRED 13598 (32436)

BLANK COMMON REQUIRED 17694 (42436)

BLANK COMMON REQUIRED 17726 (42476)

BLANK COMMON REQUIRED 17694 (42436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER 0 FCN 0.270E+07
ITER 1 FCN 0.107E+07
ITER 2 FCN 0.570E+06
ITER 3 FCN 0.347E+06
ITER 4 FCN 0.230E+06
ITER 5 FCN 0.161E+06
ITER 6 FCN 0.118E+06
ITER 7 FCN 0.900E+05
ITER 8 FCN 0.708E+05
ITER 9 FCN 0.573E+05
ITER 10 FCN 0.474E+05
ITER 11 FCN 0.400E+05
ITER 12 FCN 0.343E+05
ITER 13 FCN 0.299E+05
ITER 14 FCN 0.263E+05
ITER 15 FCN 0.234E+05

BLANK COMMON REQUIRED 17510 (42146)

BLANK COMMON REQUIRED 13414 (32146)

BLANK COMMON REQUIRED 9318 (22146)

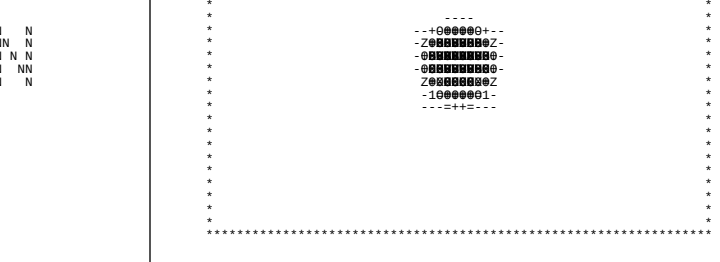
BLANK COMMON REQUIRED 5222 (12146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17726 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
E     NN  N D   D       G   G R   R A   A D   D  Y Y
EEE   N N N D   D       G     RRRR  A   A D   D   Y
E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y
```

RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ATTENUATION

XMIN = -0.12E+01 XMAX = 0.32E+02 XSUM = 0.2416E+04

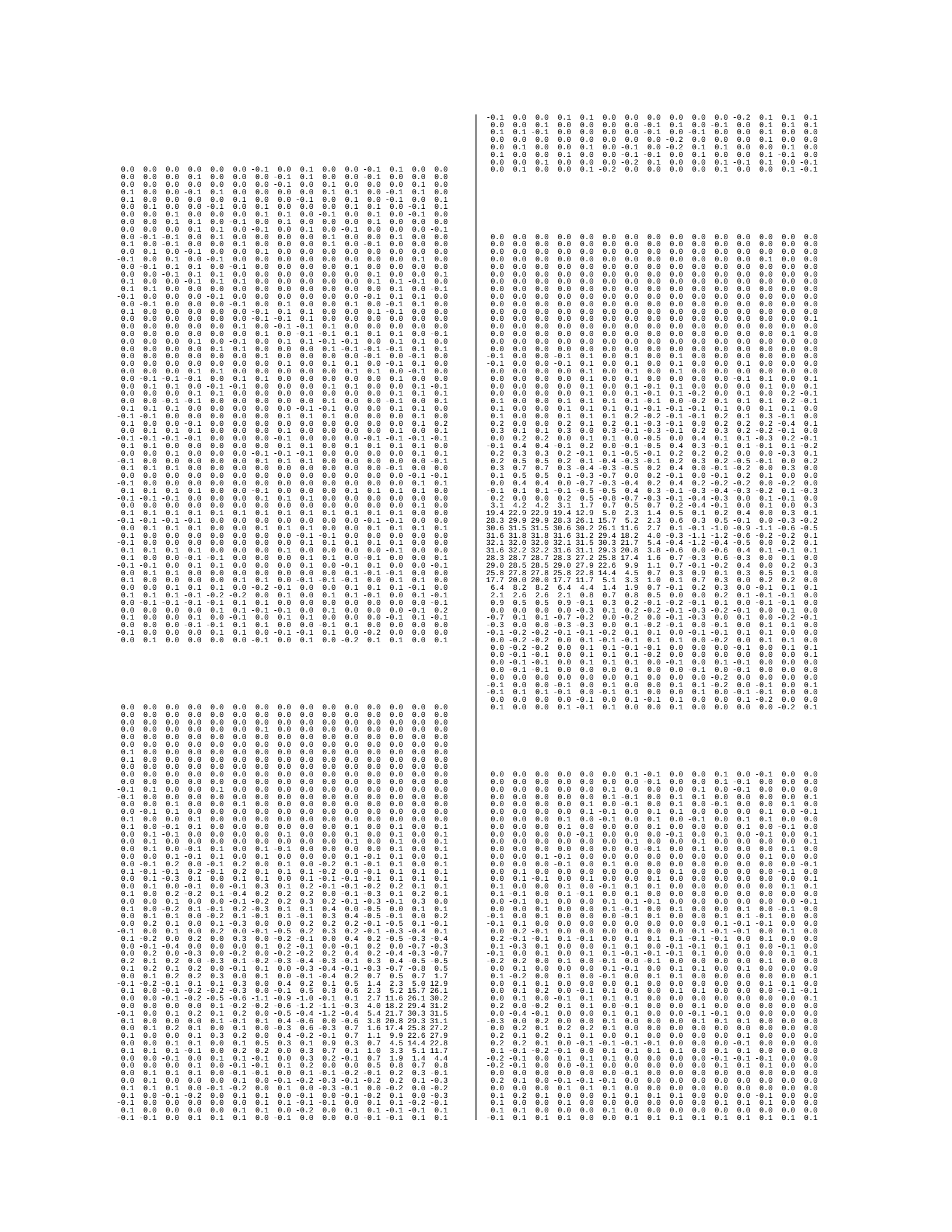


```
-.1183E+01 0.1323E+01 0.4998E+01 0.6668E+01 0.7838E+01 0.9174E+01 0.1051E+02

Z          X          A          M          0          0          0          0
0.1168E+02 0.1252E+02 0.1335E+02 0.1519E+02 0.1703E+02 0.1819E+02 0.1953E+02

0          0          0          8          8          8          8          8
0.2070E+02 0.2321E+02 0.2621E+02 0.2788E+02 0.2922E+02 0.3056E+02 0.3173E+02

8
0.3223E+02
```



```
 0.0 -0.1  0.0  0.0  0.0  0.0 -0.1 -0.1  0.0  0.0  0.0  0.0  0.0  0.0  0.0
 0.1  0.0  0.0  0.0  0.1  0.1  0.1  0.1  0.0  0.0  0.1  0.1  0.1  0.0  0.0
 0.1  0.1  0.1  0.0  0.0  0.0  0.0  0.0  0.0 -0.1 -0.1  0.0  0.0  0.0  0.0
 0.0  0.0  0.1  0.0  0.0  0.0  0.1  0.1  0.1  0.1  0.1  0.0  0.0  0.0  0.0
 0.0  0.1  0.1  0.1  0.0  0.0 -0.1  0.0  0.0  0.0  0.0  0.1  0.0  0.0  0.0
-0.2 -0.1  0.0  0.1  0.1  0.0  0.0 -0.1  0.0  0.1  0.1  0.0  0.0  0.0 -0.1
 0.0  0.0  0.0 -0.1 -0.1  0.0  0.0  0.1 -0.1  0.0  0.1  0.0  0.0  0.0  0.1
 0.0  0.0  0.0  0.1  0.0  0.0 -0.1 -0.1  0.1  0.0  0.0  0.0  0.0  0.0  0.0
 0.1  0.0 -0.1 -0.1  0.0  0.1  0.1  0.0 -0.1 -0.1 -0.1  0.0  0.1  0.1  0.0
 0.1  0.0  0.0 -0.1  0.0 -0.1  0.1  0.1  0.1  0.0  0.0 -0.1 -0.2  0.0  0.1
 0.0  0.1  0.0  0.0 -0.1  0.1  0.0 -0.1  0.1  0.1  0.0  0.1  0.0 -0.2 -0.2
 0.0 -0.1  0.1  0.1 -0.1  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.1 -0.1
 0.0  0.0  0.0  0.0  0.2 -0.1  0.0  0.0  0.0  0.1  0.0 -0.1 -0.1  0.1  0.1
 0.0  0.0  0.1  0.0 -0.1  0.1 -0.1  0.0  0.0  0.0  0.1  0.1  0.0 -0.1  0.0
 0.1  0.0  0.0  0.1  0.0  0.0  0.0  0.0  0.1 -0.1  0.0  0.0  0.1  0.1 -0.1
 0.0  0.1  0.0  0.0  0.0  0.0  0.0 -0.2  0.0  0.1 -0.1 -0.1  0.0  0.1  0.1
 0.0  0.0  0.1  0.0  0.1  0.0  0.1  0.1 -0.2  0.0  0.1  0.0 -0.1  0.0  0.0
```

```
 0.0  0.0  0.0  0.0
 0.1  0.0  0.0  0.0
 0.0  0.0  0.0  0.0
-0.1  0.0  0.0  0.1
 0.0  0.0  0.0  0.1
 0.0  0.0  0.1  0.0
 0.0  0.1  0.0  0.0
 0.1  0.1  0.0  0.0
 0.1  0.0  0.0  0.0
 0.0 -0.1 -0.1  0.0
 0.0 -0.1  0.0  0.1
-0.1  0.0  0.1  0.0
 0.0  0.1  0.0 -0.1
 0.1  0.1 -0.1  0.0
 0.1 -0.1  0.0  0.0
-0.1  0.0  0.0  0.1
 0.0  0.0  0.1  0.1
 0.0  0.0  0.0 -0.1
 0.0  0.0 -0.1  0.0
 0.0  0.0  0.0  0.1
 0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0
 0.1  0.0  0.0  0.0
 0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0
 0.1  0.0  0.0  0.0
-0.1 -0.1 -0.1  0.0
 0.0  0.1  0.1  0.0
 0.1  0.0  0.0  0.0
-0.1 -0.1  0.0  0.0
 0.0  0.1  0.1  0.1
 0.0  0.0 -0.1 -0.1
-0.1  0.0  0.0  0.1
 0.1  0.1  0.1  0.0
-0.1 -0.1 -0.1 -0.1
 0.0  0.0  0.1  0.1
 0.0  0.1  0.0  0.0
 0.0  0.0  0.0 -0.1
 0.0  0.1  0.1  0.1
 0.0  0.0  0.0  0.0
 0.0  0.0  0.0 -0.1
 0.1  0.1  0.1  0.1
 0.0 -0.1 -0.1 -0.1
 0.0  0.0  0.0  0.0
 0.1  0.1  0.1  0.1
-0.1 -0.1 -0.1 -0.1
 0.1  0.1  0.1  0.0
 0.0  0.0  0.0  0.1
 0.0  0.0  0.0 -0.1
 0.1  0.1  0.1  0.1
-0.1  0.0  0.0  0.1
 0.1  0.0 -0.1 -0.1
 0.0  0.1  0.1  0.0
 0.0  0.0  0.0  0.1
 0.1  0.1  0.0  0.0
-0.1  0.1  0.1  0.1
-0.1 -0.1 -0.1  0.0
 0.0  0.0  0.0  0.0
 0.1  0.0  0.0  0.1
-0.1  0.0  0.0  0.0
 0.0  0.0  0.0 -0.1
 0.0  0.0  0.1  0.0
```

EX10

```
      PROGRAM XATEN
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLES 8, 9, AND 10
C
C             THE PROGRAM XATEN RECONSTRUCTS ATTENUATED DATA USING
C        ATTENUATION FACTORS WHICH ARE EVALUATED FROM THE RECONSTRUCTION
C        OF THE ATTENUATION COEFFICIENTS FROM PROJECTIONS OBTAINED FROM
C        A TRANSMISSION SCAN.
C
      DIMENSION B(4096),AG(72)
      COMMON/TYPE/LTYPE
      COMMON/BLANK/WORK(18000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,PRF,BRFA,PRFA
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=4
      KDIMU=100
      NWORK=18000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=3
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE AND SCRATCH FILE FOR ATTENUATION FACTORS
C
      OPEN (LUNOUT,FILE='E10.OUT',FORM='FORMATTED')
      OPEN (LUNATN,FILE='E10.TMP',FORM='UNFORMATTED',STATUS='SCRATCH')
C
      IMIT=1
      LTYPE=1
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR A
C          TRANSMISSION SCAN
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
      CALL GRADY (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE ATTENUATION COEFFICIENTS
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      MODANG=5
      IMIT=0
      LTYPE=2
      CALL SETUP (IPAR,PAR,AG)
C
C        EVALUATE THE ATTENUATION FACTORS
C
      CALL EVATN (B)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION FOR AN EMISSION SCAN
C          WHICH IS CORRECTED FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
      CALL GRADY (B,PRFA,BRFA,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,26)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE TRANSVERSE SECTION FOR THE
C          EMISSION SCAN
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,22) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      CLOSE (LUNOUT)
      CLOSE (LUNATN)
C
C
C
   18 FORMAT(1X///////)
   20 FORMAT(1X,15F5.3)
   22 FORMAT(1X,15F5.1)
   24 FORMAT(1X///' RECONSTRUCTION FOR THE TRANSMISSION SCAN')
   26 FORMAT(1X//' RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ',
     1    'ATTENUATION')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL     --     DP VERSION 2.0     --          JULY91     *
C     ******************************************************************
C
C
C        EXAMPLE 10
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A PHANTOM WITH A CIRCULAR ANNULUS AND A CENTRAL CIRCULAR SOURCE
C        WHICH IS ATTENUATED BY A CIRCULAR ATTENUATOR.
C             IF
C                  LTYPE = 1  GETUM RETURNS TRANSMISSION DATA OF THE
C                               ATTENUATOR
C                  LTYPE = 2  GETUM RETURNS ATTENUATED PROJECTION DATA
C                               OF THE SOURCE
C
      DIMENSION DATA(*),ERR(*)
      COMMON/TYPE/LTYPE
      DIMENSION ITYPE(4),Z(4),X1(4),Y1(4),A1(4),B1(4),PHI(4)
      DATA ITYPE/-1,1,1,1/
      DATA Z/.075,30.,-30.,30./
      DATA X1/0.,0.,0.,0./
      DATA Y1/0.,0.,0.,0./
      DATA A1/60.,60.,40.,20./
      DATA B1/60.,60.,40.,20./
      DATA PHI/0.,0.,0.,0./
      DATA ITYPEX,ZX,XX,YY,AX,BX,PHIX/1,.075,0.,0.,60.,60.,0./
C
      IF (LTYPE.EQ.1) THEN
C
          CALL PHANL (1,ITYPEX,ZX,XX,YY,AX,BX,PHIX,DATA,M)
C
      ELSE
C
          CALL PHANL (4,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      ENDIF
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

```
          INTEGER PARAMETER ARRAY  (IPAR)

 I   IPAR(I)      DESCRIPTION

 1        64      LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
 2         1      RECONSTRUCT IN A SQUARE ARRAY
 3         0      GEOMETRY FLAG
                  PARALLEL BEAM GEOMETRY
 4        72      NUMBER OF PROJECTION ANGLES
 5         4      MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND PI
                  STARTING AT ZERO
 6       100      NUMBER OF RAYS FOR EACH PROJECTION
 7         1      TRANSMISSION DATA
 8     18000      DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9         2      NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10         0      EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11         5      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12         3      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE



          FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.000      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
 2    50.500      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3     0.000  NA  NOT APPLICABLE  (NOT FAN BEAM GEOMETRY)
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


BLANK COMMON REQUIRED        72    (   110)


BLANK COMMON REQUIRED       144    (   220)


BLANK COMMON REQUIRED       216    (   330)


BLANK COMMON REQUIRED       416    (   640)


BLANK COMMON REQUIRED       480    (   740)


A TOTAL OF  92 (  5 THRU  96) OF THE 100 USER PROJECTION BINS WILL BE USED
```

92 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 480 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
 GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G  GG R  R  AAAAA D   D   Y
 GGGG R   R A   A DDDD    Y
```

PARAMETERS FOR SUBROUTINE GRADY

	DESCRIPTION	
ISTP -	15	NUMBER OF ITERATION STEPS
IRLX -	1	ITERATIVE RELAXATION METHOD
IERR -	0	DO NOT USE ERROR ARRAY
IZER -	0	INITIAL SOLUTION IS ZERO

BLANK COMMON REQUIRED 516 (1004)

BLANK COMMON REQUIRED 1675 (3213)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
PRJ	PROJECTION	UNIFORM SQUARE	NO	NO

BLANK COMMON REQUIRED 1859 (3503)

BLANK COMMON REQUIRED 5955 (13503)

BLANK COMMON REQUIRED 10051 (23503)

BLANK COMMON REQUIRED 14147 (33503)

BLANK COMMON REQUIRED 14155 (33513)

BLANK COMMON REQUIRED 14147 (33503)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC

ITER 0	FCN	0.583E+05
ITER 1	FCN	0.132E+04
ITER 2	FCN	0.222E+03
ITER 3	FCN	0.147E+03
ITER 4	FCN	0.107E+03
ITER 5	FCN	0.817E+02
ITER 6	FCN	0.646E+02
ITER 7	FCN	0.523E+02
ITER 8	FCN	0.431E+02
ITER 9	FCN	0.361E+02
ITER 10	FCN	0.306E+02
ITER 11	FCN	0.263E+02
ITER 12	FCN	0.228E+02
ITER 13	FCN	0.200E+02
ITER 14	FCN	0.177E+02
ITER 15	FCN	0.157E+02

BLANK COMMON REQUIRED 13963 (33213)

BLANK COMMON REQUIRED 9867 (23213)

BLANK COMMON REQUIRED 5771 (13213)

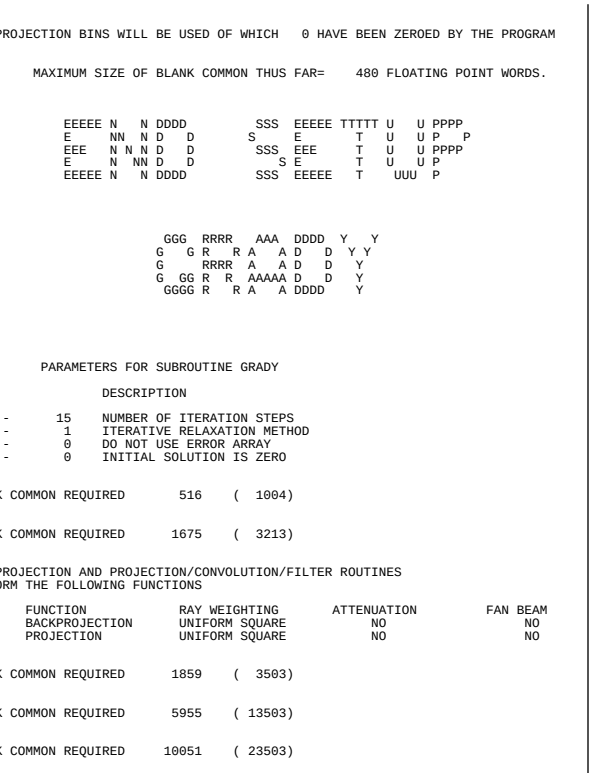
BLANK COMMON REQUIRED 1675 (3213)

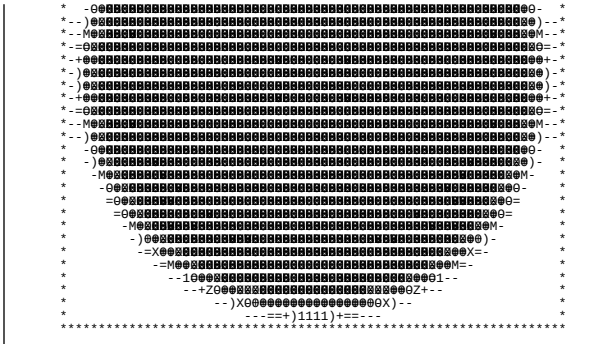
MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14155 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
E     NN  N D   D       G   G R   R A   A D   D  Y Y
EEE   N N N D   D       G     RRRR  A   A D   D   Y
E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y
```

RECONSTRUCTION FOR THE TRANSMISSION SCAN

XMIN = -0.16E-02 XMAX = 0.82E-01 XSUM = 0.2130E+03





-	=	+	)	1	Z
-.1633E-02	0.4636E-02	0.1383E-01	0.1801E-01	0.2094E-01	0.2428E-01	0.2762E-01

Z	X	A	M	0	0	0	0
0.3055E-01	0.3264E-01	0.3473E-01	0.3933E-01	0.4393E-01	0.4685E-01	0.5019E-01	

0	0	0	0	0	0	0	0
0.5312E-01	0.5939E-01	0.6691E-01	0.7109E-01	0.7444E-01	0.7778E-01	0.8071E-01	

0.8196E-01

```
0.0010.0010.0010.0010.0010.0000.0000.0010.0010.0000.0010.0010.0000.0000.001
0.001-.001-.001-.0010.0000.000-.001-.001-.001-.001-.0010.0000.000-.001-.001
0.001-.001-.001-.001-.0010.0000.000-.001-.001-.001-.001-.002-.001-.001-.001
0.001-.001-.001-.001-.001-.0010.0000.000-.001-.001-.001-.001-.0010.0000.000
0.0010.000-.001-.001-.001-.001-.0010.0000.000-.001-.001-.001-.0010.0000.001
0.0000.0000.000-.001-.001-.002-.001-.0010.0000.000-.0010.0000.0000.0010.003
0.000-.0010.0000.000-.001-.001-.001-.001-.0010.0000.0010.0010.0020.0050.010
0.001-.001-.0010.0000.000-.001-.001-.001-.0010.0000.0020.0030.0070.0150.037
0.001-.001-.001-.0010.0000.000-.001-.0010.0000.0010.0030.0090.0200.0450.060
0.000-.001-.001-.001-.001-.0010.0000.0000.0000.0010.0030.0090.0230.0490.0630.069
0.001-.001-.001-.001-.001-.0010.0010.0020.0030.0090.0250.0490.0640.0710.074
0.0010.000-.002-.001-.0010.0000.0010.0030.0090.0230.0490.0640.0700.0720.076
0.0000.000-.001-.001-.0010.0000.0020.0070.0200.0490.0640.0700.0720.0760.077
0.000-.001-.0010.0000.0000.0010.0050.0150.0450.0630.0710.0720.0760.0800.076
0.001-.001-.0010.0000.0010.0030.0100.0370.0600.0690.0740.0760.0770.0760.073
0.000-.001-.001-.0010.0030.0070.0260.0530.0650.0710.0730.0740.0740.0760.075
0.001-.001-.0010.0010.0040.0150.0450.0630.0710.0740.0750.0750.0790.0810.072
0.0020.0000.0000.0010.0080.0330.0600.0700.0730.0750.0750.0750.0750.0760.077
0.0020.0000.0010.0040.0160.0490.0650.0720.0740.0740.0750.0750.0780.0730.079
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0.0090.0180.0550.0670.0720.0750.0740.0760.0730.0750.0760.0760.0750.0740.074
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0.0070.0130.0450.0670.0720.0740.0770.0750.0750.0740.0780.0770.0760.0760.075
0.0060.0110.0410.0650.0690.0760.0780.0740.0780.0740.0770.0770.0770.0760.075
0.0070.0080.0320.0590.0690.0770.0760.0740.0770.0710.0750.0740.0730.0740.075
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0.0000.000-.001-.001-.0010.0000.0020.0070.0200.0490.0640.0700.0720.0760.077
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0.0010.000-.001-.001-.001-.001-.0010.0000.000-.001-.001-.001-.001-.0010.0000.001
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0.001-.001-.001-.0010.0000.000-.001-.001-.001-.001-.0010.0000.000-.001-.001
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```

```
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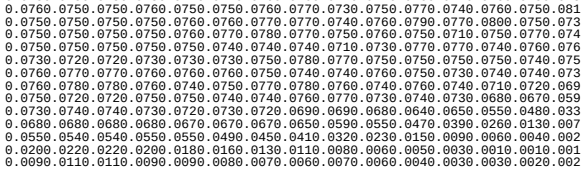
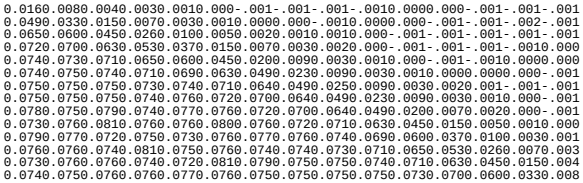
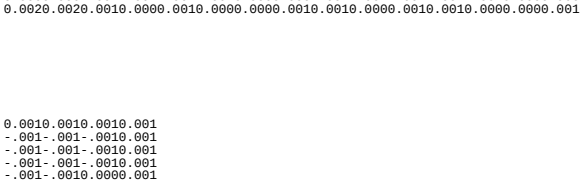
```







```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)	DESCRIPTION
1	64	LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1	RECONSTRUCT IN A SQUARE ARRAY
3	0	GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72	NUMBER OF PROJECTION ANGLES
5	5	MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100	NUMBER OF RAYS FOR EACH PROJECTION
7	0	EMISSION DATA
8	18000	DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2	NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0	EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5	PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	3	LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

BLANK COMMON REQUIRED 72 (110)

BLANK COMMON REQUIRED 144 (220)

BLANK COMMON REQUIRED 216 (330)

BLANK COMMON REQUIRED 416 (640)

BLANK COMMON REQUIRED 480 (740)

A TOTAL OF 92 (5 THRU 96) OF THE 100 USER PROJECTION BINS WILL BE USED

92 PROJECTION BINS WILL BE USED OF WHICH 0 HAVE BEEN ZEROED BY THE PROGRAM

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14155 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
EEEEE V   V  AAA  TTTTT N   N
E     V   V A   A   T   NN  N
EEE    V V  A   A   T   N N N
E      V V  AAAAA   T   N  NN
EEEEE   V   A   A   T   N   N
```

BLANK COMMON REQUIRED 4576 (10740)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 14155 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         EEEEE V   V  AAA  TTTTT N   N
E     NN  N D   D        E     V   V A   A   T   NN  N
EEE   N N N D   D        EEE    V V  A   A   T   N N N
E     N  NN D   D        E      V V  AAAAA   T   N  NN
EEEEE N   N DDDD         EEEEE   V   A   A   T   N   N
```

```
GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G  GG R  R  AAAAA D   D   Y
 GGG R   R A   A DDDD    Y
```

PARAMETERS FOR SUBROUTINE GRADY

		DESCRIPTION
ISTP -	15	NUMBER OF ITERATION STEPS
IRLX -	1	ITERATIVE RELAXATION METHOD
IERR -	0	DO NOT USE ERROR ARRAY
IZER -	0	INITIAL SOLUTION IS ZERO

BLANK COMMON REQUIRED 4612 (11004)

BLANK COMMON REQUIRED 5222 (12146)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	YES	NO
PRJ	PROJECTION	UNIFORM SQUARE	YES	NO

BLANK COMMON REQUIRED 5406 (12436)

BLANK COMMON REQUIRED 9502 (22436)

BLANK COMMON REQUIRED 13598 (32436)

BLANK COMMON REQUIRED 17694 (42436)

BLANK COMMON REQUIRED 17726 (42476)

BLANK COMMON REQUIRED 17694 (42436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC

ITER 0	FCN	0.392E+09
ITER 1	FCN	0.579E+08
ITER 2	FCN	0.159E+08
ITER 3	FCN	0.863E+07
ITER 4	FCN	0.529E+07
ITER 5	FCN	0.354E+07
ITER 6	FCN	0.247E+07
ITER 7	FCN	0.180E+07
ITER 8	FCN	0.137E+07
ITER 9	FCN	0.107E+07
ITER 10	FCN	0.870E+06
ITER 11	FCN	0.724E+06
ITER 12	FCN	0.616E+06
ITER 13	FCN	0.534E+06
ITER 14	FCN	0.469E+06
ITER 15	FCN	0.417E+06

BLANK COMMON REQUIRED 17510 (42146)

BLANK COMMON REQUIRED 13414 (32146)

BLANK COMMON REQUIRED 9318 (22146)

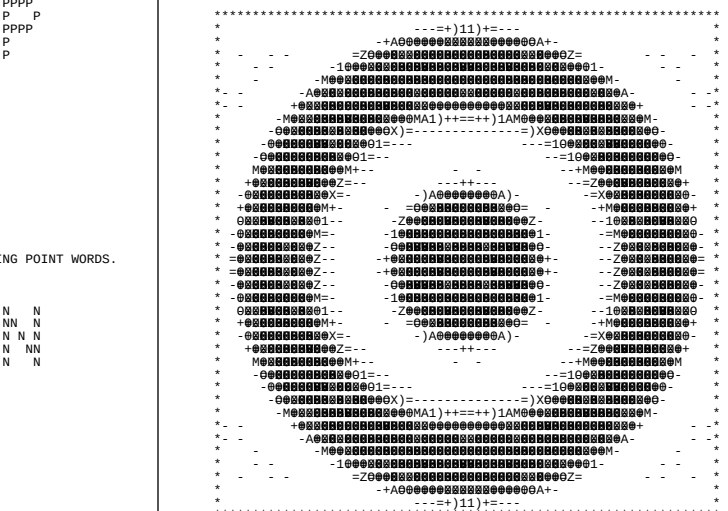
BLANK COMMON REQUIRED 5222 (12146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17726 FLOATING POINT WORDS.

```
EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
E     NN  N D   D       G   G R   R A   A D   D  Y Y
EEE   N N N D   D       G     RRRR  A   A D   D   Y
E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y
```

RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ATTENUATION

XMIN = -0.22E+01 XMAX = 0.34E+02 XSUM = 0.5710E+05

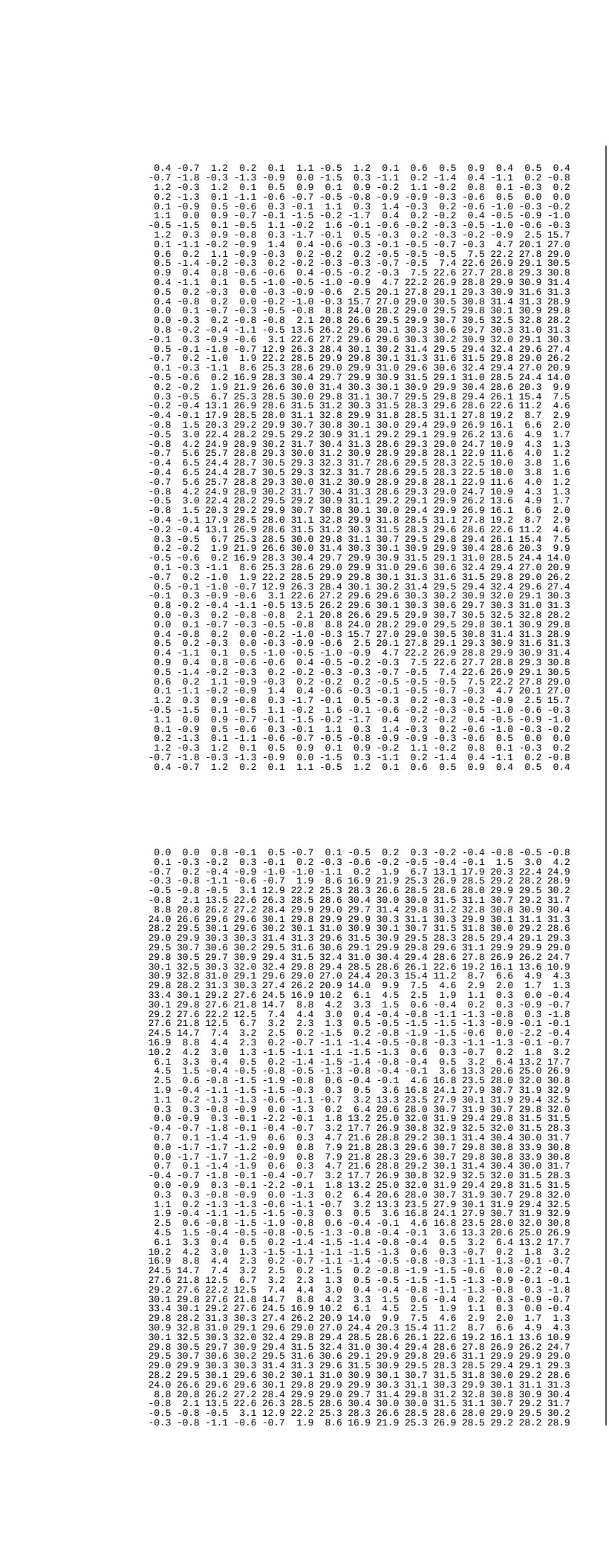


```
                    -           =           +           )           1           Z
-.2193E+01 0.5104E+00 0.4476E+01 0.6278E+01 0.7540E+01 0.8982E+01 0.1042E+02

Z           X           A           M           0           0           @           @
0.1169E+02 0.1259E+02 0.1349E+02 0.1547E+02 0.1745E+02 0.1872E+02 0.2016E+02

@           @           @           &           &           &           &           &
0.2142E+02 0.2412E+02 0.2737E+02 0.2917E+02 0.3061E+02 0.3205E+02 0.3332E+02

&
0.3386E+02
```



```
30.9 29.7 30.5 29.8 30.8 29.3 28.8 27.7 22.6  7.5 -0.3 -0.2 -0.5  0.4 -0.6
30.2 30.6 30.7 29.5 30.5 29.1 26.9 22.6  7.4 -0.5 -0.7 -0.3 -0.3 -0.2  0.2
30.3 30.3 29.9 29.0 29.0 27.8 22.2  7.5 -0.5 -0.5 -0.5  0.2 -0.2  0.2 -0.3
29.6 30.1 29.5 28.2 27.0 20.1  4.7 -0.3 -0.7 -0.5 -0.1 -0.3 -0.6  0.4  1.4
29.6 29.6 26.6 24.0 15.7  2.5 -0.9 -0.2 -0.3  0.2 -0.3  0.5 -0.1 -1.7  0.3
27.2 26.2 20.8  8.8 -0.3 -0.6 -1.0 -0.5 -0.3 -0.2 -0.6 -0.1  1.6 -0.2  1.1
22.6 13.5  2.1 -0.8 -1.0 -0.9 -0.5  0.4 -0.2  0.2  0.4 -1.7 -0.2 -1.5 -0.1
 3.1 -0.5 -0.8 -0.5 -0.2 -0.3 -1.0 -0.6  0.2 -0.3  1.4  0.3  1.1 -0.1  0.3
-0.6 -1.1 -0.8 -0.3  0.0  0.0  0.5 -0.6 -0.3 -0.9 -0.9 -0.8 -0.5 -0.7 -0.6
-0.9 -0.4  0.2 -0.7  0.2 -0.3  0.1  0.8 -0.2  1.1 -0.2  0.9  0.1  0.9  0.5
 0.3 -0.2 -0.3  0.1 -0.8  0.2 -1.1  0.4 -1.4  0.2 -1.1  0.3 -1.5  0.0 -0.9
-0.1  0.8  0.0  0.0  0.4  0.5  0.4  0.9  0.5  0.6  0.1  1.2 -0.5  1.1  0.1
```

```
 0.2  1.2 -0.7  0.4
-1.3 -0.3 -1.8 -0.7
 0.1  1.2 -0.3  1.2
-1.1  0.1 -1.3  0.2
-0.6  0.5 -0.9  0.1
-0.7  0.9  0.0  1.1
-0.5  0.1 -1.5 -0.5
-0.8  0.9  0.3  1.2
-0.9 -0.2 -1.1  0.1
-0.9  1.1  0.2  0.6
-0.3 -0.2 -1.4  0.5
-0.6  0.8  0.4  0.9
 0.5  0.1 -1.1  0.4
 0.0 -0.3  0.2  0.5
 0.0  0.2 -0.8  0.4
-0.3 -0.7  0.1  0.0
-0.8  0.2 -0.3  0.0
-1.1 -0.4 -0.2  0.8
-0.6 -0.9  0.3 -0.1
-0.7 -1.0 -0.1  0.5
 1.9 -1.0  0.2 -0.7
 8.6 -1.1 -0.3  0.1
16.9  0.2 -0.6 -0.5
21.9  1.9 -0.2  0.2
25.3  6.7 -0.5  0.3
26.9 13.1 -0.4 -0.2
28.5 17.9 -0.1 -0.4
29.2 20.3  1.5 -0.8
28.2 22.4  3.0 -0.5
28.9 24.9  4.2 -0.8
28.8 25.7  5.6 -0.7
28.7 24.4  6.5 -0.4
28.7 24.4  6.5 -0.4
28.8 25.7  5.6 -0.7
28.9 24.9  4.2 -0.8
28.2 22.4  3.0 -0.5
29.2 20.3  1.5 -0.8
28.5 17.9 -0.1 -0.4
26.9 13.1 -0.4 -0.2
25.3  6.7 -0.5  0.3
21.9  1.9 -0.2  0.2
16.9  0.2 -0.6 -0.5
 8.6 -1.1 -0.3  0.1
 1.9 -1.0  0.2 -0.7
-0.7 -1.0 -0.1  0.5
-0.6 -0.9  0.3 -0.1
-1.1 -0.4 -0.2  0.8
-0.8  0.2 -0.3  0.0
-0.3 -0.7  0.1  0.0
 0.0  0.2 -0.8  0.4
 0.0 -0.3  0.2  0.5
 0.5  0.1 -1.1  0.4
-0.6  0.8  0.4  0.9
-0.3 -0.2 -1.4  0.5
-0.9  1.1  0.2  0.6
-0.9 -0.2 -1.1  0.1
-0.8  0.9  0.3  1.2
-0.5  0.1 -1.5 -0.5
-0.7  0.9  0.0  1.1
-0.6  0.5 -0.9  0.1
-1.1  0.1 -1.3  0.2
 0.1  1.2 -0.3  1.2
-1.3 -0.3 -1.8 -0.7
 0.2  1.2 -0.7  0.4
```

EX11

```
      PROGRAM XATENU
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLES 11 AND 12
C
C             THE PROGRAM XATENU RECONSTRUCTS ATTENUATED DATA ASSUMING
C        A CONSTANT ATTENUATION COEFFICIENT AND USING ATTENUATION
C        FACTORS WHICH ARE EVALUATED AFTER DETERMINING THE BOUNDARY OF
C        THE OBJECT BY AN APPROXIMATED RECONSTRUCTION.
C
      DIMENSION B(4096),AG(72)
      COMMON/BLANK/WORK(18000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU  ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG   ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT   ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID   , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN   , PAR( 4))
C
      EXTERNAL BRF,PRF,BRFA,PRFA
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=5
      KDIMU=100
      IMIT=0
      NWORK=18000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=3
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C         OPEN OUTPUT FILE AND SCRATCH FILE FOR ATTENUATION FACTORS
C
      OPEN (LUNOUT,FILE='E11.OUT',FORM='FORMATTED')
      OPEN (LUNATN,FILE='E11.TMP',FORM='UNFORMATTED',STATUS='SCRATCH')
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION WITH NO CORRECTION
C          FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
C
      CALL GRADY (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,22)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE APPROXIMATED RECONSTRUCTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
C        EVALUATE THE ATTENUATION FACTORS ASSUMING A CONSTANT
C          ATTENUATION COEFFICIENT
C
      XLEV=3.5
      ATENL=.075
C
      CALL EVATU (B,XLEV,ATENL)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTIONS FOR AN EMISSION SCAN
C          WHICH IS CORRECTED FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
C
      CALL GRADY (B,PRFA,BRFA,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE CORRECTED RECONSTRUCTION
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      CLOSE (LUNOUT)
      CLOSE (LUNATN)
C
C
C
   18 FORMAT(1X///////)
   20 FORMAT(1X,15F5.1)
   22 FORMAT(1X//' THE APPROXIMATED RECONSTRUCTION FOR AN EMISSION SCA',
     1    'N')
   24 FORMAT(1X//' RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ',
     1    'ATTENUATION')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 11
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        AN ELLIPICAL SOURCE PHANTOM AND ELLIPICAL ATTENUATOR OF THE
C        SAME SIZE.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION ITYPE(2),Z(2),X1(2),Y1(2),A1(2),B1(2),PHI(2)
      DATA ITYPE/1,-1/
      DATA Z/30.,.075/
      DATA X1/0.,0./
      DATA Y1/0.,0./
      DATA A1/40.,40./
      DATA B1/60.,60./
      DATA PHI/0.,0./
C
      CALL PHANL (2,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1		RECONSTRUCT IN A SQUARE ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	5		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	0		EMISSION DATA
8	18000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	3		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED        72    (   110)

BLANK COMMON REQUIRED       144    (   220)

BLANK COMMON REQUIRED       216    (   330)

BLANK COMMON REQUIRED       416    (   640)

BLANK COMMON REQUIRED       480    (   740)

A TOTAL OF  92 (  5 THRU  96) OF THE 100 USER PROJECTION BINS WILL BE USED

 92 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=    480 FLOATING POINT WORDS.
```

```
    EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
    E     NN  N D   D       S     E       T   U   U P   P
    EEE   N N N D   D        SSS  EEE     T   U   U PPPP
    E     N  NN D   D           S E       T   U   U P
    EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
 GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G   GG R  R  AAAAA D   D   Y
 GGGG R   R A   A DDDD    Y
```

PARAMETERS FOR SUBROUTINE GRADY

		DESCRIPTION
ISTP -	15	NUMBER OF ITERATION STEPS
IRLX -	1	ITERATIVE RELAXATION METHOD
IERR -	0	DO NOT USE ERROR ARRAY
IZER -	0	INITIAL SOLUTION IS ZERO

BLANK COMMON REQUIRED 516 (1004)

BLANK COMMON REQUIRED 1126 (2146)

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	NO	NO
PRJ	PROJECTION	UNIFORM SQUARE	NO	NO

BLANK COMMON REQUIRED 1310 (2436)

BLANK COMMON REQUIRED 5406 (12436)

BLANK COMMON REQUIRED 9502 (22436)

BLANK COMMON REQUIRED 13598 (32436)

BLANK COMMON REQUIRED 13614 (32456)

BLANK COMMON REQUIRED 13598 (32436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC

ITER 0	FCN	0.484E+09
ITER 1	FCN	0.371E+08
ITER 2	FCN	0.132E+08
ITER 3	FCN	0.108E+08
ITER 4	FCN	0.935E+07
ITER 5	FCN	0.844E+07
ITER 6	FCN	0.779E+07
ITER 7	FCN	0.730E+07
ITER 8	FCN	0.693E+07
ITER 9	FCN	0.664E+07
ITER 10	FCN	0.641E+07
ITER 11	FCN	0.622E+07
ITER 12	FCN	0.606E+07
ITER 13	FCN	0.593E+07
ITER 14	FCN	0.582E+07
ITER 15	FCN	0.572E+07

BLANK COMMON REQUIRED 13414 (32146)

BLANK COMMON REQUIRED 9318 (22146)

BLANK COMMON REQUIRED 5222 (12146)

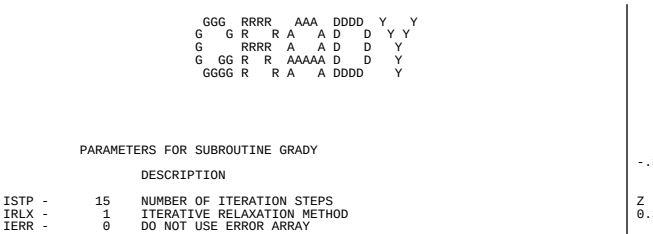
BLANK COMMON REQUIRED 1126 (2146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 13614 FLOATING POINT WORDS.

```
 EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
 E     NN  N D   D       G   G R   R A   A D   D  Y Y
 EEE   N N N D   D       G     RRRR  A   A D   D   Y
 E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
 EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y
```

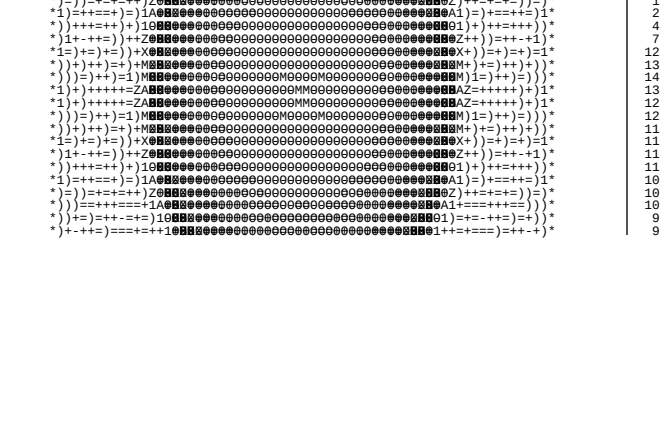
THE APPROXIMATED RECONSTRUCTION FOR AN EMISSION SCAN

XMIN = -0.36E+01 XMAX = 0.15E+02 XSUM = 0.1841E+05



	-		=		+		)		1		Z			
-.3646E+01	-.2261E+01	-.2311E+00	0.6917E+00	0.1338E+01	0.2076E+01	0.2814E+01								
Z	X	A	M	0	0	0	0							
0.3460E+01	0.3922E+01	0.4383E+01	0.5398E+01	0.6413E+01	0.7059E+01	0.7798E+01								
0	0	0	8	8	8	8	8							
0.8444E+01	0.9828E+01	0.1149E+02	0.1241E+02	0.1315E+02	0.1389E+02	0.1453E+02								
8														
0.1481E+02														

```
 0.5  0.2  1.2  1.0  0.1 -1.0  0.6  0.2 -0.8  0.4  0.1 -1.0  0.0 -0.7 -1.3
 0.0 -0.8  0.3  0.3 -0.4 -1.2 -0.2 -0.2 -1.1 -0.2 -0.4 -1.3 -0.1 -1.0 -1.3
 1.1  0.3  0.7  1.1  0.5 -0.4  0.1  0.6 -0.5  0.3  0.3 -0.8  0.5 -0.4 -0.5
 1.0  0.2  0.1  0.7  0.3 -0.6 -0.6  0.4 -0.8 -0.2  0.1 -0.8  0.2 -0.4  0.0
 1.0  0.4 -0.3  0.9  0.7  0.0 -0.5  1.1  0.1  0.2  0.5 -0.7  0.4 -0.6  0.1
 1.4  1.1  0.0  0.8  0.7  0.0 -1.1  0.7  0.0  0.1  0.6 -0.3  0.7 -0.4 -0.1
 0.4  0.8  0.1  0.4  0.9  0.5 -0.5  0.8  0.2  0.0  0.7 -0.6  0.0 -1.2 -0.2
 0.4  1.6  0.7  0.4  1.2  0.7 -0.4  0.2 -0.1 -1.0  0.3 -0.5  0.5 -0.5  0.8
 0.1  1.5  0.8 -0.4  0.5  0.1 -0.8 -0.3  0.4 -0.2  0.8  0.0  1.1 -0.3  0.1
-0.3  0.1  0.5 -0.3  0.7  1.2  0.2 -0.3  0.7 -0.2  1.4 -0.2  0.2 -0.8  0.5
 0.7  0.3  1.8  0.4  0.2  0.9  0.8  0.0  1.2 -0.6  0.3 -0.6  0.6  0.7  0.6
 1.3 -0.2  0.9  0.8  0.7  1.4  0.8 -0.8  0.3 -0.7  0.8  0.5  1.1  0.2  0.6
 1.3  0.8  1.0  1.2  0.1  0.6  0.1 -0.7  0.8  0.3  1.2  0.1  0.8  0.5 -0.2
 2.1  1.0 -0.1  0.9 -0.5  0.7  1.0  0.0  0.8  0.6  0.6  0.5  0.8  0.6  0.2
 1.8  0.6 -0.8  1.0  1.0  0.6  1.4  0.7  0.1  0.4  1.2  0.2  0.9  0.5  2.1
 1.3  1.5  0.6  0.1  1.4  0.8  1.4  0.3 -0.1  1.1  0.1  0.6  0.5  1.8  4.2
 1.7  1.6  0.8  0.1  1.5  0.4  1.0  1.1 -0.3  0.5  0.9  0.0  1.8  2.7  6.2
 0.8  2.1  1.5  0.1  0.4  0.7  1.4  0.9 -0.5  1.1 -0.1  1.2  1.8  3.7  9.6
 1.8  1.7  1.4  0.1  0.4  1.6  0.4  1.0  0.5  0.0  0.9  1.3  2.6  4.7 12.3
 1.9  0.5  1.5  1.4  0.0  0.7  0.6  1.5 -0.2 -0.7  1.0  1.7  2.9  6.9 13.0
 1.4  1.0  1.8  1.3 -0.4  0.9  0.8  0.4  0.9  0.9  1.3  2.1  3.4  9.2 13.8
 2.8  1.6  0.3  1.1  1.1  0.0  0.4  1.1  1.5  0.3  1.5  2.7  4.3 11.0 13.4
 2.6  1.3  0.0  1.8  1.3 -0.9  1.1  1.3  1.3  0.9  1.3  2.5  5.5 12.1 13.3
 1.1  1.6  1.7  0.3  0.6  0.7  0.8  0.8  1.8  0.8  1.6  2.6  7.3 13.2 12.9
 1.4  2.2  1.3 -0.5  1.4  1.2  0.2  1.4  1.9  1.0  1.3  3.0  8.4 13.9 13.1
 2.6  1.2  0.7  1.2  0.6  1.6  0.4  1.3  1.5  1.6  0.9  2.8 10.0 13.8 12.2
 2.2  0.3  1.8  1.4  0.6  1.7  1.0  0.5  1.7  1.6  1.4  3.8 11.2 13.8 11.4
 1.3  1.8  0.8  1.8  1.1  0.8  1.6  0.0  1.6  1.9  1.1  4.7 12.0 13.5 11.6
 2.4  1.7  1.0  1.4  1.2  0.7  1.4  0.8  0.8  2.2  0.7  5.7 12.7 13.0 11.4
 1.7  1.9  1.8  0.6  1.9  1.2  0.7  1.6  0.2  2.3  1.6  5.0 12.6 12.7 11.4
 2.0  1.6  1.8  1.0  1.3  1.4  0.9  1.5  0.7  1.2  2.9  4.2 14.1 13.3 10.7
 2.6  1.7  1.0  1.6  0.8  1.2  1.5  0.8  1.4  0.4  3.5  4.1 13.7 13.0 11.3
 2.6  1.7  1.0  1.6  0.8  1.2  1.5  0.8  1.4  0.4  3.5  4.1 13.7 13.0 11.3
 2.0  1.6  1.8  1.0  1.3  1.4  0.9  1.5  0.7  1.2  2.9  4.2 14.1 13.3 10.7
 1.7  1.9  1.8  0.6  1.9  1.2  0.7  1.6  0.2  2.3  1.6  5.0 12.6 12.7 11.4
 2.4  1.7  1.0  1.4  1.2  0.7  1.4  0.8  0.8  2.2  0.7  5.7 12.7 13.0 11.4
 1.3  1.8  0.8  1.8  1.1  0.8  1.6  0.0  1.6  1.9  1.1  4.7 12.0 13.5 11.6
 2.2  0.3  1.8  1.4  0.6  1.7  1.0  0.5  1.7  1.6  1.4  3.8 11.2 13.8 11.4
 2.6  1.2  0.7  1.2  0.6  1.6  0.4  1.3  1.5  1.6  0.9  2.8 10.0 13.8 12.2
 1.4  2.2  1.3 -0.5  1.4  1.2  0.2  1.4  1.9  1.0  1.3  3.0  8.4 13.9 13.1
 1.1  1.6  1.7  0.3  0.6  0.7  0.8  0.8  1.8  0.8  1.6  2.6  7.3 13.2 12.9
 2.6  1.3  0.0  1.8  1.3 -0.9  1.1  1.3  1.3  0.9  1.3  2.5  5.5 12.1 13.3
 2.8  1.6  0.3  1.1  1.1  0.0  0.4  1.1  1.5  0.3  1.5  2.7  4.3 11.0 13.4
 1.4  1.0  1.8  1.3 -0.4  0.9  0.8  0.4  0.9  0.9  1.3  2.1  3.4  9.2 13.8
 1.9  0.5  1.5  1.4  0.0  0.7  0.6  1.5 -0.2 -0.7  1.0  1.7  2.9  6.9 13.0
 1.8  1.7  1.4  0.1  0.4  1.6  0.4  1.0  0.5  0.0  0.9  1.3  2.6  4.7 12.3
 0.8  2.1  1.5  0.1  0.4  0.7  1.4  0.9 -0.5  1.1 -0.1  1.2  1.8  3.7  9.6
 1.7  1.6  0.8  0.1  1.5  0.4  1.0  1.1 -0.3  0.5  0.9  0.0  1.8  2.7  6.2
 1.3  1.5  0.6  0.1  1.4  0.8  1.4  0.3 -0.1  1.1  0.1  0.6  0.5  1.8  4.2
 1.8  0.6 -0.8  1.0  1.0  0.6  1.4  0.7  0.1  0.4  1.2  0.2  0.9  0.5  2.1
 2.1  1.0 -0.1  0.9 -0.5  0.7  1.0  0.0  0.8  0.6  0.6  0.5  0.8  0.6  0.2
 1.3  0.8  1.0  1.2  0.1  0.6  0.1 -0.7  0.8  0.3  1.2  0.1  0.8  0.5 -0.2
 1.3 -0.2  0.9  0.8  0.7  1.4  0.8 -0.8  0.3 -0.7  0.8  0.5  1.1  0.2  0.6
 0.7  0.3  1.8  0.4  0.2  0.9  0.8  0.0  1.2 -0.6  0.3 -0.6  0.6  0.7  0.6
-0.3  0.1  0.5 -0.3  0.7  1.2  0.2 -0.3  0.7 -0.2  1.4 -0.2  0.2 -0.8  0.5
 0.1  1.5  0.8 -0.4  0.5  0.1 -0.8 -0.3  0.4 -0.2  0.8  0.0  1.1 -0.3  0.1
 0.4  1.6  0.7  0.4  1.2  0.7 -0.4  0.2 -0.1 -1.0  0.3 -0.5  0.5 -0.5  0.8
 0.4  0.8  0.1  0.4  0.9  0.5 -0.5  0.8  0.2  0.0  0.7 -0.6  0.0 -1.2 -0.2
 1.4  1.1  0.0  0.8  0.7  0.0 -1.1  0.7  0.0  0.1  0.6 -0.3  0.7 -0.4 -0.1
 1.0  0.4 -0.3  0.9  0.7  0.0 -0.5  1.1  0.1  0.2  0.5 -0.7  0.4 -0.6  0.1
 1.0  0.2  0.1  0.7  0.3 -0.6 -0.6  0.4 -0.8 -0.2  0.1 -0.8  0.2 -0.4  0.0
 1.1  0.3  0.7  1.1  0.5 -0.4  0.1  0.6 -0.5  0.3  0.3 -0.8  0.5 -0.4 -0.5
 0.0 -0.8  0.3  0.3 -0.4 -1.2 -0.2 -0.2 -1.1 -0.2 -0.4 -1.3 -0.1 -1.0 -1.3
 0.5  0.2  1.2  1.0  0.1 -1.0  0.6  0.2 -0.8  0.4  0.1 -1.0  0.0 -0.7 -1.3
```



```
-0.6 -2.0 -1.1 -1.4 -1.5 -2.8 -2.4 -2.2 -2.1 -1.8 -1.7 -2.3 -3.6 -3.4 -2.2
-0.7 -2.2 -1.1 -1.0 -1.1 -2.2 -1.9 -1.4 -1.3 -1.2 -1.1 -2.0 -1.2  0.9  1.4
-0.3 -1.6 -0.7 -0.6 -1.3 -1.3 -1.0 -0.6 -0.2  0.3 -0.2  2.3  6.0  8.2 11.1
-0.4 -1.0 -0.5  0.0 -1.3 -0.5  0.2  0.6  0.9  0.9  6.5 11.5 13.7 14.0 14.2
-0.2 -0.6  0.0 -0.4 -1.4 -1.0  0.1  2.4  4.0 10.9 14.1 14.0 14.4 13.4 13.8
-0.8 -1.1 -0.6 -1.2 -0.7  1.1  3.6  7.0 13.3 14.6 14.7 14.1 12.9 12.1 12.7
-1.2 -0.2  0.9 -0.6  0.3  4.4  8.4 13.7 14.8 13.3 13.1 13.2 11.8 11.3 11.2
-0.5  0.2 -0.2  0.4  4.3  9.0 13.6 14.1 13.3 12.4 11.9 11.2 10.5 10.5 10.3
-1.4  1.1  0.7  2.7  9.2 13.6 14.3 13.1 11.8 11.3 11.4 10.7  9.8  9.5  9.1
 0.3  1.5  1.0  8.2 13.4 14.4 12.6 12.1 11.5 10.4  9.5  9.3  9.2  8.9  8.9
 0.2  1.7  4.7 12.5 13.6 13.3 12.0 10.6 10.4  9.8  9.3  9.3  8.9  8.8  8.5
 1.0  2.5 11.0 14.0 13.1 12.4 11.8 10.4 10.0  9.3  8.9  8.6  8.2  8.6  8.0
 2.2  7.5 13.8 13.8 13.1 11.1 10.5  9.7  9.6  8.8  8.1  8.1  8.0  7.9  7.3
 4.8 12.5 14.2 12.6 11.7 10.7  9.8  8.8  8.7  8.4  8.0  7.8  7.6  7.3  7.1
 7.7 13.1 13.5 12.3 10.6 10.0  9.2  8.7  8.4  8.5  7.8  7.1  7.3  7.2  7.1
12.0 14.0 12.9 11.4 10.1  9.5  8.5  8.1  7.7  7.7  7.4  7.2  7.4  6.7  6.7
13.2 13.7 12.2 10.4 10.0  9.4  8.4  8.3  7.7  7.6  6.9  6.7  7.1  6.4  6.9
14.1 13.0 11.2 10.0  9.5  8.6  8.4  7.7  7.3  7.4  7.0  6.7  7.0  6.9  6.3
13.5 11.8 10.6  9.6  8.7  8.3  8.0  7.4  7.2  7.0  6.6  6.5  6.6  6.9  6.4
12.8 11.8 10.5  9.1  8.7  8.2  7.5  7.1  7.2  6.7  6.4  6.5  6.3  6.2  6.4
12.5 11.5  9.8  9.0  8.5  7.9  7.3  7.0  7.1  6.8  6.5  6.3  6.2  6.0  5.6
11.4 10.5  9.8  9.0  8.0  7.5  7.0  6.9  6.7  6.7  6.4  5.8  5.9  6.2  6.0
11.4 10.6  9.2  8.4  7.7  7.3  7.0  6.5  6.7  6.4  6.5  6.6  6.0  6.1  5.9
11.0 10.0  8.9  8.4  8.0  7.5  7.0  6.8  7.2  6.2  5.9  6.2  5.8  6.0  5.8
11.1 10.0  9.1  8.2  7.5  7.3  7.1  6.6  6.2  6.1  6.0  6.0  5.9  6.1  5.9
10.7  9.3  8.8  7.8  7.2  7.2  6.9  6.9  6.0  6.1  6.1  5.8  5.9  6.0  6.1
10.3  8.9  8.3  7.8  7.4  7.0  6.3  7.0  6.4  6.1  5.9  5.8  6.0  5.5  5.9
10.8  9.4  8.9  7.9  7.1  7.0  6.4  6.3  6.0  6.1  6.1  6.0  5.8  5.4  5.9
 9.9  8.7  8.7  8.2  7.2  6.7  6.6  6.5  6.3  6.4  6.1  5.6  5.5  5.7  5.7
 9.9  9.3  8.0  7.7  7.4  6.3  6.6  6.3  6.2  6.2  6.1  6.0  5.9  5.8  5.4
```

9.6	9.3	8.0	7.5	7.4	6.5	6.6	6.4	6.1	5.9	5.7	5.7	5.7	5.6	5.8
10.2	8.7	8.0	7.8	7.1	6.5	6.8	6.3	6.0	5.8	5.8	5.6	5.7	5.9	5.5
10.2	8.7	8.0	7.8	7.1	6.5	6.8	6.3	6.0	5.8	5.8	5.6	5.7	5.9	5.5
9.6	9.3	8.0	7.5	7.4	6.5	6.6	6.4	6.1	5.9	5.7	5.7	5.7	5.6	5.8
9.9	9.3	8.0	7.7	7.4	6.3	6.6	6.3	6.2	6.2	6.1	6.0	5.9	5.8	5.4
9.9	8.7	8.7	8.2	7.2	6.7	6.6	6.5	6.3	6.4	6.1	5.6	5.5	5.7	5.7
10.8	9.4	8.9	7.9	7.1	7.0	6.4	6.3	6.0	6.1	6.1	6.0	5.8	5.4	5.9
10.3	8.9	8.3	7.8	7.4	7.0	6.3	7.0	6.4	6.1	5.9	5.8	6.0	5.5	5.9
10.7	9.3	8.8	7.8	7.2	7.2	6.9	6.9	6.0	6.1	6.1	5.8	5.9	6.0	6.1
11.1	10.0	9.1	8.2	7.5	7.3	7.1	6.6	6.2	6.1	6.0	6.0	5.9	6.1	5.9
11.0	10.0	8.9	8.4	8.0	7.5	7.0	6.8	7.2	6.2	5.9	6.2	5.8	6.0	5.8
11.4	10.6	9.2	8.4	7.7	7.3	7.0	6.5	6.7	6.4	6.5	6.6	6.0	6.1	5.9
11.4	10.5	9.8	9.0	8.0	7.5	7.0	6.9	6.7	6.7	6.4	5.8	5.9	6.2	6.0
12.5	11.5	9.8	9.0	8.5	7.9	7.3	7.0	7.1	6.8	6.5	6.3	6.2	6.0	5.6
12.8	11.8	10.5	9.1	8.7	8.2	7.5	7.1	7.2	6.7	6.4	6.5	6.3	6.2	6.4
13.5	11.8	10.6	9.6	8.7	8.3	8.0	7.4	7.2	7.0	6.6	6.5	6.6	6.9	6.4
14.1	13.0	11.2	10.0	9.5	8.6	8.4	7.7	7.3	7.4	7.0	6.7	7.0	6.9	6.3
13.2	13.7	12.2	10.4	10.0	9.4	8.4	8.3	7.7	7.6	6.9	6.7	7.1	6.4	6.9
12.0	14.0	12.9	11.4	10.1	9.5	8.5	8.1	7.7	7.7	7.4	7.2	7.4	6.7	6.7
7.7	13.1	13.5	12.3	10.6	10.0	9.2	8.7	8.4	8.5	7.8	7.1	7.3	7.2	7.1
4.8	12.5	14.2	12.6	11.7	10.7	9.8	8.8	8.7	8.4	8.0	7.8	7.6	7.3	7.1
2.2	7.5	13.8	13.8	13.1	11.1	10.5	9.7	9.6	8.8	8.1	8.1	8.0	7.9	7.3
1.0	2.5	11.0	14.0	13.1	12.4	11.8	10.4	10.0	9.3	8.9	8.6	8.2	8.6	8.0
0.2	1.7	4.7	12.5	13.6	13.3	12.0	10.6	10.4	9.8	9.3	9.3	8.9	8.8	8.5
0.3	1.5	1.0	8.2	13.4	14.4	12.6	12.1	11.5	10.4	9.5	9.3	9.2	8.9	8.9
-1.4	1.1	0.7	2.7	9.2	13.6	14.3	13.1	11.8	11.3	11.4	10.7	9.8	9.5	9.1
-0.5	0.2	-0.2	0.4	4.3	9.0	13.6	14.1	13.3	12.4	11.9	11.2	10.5	10.5	10.3
-1.2	-0.2	0.9	-0.6	0.3	4.4	8.4	13.7	14.8	13.3	13.1	13.2	11.8	11.3	11.2
-0.8	-1.1	-0.6	-1.2	-0.7	1.1	3.6	7.0	13.3	14.6	14.7	14.1	12.9	12.1	12.7
-0.2	-0.6	0.0	-0.4	-1.4	-1.0	0.1	2.4	4.0	10.9	14.1	14.0	14.4	13.4	13.8
-0.4	-1.0	-0.5	0.0	-1.3	-0.5	0.2	0.6	0.9	0.9	6.5	11.5	13.7	14.0	14.2
-0.3	-1.6	-0.7	-0.6	-1.3	-1.3	-1.0	-0.6	-0.2	0.3	-0.2	2.3	6.0	8.2	11.1
-0.7	-2.2	-1.1	-1.0	-1.1	-2.2	-1.9	-1.4	-1.3	-1.2	-1.1	-2.0	-1.2	0.9	1.4
-0.6	-2.0	-1.1	-1.4	-1.5	-2.8	-2.4	-2.2	-2.1	-1.8	-1.7	-2.3	-3.6	-3.4	-2.2

-1.7	-2.6	-2.6	-1.7	-2.2	-3.4	-3.6	-2.3	-1.7	-1.8	-2.1	-2.2	-2.4	-2.8	-1.5
1.6	2.5	2.5	1.6	1.4	0.9	-1.2	-2.0	-1.1	-1.2	-1.3	-1.4	-1.9	-2.2	-1.1
12.6	12.5	12.5	12.6	11.1	8.2	6.0	2.3	-0.2	0.3	-0.2	-0.6	-1.0	-1.3	-1.3
14.2	13.9	13.9	14.2	14.2	14.0	13.7	11.5	6.5	0.9	0.9	0.6	0.2	-0.5	-1.3
12.9	13.3	13.3	12.9	13.8	13.4	14.4	14.0	14.1	10.9	4.0	2.4	0.1	-1.0	-1.4
11.9	11.6	11.6	11.9	12.7	12.1	12.9	14.1	14.7	14.6	13.3	7.0	3.6	1.1	-0.7
11.0	11.4	11.4	11.0	11.2	11.3	11.8	13.2	13.1	13.3	14.8	13.7	8.4	4.4	0.3
10.1	10.3	10.3	10.1	10.3	10.5	10.5	11.2	11.9	12.4	13.3	14.1	13.6	9.0	4.3
9.1	9.0	9.0	9.1	9.1	9.5	9.8	10.7	11.4	11.3	11.8	13.1	14.3	13.6	9.2
8.9	8.8	8.8	8.9	8.9	8.9	9.2	9.3	9.5	10.4	11.5	12.1	12.6	14.4	13.4
8.2	8.2	8.2	8.2	8.5	8.8	8.9	9.3	9.3	9.8	10.4	10.6	12.0	13.3	13.6
7.8	7.8	7.8	7.8	8.0	8.6	8.2	8.6	8.9	9.3	10.0	10.4	11.8	12.4	13.1
7.8	7.5	7.5	7.8	7.3	7.9	8.0	8.1	8.1	8.8	9.6	9.7	10.5	11.1	13.1
7.5	7.3	7.3	7.5	7.1	7.3	7.6	7.8	8.0	8.4	8.7	8.8	9.8	10.7	11.7
6.7	7.2	7.2	6.7	7.1	7.2	7.3	7.1	7.8	8.5	8.4	8.7	9.2	10.0	10.6
6.6	7.0	7.0	6.6	6.7	6.7	7.4	7.2	7.4	7.7	7.7	8.1	8.5	9.5	10.1
6.8	6.4	6.4	6.8	6.9	6.4	7.1	6.7	6.9	7.6	7.7	8.3	8.4	9.4	10.0
6.3	6.3	6.3	6.3	6.3	6.9	7.0	6.7	7.0	7.4	7.3	7.7	8.4	8.6	9.5
6.2	6.5	6.5	6.2	6.4	6.9	6.6	6.5	6.6	7.0	7.2	7.4	8.0	8.3	8.7
6.3	6.0	6.0	6.3	6.4	6.2	6.3	6.5	6.4	6.7	7.2	7.1	7.5	8.2	8.7
5.8	5.9	5.9	5.8	5.6	6.0	6.2	6.3	6.5	6.8	7.1	7.0	7.3	7.9	8.5
6.0	6.2	6.2	6.0	6.0	6.2	5.9	5.8	6.4	6.7	6.7	6.9	7.0	7.5	8.0
6.0	5.9	5.9	6.0	5.9	6.1	6.0	6.6	6.5	6.4	6.7	6.5	7.0	7.3	7.7
5.9	5.7	5.7	5.9	5.8	6.0	5.8	6.2	5.9	6.2	7.2	6.8	7.0	7.5	8.0
5.6	5.6	5.6	5.6	5.9	6.1	5.9	6.0	6.0	6.1	6.2	6.6	7.1	7.3	7.5
5.6	5.7	5.7	5.6	6.1	6.0	5.9	5.8	6.1	6.1	6.0	6.9	6.9	7.2	7.2
5.6	5.5	5.5	5.6	5.9	5.5	6.0	5.8	5.9	6.1	6.4	7.0	6.3	7.0	7.4
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5.5	5.8	5.8	5.5	5.7	5.7	5.5	5.6	6.1	6.4	6.3	6.5	6.6	6.7	7.2
5.8	5.6	5.6	5.8	5.4	5.8	5.9	6.0	6.1	6.2	6.2	6.3	6.6	6.3	7.4
6.0	5.4	5.4	6.0	5.8	5.6	5.7	5.7	5.7	5.9	6.1	6.4	6.6	6.5	7.4
5.3	5.4	5.4	5.3	5.5	5.9	5.7	5.6	5.8	5.8	6.0	6.3	6.8	6.5	7.1
5.3	5.4	5.4	5.3	5.5	5.9	5.7	5.6	5.8	5.8	6.0	6.3	6.8	6.5	7.1
6.0	5.4	5.4	6.0	5.8	5.6	5.7	5.7	5.7	5.9	6.1	6.4	6.6	6.5	7.4
5.8	5.6	5.6	5.8	5.4	5.8	5.9	6.0	6.1	6.2	6.2	6.3	6.6	6.3	7.4
5.5	5.8	5.8	5.5	5.7	5.7	5.5	5.6	6.1	6.4	6.3	6.5	6.6	6.7	7.2
5.6	5.6	5.6	5.6	5.9	5.4	5.8	6.0	6.1	6.1	6.0	6.3	6.4	7.0	7.1
5.6	5.5	5.5	5.6	5.9	5.5	6.0	5.8	5.9	6.1	6.4	7.0	6.3	7.0	7.4
5.6	5.7	5.7	5.6	6.1	6.0	5.9	5.8	6.1	6.1	6.0	6.9	6.9	7.2	7.2
5.6	5.6	5.6	5.6	5.9	6.1	5.9	6.0	6.0	6.1	6.2	6.6	7.1	7.3	7.5
5.9	5.7	5.7	5.9	5.8	6.0	5.8	6.2	5.9	6.2	7.2	6.8	7.0	7.5	8.0
6.0	5.9	5.9	6.0	5.9	6.1	6.0	6.6	6.5	6.4	6.7	6.5	7.0	7.3	7.7
6.0	6.2	6.2	6.0	6.0	6.2	5.9	5.8	6.4	6.7	6.7	6.9	7.0	7.5	8.0
5.8	5.9	5.9	5.8	5.6	6.0	6.2	6.3	6.5	6.8	7.1	7.0	7.3	7.9	8.5
6.3	6.0	6.0	6.3	6.4	6.2	6.3	6.5	6.4	6.7	7.2	7.1	7.5	8.2	8.7
6.2	6.5	6.5	6.2	6.4	6.9	6.6	6.5	6.6	7.0	7.2	7.4	8.0	8.3	8.7
6.3	6.3	6.3	6.3	6.3	6.9	7.0	6.7	7.0	7.4	7.3	7.7	8.4	8.6	9.5
6.8	6.4	6.4	6.8	6.9	6.4	7.1	6.7	6.9	7.6	7.7	8.3	8.4	9.4	10.0
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6.7	7.2	7.2	6.7	7.1	7.2	7.3	7.1	7.8	8.5	8.4	8.7	9.2	10.0	10.6
7.5	7.3	7.3	7.5	7.1	7.3	7.6	7.8	8.0	8.4	8.7	8.8	9.8	10.7	11.7
7.8	7.5	7.5	7.8	7.3	7.9	8.0	8.1	8.1	8.8	9.6	9.7	10.5	11.1	13.1
7.8	7.8	7.8	7.8	8.0	8.6	8.2	8.6	8.9	9.3	10.0	10.4	11.8	12.4	13.1
8.2	8.2	8.2	8.2	8.5	8.8	8.9	9.3	9.3	9.8	10.4	10.6	12.0	13.3	13.6
8.9	8.8	8.8	8.9	8.9	8.9	9.2	9.3	9.5	10.4	11.5	12.1	12.6	14.4	13.4
9.1	9.0	9.0	9.1	9.1	9.5	9.8	10.7	11.4	11.3	11.8	13.1	14.3	13.6	9.2
10.1	10.3	10.3	10.1	10.3	10.5	10.5	11.2	11.9	12.4	13.3	14.1	13.6	9.0	4.3
11.0	11.4	11.4	11.0	11.2	11.3	11.8	13.2	13.1	13.3	14.8	13.7	8.4	4.4	0.3
11.9	11.6	11.6	11.9	12.7	12.1	12.9	14.1	14.7	14.6	13.3	7.0	3.6	1.1	-0.7
12.9	13.3	13.3	12.9	13.8	13.4	14.4	14.0	14.1	10.9	4.0	2.4	0.1	-1.0	-1.4
14.2	13.9	13.9	14.2	14.2	14.0	13.7	11.5	6.5	0.9	0.9	0.6	0.2	-0.5	-1.3
12.6	12.5	12.5	12.6	11.1	8.2	6.0	2.3	-0.2	0.3	-0.2	-0.6	-1.0	-1.3	-1.3
1.6	2.5	2.5	1.6	1.4	0.9	-1.2	-2.0	-1.1	-1.2	-1.3	-1.4	-1.9	-2.2	-1.1
-1.7	-2.6	-2.6	-1.7	-2.2	-3.4	-3.6	-2.3	-1.7	-1.8	-2.1	-2.2	-2.4	-2.8	-1.5

-1.4	-1.1	-2.0	-0.6	-1.3	-0.7	0.0	-1.0	0.1	0.4	-0.8	0.2	0.6	-1.0	0.1
-1.0	-1.1	-2.2	-0.7	-1.3	-1.0	-0.1	-1.3	-0.4	-0.2	-1.1	-0.2	-0.2	-1.2	-0.4
-0.6	-0.7	-1.6	-0.3	-0.5	-0.4	0.5	-0.8	0.3	0.3	-0.5	0.6	0.1	-0.4	0.5
0.0	-0.5	-1.0	-0.4	0.0	-0.4	0.2	-0.8	0.1	-0.2	-0.8	0.4	-0.6	-0.6	0.3
-0.4	0.0	-0.6	-0.2	0.1	-0.6	0.4	-0.7	0.5	0.2	0.1	1.1	-0.5	0.0	0.7
-1.2	-0.6	-1.1	-0.8	-0.1	-0.4	0.7	-0.3	0.6	0.1	0.0	0.7	-1.1	0.0	0.7
-0.6	0.9	-0.2	-1.2	-0.2	-1.2	0.0	-0.6	0.7	0.0	0.2	0.8	-0.5	0.5	0.9
0.4	-0.2	0.2	-0.5	0.8	-0.5	0.5	-0.5	0.3	-1.0	-0.1	0.2	-0.4	0.7	1.2
2.7	0.7	1.1	-1.4	0.1	-0.3	1.1	0.0	0.8	-0.2	0.4	-0.3	-0.8	0.1	0.5
8.2	1.0	1.5	0.3	0.5	-0.8	0.2	-0.2	1.4	-0.2	0.7	-0.3	0.2	1.2	0.7
12.5	4.7	1.7	0.2	0.6	0.7	0.6	-0.6	0.3	-0.6	1.2	0.0	0.8	0.9	0.2
14.0	11.0	2.5	1.0	0.6	0.2	1.1	0.5	0.8	-0.7	0.3	-0.8	0.8	1.4	0.7
13.8	13.8	7.5	2.2	-0.2	0.5	0.8	0.1	1.2	0.3	0.8	-0.7	0.1	0.6	0.1
12.6	14.2	12.5	4.8	0.2	0.6	0.8	0.5	0.6	0.6	0.8	0.0	1.0	0.7	-0.5
12.3	13.5	13.1	7.7	2.1	0.5	0.9	0.2	1.2	0.4	0.1	0.7	1.4	0.6	1.0
11.4	12.9	14.0	12.0	4.2	1.8	0.5	0.6	0.1	1.1	-0.1	0.3	1.4	0.8	1.4
10.4	12.2	13.7	13.2	6.2	2.7	1.8	0.0	0.9	0.5	-0.3	1.1	1.0	0.4	1.5
10.0	11.2	13.0	14.1	9.6	3.7	1.8	1.2	-0.1	1.1	-0.5	0.9	1.4	0.7	0.4
9.6	10.6	11.8	13.5	12.3	4.7	2.6	1.3	0.9	0.0	0.5	1.0	0.4	1.6	0.4
9.1	10.5	11.8	12.8	13.0	6.9	2.9	1.7	1.0	0.7	-0.2	1.5	0.6	0.7	0.0
9.0	9.8	11.5	12.5	13.8	9.2	3.4	2.1	1.3	0.9	0.9	0.4	0.8	0.9	-0.4

9.0	9.8	10.5	11.4	13.4	11.0	4.3	2.7	1.5	0.3	1.5	1.1	0.4	0.0	1.1
8.4	9.2	10.6	11.4	13.3	12.1	5.5	2.5	1.3	0.9	1.3	1.3	1.1	-0.9	1.3
8.4	8.9	10.0	11.0	12.9	13.2	7.3	2.6	1.6	0.8	1.8	0.8	0.8	0.7	0.6
8.2	9.1	10.0	11.1	13.1	13.9	8.4	3.0	1.3	1.0	1.9	1.4	0.2	1.2	1.4
7.8	8.8	9.3	10.7	12.2	13.8	10.0	2.8	0.9	1.6	1.5	1.3	0.4	1.6	0.6
7.8	8.3	8.9	10.3	11.4	13.8	11.2	3.8	1.4	1.6	1.7	0.5	1.0	1.7	0.6
7.9	8.9	9.4	10.8	11.6	13.5	12.0	4.7	1.1	1.9	1.6	0.0	1.6	0.8	1.1
8.2	8.7	8.7	9.9	11.4	13.0	12.7	5.7	0.7	2.2	0.8	0.8	1.4	0.7	1.2
7.7	8.0	9.3	9.9	11.4	12.7	12.6	5.0	1.6	2.3	0.2	1.6	0.7	1.2	1.9
7.5	8.0	9.3	9.6	10.7	13.3	14.1	4.2	2.9	1.2	0.7	1.5	0.9	1.4	1.3
7.8	8.0	8.7	10.2	11.3	13.0	13.7	4.1	3.5	0.4	1.4	0.8	1.5	1.2	0.8
7.8	8.0	8.7	10.2	11.3	13.0	13.7	4.1	3.5	0.4	1.4	0.8	1.5	1.2	0.8
7.5	8.0	9.3	9.6	10.7	13.3	14.1	4.2	2.9	1.2	0.7	1.5	0.9	1.4	1.3
7.7	8.0	9.3	9.9	11.4	12.7	12.6	5.0	1.6	2.3	0.2	1.6	0.7	1.2	1.9
8.2	8.7	8.7	9.9	11.4	13.0	12.7	5.7	0.7	2.2	0.8	0.8	1.4	0.7	1.2
7.9	8.9	9.4	10.8	11.6	13.5	12.0	4.7	1.1	1.9	1.6	0.0	1.6	0.8	1.1
7.8	8.3	8.9	10.3	11.4	13.8	11.2	3.8	1.4	1.6	1.7	0.5	1.0	1.7	0.6
7.8	8.8	9.3	10.7	12.2	13.8	10.0	2.8	0.9	1.6	1.5	1.3	0.4	1.6	0.6
8.2	9.1	10.0	11.1	13.1	13.9	8.4	3.0	1.3	1.0	1.9	1.4	0.2	1.2	1.4
8.4	8.9	10.0	11.0	12.9	13.2	7.3	2.6	1.6	0.8	1.8	0.8	0.8	0.7	0.6
8.4	9.2	10.6	11.4	13.3	12.1	5.5	2.5	1.3	0.9	1.3	1.3	1.1	-0.9	1.3
9.0	9.8	10.5	11.4	13.4	11.0	4.3	2.7	1.5	0.3	1.5	1.1	0.4	0.0	1.1
9.0	9.8	11.5	12.5	13.8	9.2	3.4	2.1	1.3	0.9	0.9	0.4	0.8	0.9	-0.4
9.1	10.5	11.8	12.8	13.0	6.9	2.9	1.7	1.0	0.7	-0.2	1.5	0.6	0.7	0.0
9.6	10.6	11.8	13.5	12.3	4.7	2.6	1.3	0.9	0.0	0.5	1.0	0.4	1.6	0.4
10.0	11.2	13.0	14.1	9.6	3.7	1.8	1.2	-0.1	1.1	-0.5	0.9	1.4	0.7	0.4
10.4	12.2	13.7	13.2	6.2	2.7	1.8	0.0	0.9	0.5	-0.3	1.1	1.0	0.4	1.5
11.4	12.9	14.0	12.0	4.2	1.8	0.5	0.6	0.1	1.1	-0.1	0.3	1.4	0.8	1.4
12.3	13.5	13.1	7.7	2.1	0.5	0.9	0.2	1.2	0.4	0.1	0.7	1.4	0.6	1.0
12.6	14.2	12.5	4.8	0.2	0.6	0.8	0.5	0.6	0.6	0.8	0.0	1.0	0.7	-0.5
13.8	13.8	7.5	2.2	-0.2	0.5	0.8	0.1	1.2	0.3	0.8	-0.7	0.1	0.6	0.1
14.0	11.0	2.5	1.0	0.6	0.2	1.1	0.5	0.8	-0.7	0.3	-0.8	0.8	1.4	0.7
12.5	4.7	1.7	0.2	0.6	0.7	0.6	-0.6	0.3	-0.6	1.2	0.0	0.8	0.9	0.2
8.2	1.0	1.5	0.3	0.5	-0.8	0.2	-0.2	1.4	-0.2	0.7	-0.3	0.2	1.2	0.7
2.7	0.7	1.1	-1.4	0.1	-0.3	1.1	0.0	0.8	-0.2	0.4	-0.3	-0.8	0.1	0.5
0.4	-0.2	0.2	-0.5	0.8	-0.5	0.5	-0.5	0.3	-1.0	-0.1	0.2	-0.4	0.7	1.2
-0.6	0.9	-0.2	-1.2	-0.2	-1.2	0.0	-0.6	0.7	0.0	0.2	0.8	-0.5	0.5	0.9
-1.2	-0.6	-1.1	-0.8	-0.1	-0.4	0.7	-0.3	0.6	0.1	0.0	0.7	-1.1	0.0	0.7
-0.4	0.0	-0.6	-0.2	0.1	-0.6	0.4	-0.7	0.5	0.2	0.1	1.1	-0.5	0.0	0.7
0.0	-0.5	-1.0	-0.4	0.0	-0.4	0.2	-0.8	0.1	-0.2	-0.8	0.4	-0.6	-0.6	0.3
-0.6	-0.7	-1.6	-0.3	-0.5	-0.4	0.5	-0.8	0.3	0.3	-0.5	0.6	0.1	-0.4	0.5
-1.0	-1.1	-2.2	-0.7	-1.3	-1.0	-0.1	-1.3	-0.4	-0.2	-1.1	-0.2	-0.2	-1.2	-0.4
-1.4	-1.1	-2.0	-0.6	-1.3	-0.7	0.0	-1.0	0.1	0.4	-0.8	0.2	0.6	-1.0	0.1

1.0	1.2	0.2	0.5
0.3	0.3	-0.8	0.0
1.1	0.7	0.3	1.1
0.7	0.1	0.2	1.0
0.9	-0.3	0.4	1.0
0.8	0.0	1.1	1.4
0.4	0.1	0.8	0.4
0.4	0.7	1.6	0.4
-0.4	0.8	1.5	0.1
-0.3	0.5	0.1	-0.3
0.4	1.8	0.3	0.7
0.8	0.9	-0.2	1.3
1.2	1.0	0.8	1.3
0.9	-0.1	1.0	2.1
1.0	-0.8	0.6	1.8
0.1	0.6	1.5	1.3
0.1	0.8	1.6	1.7
0.1	1.5	2.1	0.8
0.1	1.4	1.7	1.8
1.4	1.5	0.5	1.9
1.3	1.8	1.0	1.4
1.1	0.3	1.6	2.8
1.8	0.0	1.3	2.6
0.3	1.7	1.6	1.1
-0.5	1.3	2.2	1.4
1.2	0.7	1.2	2.6
1.4	1.8	0.3	2.2
1.8	0.8	1.8	1.3
1.4	1.0	1.7	2.4
0.6	1.8	1.9	1.7
1.0	1.8	1.6	2.0
1.6	1.0	1.7	2.6
1.6	1.0	1.7	2.6
1.0	1.8	1.6	2.0
0.6	1.8	1.9	1.7
1.4	1.0	1.7	2.4
1.8	0.8	1.8	1.3
1.4	1.8	0.3	2.2
1.2	0.7	1.2	2.6
-0.5	1.3	2.2	1.4
0.3	1.7	1.6	1.1
1.8	0.0	1.3	2.6
1.1	0.3	1.6	2.8
1.3	1.8	1.0	1.4
1.4	1.5	0.5	1.9
0.1	1.4	1.7	1.8
0.1	1.5	2.1	0.8
0.1	0.8	1.6	1.7
0.1	0.6	1.5	1.3
1.0	-0.8	0.6	1.8
0.9	-0.1	1.0	2.1
1.2	1.0	0.8	1.3
0.8	0.9	-0.2	1.3
0.4	1.8	0.3	0.7
-0.3	0.5	0.1	-0.3
-0.4	0.8	1.5	0.1
0.4	0.7	1.6	0.4
0.4	0.1	0.8	0.4
0.8	0.0	1.1	1.4
0.9	-0.3	0.4	1.0
0.7	0.1	0.2	1.0
1.1	0.7	0.3	1.1
0.3	0.3	-0.8	0.0
1.0	1.2	0.2	0.5

```
EEEEE V   V  AAA  TTTTT U   U
E     V   V A   A   T   U   U
EEE    V V  A   A   T   U   U
E      V V  AAAAA   T   U   U
EEEEE   V   A   A   T    UUU
```

PARAMETERS FOR SUBROUTINE EVATU

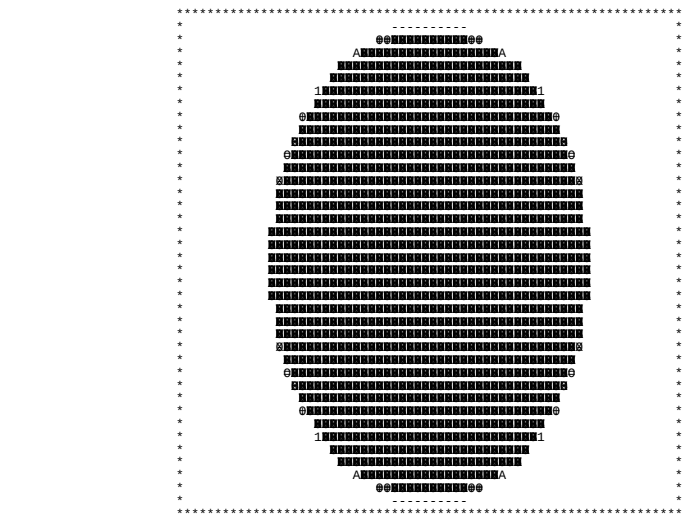
DESCRIPTION

XLEV - 3.500 THE TARGET-TO-NONTARGET RATIO
ATENL - 0.075 ATTENUATION COEFFICIENT

BLANK COMMON REQUIRED 5222 (12146)

BLANK COMMON REQUIRED 9318 (22146)

XMIN = 0.00E+00 XMAX = 0.75E-01 XSUM = 0.1494E+03



0.0000E+00 0.5625E-02 0.1387E-01 0.1762E-01 0.2025E-01 0.2325E-01 0.2625E-01

0.2887E-01 0.3075E-01 0.3263E-01 0.3675E-01 0.4088E-01 0.4350E-01 0.4650E-01

0.4913E-01 0.5475E-01 0.6150E-01 0.6525E-01 0.6825E-01 0.7125E-01 0.7387E-01

0.7500E-01

BLANK COMMON REQUIRED 5222 (12146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 13614 FLOATING POINT WORDS.

EEEEE N N DDDD EEEEE V V AAA TTTTT U U
E NN N D D E V V A A T U U
EEE N N N D D EEE V V A A T U U
E N NN D D E V V AAAAA T U U
EEEEE N N DDDD EEEEE V A A T UUU

GGG RRRR AAA DDDD Y Y
G G R R A A D D Y Y
G RRRR A A D D Y
G GG R R AAAAA D D Y
GGGG R R A A DDDD Y

PARAMETERS FOR SUBROUTINE GRADY

DESCRIPTION

ISTP - 15 NUMBER OF ITERATION STEPS
IRLX - 1 ITERATIVE RELAXATION METHOD
IERR - 0 DO NOT USE ERROR ARRAY
IZER - 0 INITIAL SOLUTION IS ZERO

BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG	FUNCTION	RAY WEIGHTING	ATTENUATION	FAN BEAM
BCK	BACKPROJECTION	UNIFORM SQUARE	YES	NO
PRJ	PROJECTION	UNIFORM SQUARE	YES	NO

BLANK COMMON REQUIRED 5406 (12436)

BLANK COMMON REQUIRED 9502 (22436)

BLANK COMMON REQUIRED 13598 (32436)

BLANK COMMON REQUIRED 17694 (42436)

BLANK COMMON REQUIRED 17710 (42456)

BLANK COMMON REQUIRED 17694 (42436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER 0 FCN 0.484E+09
ITER 1 FCN 0.596E+08
ITER 2 FCN 0.186E+08
ITER 3 FCN 0.115E+08
ITER 4 FCN 0.758E+07
ITER 5 FCN 0.528E+07
ITER 6 FCN 0.385E+07
ITER 7 FCN 0.295E+07
ITER 8 FCN 0.234E+07
ITER 9 FCN 0.192E+07
ITER 10 FCN 0.162E+07
ITER 11 FCN 0.139E+07
ITER 12 FCN 0.122E+07
ITER 13 FCN 0.108E+07
ITER 14 FCN 0.967E+06
ITER 15 FCN 0.876E+06

BLANK COMMON REQUIRED 17510 (42146)

BLANK COMMON REQUIRED 13414 (32146)

BLANK COMMON REQUIRED 9318 (22146)

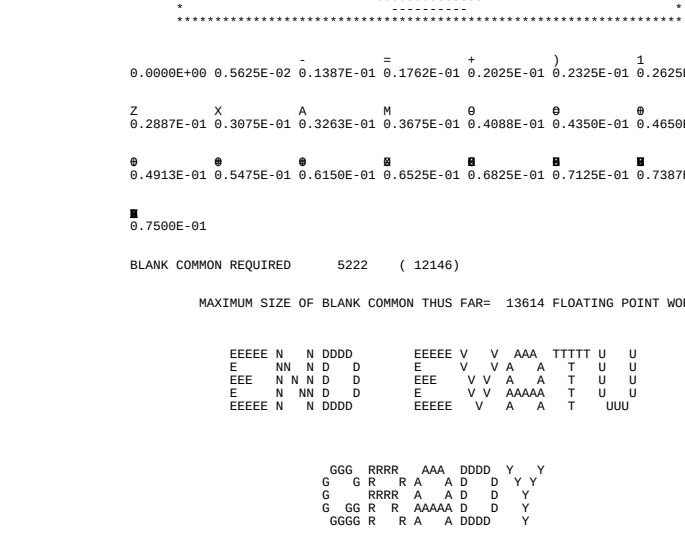
BLANK COMMON REQUIRED 5222 (12146)

MAXIMUM SIZE OF BLANK COMMON THUS FAR= 17710 FLOATING POINT WORDS.

EEEEE N N DDDD GGG RRRR AAA DDDD Y Y
E NN N D D G G R R A A D D Y Y
EEE N N N D D G RRRR A A D D Y
E N NN D D G GG R R AAAAA D D Y
EEEEE N N DDDD GGGG R R A A DDDD Y

RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ATTENUATION

XMIN = -0.30E+01 XMAX = 0.36E+02 XSUM = 0.5996E+05



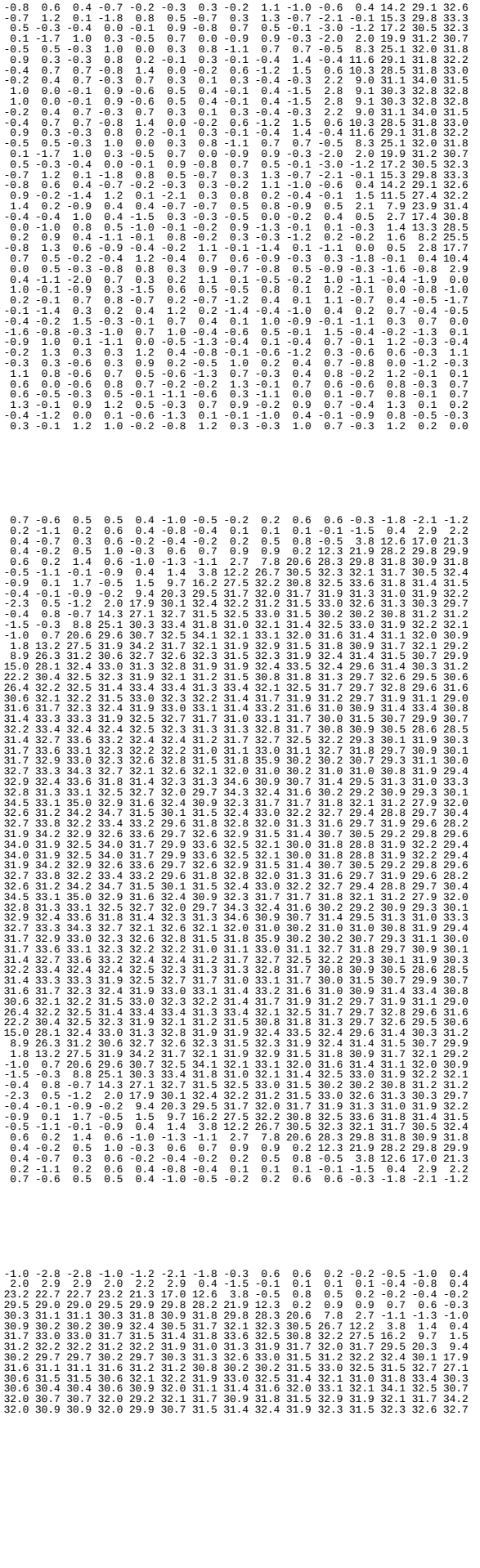
-.2975E+01 -.5850E-01 0.4219E+01 0.6164E+01 0.7525E+01 0.9080E+01 0.1064E+02

0.1200E+02 0.1297E+02 0.1394E+02 0.1608E+02 0.1822E+02 0.1958E+02 0.2114E+02

0.2250E+02 0.2541E+02 0.2891E+02 0.3086E+02 0.3241E+02 0.3397E+02 0.3533E+02

0.3591E+02

0.3 -0.1 1.2 1.0 -0.2 -0.8 1.2 0.3 -0.3 1.0 0.7 -0.3 1.2 0.2 0.0
-0.4 -1.2 0.0 0.1 -0.6 -1.3 0.1 -0.1 -1.0 0.4 -0.1 -0.9 0.8 -0.5 -0.3
1.3 -0.1 0.9 1.2 0.5 -0.3 0.7 0.9 -0.2 0.9 0.7 -0.4 1.3 0.1 0.2
0.6 -0.5 -0.3 0.5 -0.1 -1.1 -0.6 0.3 -1.1 0.0 0.1 -0.7 0.8 -0.1 0.7
0.6 0.0 -0.6 0.8 0.7 -0.2 -0.2 1.3 -0.1 0.7 0.6 -0.6 0.8 -0.3 0.7
1.1 0.8 -0.6 0.7 0.5 -0.6 -1.3 0.7 -0.3 0.4 0.8 -0.2 1.2 -0.1 0.1
-0.3 0.3 -0.6 0.3 0.9 0.2 -0.5 1.0 0.2 0.4 0.7 -0.8 0.0 -1.2 -0.3
-0.2 1.3 0.3 0.3 1.2 0.4 -0.8 -0.1 -0.6 -1.2 0.3 -0.6 0.6 -0.3 1.1
-0.9 1.0 0.1 -1.1 0.0 -0.5 -1.3 -0.4 0.1 -0.4 0.7 -0.1 1.2 -0.3 -0.4
-1.6 -0.8 -0.3 -1.0 0.7 1.0 -0.4 -0.6 0.5 -0.1 1.5 -0.4 -0.2 -1.3 0.1
-0.4 -0.2 1.5 -0.3 -0.1 0.7 0.4 0.1 1.0 -0.9 -0.1 -1.1 0.3 0.7 0.0
-0.1 -1.4 0.3 0.2 0.4 1.2 0.2 -1.4 -0.4 -1.0 0.4 0.2 0.7 -0.4 -0.5
0.2 -0.1 0.7 0.8 -0.7 0.2 -0.7 -1.2 0.4 0.1 1.1 -0.7 0.4 -0.5 -1.7
1.0 -0.1 -0.9 0.3 -1.5 0.6 0.5 -0.5 0.8 0.1 0.2 -0.1 0.0 -0.8 -1.0
0.4 -1.1 -2.0 0.7 0.3 0.2 1.1 0.1 -0.5 -0.2 1.0 -1.1 -0.4 -1.9 0.0
0.0 0.5 -0.3 -0.8 0.8 0.3 0.9 -0.7 -0.8 0.5 -0.9 -0.3 -1.6 -0.8 2.9
0.7 0.5 -0.2 -0.4 1.2 -0.4 0.8 0.6 -0.9 -0.3 0.3 -1.8 -0.1 0.4 10.4
-0.8 1.3 0.6 -0.9 -0.4 -0.2 1.1 -0.1 -1.4 0.1 -1.1 0.0 0.5 2.8 17.7
0.2 0.9 0.4 -1.1 -0.1 0.8 -0.2 0.3 -0.3 -1.2 0.2 -0.2 1.6 8.2 25.5
0.0 -1.0 0.8 0.5 -1.0 -0.1 -0.2 0.9 -1.3 -0.1 0.1 -0.3 1.4 13.3 28.5
-0.4 -0.4 1.0 0.4 -1.5 0.3 -0.3 -0.5 0.0 -0.2 0.4 0.5 2.7 17.4 30.8
1.4 0.2 -0.9 0.4 0.4 -0.7 -0.7 0.5 0.8 -0.9 0.5 2.1 7.9 23.9 31.4
0.9 -0.2 -1.4 1.2 0.1 -2.1 0.3 0.8 0.2 -0.4 -0.1 1.5 11.5 27.4 32.2



```
 0.7 -0.6  0.8  1.1
 0.3 -0.6  0.3 -0.3
 0.3  0.3  1.3 -0.2
-1.1  0.1  1.0 -0.9
-1.0 -0.3 -0.8 -1.6
-0.3  1.5 -0.2 -0.4
 0.2  0.3 -1.4 -0.1
 0.8  0.7 -0.1  0.2
 0.3 -0.9 -0.1  1.0
 0.7 -2.0 -1.1  0.4
-0.8 -0.3  0.5  0.0
-0.4 -0.2  0.5  0.7
-0.9  0.6  1.3 -0.8
-1.1  0.4  0.9  0.2
 0.5  0.8 -1.0  0.0
 0.4  1.0 -0.4 -0.4
 0.4 -0.9  0.2  1.4
 1.2 -1.4 -0.2  0.9
-0.7  0.4  0.6 -0.8
-1.8  0.1  1.2 -0.7
 0.0 -0.4 -0.3  0.5
 0.3  1.0 -1.7  0.1
 1.0 -0.3  0.5 -0.5
 0.8 -0.3  0.3  0.9
-0.8  0.7  0.7 -0.4
-0.3  0.7  0.4 -0.2
 0.9 -0.1  0.0  1.0
 0.9 -0.1  0.0  1.0
-0.3  0.7  0.4 -0.2
-0.8  0.7  0.7 -0.4
 0.8 -0.3  0.3  0.9
 1.0 -0.3  0.5 -0.5
 0.3  1.0 -1.7  0.1
 0.0 -0.4 -0.3  0.5
-1.8  0.1  1.2 -0.7
-0.7  0.4  0.6 -0.8
 1.2 -1.4 -0.2  0.9
 0.4 -0.9  0.2  1.4
 0.4  1.0 -0.4 -0.4
 0.5  0.8 -1.0  0.0
-1.1  0.4  0.9  0.2
-0.9  0.6  1.3 -0.8
-0.4 -0.2  0.5  0.7
-0.8 -0.3  0.5  0.0
 0.7 -2.0 -1.1  0.4
 0.3 -0.9 -0.1  1.0
 0.8  0.7 -0.1  0.2
 0.2  0.3 -1.4 -0.1
-0.3  1.5 -0.2 -0.4
-1.0 -0.3 -0.8 -1.6
-1.1  0.1  1.0 -0.9
 0.3  0.3  1.3 -0.2
 0.3 -0.6  0.3 -0.3
 0.7 -0.6  0.8  1.1
 0.8 -0.6  0.0  0.6
 0.5 -0.3 -0.5  0.6
 1.2  0.9 -0.1  1.3
 0.1  0.0 -1.2 -0.4
 1.0  1.2 -0.1  0.3
```

EX12

```
      PROGRAM XATENU
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLES 11 AND 12
C
C             THE PROGRAM XATENU RECONSTRUCTS ATTENUATED DATA ASSUMING
C        A CONSTANT ATTENUATION COEFFICIENT AND USING ATTENUATION
C        FACTORS WHICH ARE EVALUATED AFTER DETERMINING THE BOUNDARY OF
C        THE OBJECT BY AN APPROXIMATED RECONSTRUCTION.
C
      DIMENSION B(4096),AG(72)
      COMMON/BLANK/WORK(18000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU  ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG   ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT   ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID   , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN   , PAR( 4))
C
      EXTERNAL BRF,PRF,BRFA,PRFA
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=1
      IGEOM=0
      NANG=72
      MODANG=5
      KDIMU=100
      IMIT=0
      NWORK=18000
      NFLOAT=2
      ISTORE=0
      IPRINT=5
      LUNATN=3
      PWID=1.
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C         OPEN OUTPUT FILE AND SCRATCH FILE FOR ATTENUATION FACTORS
C
      OPEN (LUNOUT,FILE='E12.OUT',FORM='FORMATTED')
      OPEN (LUNATN,FILE='E12.TMP',FORM='UNFORMATTED',STATUS='SCRATCH')
C
      CALL SETUP (IPAR,PAR,AG)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTION WITH NO CORRECTION
C          FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
C
      CALL GRADY (B,PRF,BRF,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,22)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE APPROXIMATED RECONSTRUCTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
C        EVALUATE THE ATTENUATION FACTORS ASSUMING A CONSTANT
C          ATTENUATION COEFFICIENT
C
      XLEV=3.5
      ATENL=.075
C
      CALL EVATU (B,XLEV,ATENL)
C
C        RECONSTRUCTION OF THE TRANSVERSE SECTIONS FOR AN EMISSION SCAN
C          WHICH IS CORRECTED FOR ATTENUATION
C
      ISTP=15
      IRLX=1
      IERR=0
      IZER=0
C
      CALL GRADY (B,PRFA,BRFA,ISTP,IRLX,IERR,IZER)
C
      WRITE (LUNOUT,24)
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE CORRECTED RECONSTRUCTION
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,18)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,20) (B(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
      CLOSE (LUNOUT)
      CLOSE (LUNATN)
C
C
C
   18 FORMAT(1X///////)
   20 FORMAT(1X,15F5.1)
   22 FORMAT(1X//' THE APPROXIMATED RECONSTRUCTION FOR AN EMISSION SCA',
     1    'N')
   24 FORMAT(1X//' RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ',
     1    'ATTENUATION')
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 12
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A PHANTOM WITH A CIRCULAR ANNULUS AND A CENTRAL CIRCULAR SOURCE
C        WHICH IS ATTENUATED BY A CIRCULAR ATTENUATOR.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION ITYPE(4),Z(4),X1(4),Y1(4),A1(4),B1(4),PHI(4)
      DATA ITYPE/-1,1,1,1/
      DATA Z/.075,30.,-30.,30./
      DATA X1/0.,0.,0.,0./
      DATA Y1/0.,0.,0.,0./
      DATA A1/60.,60.,40.,20./
      DATA B1/60.,60.,40.,20./
      DATA PHI/0.,0.,0.,0./
C
      CALL PHANL (4,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	1		RECONSTRUCT IN A SQUARE ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	72		NUMBER OF PROJECTION ANGLES
5	5		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND 2*PI STARTING AT ZERO
6	100		NUMBER OF RAYS FOR EACH PROJECTION
7	0		EMISSION DATA
8	18000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	5		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	3		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED        72    (   110)

BLANK COMMON REQUIRED       144    (   220)

BLANK COMMON REQUIRED       216    (   330)

BLANK COMMON REQUIRED       416    (   640)

BLANK COMMON REQUIRED       480    (   740)

A TOTAL OF  92 (  5 THRU  96) OF THE 100 USER PROJECTION BINS WILL BE USED

 92 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=    480 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
 GGG  RRRR   AAA  DDDD  Y   Y
G   G R   R A   A D   D  Y Y
G     RRRR  A   A D   D   Y
G   GG R  R  AAAAA D   D   Y
 GGGG R   R A   A DDDD    Y


        PARAMETERS FOR SUBROUTINE GRADY

                DESCRIPTION

ISTP -      15    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO


BLANK COMMON REQUIRED       516    (  1004)


BLANK COMMON REQUIRED      1126    (  2146)


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      UNIFORM SQUARE           NO                NO
PRJ     PROJECTION          UNIFORM SQUARE           NO                NO


BLANK COMMON REQUIRED      1310    (  2436)


BLANK COMMON REQUIRED      5406    ( 12436)


BLANK COMMON REQUIRED      9502    ( 22436)


BLANK COMMON REQUIRED     13598    ( 32436)


BLANK COMMON REQUIRED     13630    ( 32476)


BLANK COMMON REQUIRED     13598    ( 32436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.392E+09
ITER  1     FCN   0.360E+08
ITER  2     FCN   0.102E+08
ITER  3     FCN   0.678E+07
ITER  4     FCN   0.497E+07
ITER  5     FCN   0.390E+07
ITER  6     FCN   0.315E+07
ITER  7     FCN   0.262E+07
ITER  8     FCN   0.223E+07
ITER  9     FCN   0.192E+07
ITER 10     FCN   0.168E+07
ITER 11     FCN   0.149E+07
ITER 12     FCN   0.133E+07
ITER 13     FCN   0.120E+07
ITER 14     FCN   0.109E+07
ITER 15     FCN   0.991E+06


BLANK COMMON REQUIRED     13414    ( 32146)


BLANK COMMON REQUIRED      9318    ( 22146)


BLANK COMMON REQUIRED      5222    ( 12146)

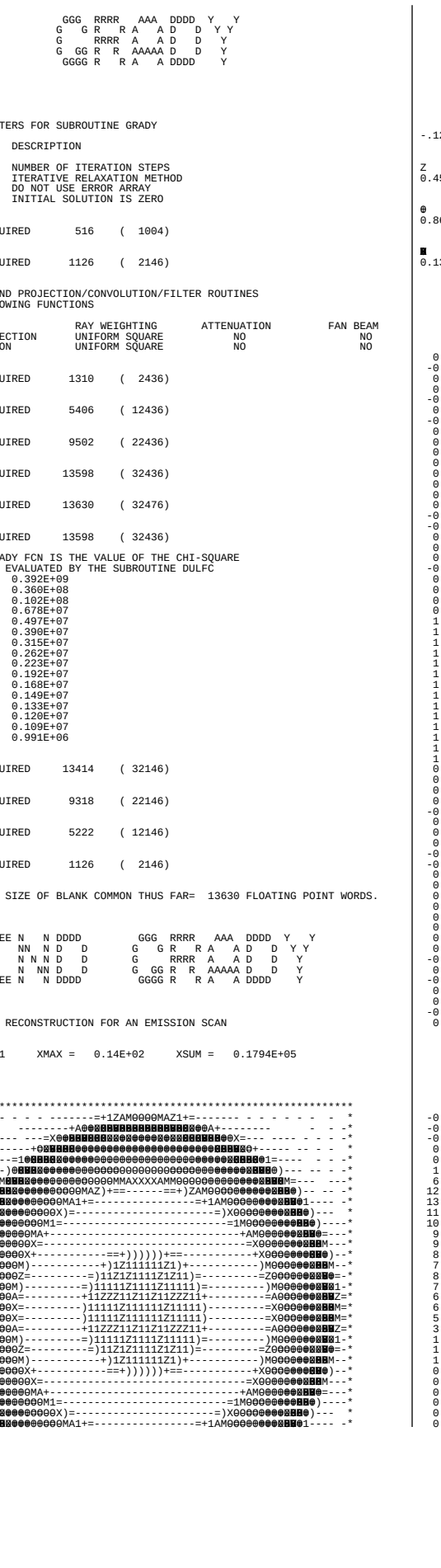

BLANK COMMON REQUIRED      1126    (  2146)

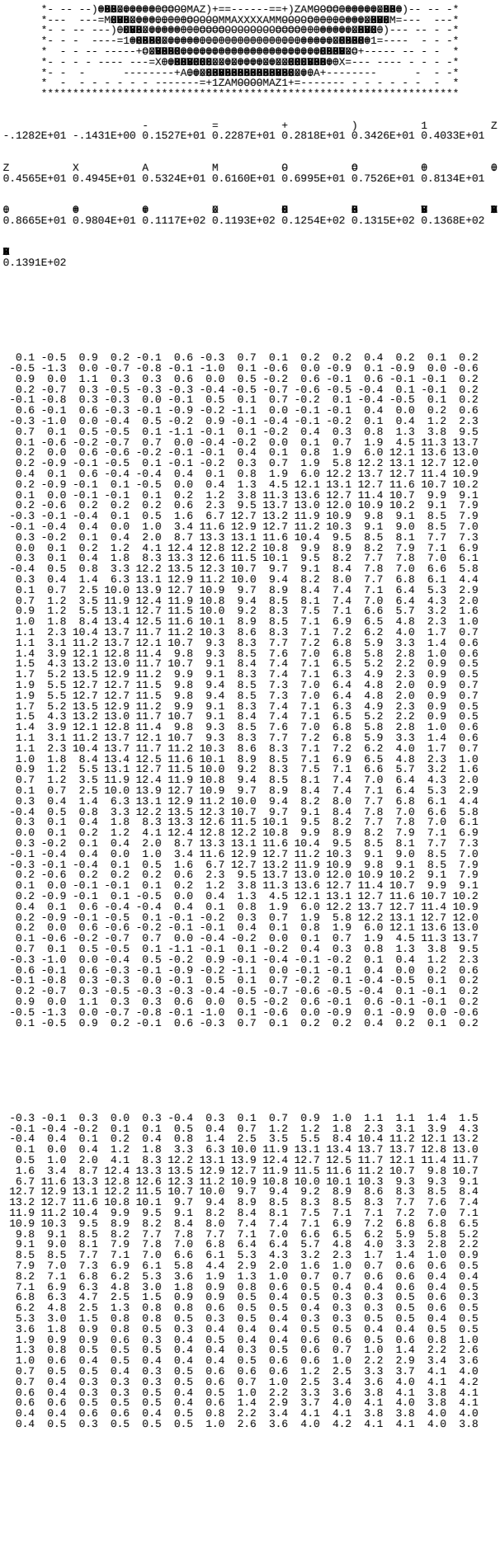

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=  13630 FLOATING POINT WORDS.


            EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
            E     NN  N D   D       G   G R   R A   A D   D  Y Y
            EEE   N N N D   D       G     RRRR  A   A D   D   Y
            E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
            EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y


THE APPROXIMATED RECONSTRUCTION FOR AN EMISSION SCAN

XMIN =  -0.13E+01     XMAX =   0.14E+02     XSUM =   0.1794E+05
```





```
                    -           =           +           )           1           Z
-.1282E+01 -.1431E+00 0.1527E+01 0.2287E+01 0.2818E+01 0.3426E+01 0.4033E+01

Z           X           A           M           0           0           0           0
0.4565E+01 0.4945E+01 0.5324E+01 0.6160E+01 0.6995E+01 0.7526E+01 0.8134E+01

0           0           0           8           8           8           9           9
0.8665E+01 0.9804E+01 0.1117E+02 0.1193E+02 0.1254E+02 0.1315E+02 0.1368E+02

9
0.1391E+02
```

0.5	0.5	0.3	0.4	0.6	0.6	1.3	3.0	3.8	3.9	3.9	4.0	3.9	3.9	4.0
0.6	0.3	0.3	0.4	0.5	0.7	1.6	3.1	3.7	3.8	3.9	3.9	3.9	4.2	3.9
0.6	0.3	0.3	0.4	0.5	0.7	1.6	3.1	3.7	3.8	3.9	3.9	3.9	4.2	3.9
0.5	0.5	0.3	0.4	0.6	0.6	1.3	3.0	3.8	3.9	3.9	4.0	3.9	3.9	4.0
0.4	0.5	0.3	0.5	0.5	0.5	1.0	2.6	3.6	4.0	4.2	4.1	4.1	4.0	3.8
0.4	0.4	0.6	0.6	0.4	0.5	0.8	2.2	3.4	4.1	4.1	3.8	3.8	4.0	4.0
0.6	0.6	0.5	0.5	0.5	0.4	0.6	1.4	2.9	3.7	4.0	4.1	4.0	3.8	4.1
0.6	0.4	0.3	0.3	0.5	0.4	0.5	1.0	2.2	3.3	3.6	3.8	4.1	3.8	4.1
0.7	0.4	0.3	0.3	0.3	0.5	0.6	0.7	1.0	2.5	3.4	3.6	4.0	4.1	4.2
0.7	0.5	0.5	0.4	0.3	0.5	0.6	0.6	0.6	1.2	2.5	3.3	3.7	4.1	4.0
1.0	0.6	0.4	0.5	0.4	0.4	0.4	0.5	0.6	0.6	1.0	2.2	2.9	3.4	3.6
1.3	0.8	0.5	0.5	0.5	0.4	0.4	0.3	0.5	0.6	0.7	1.0	1.4	2.2	2.6
1.9	0.9	0.9	0.6	0.3	0.4	0.5	0.4	0.4	0.6	0.6	0.5	0.6	0.8	1.0
3.6	1.8	0.9	0.8	0.5	0.3	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.5
5.3	3.0	1.5	0.8	0.8	0.5	0.3	0.5	0.4	0.3	0.3	0.5	0.5	0.4	0.5
6.2	4.8	2.5	1.3	0.8	0.8	0.6	0.5	0.5	0.4	0.3	0.3	0.5	0.6	0.5
6.8	6.3	4.7	2.5	1.5	0.9	0.9	0.5	0.4	0.5	0.3	0.3	0.5	0.6	0.3
7.1	6.9	6.3	4.8	3.0	1.8	0.9	0.8	0.6	0.5	0.4	0.4	0.6	0.4	0.5
8.2	7.1	6.8	6.2	5.3	3.6	1.9	1.3	1.0	0.7	0.7	0.6	0.6	0.4	0.4
7.9	7.0	7.3	6.9	6.1	5.8	4.4	2.9	2.0	1.6	1.0	0.7	0.6	0.6	0.5
8.5	8.5	7.7	7.1	7.0	6.6	6.1	5.3	4.3	3.2	2.3	1.7	1.4	1.0	0.9
9.1	9.0	8.1	7.9	7.8	7.0	6.8	6.4	6.4	5.7	4.8	4.0	3.3	2.8	2.2
9.8	9.1	8.5	8.2	7.7	7.8	7.7	7.1	7.0	6.6	6.5	6.2	5.9	5.8	5.2
10.9	10.3	9.5	8.9	8.2	8.4	8.0	7.4	7.4	7.1	6.9	7.2	6.8	6.8	6.5
11.9	11.2	10.4	9.9	9.5	9.1	8.2	8.4	8.1	7.5	7.1	7.1	7.2	7.0	7.1
13.2	12.7	11.6	10.8	10.1	9.7	9.4	8.9	8.5	8.3	8.5	8.3	7.7	7.6	7.4
12.7	12.9	13.1	12.2	11.5	10.7	10.0	9.7	9.4	9.2	8.9	8.6	8.3	8.5	8.4
6.7	11.6	13.3	12.8	12.6	12.3	11.2	10.9	10.8	10.0	10.1	10.3	9.3	9.3	9.1
1.6	3.4	8.7	12.4	13.3	13.5	12.9	12.7	11.9	11.5	11.6	11.2	10.7	9.8	10.7
0.5	1.0	2.0	4.1	8.3	12.2	13.1	13.9	12.4	12.7	12.5	11.7	12.1	11.4	11.7
0.1	0.0	0.4	1.2	1.8	3.3	6.3	10.0	11.9	13.1	13.4	13.7	13.7	12.8	13.0
-0.4	0.4	0.1	0.2	0.4	0.8	1.4	2.5	3.5	5.5	8.4	10.4	11.2	12.1	13.2
-0.1	-0.4	-0.2	0.1	0.1	0.5	0.4	0.7	1.2	1.2	1.8	2.3	3.1	3.9	4.3
-0.3	-0.1	0.3	0.0	0.3	-0.4	0.3	0.1	0.7	0.9	1.0	1.1	1.1	1.4	1.5

1.7	1.9	1.9	1.7	1.5	1.4	1.1	1.1	1.0	0.9	0.7	0.1	0.3	-0.4	0.3
5.2	5.5	5.5	5.2	4.3	3.9	3.1	2.3	1.8	1.2	1.2	0.7	0.4	0.5	0.1
13.5	12.7	12.7	13.5	13.2	12.1	11.2	10.4	8.4	5.5	3.5	2.5	1.4	0.8	0.4
12.9	12.7	12.7	12.9	13.0	12.8	13.7	13.7	13.4	13.1	11.9	10.0	6.3	3.3	1.8
11.2	11.5	11.5	11.2	11.7	11.4	12.1	11.7	12.5	12.7	12.4	13.9	13.1	12.2	8.3
9.9	9.8	9.8	9.9	10.7	9.8	10.7	11.2	11.6	11.5	11.9	12.7	12.9	13.5	13.3
9.1	9.4	9.4	9.1	9.1	9.3	9.3	10.3	10.1	10.0	10.8	10.9	11.2	12.3	12.6
8.3	8.5	8.5	8.3	8.4	8.5	8.3	8.6	8.9	9.2	9.4	9.7	10.0	10.7	11.5
7.4	7.3	7.3	7.4	7.4	7.6	7.7	8.3	8.5	8.3	8.5	8.9	9.4	9.7	10.1
7.1	7.0	7.0	7.1	7.1	7.0	7.2	7.1	7.1	7.5	8.1	8.4	8.2	9.1	9.5
6.3	6.4	6.4	6.3	6.5	6.8	6.8	7.2	6.9	7.1	7.4	7.4	8.0	8.4	8.2
4.9	4.8	4.8	4.9	5.2	5.8	5.9	6.2	6.5	6.6	7.0	7.1	7.7	7.8	7.7
2.3	2.0	2.0	2.3	2.2	2.8	3.3	4.0	4.8	5.7	6.4	6.4	6.8	7.0	7.8
0.9	0.9	0.9	0.9	0.9	1.0	1.4	1.7	2.3	3.2	4.3	5.3	6.1	6.6	7.0
0.5	0.7	0.7	0.5	0.5	0.6	0.6	0.7	1.0	1.6	2.0	2.9	4.4	5.8	6.1
0.5	0.6	0.6	0.5	0.4	0.4	0.6	0.6	0.7	0.7	1.0	1.3	1.9	3.6	5.3
0.5	0.3	0.3	0.5	0.5	0.4	0.6	0.4	0.4	0.5	0.6	0.8	0.9	1.8	3.0
0.3	0.3	0.3	0.3	0.3	0.6	0.5	0.3	0.3	0.5	0.4	0.5	0.9	0.9	1.5
0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.3	0.3	0.4	0.5	0.5	0.6	0.8	0.8
0.6	0.5	0.5	0.6	0.5	0.4	0.5	0.5	0.3	0.3	0.4	0.5	0.3	0.5	0.8
0.6	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.3	0.5
1.3	1.6	1.6	1.3	1.0	0.8	0.6	0.5	0.6	0.6	0.4	0.4	0.5	0.4	0.3
3.0	3.1	3.1	3.0	2.6	2.2	1.4	1.0	0.7	0.6	0.5	0.3	0.4	0.4	0.5
3.8	3.7	3.7	3.8	3.6	3.4	2.9	2.2	1.0	0.6	0.6	0.5	0.4	0.4	0.4
3.9	3.8	3.8	3.9	4.0	4.1	3.7	3.3	2.5	1.2	0.6	0.6	0.6	0.5	0.3
3.9	3.9	3.9	3.9	4.2	4.1	4.0	3.6	3.4	2.5	1.0	0.7	0.6	0.5	0.3
4.0	3.9	3.9	4.0	4.1	3.8	4.1	3.8	3.6	3.3	2.2	1.0	0.5	0.4	0.5
3.9	3.9	3.9	3.9	4.1	3.8	4.0	4.1	4.0	3.7	2.9	1.4	0.6	0.4	0.5
3.9	4.2	4.2	3.9	4.0	4.0	3.8	3.8	4.1	4.1	3.4	2.2	0.8	0.5	0.4
4.0	3.9	3.9	4.0	3.8	4.0	4.1	4.1	4.2	4.0	3.6	2.6	1.0	0.5	0.5
4.2	3.7	3.7	4.2	4.0	3.9	3.9	4.0	3.9	3.9	3.8	3.0	1.3	0.6	0.6
3.7	3.8	3.8	3.7	3.9	4.2	3.9	3.9	3.9	3.8	3.7	3.1	1.6	0.7	0.5
3.7	3.8	3.8	3.7	3.9	4.2	3.9	3.9	3.9	3.8	3.7	3.1	1.6	0.7	0.5
4.2	3.7	3.7	4.2	4.0	3.9	3.9	4.0	3.9	3.9	3.8	3.0	1.3	0.6	0.6
4.0	3.9	3.9	4.0	3.8	4.0	4.1	4.1	4.2	4.0	3.6	2.6	1.0	0.5	0.5
3.9	4.2	4.2	3.9	4.0	4.0	3.8	3.8	4.1	4.1	3.4	2.2	0.8	0.5	0.4
3.9	3.9	3.9	3.9	4.1	3.8	4.0	4.1	4.0	3.7	2.9	1.4	0.6	0.4	0.5
4.0	3.9	3.9	4.0	4.1	3.8	4.1	3.8	3.6	3.3	2.2	1.0	0.5	0.4	0.5
3.9	3.9	3.9	3.9	4.2	4.1	4.0	3.6	3.4	2.5	1.0	0.7	0.6	0.5	0.3
3.9	3.8	3.8	3.9	4.0	4.1	3.7	3.3	2.5	1.2	0.6	0.6	0.6	0.5	0.3
3.8	3.7	3.7	3.8	3.6	3.4	2.9	2.2	1.0	0.6	0.6	0.5	0.4	0.4	0.4
3.0	3.1	3.1	3.0	2.6	2.2	1.4	1.0	0.7	0.6	0.5	0.3	0.4	0.4	0.5
1.3	1.6	1.6	1.3	1.0	0.8	0.6	0.5	0.6	0.6	0.4	0.4	0.5	0.4	0.3
0.6	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.3	0.5
0.6	0.5	0.5	0.6	0.5	0.4	0.5	0.5	0.3	0.3	0.4	0.5	0.3	0.5	0.8
0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.3	0.3	0.4	0.5	0.5	0.6	0.8	0.8
0.3	0.3	0.3	0.3	0.3	0.6	0.5	0.3	0.3	0.5	0.4	0.5	0.9	0.9	1.5
0.5	0.3	0.3	0.5	0.5	0.4	0.6	0.4	0.4	0.5	0.6	0.8	0.9	1.8	3.0
0.5	0.6	0.6	0.5	0.4	0.4	0.6	0.6	0.7	0.7	1.0	1.3	1.9	3.6	5.3
0.5	0.7	0.7	0.5	0.5	0.6	0.6	0.7	1.0	1.6	2.0	2.9	4.4	5.8	6.1
0.9	0.9	0.9	0.9	0.9	1.0	1.4	1.7	2.3	3.2	4.3	5.3	6.1	6.6	7.0
2.3	2.0	2.0	2.3	2.2	2.8	3.3	4.0	4.8	5.7	6.4	6.4	6.8	7.0	7.8
4.9	4.8	4.8	4.9	5.2	5.8	5.9	6.2	6.5	6.6	7.0	7.1	7.7	7.8	7.7
6.3	6.4	6.4	6.3	6.5	6.8	6.8	7.2	6.9	7.1	7.4	7.4	8.0	8.4	8.2
7.1	7.0	7.0	7.1	7.1	7.0	7.2	7.1	7.1	7.5	8.1	8.4	8.2	9.1	9.5
7.4	7.3	7.3	7.4	7.4	7.6	7.7	8.3	8.5	8.3	8.5	8.9	9.4	9.7	10.1
8.3	8.5	8.5	8.3	8.4	8.5	8.3	8.6	8.9	9.2	9.4	9.7	10.0	10.7	11.5
9.1	9.4	9.4	9.1	9.1	9.3	9.3	10.3	10.1	10.0	10.8	10.9	11.2	12.3	12.6
9.9	9.8	9.8	9.9	10.7	9.8	10.7	11.2	11.6	11.5	11.9	12.7	12.9	13.5	13.3
11.2	11.5	11.5	11.2	11.7	11.4	12.1	11.7	12.5	12.7	12.4	13.9	13.1	12.2	8.3
12.9	12.7	12.7	12.9	13.0	12.8	13.7	13.7	13.4	13.1	11.9	10.0	6.3	3.3	1.8
13.5	12.7	12.7	13.5	13.2	12.1	11.2	10.4	8.4	5.5	3.5	2.5	1.4	0.8	0.4
5.2	5.5	5.5	5.2	4.3	3.9	3.1	2.3	1.8	1.2	1.2	0.7	0.4	0.5	0.1
1.7	1.9	1.9	1.7	1.5	1.4	1.1	1.1	1.0	0.9	0.7	0.1	0.3	-0.4	0.3

0.0	0.3	-0.1	-0.3	0.2	0.1	0.2	0.4	0.2	0.2	0.1	0.7	-0.3	0.6	-0.1
0.1	-0.2	-0.4	-0.1	-0.6	0.0	-0.9	0.1	-0.9	0.0	-0.6	0.1	-1.0	-0.1	-0.8
0.2	0.1	0.4	-0.4	0.2	-0.1	-0.1	0.6	-0.1	0.6	-0.2	0.5	0.0	0.6	0.3
1.2	0.4	0.0	0.1	0.2	-0.1	0.1	-0.4	-0.5	-0.6	-0.7	-0.5	-0.4	-0.3	-0.3
4.1	2.0	1.0	0.5	0.2	0.1	-0.5	-0.4	0.1	-0.2	0.7	0.1	0.5	-0.1	0.0
12.4	8.7	3.4	1.6	0.6	0.2	0.0	0.4	-0.1	-0.1	0.0	-1.1	-0.2	-0.9	-0.1
12.8	13.3	11.6	6.7	2.3	1.2	0.4	0.1	-0.2	-0.1	-0.4	-0.1	0.9	-0.2	0.5
12.2	13.1	12.9	12.7	9.5	3.8	1.3	0.8	0.3	0.4	-0.2	0.1	-0.1	-1.1	0.1
10.8	11.6	12.7	13.2	13.7	11.3	4.5	1.9	0.7	0.1	0.0	-0.2	-0.4	0.0	0.7
9.9	10.4	11.2	11.9	13.0	13.6	12.1	6.0	1.9	0.8	0.1	0.4	-0.1	-0.1	-0.2
8.9	9.5	10.3	10.9	12.0	12.7	13.1	12.2	5.8	1.9	0.7	0.3	-0.2	-0.1	0.1
8.2	8.5	9.1	9.8	10.9	11.4	12.7	13.7	12.2	6.0	1.9	0.8	0.1	0.4	-0.4
7.9	8.1	9.0	9.1	10.2	10.7	11.6	12.7	13.1	12.1	4.5	1.3	0.4	0.0	-0.5
7.1	7.7	8.5	8.5	9.1	9.9	10.7	11.4	12.7	13.6	11.3	3.8	1.2	0.2	0.1
6.9	7.3	7.0	7.9	7.9	9.1	10.2	10.9	12.0	13.0	13.7	9.5	2.3	0.6	0.2
6.2	6.8	7.1	8.2	7.9	8.5	9.1	9.8	10.9	11.9	13.2	12.7	6.7	1.6	0.5
4.8	6.3	6.9	7.1	7.0	8.5	9.0	9.1	10.3	11.2	12.7	12.9	11.6	3.4	1.0
2.5	4.7	6.3	6.8	7.3	7.7	8.1	8.5	9.5	10.4	11.6	13.1	13.3	8.7	2.0
1.3	2.5	4.8	6.2	6.9	7.1	7.9	8.2	8.9	9.9	10.8	12.2	12.8	12.4	4.1
0.8	1.5	3.0	5.3	6.1	7.0	7.8	7.7	8.2	9.5	10.1	11.5	12.6	13.3	8.3
0.8	0.9	1.8	3.6	5.8	6.6	7.0	7.8	8.4	9.1	9.7	10.7	12.3	13.5	12.2

0.6	0.9	0.9	1.9	4.4	6.1	6.8	7.7	8.0	8.2	9.4	10.0	11.2	12.9	13.1
0.5	0.5	0.8	1.3	2.9	5.3	6.4	7.1	7.4	8.4	8.9	9.7	10.9	12.7	13.9
0.5	0.4	0.6	1.0	2.0	4.3	6.4	7.0	7.4	8.1	8.5	9.4	10.8	11.9	12.4
0.4	0.5	0.5	0.7	1.6	3.2	5.7	6.6	7.1	7.5	8.3	9.2	10.0	11.5	12.7
0.3	0.3	0.4	0.7	1.0	2.3	4.8	6.5	6.9	7.1	8.5	8.9	10.1	11.6	12.5
0.3	0.3	0.4	0.6	0.7	1.7	4.0	6.2	7.2	7.1	8.3	8.6	10.3	11.2	11.7
0.5	0.5	0.6	0.6	0.6	1.4	3.3	5.9	6.8	7.2	7.7	8.3	9.3	10.7	12.1
0.6	0.6	0.4	0.4	0.6	1.0	2.8	5.8	6.8	7.0	7.6	8.5	9.3	9.8	11.4
0.5	0.3	0.5	0.4	0.5	0.9	2.2	5.2	6.5	7.1	7.4	8.4	9.1	10.7	11.7
0.4	0.3	0.5	0.5	0.5	0.9	2.3	4.9	6.3	7.1	7.4	8.3	9.1	9.9	11.2
0.4	0.3	0.3	0.6	0.7	0.9	2.0	4.8	6.4	7.0	7.3	8.5	9.4	9.8	11.5
0.4	0.3	0.3	0.6	0.7	0.9	2.0	4.8	6.4	7.0	7.3	8.5	9.4	9.8	11.5
0.4	0.3	0.5	0.5	0.5	0.9	2.3	4.9	6.3	7.1	7.4	8.3	9.1	9.9	11.2
0.5	0.3	0.5	0.4	0.5	0.9	2.2	5.2	6.5	7.1	7.4	8.4	9.1	10.7	11.7
0.6	0.6	0.4	0.4	0.6	1.0	2.8	5.8	6.8	7.0	7.6	8.5	9.3	9.8	11.4
0.5	0.5	0.6	0.6	0.6	1.4	3.3	5.9	6.8	7.2	7.7	8.3	9.3	10.7	12.1
0.3	0.3	0.4	0.6	0.7	1.7	4.0	6.2	7.2	7.1	8.3	8.6	10.3	11.2	11.7
0.3	0.3	0.4	0.7	1.0	2.3	4.8	6.5	6.9	7.1	8.5	8.9	10.1	11.6	12.5
0.4	0.5	0.5	0.7	1.6	3.2	5.7	6.6	7.1	7.5	8.3	9.2	10.0	11.5	12.7
0.5	0.4	0.6	1.0	2.0	4.3	6.4	7.0	7.4	8.1	8.5	9.4	10.8	11.9	12.4
0.5	0.5	0.8	1.3	2.9	5.3	6.4	7.1	7.4	8.4	8.9	9.7	10.9	12.7	13.9
0.6	0.9	0.9	1.9	4.4	6.1	6.8	7.7	8.0	8.2	9.4	10.0	11.2	12.9	13.1
0.8	0.9	1.8	3.6	5.8	6.6	7.0	7.8	8.4	9.1	9.7	10.7	12.3	13.5	12.2
0.8	1.5	3.0	5.3	6.1	7.0	7.8	7.7	8.2	9.5	10.1	11.5	12.6	13.3	8.3
1.3	2.5	4.8	6.2	6.9	7.1	7.9	8.2	8.9	9.9	10.8	12.2	12.8	12.4	4.1
2.5	4.7	6.3	6.8	7.3	7.7	8.1	8.5	9.5	10.4	11.6	13.1	13.3	8.7	2.0
4.8	6.3	6.9	7.1	7.0	8.5	9.0	9.1	10.3	11.2	12.7	12.9	11.6	3.4	1.0
6.2	6.8	7.1	8.2	7.9	8.5	9.1	9.8	10.9	11.9	13.2	12.7	6.7	1.6	0.5
6.9	7.3	7.0	7.9	7.9	9.1	10.2	10.9	12.0	13.0	13.7	9.5	2.3	0.6	0.2
7.1	7.7	8.5	8.5	9.1	9.9	10.7	11.4	12.7	13.6	11.3	3.8	1.2	0.2	0.1
7.9	8.1	9.0	9.1	10.2	10.7	11.6	12.7	13.1	12.1	4.5	1.3	0.4	0.0	-0.5
8.2	8.5	9.1	9.8	10.9	11.4	12.7	13.7	12.2	6.0	1.9	0.8	0.1	0.4	-0.4
8.9	9.5	10.3	10.9	12.0	12.7	13.1	12.2	5.8	1.9	0.7	0.3	-0.2	-0.1	0.1
9.9	10.4	11.2	11.9	13.0	13.6	12.1	6.0	1.9	0.8	0.1	0.4	-0.1	-0.1	-0.2
10.8	11.6	12.7	13.2	13.7	11.3	4.5	1.9	0.7	0.1	0.0	-0.2	-0.4	0.0	0.7
12.2	13.1	12.9	12.7	9.5	3.8	1.3	0.8	0.3	0.4	-0.2	0.1	-0.1	-1.1	0.1
12.8	13.3	11.6	6.7	2.3	1.2	0.4	0.1	-0.2	-0.1	-0.4	-0.1	0.9	-0.2	0.5
12.4	8.7	3.4	1.6	0.6	0.2	0.0	0.4	-0.1	-0.1	0.0	-1.1	-0.2	-0.9	-0.1
4.1	2.0	1.0	0.5	0.2	0.1	-0.5	-0.4	0.1	-0.2	0.7	0.1	0.5	-0.1	0.0
1.2	0.4	0.0	0.1	0.2	-0.1	0.1	-0.4	-0.5	-0.6	-0.7	-0.5	-0.4	-0.3	-0.3
0.2	0.1	0.4	-0.4	0.2	-0.1	-0.1	0.6	-0.1	0.6	-0.2	0.5	0.0	0.6	0.3
0.1	-0.2	-0.4	-0.1	-0.6	0.0	-0.9	0.1	-0.9	0.0	-0.6	0.1	-1.0	-0.1	-0.8
0.0	0.3	-0.1	-0.3	0.2	0.1	0.2	0.4	0.2	0.2	0.1	0.7	-0.3	0.6	-0.1

0.2	0.9	-0.5	0.1
-0.7	0.0	-1.3	-0.5
0.3	1.1	0.0	0.9
-0.5	0.3	-0.7	0.2
-0.3	0.3	-0.8	-0.1
-0.3	0.6	-0.1	0.6
-0.4	0.0	-1.0	-0.3
-0.5	0.5	0.1	0.7
-0.7	-0.2	-0.6	0.1
-0.6	0.6	0.0	0.2
-0.5	-0.1	-0.9	0.2
-0.4	0.6	0.1	0.4
0.1	-0.1	-0.9	0.2
-0.1	-0.1	0.0	0.1
0.2	0.2	-0.6	0.2
0.1	-0.4	-0.1	-0.3
0.0	0.4	-0.4	-0.1
0.4	0.1	-0.2	0.3
1.2	0.2	0.1	0.0
1.8	0.4	0.1	0.3
3.3	0.8	0.5	-0.4
6.3	1.4	0.4	0.3
10.0	2.5	0.7	0.1
11.9	3.5	1.2	0.7
13.1	5.5	1.2	0.9
13.4	8.4	1.8	1.0
13.7	10.4	2.3	1.1
13.7	11.2	3.1	1.1
12.8	12.1	3.9	1.4
13.0	13.2	4.3	1.5
12.9	13.5	5.2	1.7
12.7	12.7	5.5	1.9
12.7	12.7	5.5	1.9
12.9	13.5	5.2	1.7
13.0	13.2	4.3	1.5
12.8	12.1	3.9	1.4
13.7	11.2	3.1	1.1
13.7	10.4	2.3	1.1
13.4	8.4	1.8	1.0
13.1	5.5	1.2	0.9
11.9	3.5	1.2	0.7
10.0	2.5	0.7	0.1
6.3	1.4	0.4	0.3
3.3	0.8	0.5	-0.4
1.8	0.4	0.1	0.3
1.2	0.2	0.1	0.0
0.4	0.1	-0.2	0.3
0.0	0.4	-0.4	-0.1
0.1	-0.4	-0.1	-0.3
0.2	0.2	-0.6	0.2
-0.1	-0.1	0.0	0.1
0.1	-0.1	-0.9	0.2
-0.4	0.6	0.1	0.4
-0.5	-0.1	-0.9	0.2
-0.6	0.6	0.0	0.2
-0.7	-0.2	-0.6	0.1
-0.5	0.5	0.1	0.7
-0.4	0.0	-1.0	-0.3
-0.3	0.6	-0.1	0.6
-0.3	0.3	-0.8	-0.1
-0.5	0.3	-0.7	0.2
0.3	1.1	0.0	0.9
-0.7	0.0	-1.3	-0.5
0.2	0.9	-0.5	0.1

```
EEEEE V   V  AAA  TTTTT U   U
E     V   V A   A   T   U   U
EEE    V V  A   A   T   U   U
E      V V  AAAAA   T   U   U
EEEEE   V   A   A   T    UUU
```

PARAMETERS FOR SUBROUTINE EVATU

DESCRIPTION

XLEV - 3.500 THE TARGET-TO-NONTARGET RATIO
ATENL - 0.075 ATTENUATION COEFFICIENT

```
BLANK COMMON REQUIRED      5222    ( 12146)

BLANK COMMON REQUIRED      9318    ( 22146)

XMIN =   0.00E+00     XMAX =   0.75E-01     XSUM =   0.2268E+03
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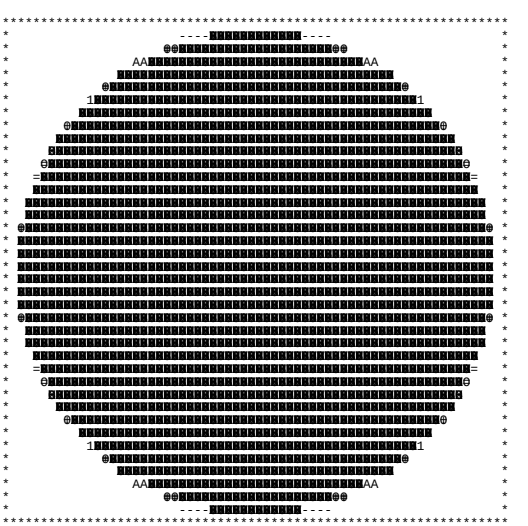

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                  -           =           +           )           1           Z
0.0000E+00 0.5625E-02 0.1387E-01 0.1762E-01 0.2025E-01 0.2325E-01 0.2625E-01

Z           X           A           M           Θ           Θ           Θ           Θ
0.2887E-01 0.3075E-01 0.3263E-01 0.3675E-01 0.4088E-01 0.4350E-01 0.4650E-01

Θ           Θ           Θ           Θ           Θ           Θ           Θ           Θ
0.4913E-01 0.5475E-01 0.6150E-01 0.6525E-01 0.6825E-01 0.7125E-01 0.7387E-01

Θ
0.7500E-01

BLANK COMMON REQUIRED      5222    ( 12146)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  13630 FLOATING POINT WORDS.


            EEEEE N   N DDDD        EEEEE V   V  AAA  TTTTT U   U
            E     NN  N D   D       E     V   V A   A   T   U   U
            EEE   N N N D   D       EEE    V V  A   A   T   U   U
            E     N  NN D   D       E      V V  AAAAA   T   U   U
            EEEEE N   N DDDD        EEEEE   V   A   A   T    UUU


             GGG  RRRR   AAA  DDDD  Y   Y
            G   G R   R A   A D   D  Y Y
            G     RRRR  A   A D   D   Y
            G  GG R  R  AAAAA D   D   Y
             GGGG R   R A   A DDDD    Y


          PARAMETERS FOR SUBROUTINE GRADY

                DESCRIPTION

ISTP -      15    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       0    DO NOT USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      UNIFORM SQUARE           YES                NO
PRJ     PROJECTION          UNIFORM SQUARE           YES                NO


BLANK COMMON REQUIRED      5406    ( 12436)

BLANK COMMON REQUIRED      9502    ( 22436)

BLANK COMMON REQUIRED     13598    ( 32436)

BLANK COMMON REQUIRED     17694    ( 42436)

BLANK COMMON REQUIRED     17726    ( 42476)

BLANK COMMON REQUIRED     17694    ( 42436)

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.392E+09
ITER  1     FCN   0.609E+08
ITER  2     FCN   0.179E+08
ITER  3     FCN   0.102E+08
ITER  4     FCN   0.648E+07
ITER  5     FCN   0.451E+07
ITER  6     FCN   0.328E+07
ITER  7     FCN   0.250E+07
ITER  8     FCN   0.197E+07
ITER  9     FCN   0.161E+07
ITER 10     FCN   0.135E+07
ITER 11     FCN   0.116E+07
ITER 12     FCN   0.101E+07
ITER 13     FCN   0.893E+06
ITER 14     FCN   0.800E+06
ITER 15     FCN   0.723E+06

BLANK COMMON REQUIRED     17510    ( 42146)

BLANK COMMON REQUIRED     13414    ( 32146)

BLANK COMMON REQUIRED      9318    ( 22146)

BLANK COMMON REQUIRED      5222    ( 12146)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  17726 FLOATING POINT WORDS.


            EEEEE N   N DDDD         GGG  RRRR   AAA  DDDD  Y   Y
            E     NN  N D   D       G   G R   R A   A D   D  Y Y
            EEE   N N N D   D       G     RRRR  A   A D   D   Y
            E     N  NN D   D       G  GG R  R  AAAAA D   D   Y
            EEEEE N   N DDDD         GGGG R   R A   A DDDD    Y


RECONSTRUCTION FOR THE EMISSION SCAN CORRECTED FOR ATTENUATION

XMIN =  -0.51E+01     XMAX =   0.36E+02     XSUM =   0.6106E+05
```

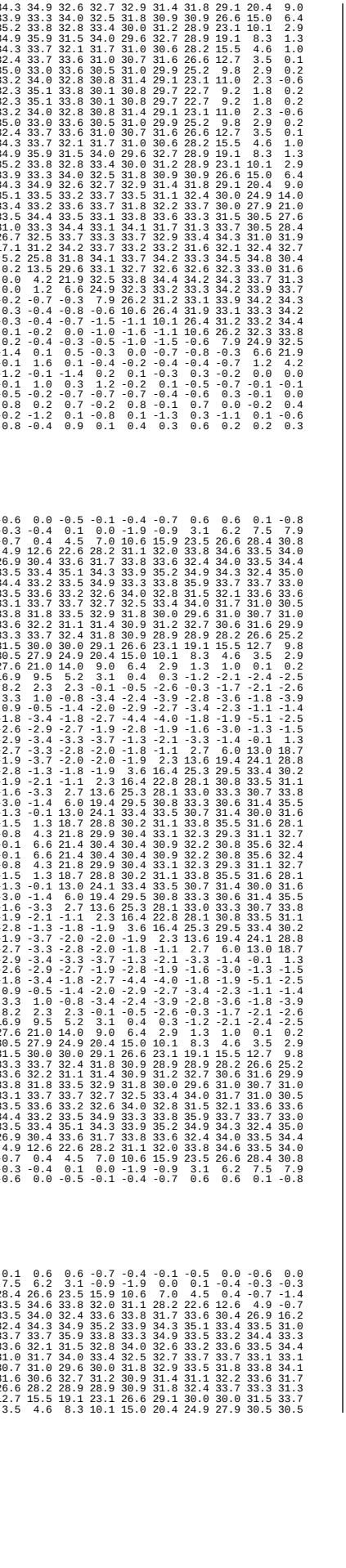
```
                  -           =           +           )           1           Z
-.5107E+01 -.2034E+01 0.2474E+01 0.4523E+01 0.5957E+01 0.7596E+01 0.9235E+01

Z           X           A           M           Θ           Θ           Θ           Θ
0.1067E+02 0.1169E+02 0.1272E+02 0.1497E+02 0.1723E+02 0.1866E+02 0.2030E+02

Θ           Θ           Θ           Θ           Θ           Θ           Θ           Θ
0.2173E+02 0.2481E+02 0.2850E+02 0.3054E+02 0.3218E+02 0.3382E+02 0.3526E+02

Θ
0.3587E+02
```

```
 0.3 -0.7  1.3  0.0  0.1  0.8 -0.4  0.9  0.1  0.4  0.3  0.6  0.2  0.2  0.3
-0.7 -1.6  0.0 -1.2 -0.8 -0.2 -1.2  0.1 -0.8  0.1 -1.3  0.3 -1.1  0.1 -0.6
 1.3  0.0  1.5  0.2  0.6  0.8  0.2  0.7 -0.2  0.8 -0.1  0.7  0.0 -0.2  0.4
 0.0 -1.2  0.2 -1.0 -0.4 -0.5 -0.2 -0.7 -0.7 -0.7 -0.4 -0.6  0.3 -0.1  0.0
 0.1 -0.8  0.6 -0.4  0.3 -0.1  1.0  0.3  1.2 -0.2  0.1 -0.5 -0.7 -0.1 -0.1
 0.8 -0.2  0.8 -0.5 -0.1 -1.2 -0.1 -1.4  0.2  0.1 -0.3  0.3 -0.2  0.0  0.0
-0.4 -1.2  0.2 -0.2  1.0 -0.1  1.6  0.1 -0.4 -0.2 -0.4 -0.4 -0.7  1.2  4.2
 0.9  0.1  0.7 -0.7  0.3 -1.4  0.1  0.5 -0.3  0.0 -0.7 -0.8 -0.3  6.6 21.9
 0.1 -0.8 -0.2 -0.7  1.2  0.2 -0.4 -0.3 -0.5 -1.0 -1.5 -0.6  7.9 24.9 32.5
 0.4  0.1  0.8 -0.7 -0.2  0.1 -0.2  0.0 -1.0 -1.6 -1.1 10.6 26.2 32.3 33.8
 0.3 -1.3 -0.1 -0.4  0.1 -0.3 -0.4 -0.7 -1.5 -1.1 10.1 26.4 31.2 33.2 34.4
 0.6  0.3  0.7 -0.6 -0.5  0.3 -0.4 -0.8 -0.6 10.6 26.4 31.9 33.1 33.3 34.2
 0.2 -1.1  0.0  0.3 -0.7 -0.2 -0.7 -0.3  7.9 26.2 31.2 33.1 33.9 34.2 34.3
 0.2  0.1 -0.2 -0.1 -0.1  0.0  1.2  6.6 24.9 32.3 33.2 33.3 34.2 33.9 33.7
 0.3 -0.6  0.4  0.0 -0.1  0.0  4.2 21.9 32.5 33.8 34.4 34.2 34.3 33.7 31.3
 0.0  0.0 -0.4 -0.3 -0.9  0.2 13.5 29.6 33.1 32.7 32.6 32.6 32.3 33.0 31.6
 0.1 -0.3  0.3 -1.2 -1.0  5.2 25.8 31.8 34.1 33.7 34.2 33.3 34.5 34.8 30.4
 0.7 -0.4 -0.6 -1.5 -0.6 17.1 31.2 34.2 33.7 33.2 33.2 31.6 32.1 32.4 32.7
-0.2 -0.2 -1.0 -1.1  5.9 26.7 32.5 33.7 33.3 33.7 32.9 33.4 34.3 31.0 31.9
 0.0 -0.3 -1.4 -0.7 16.2 31.0 33.3 34.4 33.1 34.1 31.7 31.3 33.7 30.5 28.4
-0.6 -0.3 -0.7  4.9 26.9 33.5 34.4 33.5 33.1 33.8 33.6 33.3 31.5 30.5 27.6
 0.0 -0.4  0.4 12.6 30.4 33.4 33.2 33.6 33.7 31.8 32.2 33.7 30.0 27.9 21.0
-0.5  0.1  4.5 22.6 33.6 35.1 33.5 33.2 33.7 33.5 31.1 32.4 30.0 24.9 14.0
```



```
-0.5  0.8 -0.2  0.8
-0.2  0.2 -1.2 -0.4
-0.7  0.7  0.1  0.9
-0.7 -0.2 -0.8  0.1
-0.7  0.8  0.1  0.4
-0.4 -0.1 -1.3  0.3
-0.6  0.7  0.3  0.6
 0.3  0.0 -1.1  0.2
-0.1 -0.2  0.1  0.2
 0.0  0.4 -0.6  0.3
-0.3 -0.4  0.0  0.0
-1.2  0.3 -0.3  0.1
-1.5 -0.6 -0.4  0.7
-1.1 -1.0 -0.2 -0.2
-0.7 -1.4 -0.3  0.0
 4.9 -0.7 -0.3 -0.6
12.6  0.4 -0.4  0.0
22.6  4.5  0.1 -0.5
28.2  7.0  0.0 -0.1
31.1 10.6 -1.9 -0.4
32.0 15.9 -0.9 -0.7
33.8 23.5  3.1  0.6
34.6 26.6  6.2  0.6
33.5 28.4  7.5  0.1
34.0 30.8  7.9 -0.8
33.7 31.2  9.4 -1.4
33.5 29.7 10.2 -1.3
33.5 29.7 10.2 -1.3
33.7 31.2  9.4 -1.4
34.0 30.8  7.9 -0.8
33.5 28.4  7.5  0.1
34.6 26.6  6.2  0.6
33.8 23.5  3.1  0.6
32.0 15.9 -0.9 -0.7
31.1 10.6 -1.9 -0.4
28.2  7.0  0.0 -0.1
22.6  4.5  0.1 -0.5
12.6  0.4 -0.4  0.0
 4.9 -0.7 -0.3 -0.6
-0.7 -1.4 -0.3  0.0
-1.1 -1.0 -0.2 -0.2
-1.5 -0.6 -0.4  0.7
-1.2  0.3 -0.3  0.1
-0.3 -0.4  0.0  0.0
 0.0  0.4 -0.6  0.3
-0.1 -0.2  0.1  0.2
 0.3  0.0 -1.1  0.2
-0.6  0.7  0.3  0.6
-0.4 -0.1 -1.3  0.3
-0.7  0.8  0.1  0.4
-0.7 -0.2 -0.8  0.1
-0.7  0.7  0.1  0.9
-0.2  0.2 -1.2 -0.4
-0.5  0.8 -0.2  0.8
-0.4  0.6 -0.8  0.1
-1.0  0.2 -1.2  0.0
 0.2  1.5  0.0  1.3
-1.2  0.0 -1.6 -0.7
 0.0  1.3 -0.7  0.3
```

EX13

```
      PROGRAM XMARR
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 13
C
C             THE PROGRAM XMARR RECONSTRUCTS PROJECTION DATA FOR A RING
C        DETECTOR USING THE ALGORITHM DEVELOPED BY MARR FOR REPRESENTING
C        THE RECONSTRUCTED IMAGE AS AN EXPANSION OF ORTHOGONAL
C        POLYNOMIALS.
C
      DIMENSION B(4096)
      COMMON/BLANK/WORK(3000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=64
      ICIR=0
      IGEOM=3
      NANG=64
      MODANG=5
      KDIMU=100
      IMIT=1
      NWORK=3000
      NFLOAT=2
      ISTORE=0
      IPRINT=7
      LUNATN=0
      PI=4.*ATAN(1.)
      PWID=NANG/(PI*NDIMU)
      AXISU=50.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E13.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
      NDEG=62
      CALL MARR (B,NDEG)
C
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT OF THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,14)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,16) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   14 FORMAT(1X///////)
   16 FORMAT(1X,15F5.1)
      END
      SUBROUTINE GETUM (M,D,E)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 13
C
C             THIS GETUM SUBROUTINE GENERATES PROJECTION DATA FOR A RING
C        DETECTOR OF A CHEST PHANTOM CONSISTING OF A HEART, LUNGS AND
C        SURROUNDING TISSUE.
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DIMENSION D(*),E(*),B2(4096)
      DIMENSION A(4),B(4),X(4),Y(4),Z(4),PHI(4),ITYPE(4)
      DATA NPHAN/4/
      DATA A/40.,10.,14.,14./
      DATA B/40.,10.,10.,10./
      DATA X/0.,0.,10.,-10./
      DATA Y/0.,-10.,0.,0./
      DATA Z/5.,27.,-4.,-4./
      DATA PHI/0.,0.,0.,0./
      DATA ITYPE/1,1,1,1/
C
      DATA IFLG/0/
C
      IF (IFLG.EQ.0) THEN
          IFLG=1
          PI=4.*ATAN(1.)
          PHI(3)=PI/2.
          PHI(4)=PI/2.
C
C        SCALE PHANTOM PARAMETERS TO SIZE OF RING
C
          FAC=NDIMU/64.*PWID
          DO 10 I=1,NPHAN
              A(I)=A(I)*FAC
              B(I)=B(I)*FAC
              X(I)=X(I)*FAC
   10         Y(I)=Y(I)*FAC
C
          IF (IMIT.EQ.0) THEN
              PWIDTH=-PWID
          ELSE
              PWIDTH=PWID
          ENDIF
          CALL PHAN (NPHAN,10,ITYPE,Z,X,Y,A,B,PHI,B2,NDIMU,PWIDTH)
          CALL ARRAY (B2,NDIMU)
C
      ENDIF
C
      CALL PHANL (NPHAN,ITYPE,Z,X,Y,A,B,PHI,D,M)
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	64		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0	NA	NOT APPLICABLE (RING GEOMETRY)
3	3		GEOMETRY FLAG RING DETECTOR GEOMETRY
4	64		NUMBER OF PROJECTION ANGLES (EQUAL TO NUMBER OF CRYSTALS)
5	5	NA	NOT APPLICABLE (RING GEOMETRY)
6	100	NA	NOT APPLICABLE (RING GEOMETRY)
7	1		TRANSMISSION DATA
8	3000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	7		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT PROJECTION DATA AND UNCERTAINTIES PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0	NA	NOT APPLICABLE (RING GEOMETRY)

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	0.318		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	50.500	NA	NOT APPLICABLE (RING GEOMETRY)
3	0.000	NA	NOT APPLICABLE (RING GEOMETRY)

```
BLANK COMMON REQUIRED       128    (   200)

BLANK COMMON REQUIRED       256    (   400)

BLANK COMMON REQUIRED       384    (   600)

BLANK COMMON REQUIRED       512    (  1000)

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=    512 FLOATING POINT WORDS.
```

```
EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
E     NN  N D   D       S     E       T   U   U P   P
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D           S E       T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P
```

```
M   M  AAA  RRRR  RRRR
MM MM A   A R   R R   R
M M M A   A RRRR  RRRR
M   M AAAAA R  R  R  R
M   M A   A R   R R   R
```

PARAMETERS FOR SUBROUTINE MARR

		DESCRIPTION
NXTAL -	64	NUMBER OF CRYSTALS

```
NDEG  -     62    DEGREE OF THE POLYNOMIAL


BLANK COMMON REQUIRED      2528    (  4740)


BLANK COMMON REQUIRED      2656    (  5140)


BLANK COMMON REQUIRED      2718    (  5236)


BLANK COMMON REQUIRED      2780    (  5334)


BLANK COMMON REQUIRED      2812    (  5374)

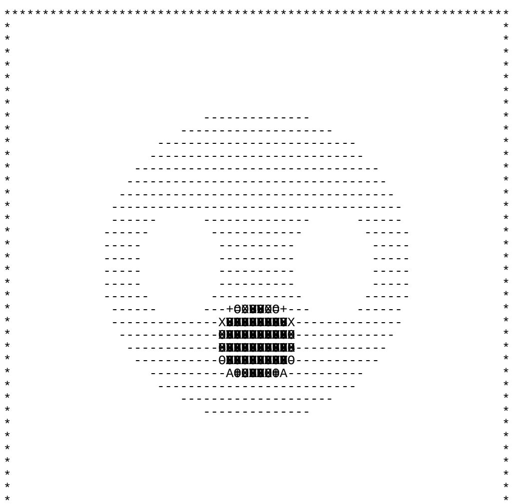

BLANK COMMON REQUIRED      2844    (  5434)
```

```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    3.142
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                 X         Y         A         B        PHI      DENS
      1   - EL@)@)     0.00 ,     5.00
                       (   0.00),(   0.00)(  40.00),(  40.00)          (   1.59)
      1   - EL  @ @     0.00 ,    27.00
                       (   0.00),( -10.00)(  10.00),(  10.00)          (   8.59)
      1   - EL@ @ @     1.57 ,    -4.00
                       (  10.00),(   0.00)(  14.00),(  10.00)          (  -1.27)
      1   - EL  @ @     1.57 ,    -4.00
                       ( -10.00),(   0.00)(  14.00),(  10.00)          (  -1.27)
```

```
EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
E     NN  N D   D       P   P H   H A   A NN  N
EEE   N N N D   D       PPPP  HHHHH A   A N N N
E     N  NN D   D       P     H   H AAAAA N  NN
EEEEE N   N DDDD        P     H   H A   A N   N
```

```
XMIN =   0.00E+00     XMAX =   0.10E+02     XSUM =   0.2395E+04
```



```
                   -          =          +          )          1          Z
0.0000E+00 0.7639E+00 0.1884E+01 0.2394E+01 0.2750E+01 0.3158E+01 0.3565E+01

Z          X          A          M          θ          θ          ⊕          ⊕
0.3922E+01 0.4176E+01 0.4431E+01 0.4991E+01 0.5551E+01 0.5908E+01 0.6315E+01

⊕          ⊕          ⊕          ⊠          ■          ■          ■          ■
0.6672E+01 0.7436E+01 0.8352E+01 0.8862E+01 0.9269E+01 0.9677E+01 0.1003E+02

■
0.1019E+02
```

```
BLANK COMMON REQUIRED      2876    (  5474)

RING DATA FOR DETECTORS SPACED   1 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   2 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   3 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   4 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   5 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   6 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   7 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   8 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED   9 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00

RING DATA FOR DETECTORS SPACED  10 APART
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
     0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
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      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  11 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  12 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  13 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  14 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  15 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  16 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  17 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  18 APART
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
      0.000E+00   0.000E+00   0.000E+00   0.000E+00

 RING DATA FOR DETECTORS SPACED  19 APART
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01   0.189E+01
      0.189E+01   0.189E+01   0.189E+01   0.189E+01

 RING DATA FOR DETECTORS SPACED  20 APART
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01   0.286E+01
      0.286E+01   0.286E+01   0.286E+01   0.286E+01

 RING DATA FOR DETECTORS SPACED  21 APART
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01   0.355E+01
      0.355E+01   0.355E+01   0.355E+01   0.355E+01

 RING DATA FOR DETECTORS SPACED  22 APART
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01   0.410E+01
      0.410E+01   0.410E+01   0.410E+01   0.410E+01

 RING DATA FOR DETECTORS SPACED  23 APART
      0.456E+01   0.456E+01   0.456E+01   0.456E+01   0.456E+01
      0.456E+01   0.456E+01   0.456E+01   0.456E+01   0.456E+01
      0.456E+01   0.456E+01   0.456E+01   0.456E+01   0.423E+01
      0.392E+01   0.373E+01   0.358E+01   0.348E+01   0.341E+01
      0.338E+01   0.338E+01   0.341E+01   0.348E+01   0.358E+01
      0.373E+01   0.392E+01   0.423E+01   0.456E+01   0.456E+01
      0.456E+01   0.456E+01   0.769E+01   0.896E+01   0.966E+01
      0.101E+02   0.102E+02   0.102E+02   0.101E+02   0.966E+01
      0.896E+01   0.769E+01   0.456E+01   0.456E+01   0.456E+01
      0.456E+01   0.423E+01   0.392E+01   0.373E+01   0.358E+01
      0.348E+01   0.341E+01   0.338E+01   0.338E+01   0.341E+01
      0.348E+01   0.358E+01   0.373E+01   0.392E+01   0.423E+01
      0.456E+01   0.456E+01   0.456E+01   0.456E+01

 RING DATA FOR DETECTORS SPACED  24 APART
      0.494E+01   0.494E+01   0.494E+01   0.494E+01   0.494E+01
      0.494E+01   0.494E+01   0.494E+01   0.494E+01   0.494E+01
      0.494E+01   0.447E+01   0.419E+01   0.399E+01   0.383E+01
      0.370E+01   0.359E+01   0.350E+01   0.343E+01   0.339E+01
      0.338E+01   0.339E+01   0.343E+01   0.350E+01   0.359E+01
      0.370E+01   0.383E+01   0.399E+01   0.419E+01   0.809E+01
      0.102E+02   0.111E+02   0.117E+02   0.121E+02   0.123E+02
      0.124E+02   0.125E+02   0.124E+02   0.123E+02   0.121E+02
      0.117E+02   0.111E+02   0.102E+02   0.809E+01   0.419E+01
      0.399E+01   0.383E+01   0.370E+01   0.359E+01   0.350E+01
      0.343E+01   0.339E+01   0.338E+01   0.339E+01   0.343E+01
      0.350E+01   0.359E+01   0.370E+01   0.383E+01   0.399E+01
      0.419E+01   0.447E+01   0.494E+01   0.494E+01

 RING DATA FOR DETECTORS SPACED  25 APART
      0.526E+01   0.526E+01   0.526E+01   0.526E+01   0.526E+01
      0.526E+01   0.526E+01   0.526E+01   0.497E+01   0.459E+01
      0.437E+01   0.420E+01   0.406E+01   0.393E+01   0.383E+01
      0.374E+01   0.366E+01   0.360E+01   0.356E+01   0.354E+01
      0.354E+01   0.356E+01   0.360E+01   0.366E+01   0.374E+01
      0.383E+01   0.616E+01   0.897E+01   0.104E+02   0.114E+02
      0.122E+02   0.129E+02   0.134E+02   0.135E+02   0.136E+02
      0.136E+02   0.136E+02   0.136E+02   0.135E+02   0.134E+02
      0.129E+02   0.122E+02   0.114E+02   0.104E+02   0.897E+01
      0.616E+01   0.383E+01   0.374E+01   0.366E+01   0.360E+01
      0.356E+01   0.354E+01   0.354E+01   0.356E+01   0.360E+01
      0.366E+01   0.374E+01   0.383E+01   0.393E+01   0.406E+01
      0.420E+01   0.437E+01   0.459E+01   0.497E+01

 RING DATA FOR DETECTORS SPACED  26 APART
      0.507E+01   0.553E+01   0.553E+01   0.553E+01   0.553E+01
      0.553E+01   0.507E+01   0.477E+01   0.458E+01   0.443E+01
      0.430E+01   0.420E+01   0.410E+01   0.402E+01   0.395E+01
      0.390E+01   0.385E+01   0.383E+01   0.381E+01   0.380E+01
      0.381E+01   0.383E+01   0.385E+01   0.390E+01   0.736E+01
      0.963E+01   0.109E+02   0.118E+02   0.123E+02   0.127E+02
      0.130E+02   0.132E+02   0.135E+02   0.139E+02   0.139E+02
      0.139E+02   0.139E+02   0.139E+02   0.135E+02   0.132E+02
      0.130E+02   0.127E+02   0.123E+02   0.118E+02   0.109E+02
      0.963E+01   0.736E+01   0.390E+01   0.385E+01   0.383E+01
      0.381E+01   0.380E+01   0.381E+01   0.383E+01   0.385E+01
      0.390E+01   0.395E+01   0.402E+01   0.410E+01   0.420E+01
      0.430E+01   0.443E+01   0.458E+01   0.477E+01

 RING DATA FOR DETECTORS SPACED  27 APART
      0.496E+01   0.523E+01   0.576E+01   0.576E+01   0.523E+01
      0.496E+01   0.478E+01   0.464E+01   0.453E+01   0.444E+01
      0.436E+01   0.430E+01   0.425E+01   0.421E+01   0.419E+01
      0.418E+01   0.418E+01   0.419E+01   0.419E+01   0.419E+01
      0.419E+01   0.418E+01   0.817E+01   0.102E+02   0.114E+02
      0.121E+02   0.125E+02   0.128E+02   0.129E+02   0.129E+02
      0.128E+02   0.127E+02   0.127E+02   0.129E+02   0.133E+02
      0.133E+02   0.129E+02   0.127E+02   0.127E+02   0.128E+02
      0.129E+02   0.129E+02   0.128E+02   0.125E+02   0.121E+02
      0.114E+02   0.102E+02   0.817E+01   0.418E+01   0.419E+01
      0.419E+01   0.419E+01   0.419E+01   0.418E+01   0.418E+01
      0.419E+01   0.421E+01   0.425E+01   0.430E+01   0.436E+01
      0.444E+01   0.453E+01   0.464E+01   0.478E+01

 RING DATA FOR DETECTORS SPACED  28 APART
      0.495E+01   0.511E+01   0.481E+01   0.511E+01   0.495E+01
      0.482E+01   0.473E+01   0.465E+01   0.459E+01   0.454E+01
      0.451E+01   0.450E+01   0.451E+01   0.453E+01   0.458E+01
      0.464E+01   0.471E+01   0.476E+01   0.478E+01   0.476E+01
      0.904E+01   0.109E+02   0.120E+02   0.126E+02   0.129E+02
      0.129E+02   0.128E+02   0.126E+02   0.123E+02   0.119E+02
      0.115E+02   0.111E+02   0.109E+02   0.108E+02   0.104E+02
      0.108E+02   0.109E+02   0.111E+02   0.115E+02   0.119E+02
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     0.123E+02   0.126E+02   0.128E+02   0.129E+02   0.129E+02
     0.126E+02   0.120E+02   0.109E+02   0.904E+01   0.476E+01
     0.478E+01   0.476E+01   0.471E+01   0.464E+01   0.458E+01
     0.453E+01   0.451E+01   0.450E+01   0.451E+01   0.454E+01
     0.459E+01   0.465E+01   0.473E+01   0.482E+01

RING DATA FOR DETECTORS SPACED  29 APART
     0.438E+01   0.424E+01   0.424E+01   0.438E+01   0.488E+01
     0.481E+01   0.477E+01   0.474E+01   0.473E+01   0.474E+01
     0.477E+01   0.484E+01   0.495E+01   0.511E+01   0.534E+01
     0.569E+01   0.608E+01   0.608E+01   0.106E+02   0.125E+02
     0.132E+02   0.135E+02   0.135E+02   0.134E+02   0.130E+02
     0.125E+02   0.118E+02   0.110E+02   0.101E+02   0.894E+01
     0.760E+01   0.488E+01   0.438E+01   0.424E+01   0.424E+01
     0.438E+01   0.488E+01   0.760E+01   0.894E+01   0.101E+02
     0.110E+02   0.118E+02   0.125E+02   0.130E+02   0.134E+02
     0.135E+02   0.135E+02   0.132E+02   0.125E+02   0.106E+02
     0.608E+01   0.608E+01   0.569E+01   0.534E+01   0.511E+01
     0.495E+01   0.484E+01   0.477E+01   0.474E+01   0.473E+01
     0.474E+01   0.477E+01   0.481E+01   0.488E+01

RING DATA FOR DETECTORS SPACED  30 APART
     0.397E+01   0.394E+01   0.397E+01   0.407E+01   0.429E+01
     0.488E+01   0.489E+01   0.491E+01   0.497E+01   0.508E+01
     0.524E+01   0.553E+01   0.617E+01   0.617E+01   0.617E+01
     0.617E+01   0.110E+02   0.127E+02   0.138E+02   0.144E+02
     0.146E+02   0.145E+02   0.142E+02   0.129E+02   0.117E+02
     0.103E+02   0.831E+01   0.491E+01   0.489E+01   0.488E+01
     0.429E+01   0.407E+01   0.397E+01   0.394E+01   0.397E+01
     0.407E+01   0.429E+01   0.488E+01   0.489E+01   0.491E+01
     0.831E+01   0.103E+02   0.117E+02   0.129E+02   0.142E+02
     0.145E+02   0.146E+02   0.144E+02   0.138E+02   0.127E+02
     0.110E+02   0.617E+01   0.617E+01   0.617E+01   0.617E+01
     0.553E+01   0.524E+01   0.508E+01   0.497E+01   0.491E+01
     0.489E+01   0.488E+01   0.429E+01   0.407E+01

RING DATA FOR DETECTORS SPACED  31 APART
     0.380E+01   0.380E+01   0.384E+01   0.394E+01   0.411E+01
     0.440E+01   0.511E+01   0.523E+01   0.545E+01   0.591E+01
     0.623E+01   0.623E+01   0.623E+01   0.754E+01   0.113E+02
     0.129E+02   0.139E+02   0.145E+02   0.147E+02   0.145E+02
     0.141E+02   0.133E+02   0.121E+02   0.103E+02   0.591E+01
     0.545E+01   0.523E+01   0.511E+01   0.440E+01   0.411E+01
     0.394E+01   0.384E+01   0.380E+01   0.380E+01   0.384E+01
     0.394E+01   0.411E+01   0.440E+01   0.511E+01   0.523E+01
     0.545E+01   0.591E+01   0.103E+02   0.121E+02   0.133E+02
     0.141E+02   0.145E+02   0.147E+02   0.145E+02   0.139E+02
     0.129E+02   0.113E+02   0.754E+01   0.623E+01   0.623E+01
     0.623E+01   0.591E+01   0.545E+01   0.523E+01   0.511E+01
     0.440E+01   0.411E+01   0.394E+01   0.384E+01

RING DATA FOR DETECTORS SPACED  32 APART
     0.375E+01   0.377E+01   0.383E+01   0.394E+01   0.411E+01
     0.439E+01   0.487E+01   0.625E+01   0.625E+01   0.625E+01
     0.625E+01   0.906E+01   0.117E+02   0.131E+02   0.140E+02
     0.145E+02   0.147E+02   0.145E+02   0.140E+02   0.131E+02
     0.117E+02   0.906E+01   0.625E+01   0.625E+01   0.625E+01
     0.625E+01   0.487E+01   0.439E+01   0.411E+01   0.394E+01
     0.383E+01   0.377E+01


BLANK COMMON REQUIRED       860    (  1534)


BLANK COMMON REQUIRED       732    (  1334)


BLANK COMMON REQUIRED       670    (  1236)


BLANK COMMON REQUIRED       608    (  1140)


BLANK COMMON REQUIRED       576    (  1100)


BLANK COMMON REQUIRED       544    (  1040)


         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   2876 FLOATING POINT WORDS.


                EEEEE N   N DDDD        M   M  AAA  RRRR  RRRR
                E     NN  N D   D       MM MM A   A R   R R   R
                EEE   N N N D   D       M M M A   A RRRR  RRRR
                E     N  NN D   D       M   M AAAAA R  R  R  R
                EEEEE N   N DDDD        M   M A   A R   R R   R


XMIN =  -0.57E+00     XMAX =   0.12E+02     XSUM =   0.2386E+04
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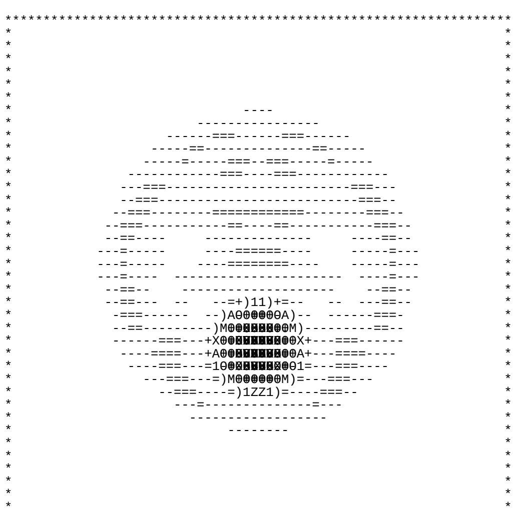

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       ******************************************************************


                    -            =            +            )            1            Z
-.5668E+00 0.3438E+00 0.1679E+01 0.2286E+01 0.2711E+01 0.3197E+01 0.3683E+01

Z          X          A          M          Θ          Θ          ⊕          ⊕
0.4108E+01 0.4411E+01 0.4715E+01 0.5382E+01 0.6050E+01 0.6475E+01 0.6961E+01

⊕          ⊕          ⊕          ⊠          ⊠          ■          ■          ■
0.7386E+01 0.8296E+01 0.9389E+01 0.9996E+01 0.1048E+02 0.1097E+02 0.1139E+02

■
0.1157E+02
```

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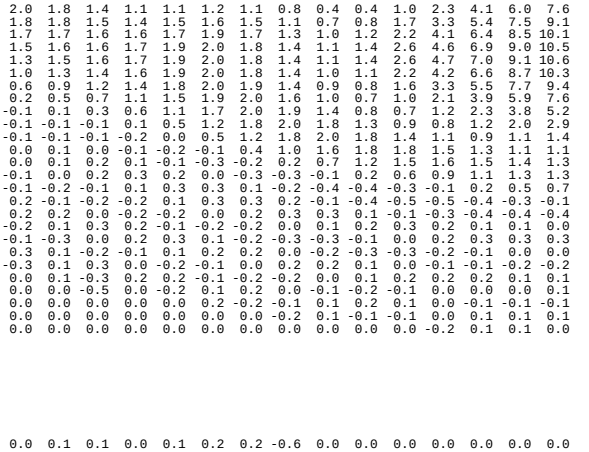
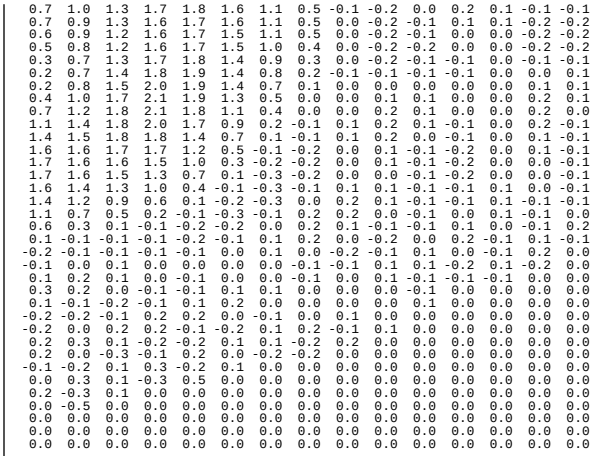
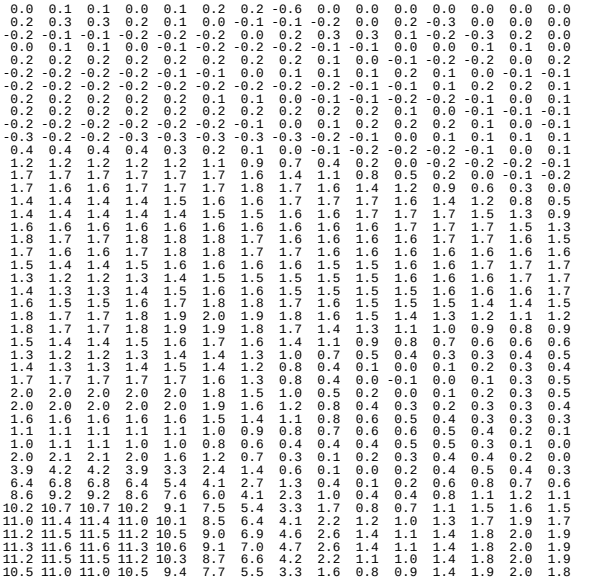
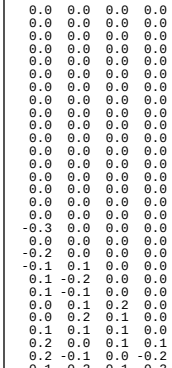
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.1  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.2  0.1  0.1  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.2  0.0 -0.1  0.0  0.1  0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.1 -0.1  0.0  0.1  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2  0.1 -0.1 -0.1  0.0  0.0 -0.1 -0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.0 -0.1  0.0  0.0 -0.1 -0.1  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.0  0.1  0.1 -0.1 -0.2 -0.1  0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.1  0.0 -0.1 -0.1  0.0  0.1
  0.0  0.0  0.0  0.0  0.0 -0.1  0.0  0.0  0.1  0.1  0.0  0.0  0.1  0.1  0.0
  0.0  0.0  0.0  0.0  0.1  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.1  0.0 -0.2
  0.0  0.0  0.0 -0.3 -0.1  0.1 -0.1 -0.1  0.0  0.0  0.0  0.1  0.1  0.0 -0.2
  0.0  0.0  0.0  0.0  0.1  0.0 -0.1  0.0  0.0  0.0  0.0  0.1  0.1 -0.1 -0.1
  0.0  0.0  0.0 -0.2  0.2 -0.1 -0.1  0.1  0.0 -0.1  0.0  0.1  0.0 -0.1  0.1
  0.0  0.0  0.1 -0.1  0.0 -0.2  0.1  0.1 -0.1 -0.1  0.0  0.0  0.0  0.0  0.2
  0.0  0.0 -0.2  0.1 -0.1 -0.1  0.1  0.0 -0.2 -0.1  0.0  0.0 -0.1  0.0  0.5
  0.0  0.0 -0.1  0.1 -0.2  0.0  0.1 -0.1 -0.1  0.0  0.1  0.0 -0.1  0.1  0.7
  0.0  0.2  0.1  0.0 -0.1  0.1  0.0 -0.1 -0.1  0.1  0.1 -0.1 -0.1  0.3  1.0
  0.0  0.1  0.2  0.0  0.0  0.1  0.0 -0.1  0.0  0.1  0.0 -0.1  0.0  0.6  1.3
  0.0  0.1  0.1  0.1  0.1  0.1  0.0  0.0  0.1  0.1 -0.1 -0.1  0.2  0.9  1.6
  0.1  0.1  0.0  0.2  0.1  0.0  0.0  0.1  0.1  0.0 -0.1  0.0  0.5  1.2  1.8
 -0.2  0.0 -0.1  0.2  0.1  0.0  0.1  0.2  0.1 -0.1 -0.1  0.2  0.8  1.4  1.9
 -0.3 -0.1 -0.2  0.1  0.0 -0.1  0.1  0.2  0.0 -0.2 -0.1  0.3  1.0  1.6  1.9
 -0.2 -0.2 -0.2  0.0 -0.1 -0.1  0.1  0.2  0.0 -0.2 -0.1  0.5  1.1  1.6  1.8
 -0.1 -0.2 -0.2  0.0 -0.2 -0.2  0.1  0.1 -0.1 -0.2  0.0  0.5  1.1  1.6  1.7
 -0.1 -0.1 -0.1  0.0 -0.2 -0.2  0.0  0.0 -0.1 -0.2  0.0  0.5  1.1  1.5  1.7
  0.0  0.0  0.0  0.0 -0.2 -0.2  0.0  0.0 -0.2 -0.2  0.0  0.4  1.0  1.5  1.7
  0.0  0.1  0.1  0.1 -0.1 -0.1  0.0 -0.1 -0.1 -0.2  0.0  0.3  0.9  1.4  1.8
  0.1  0.0  0.1  0.1  0.1  0.0  0.0 -0.1 -0.1 -0.1 -0.1  0.2  0.8  1.4  1.9
  0.2  0.0  0.1  0.0  0.1  0.1  0.0  0.0  0.0  0.0  0.0  0.1  0.7  1.4  1.9
  0.2 -0.1  0.1 -0.1  0.1  0.2  0.0  0.0  0.1  0.1  0.0  0.0  0.5  1.3  1.9
 -0.4 -0.2  0.1 -0.2  0.0  0.2  0.0  0.0  0.1  0.2  0.0  0.0  0.4  1.1  1.8
  0.0 -0.2  0.2 -0.1 -0.1  0.2  0.0 -0.1  0.1  0.2  0.1 -0.1  0.2  0.9  1.7
  0.0 -0.1  0.2  0.0 -0.1  0.1  0.0 -0.1  0.0  0.2  0.1 -0.1  0.1  0.7  1.4
  0.0  0.2  0.1  0.1 -0.1  0.1  0.0 -0.2 -0.1  0.1  0.0 -0.2 -0.1  0.5  1.2
  0.0 -0.2 -0.1  0.1 -0.1  0.0  0.0 -0.2 -0.1  0.1  0.0 -0.2 -0.2  0.3  1.0
  0.0  0.0 -0.2  0.0 -0.1  0.0  0.0 -0.2 -0.1  0.0  0.0 -0.2 -0.3  0.1  0.7
  0.0  0.0  0.0 -0.1 -0.1  0.0  0.1 -0.1 -0.1  0.1  0.1 -0.1 -0.3 -0.1  0.4
  0.0  0.0  0.0 -0.1 -0.1 -0.1  0.1 -0.1 -0.1  0.1  0.2  0.0 -0.3 -0.2  0.1
  0.0  0.0  0.0 -0.1  0.0 -0.1  0.1  0.0 -0.1  0.0  0.2  0.2 -0.1 -0.3 -0.1
  0.0  0.0  0.0  0.2  0.2 -0.1  0.0  0.1 -0.1 -0.1  0.1  0.2  0.0 -0.2 -0.2
  0.0  0.0  0.0  0.0 -0.1  0.1 -0.1  0.2  0.0 -0.2  0.0  0.2  0.1 -0.1 -0.2
  0.0  0.0  0.0  0.0  0.0  0.2 -0.1  0.0  0.1 -0.1 -0.2  0.0  0.1  0.0 -0.1
  0.0  0.0  0.0  0.0  0.0 -0.2  0.1 -0.2  0.1  0.1 -0.1 -0.1  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0 -0.1 -0.1 -0.1  0.1  0.0 -0.1  0.0  0.0 -0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.1  0.0  0.0  0.0  0.1  0.1 -0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.0  0.0  0.0  0.0  0.2  0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.0 -0.1  0.0  0.2
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1 -0.1  0.2  0.1 -0.2 -0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.2 -0.2  0.1  0.1 -0.2
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.2 -0.2  0.0  0.2
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1 -0.2
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
```

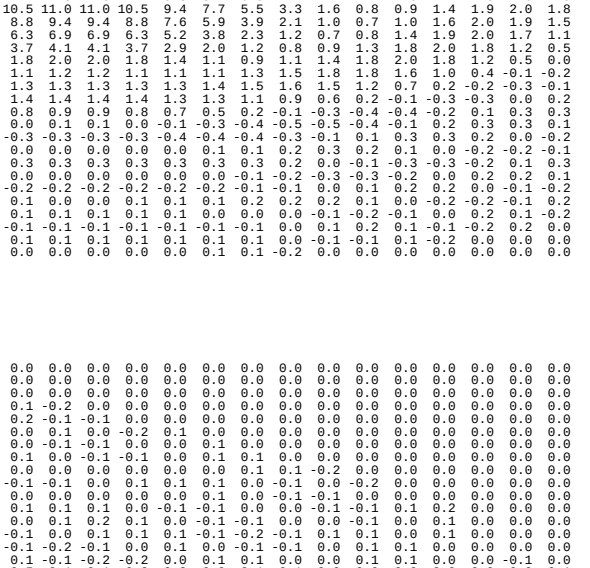
```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.6  0.2  0.2  0.1
  0.0  0.0  0.0  0.0  0.0  0.0  0.0 -0.3  0.2  0.0 -0.2 -0.1 -0.1  0.0  0.1
  0.0  0.0  0.0  0.0  0.0  0.2 -0.3 -0.2  0.1  0.3  0.3  0.2  0.0 -0.2 -0.2
  0.0  0.0 -0.2  0.1  0.0  0.1  0.1  0.0  0.0 -0.1 -0.1 -0.2 -0.2 -0.2 -0.1
  0.0 -0.1 -0.1  0.2  0.2  0.0 -0.2 -0.2 -0.1  0.0  0.1  0.2  0.2  0.2  0.2
 -0.2  0.0  0.1  0.0 -0.1 -0.1  0.0  0.1  0.2  0.1  0.1  0.1  0.0 -0.1 -0.1
  0.0 -0.1 -0.1  0.0  0.1  0.2  0.2  0.1 -0.1 -0.1 -0.2 -0.2 -0.2 -0.2 -0.2
 -0.1 -0.1  0.0  0.1  0.1  0.0 -0.1 -0.2 -0.2 -0.1 -0.1  0.0  0.1  0.1  0.2
  0.0  0.0  0.0  0.0 -0.1 -0.1 -0.1  0.0  0.1  0.2  0.2  0.2  0.2  0.2  0.2
  0.1  0.0 -0.1 -0.1 -0.1  0.0  0.1  0.2  0.2  0.2  0.1  0.0 -0.1 -0.2 -0.2
  0.0  0.0  0.0  0.0  0.1  0.1  0.1  0.1  0.0 -0.1 -0.2 -0.3 -0.3 -0.3 -0.3
  0.0  0.1  0.1  0.1  0.1  0.0 -0.1 -0.2 -0.2 -0.2 -0.1  0.0  0.1  0.2  0.3
  0.1  0.2  0.1  0.0 -0.1 -0.2 -0.2 -0.2  0.0  0.2  0.4  0.7  0.9  1.1  1.2
  0.1  0.1  0.0 -0.1 -0.2 -0.1  0.0  0.2  0.5  0.8  1.1  1.4  1.6  1.7  1.7
  0.0 -0.1 -0.2 -0.1  0.0  0.3  0.6  0.9  1.2  1.4  1.6  1.7  1.8  1.7  1.7
 -0.2 -0.2 -0.1  0.1  0.5  0.8  1.2  1.4  1.6  1.7  1.7  1.7  1.6  1.6  1.5
 -0.2 -0.1  0.1  0.5  0.9  1.3  1.5  1.7  1.7  1.7  1.6  1.6  1.5  1.5  1.4
 -0.1  0.1  0.5  0.9  1.3  1.5  1.7  1.7  1.7  1.6  1.6  1.6  1.6  1.6  1.6
  0.1  0.5  0.9  1.2  1.5  1.6  1.7  1.7  1.6  1.6  1.6  1.6  1.7  1.8  1.8
  0.4  0.9  1.2  1.5  1.6  1.6  1.6  1.6  1.6  1.6  1.6  1.7  1.7  1.8  1.8
  0.7  1.2  1.6  1.7  1.7  1.7  1.7  1.6  1.6  1.5  1.5  1.6  1.6  1.6  1.6
  1.1  1.6  1.8  1.8  1.7  1.7  1.6  1.6  1.6  1.5  1.5  1.5  1.5  1.5  1.4
  1.4  1.8  2.0  1.9  1.7  1.6  1.6  1.6  1.5  1.5  1.5  1.5  1.6  1.6  1.5
  1.7  2.0  2.0  1.7  1.5  1.4  1.4  1.5  1.5  1.5  1.6  1.7  1.8  1.8  1.7
  1.8  2.0  1.8  1.5  1.2  1.1  1.2  1.3  1.4  1.5  1.6  1.8  1.9  2.0  1.9
  1.9  1.9  1.5  1.1  0.9  0.8  0.9  1.0  1.1  1.3  1.4  1.7  1.8  1.9  1.9
  1.9  1.7  1.3  0.9  0.6  0.6  0.6  0.7  0.8  0.9  1.1  1.4  1.6  1.7  1.6
  1.9  1.6  1.1  0.7  0.5  0.4  0.3  0.3  0.4  0.5  0.7  1.0  1.3  1.4  1.4
  1.8  1.4  1.0  0.7  0.4  0.3  0.2  0.1  0.0  0.1  0.4  0.8  1.2  1.4  1.5
  1.7  1.3  1.0  0.7  0.5  0.3  0.1  0.0 -0.1  0.0  0.4  0.8  1.3  1.6  1.7
  1.6  1.3  0.9  0.7  0.5  0.3  0.2  0.1  0.0  0.2  0.5  1.0  1.5  1.8  2.0
  1.6  1.2  0.9  0.6  0.4  0.3  0.3  0.2  0.3  0.4  0.8  1.2  1.6  1.9  2.0
  1.6  1.2  0.8  0.5  0.3  0.3  0.3  0.4  0.5  0.6  0.8  1.1  1.4  1.5  1.6
  1.7  1.3  0.7  0.3  0.1  0.2  0.4  0.5  0.6  0.6  0.7  0.8  0.9  1.0  1.1
  1.8  1.4  0.7  0.2  0.0  0.1  0.3  0.5  0.5  0.4  0.4  0.4  0.6  0.8  1.0
  2.0  1.5  0.8  0.2  0.0  0.2  0.4  0.4  0.3  0.2  0.1  0.3  0.7  1.2  1.6
  2.1  1.7  1.0  0.4  0.3  0.4  0.5  0.4  0.2  0.0  0.1  0.6  1.4  2.4  3.3
  2.1  1.8  1.2  0.7  0.6  0.7  0.8  0.6  0.2  0.1  0.4  1.3  2.7  4.1  5.4
```

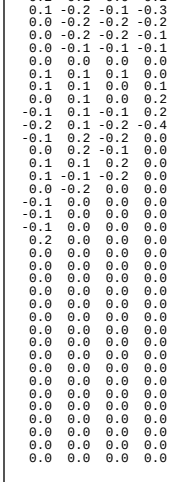


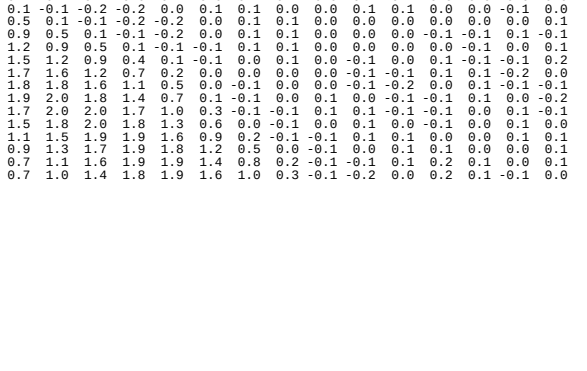












EX14

```
      PROGRAM XENTPY
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 14
C
C             THE PROGRAM XENTPY RECONSTRUCTS PARALLEL BEAM PROJECTION
C        DATA BY MAXIMIZING THE ENTROPY OF THE RECONSTRUCTED IMAGE.
C
      DIMENSION B(441),AG(4)
      COMMON/BLANK/WORK(1500)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BRF,PRF
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=21
      ICIR=0
      IGEOM=0
      NANG=4
      MODANG=4
      KDIMU=25
      IMIT=1
      NWORK=1500
      NFLOAT=2
      ISTORE=0
      IPRINT=23
      LUNATN=0
      PWID=1.
      AXISU=13.
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E14.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
      LIMITX=1000
      ERENTX=.000001
C
      CALL ENTPY (B,PRF,BRF,LIMITX,ERENTX)
C
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
         WRITE (LUNOUT,14)
         KK2=MIN(15*K,NDIMU)
         DO 10 J=1,NDIMU
            ISUB1=NMAT-J*NDIMU+KK1
            ISUB2=NMAT-J*NDIMU+KK2
   10       WRITE (LUNOUT,16) (B(I),I=ISUB1,ISUB2)
   12    KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   14 FORMAT(1X///////)
   16 FORMAT(1X,15F5.1)
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 14
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        A CIRCULAR PHANTOM WITH TWO RECTANGULAR HOLES.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION B(441)
      DIMENSION ITYPE(3),X1(3),Y1(3),A1(3),B1(3),PHI(3),Z(3)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL PRF
C
      DATA ITYPE/1,2,2/
      DATA X1/0.,-3.,2./
      DATA Y1/0.,0.,-2./
      DATA A1/20.,3.,5./
      DATA B1/20.,7.,3./
      DATA PHI/0.,0.,0./
      DATA Z/20.,-15.,-15./
      DATA NPHAN,INTG/3,10/
C
      IF (M.EQ.1) THEN
          IF (IMIT.EQ.0) THEN
              PWIDTH=-PWID
          ELSE
              PWIDTH=PWID
          ENDIF
          CALL PHAN (NPHAN,INTG,ITYPE,Z,X1,Y1,A1,B1,PHI,B,NDIMU,PWIDTH)
          CALL ARRAY (B,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE PHANTOM
C
          NMAT=NDIMU**2
          KK1=1
          KU=NDIMU/15+1
          DO 12 K=1,KU
              WRITE (LUNOUT,16)
              KK2=MIN(15*K,NDIMU)
              DO 10 J=1,NDIMU
                  ISUB1=NMAT-J*NDIMU+KK1
                  ISUB2=NMAT-J*NDIMU+KK2
   10             WRITE (LUNOUT,18) (B(I),I=ISUB1,ISUB2)
   12         KK1=KK2+1
C
      ENDIF
C
      CALL PJECT (B,DATA,M,PRF)
C
      RETURN
C
C
C
   16 FORMAT(1X///////)
   18 FORMAT(1X,15F5.1)
      END
```

```
                         SSS  EEEEE TTTTT U   U PPPP
                        S     E       T   U   U P   P
                         SSS  EEE     T   U   U PPPP
                            S E       T   U   U P
                        SSS  EEEEE   T    UUU  P
```

```
          INTEGER PARAMETER ARRAY  (IPAR)

 I   IPAR(I)      DESCRIPTION

 1        21      LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
 2         0      RECONSTRUCT IN A CIRCULAR ARRAY
 3         0      GEOMETRY FLAG
                  PARALLEL BEAM GEOMETRY
 4         4      NUMBER OF PROJECTION ANGLES
 5         4      MODE FOR PROJECTION ANGLE INPUT  (SEE FOLLOWING LINES)
                  ANGLES GENERATED BETWEEN ZERO AND PI
                  STARTING AT ZERO
 6        25      NUMBER OF RAYS FOR EACH PROJECTION
 7         1      TRANSMISSION DATA
 8      1500      DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
 9         2      NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10         0      EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11        23      PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES)
                  PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED
                  PRINT PROJECTION DATA AND UNCERTAINTIES
                  PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
                  PRINT VALUES FOR THE LAGRANGE MULTIPLIERS AND THE GRADIENT
                    FOR THE FUNCTION OF LAGRANGE MULTIPLIERS FOR THE ENTROPY
                    RECONSTRUCTION
12         0      LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE
```

```
          FLOATING POINT PARAMETER ARRAY  (PAR)

 I    PAR(I)      DESCRIPTION

 1     1.000      PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
 2    13.000      LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
 3     0.000  NA  NOT APPLICABLE  (NOT FAN BEAM GEOMETRY)
 4     0.000  NA  CONSTANT ATTENUATION COEFFICIENT IN UNITS
                  OF INVERSE PROJECTION BIN WIDTHS


BLANK COMMON REQUIRED         4    (     4)


BLANK COMMON REQUIRED         8    (    10)


BLANK COMMON REQUIRED        12    (    14)


BLANK COMMON REQUIRED        62    (    76)


BLANK COMMON REQUIRED        83    (   123)

A TOTAL OF  25 (  1 THRU  25) OF THE  25 USER PROJECTION BINS WILL BE USED


 25 PROJECTION BINS WILL BE USED OF WHICH   0 HAVE BEEN ZEROED BY THE PROGRAM


         MAXIMUM SIZE OF BLANK COMMON THUS FAR=     83 FLOATING POINT WORDS.
```

```
            EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
            E     NN  N D   D       S     E       T   U   U P   P
```

```
EEE   N N N D   D        SSS  EEE     T   U   U PPPP
E     N  NN D   D         S E        T   U   U P
EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


EEEEE N   N TTTTT PPPP  Y   Y
E     NN  N   T   P   P  Y Y
EEE   N N N   T   PPPP    Y
E     N  NN   T   P       Y
EEEEE N   N   T   P       Y


        PARAMETERS FOR SUBROUTINE ENTPY

              DESCRIPTION

LIMITX -     1000  MAXIMUM NUMBER OF ITERATIONS ALLOWED TO MAXIMIZE THE
                     OBJECTIVE FUNCTION FOR THE DUAL PROGRAM
ERENTX -  0.1E-05  TEST VALUE REPRESENTING THE THE EXPECTED ABSOLUTE ERROR


BLANK COMMON REQUIRED        85    (   125)


BLANK COMMON REQUIRED       207    (   317)


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      UNIFORM SQUARE          NO                  NO
PRJ     PROJECTION          UNIFORM SQUARE          NO                  NO


BLANK COMMON REQUIRED       332    (   514)


BLANK COMMON REQUIRED       681    (  1251)


BLANK COMMON REQUIRED       781    (  1415)


BLANK COMMON REQUIRED       881    (  1561)


BLANK COMMON REQUIRED       981    (  1725)


BLANK COMMON REQUIRED      1181    (  2235)


                        PPPP  H   H  AAA  N   N
                        P   P H   H A   A NN  N
                        PPPP  HHHHH A   A N N N
                        P     H   H AAAAA N  NN
                        P     H   H A   A N   N



PHANTOM GENERATED
  ARRAY SIZE   21 X  21   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    3
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE              X         Y         A         B       PHI      DENS
      1   - EL@4@4     0.00 ,   20.00
                     (   0.00),(   0.00)(  20.00),(  20.00)         (  20.00)
      2   - RE  @ @      0.00 ,  -15.00
                     (  -3.00),(   0.00)(   3.00),(   7.00)         ( -15.00)
      2   - RE@ @ @      0.00 ,  -15.00
                     (   2.00),(  -2.00)(   5.00),(   3.00)         ( -15.00)


              EEEEE N   N DDDD        PPPP  H   H  AAA  N   N
              E     NN  N D   D       P   P H   H A   A NN  N
              EEE   N N N D   D       PPPP  HHHHH A   A N N N
              E     N  NN D   D       P     H   H AAAAA N  NN
              EEEEE N   N DDDD        P     H   H A   A N   N


XMIN =   0.00E+00     XMAX =   0.20E+02     XSUM =   0.5746E+04


                        **********************
                        *     +@@@@@@@@@@+     *
                        *   M@@@@@@@@@@@@@M    *
                        *  @@@@@@@@@@@@@@@@@   *
                        * @@@@@@@@@@@@@@@@@@@  *
                        *=@@@@@+++@@@@@@@@@@=*
                        *M@@@@@+++@@@@@@@@@@M*
                        *M@@@@@+++@XXXXX@@@@@M*
                        *=@@@@@+++@+++++@@@@@=*
                        * @@@@@@@@@@@@@@@@@@@ *
                        *  @@@@@@@@@@@@@@@@@  *
                        *   M@@@@@@@@@@@@@M    *
                        *     +@@@@@@@@@@+     *
                        **********************

                -       =       +       )       1       Z
0.0000E+00 0.1500E+01 0.3700E+01 0.4700E+01 0.5400E+01 0.6200E+01 0.7000E+01

Z       X       A       M       @       @       @       @
0.7700E+01 0.8200E+01 0.8700E+01 0.9800E+01 0.1090E+02 0.1160E+02 0.1240E+02

@       @       @       @       @       @       @       @       @
0.1310E+02 0.1460E+02 0.1640E+02 0.1740E+02 0.1820E+02 0.1900E+02 0.1970E+02

@
0.2000E+02
```

```
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  1.2  5.8  9.0 10.0  9.0  5.8  1.2  0.0
 0.0  0.0  0.0  0.0  0.0  3.4 13.2 19.6 20.0 20.0 20.0 20.0 20.0 19.6 13.2
 0.0  0.0  0.0  0.2  9.8 19.6 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  0.0  0.2 12.8 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  0.0  9.8 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  3.4 19.6 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0 13.2 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 1.2 19.6 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0 20.0 20.0 20.0 20.0 20.0
 5.8 20.0 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0 20.0 20.0 20.0 20.0 20.0
 9.0 20.0 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0 20.0 20.0 20.0 20.0 20.0
10.0 20.0 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0 20.0 20.0 20.0 20.0 20.0
 9.0 20.0 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0  5.0  5.0  5.0  5.0  5.0
 5.8 20.0 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0  5.0  5.0  5.0  5.0  5.0
 1.2 19.6 20.0 20.0 20.0 20.0  5.0  5.0  5.0 20.0  5.0  5.0  5.0  5.0  5.0
 0.0 13.2 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  3.4 19.6 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  0.0  9.8 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  0.0  0.2 12.8 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  0.0  0.0  0.2  9.8 19.6 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0
 0.0  0.0  0.0  0.0  0.0  3.4 13.2 19.6 20.0 20.0 20.0 20.0 20.0 19.6 13.2
 0.0  0.0  0.0  0.0  0.0  0.0  0.0  1.2  5.8  9.0 10.0  9.0  5.8  1.2  0.0
```

```
 0.0  0.0  0.0  0.0  0.0  0.0
 3.4  0.0  0.0  0.0  0.0  0.0
19.6  9.8  0.2  0.0  0.0  0.0
20.0 20.0 12.8  0.2  0.0  0.0
20.0 20.0 20.0  9.8  0.0  0.0
20.0 20.0 20.0 19.6  3.4  0.0
20.0 20.0 20.0 20.0 13.2  0.0
20.0 20.0 20.0 20.0 19.6  1.2
20.0 20.0 20.0 20.0 20.0  5.8
20.0 20.0 20.0 20.0 20.0  9.0
20.0 20.0 20.0 20.0 20.0 10.0
20.0 20.0 20.0 20.0 20.0  9.0
20.0 20.0 20.0 20.0 20.0  5.8
20.0 20.0 20.0 20.0 19.6  1.2
20.0 20.0 20.0 20.0 13.2  0.0
20.0 20.0 20.0 19.6  3.4  0.0
20.0 20.0 20.0  9.8  0.0  0.0
20.0 20.0 12.8  0.2  0.0  0.0
19.6  9.8  0.2  0.0  0.0  0.0
 3.4  0.0  0.0  0.0  0.0  0.0
 0.0  0.0  0.0  0.0  0.0  0.0


                        PPPP      J EEEEE  CCC  TTTTT
                        P   P     J E     C   C   T
                        PPPP      J EEE   C       T
                        P     J   J E     C   C   T
                        P      JJJ  EEEEE  CCC    T


BLANK COMMON REQUIRED      1206    (  2266)

PROJECTION DATA FOR ANGLE NO.   1     0.000 RADIANS     0.000 DEGREES
     0.000E+00   0.000E+00   0.420E+02   0.172E+03   0.239E+03
     0.286E+03   0.320E+03   0.346E+03   0.366E+03   0.262E+03
     0.272E+03   0.278E+03   0.355E+03   0.353E+03   0.347E+03
     0.337E+03   0.366E+03   0.346E+03   0.320E+03   0.286E+03
     0.239E+03   0.172E+03   0.420E+02   0.000E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   2     0.785 RADIANS    45.000 DEGREES
     0.000E+00   0.450E+00   0.530E+02   0.169E+03   0.237E+03
     0.279E+03   0.321E+03   0.327E+03   0.323E+03   0.310E+03
     0.330E+03   0.357E+03   0.358E+03   0.336E+03   0.324E+03
     0.310E+03   0.323E+03   0.327E+03   0.321E+03   0.279E+03
     0.237E+03   0.169E+03   0.530E+02   0.450E+00   0.000E+00

PROJECTION DATA FOR ANGLE NO.   3     1.571 RADIANS    90.000 DEGREES
     0.000E+00   0.000E+00   0.420E+02   0.172E+03   0.239E+03
     0.286E+03   0.320E+03   0.346E+03   0.321E+03   0.337E+03
     0.347E+03   0.353E+03   0.355E+03   0.398E+03   0.287E+03
     0.277E+03   0.261E+03   0.346E+03   0.320E+03   0.286E+03
     0.239E+03   0.172E+03   0.420E+02   0.000E+00   0.000E+00


BLANK COMMON REQUIRED      1181    (  2235)

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1206 FLOATING POINT WORDS.


              EEEEE N   N DDDD        PPPP      J EEEEE  CCC  TTTTT
              E     NN  N D   D       P   P     J E     C   C   T
              EEE   N N N D   D       PPPP      J EEE   C       T
              E     N  NN D   D       P     J   J E     C   C   T
              EEEEE N   N DDDD        P      JJJ  EEEEE  CCC    T


PROJECTION DATA FOR ANGLE NO.   4     2.356 RADIANS   135.000 DEGREES
     0.000E+00   0.450E+00   0.530E+02   0.169E+03   0.237E+03
     0.279E+03   0.321E+03   0.346E+03   0.373E+03   0.372E+03
     0.362E+03   0.333E+03   0.298E+03   0.282E+03   0.300E+03
     0.309E+03   0.323E+03   0.327E+03   0.321E+03   0.279E+03
     0.237E+03   0.169E+03   0.530E+02   0.450E+00   0.000E+00


INITIAL ESTIMATE FOR THE LAGRANGE MULTIPILERS


THE INITIAL SOLUTION FOR XLAGR(I),I=1, 100
   0.174E-03   0.174E-03   0.731E-02   0.300E-01   0.416E-01
   0.497E-01   0.556E-01   0.602E-01   0.638E-01   0.455E-01
   0.473E-01   0.484E-01   0.618E-01   0.615E-01   0.603E-01
   0.586E-01   0.638E-01   0.602E-01   0.556E-01   0.497E-01
   0.416E-01   0.300E-01   0.731E-02   0.174E-03   0.174E-03
   0.174E-03   0.783E-04   0.922E-02   0.295E-01   0.413E-01
   0.486E-01   0.558E-01   0.568E-01   0.562E-01   0.541E-01
   0.574E-01   0.621E-01   0.624E-01   0.586E-01   0.564E-01
   0.541E-01   0.562E-01   0.568E-01   0.558E-01   0.486E-01
   0.413E-01   0.295E-01   0.922E-02   0.783E-04   0.174E-03
   0.174E-03   0.174E-03   0.731E-02   0.300E-01   0.416E-01
   0.497E-01   0.556E-01   0.602E-01   0.560E-01   0.586E-01
   0.603E-01   0.615E-01   0.618E-01   0.693E-01   0.499E-01
   0.482E-01   0.455E-01   0.602E-01   0.556E-01   0.497E-01
   0.416E-01   0.300E-01   0.731E-02   0.174E-03   0.174E-03
   0.174E-03   0.783E-04   0.922E-02   0.295E-01   0.413E-01
   0.486E-01   0.559E-01   0.603E-01   0.650E-01   0.647E-01
   0.631E-01   0.580E-01   0.519E-01   0.491E-01   0.522E-01
   0.538E-01   0.562E-01   0.568E-01   0.558E-01   0.486E-01
   0.413E-01   0.295E-01   0.922E-02   0.783E-04   0.174E-03
```

```
THE ESTIMATE OF THE MINIMUM IS EST =  5.8551 .

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.585E+01
ITER  1     FCN   0.581E+01
ITER  2     FCN   0.580E+01
ITER  3     FCN   0.580E+01
ITER  4     FCN   0.579E+01
ITER  5     FCN   0.579E+01
ITER  6     FCN   0.579E+01
ITER  7     FCN   0.579E+01
ITER  8     FCN   0.579E+01
ITER  9     FCN   0.579E+01
ITER 10     FCN   0.579E+01
ITER 11     FCN   0.579E+01
ITER 12     FCN   0.579E+01
ITER 13     FCN   0.579E+01
ITER 14     FCN   0.579E+01
ITER 15     FCN   0.579E+01
ITER 16     FCN   0.579E+01
ITER 17     FCN   0.579E+01
ITER 18     FCN   0.579E+01
ITER 19     FCN   0.579E+01
ITER 20     FCN   0.579E+01
ITER 21     FCN   0.579E+01
ITER 22     FCN   0.579E+01
ITER 23     FCN   0.579E+01
ITER 24     FCN   0.579E+01
ITER 25     FCN   0.579E+01
ITER 26     FCN   0.579E+01
ITER 27     FCN   0.579E+01
ITER 28     FCN   0.579E+01
ITER 29     FCN   0.579E+01
ITER 30     FCN   0.579E+01
ITER 31     FCN   0.579E+01
ITER 32     FCN   0.579E+01
ITER 33     FCN   0.579E+01
ITER 34     FCN   0.579E+01
ITER 35     FCN   0.579E+01
ITER 36     FCN   0.579E+01
ITER 37     FCN   0.579E+01
ITER 38     FCN   0.579E+01
ITER 39     FCN   0.579E+01
ITER 40     FCN   0.579E+01
ITER 41     FCN   0.579E+01
ITER 42     FCN   0.579E+01
ITER 43     FCN   0.579E+01
ITER 44     FCN   0.579E+01
ITER 45     FCN   0.579E+01
ITER 46     FCN   0.579E+01
ITER 47     FCN   0.579E+01
ITER 48     FCN   0.579E+01
ITER 49     FCN   0.579E+01
ITER 50     FCN   0.579E+01
ITER 51     FCN   0.579E+01
ITER 52     FCN   0.579E+01
ITER 53     FCN   0.579E+01
ITER 54     FCN   0.579E+01
ITER 55     FCN   0.579E+01
ITER 56     FCN   0.579E+01
ITER 57     FCN   0.579E+01
ITER 58     FCN   0.579E+01
ITER 59     FCN   0.579E+01
ITER 60     FCN   0.579E+01
ITER 61     FCN   0.579E+01
ITER 62     FCN   0.579E+01
ITER 63     FCN   0.579E+01
ITER 64     FCN   0.579E+01
ITER 65     FCN   0.579E+01
ITER 66     FCN   0.579E+01
ITER 67     FCN   0.579E+01
ITER 68     FCN   0.579E+01
ITER 69     FCN   0.579E+01
ITER 70     FCN   0.579E+01
ITER 71     FCN   0.579E+01
ITER 72     FCN   0.579E+01
ITER 73     FCN   0.579E+01
ITER 74     FCN   0.579E+01
ITER 75     FCN   0.579E+01
ITER 76     FCN   0.579E+01
ITER 77     FCN   0.579E+01
ITER 78     FCN   0.579E+01
ITER 79     FCN   0.579E+01
ITER 80     FCN   0.579E+01
ITER 81     FCN   0.579E+01
ITER 82     FCN   0.579E+01
ITER 83     FCN   0.579E+01
ITER 84     FCN   0.579E+01
ITER 85     FCN   0.579E+01
ITER 86     FCN   0.579E+01
ITER 87     FCN   0.579E+01
ITER 88     FCN   0.579E+01
ITER 89     FCN   0.579E+01
ITER 90     FCN   0.579E+01
ITER 91     FCN   0.579E+01
ITER 92     FCN   0.579E+01
ITER 93     FCN   0.579E+01
ITER 94     FCN   0.579E+01
ITER 95     FCN   0.579E+01
ITER 96     FCN   0.579E+01
ITER 97     FCN   0.579E+01
ITER 98     FCN   0.579E+01
ITER 99     FCN   0.579E+01
ITER100     FCN   0.579E+01
ITER101     FCN   0.579E+01
ITER102     FCN   0.579E+01
ITER103     FCN   0.579E+01
ITER104     FCN   0.579E+01
ITER105     FCN   0.579E+01
ITER106     FCN   0.579E+01
ITER107     FCN   0.579E+01
ITER108     FCN   0.579E+01
ITER109     FCN   0.579E+01
ITER110     FCN   0.579E+01
ITER111     FCN   0.579E+01
ITER112     FCN   0.579E+01
ITER113     FCN   0.579E+01
ITER114     FCN   0.579E+01
ITER115     FCN   0.579E+01
ITER116     FCN   0.579E+01
ITER117     FCN   0.579E+01
ITER118     FCN   0.579E+01
ITER119     FCN   0.579E+01
ITER120     FCN   0.579E+01
ITER121     FCN   0.579E+01
ITER122     FCN   0.579E+01
ITER123     FCN   0.579E+01
ITER124     FCN   0.579E+01
ITER125     FCN   0.579E+01
ITER126     FCN   0.579E+01
ITER127     FCN   0.579E+01
ITER128     FCN   0.579E+01
ITER129     FCN   0.579E+01
ITER130     FCN   0.579E+01
ITER131     FCN   0.579E+01
ITER132     FCN   0.579E+01
ITER133     FCN   0.579E+01
ITER134     FCN   0.579E+01
ITER135     FCN   0.579E+01
ITER136     FCN   0.579E+01
ITER137     FCN   0.579E+01
ITER138     FCN   0.579E+01
ITER139     FCN   0.579E+01
ITER140     FCN   0.579E+01
ITER141     FCN   0.579E+01
ITER142     FCN   0.579E+01
ITER143     FCN   0.579E+01
ITER144     FCN   0.579E+01
ITER145     FCN   0.579E+01
ITER146     FCN   0.579E+01
ITER147     FCN   0.579E+01
ITER148     FCN   0.579E+01
ITER149     FCN   0.579E+01
ITER150     FCN   0.579E+01
ITER151     FCN   0.579E+01
ITER152     FCN   0.579E+01
ITER153     FCN   0.579E+01
ITER154     FCN   0.579E+01
ITER155     FCN   0.579E+01
ITER156     FCN   0.579E+01
ITER157     FCN   0.579E+01
ITER158     FCN   0.579E+01
ITER159     FCN   0.579E+01
ITER160     FCN   0.579E+01
ITER161     FCN   0.579E+01
ITER162     FCN   0.579E+01
ITER163     FCN   0.579E+01
ITER164     FCN   0.579E+01
ITER165     FCN   0.579E+01
ITER166     FCN   0.579E+01


THE OPTIMUM SOLUTION FOR THE LAGRANGE MULTIPILERS
   WAS DETERMINED IN  167 ITERATIONS.


FINAL SOLUTION FOR THE LAGRANGE MULTIPILERS


THE FINAL SOLUTION FOR XLAGR(I),I=1, 100
   0.174E-03   0.174E-03  -0.177E+00   0.775E+00   0.761E+00
   0.627E+00   0.448E+00   0.259E+00   0.120E+00  -0.372E+00
  -0.417E+00  -0.440E+00  -0.221E+00  -0.232E+00  -0.238E+00
  -0.230E+00  -0.527E-01   0.990E-02   0.119E+00   0.233E+00
   0.329E+00   0.340E+00  -0.594E+00   0.174E-03   0.174E-03
   0.174E-03   0.276E+01  -0.256E+01  -0.124E+01  -0.852E+00
  -0.644E+00  -0.480E+00  -0.424E+00  -0.322E+00  -0.263E+00
  -0.810E-01   0.640E-01   0.132E+00   0.748E-01   0.155E+00
   0.900E-01   0.185E+00   0.199E+00   0.250E+00   0.193E+00
   0.128E+00  -0.917E-01  -0.136E+01   0.514E+01   0.174E-03
   0.174E-03   0.174E-03   0.338E+00   0.113E+01   0.102E+01
   0.820E+00   0.627E+00   0.438E+00   0.159E+00   0.251E-01
  -0.716E-01  -0.152E+00  -0.224E+00  -0.171E+00  -0.541E+00
  -0.587E+00  -0.584E+00  -0.195E+00  -0.829E-01   0.197E-01
   0.665E-01   0.446E-02  -0.980E+00   0.174E-03   0.174E-03
   0.174E-03  -0.131E+01  -0.176E+01  -0.546E+00  -0.241E+00
  -0.801E-01   0.620E-01   0.198E+00   0.393E+00   0.460E+00
   0.523E+00   0.415E+00   0.326E+00   0.242E+00   0.400E+00
   0.363E+00   0.407E+00   0.423E+00   0.486E+00   0.412E+00
   0.292E+00  -0.357E-01  -0.132E+01   0.953E+00   0.174E-03


THE VALUE OF THE MINIMUM IS  5.7919 .


THE GRADIENT GRAD(I),I=1, 100
   0.000E+00   0.000E+00  -0.897E-10  -0.682E-10   0.111E-08
  -0.302E-09  -0.112E-08   0.872E-09  -0.162E-08   0.999E-09
  -0.126E-08  -0.416E-09   0.424E-09   0.162E-09  -0.826E-09
  -0.910E-09   0.121E-08  -0.643E-09   0.570E-09   0.699E-10
  -0.448E-09   0.102E-08   0.705E-09   0.000E+00   0.000E+00
   0.000E+00   0.905E-10   0.136E-08   0.198E-08   0.135E-08
   0.108E-08  -0.695E-10   0.878E-09  -0.155E-09   0.393E-09
  -0.128E-08   0.269E-09  -0.104E-08   0.512E-09  -0.122E-09
   0.215E-09   0.488E-09   0.806E-10   0.726E-09  -0.129E-08
  -0.267E-08  -0.181E-08  -0.132E-08  -0.228E-09   0.000E+00
   0.000E+00   0.000E+00  -0.173E-08  -0.149E-08  -0.179E-09
  -0.164E-09   0.167E-09  -0.727E-09  -0.294E-09  -0.905E-09
  -0.718E-09   0.233E-09  -0.648E-09   0.614E-10   0.118E-08
  -0.807E-09   0.129E-08   0.749E-09   0.420E-09   0.969E-09
   0.167E-08  -0.911E-10   0.466E-09   0.000E+00   0.000E+00
   0.000E+00   0.121E-09   0.662E-09   0.985E-09   0.239E-09
  -0.931E-09   0.108E-08  -0.253E-09   0.406E-09  -0.128E-08
   0.136E-08   0.297E-09  -0.123E-08   0.498E-09  -0.695E-09
   0.258E-10   0.918E-09  -0.101E-08  -0.263E-09  -0.115E-08
   0.229E-09   0.616E-10  -0.365E-09  -0.266E-09   0.000E+00


THE ENTROPY OF THE RECONSTRUCTION IS  5.7919 .

BLANK COMMON REQUIRED      1056    (  2040)

BLANK COMMON REQUIRED       707    (  1303)

BLANK COMMON REQUIRED       607    (  1137)

BLANK COMMON REQUIRED       507    (   773)

BLANK COMMON REQUIRED       407    (   627)

BLANK COMMON REQUIRED       207    (   317)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=   1206 FLOATING POINT WORDS.


            EEEEE N   N DDDD        EEEEE N   N TTTTT PPPP  Y   Y
            E     NN  N D   D       E     NN  N   T   P   P  Y Y
            EEE   N N N D   D       EEE   N N N   T   PPPP    Y
            E     N  NN D   D       E     N  NN   T   P       Y
            EEEEE N   N DDDD        EEEEE N   N   T   P       Y


XMIN =   0.00E+00     XMAX =   0.27E+02     XSUM =   0.5744E+04



                        **********
```

```
                -         =         +         )         1         Z
0.0000E+00 0.2060E+01 0.5081E+01 0.6454E+01 0.7415E+01 0.8514E+01 0.9612E+01

Z         X         A         M         Θ         Θ         Θ         Θ
0.1057E+02 0.1126E+02 0.1195E+02 0.1346E+02 0.1497E+02 0.1593E+02 0.1703E+02

Θ         Θ         Θ         Θ         Θ         Θ         Θ         Θ
0.1799E+02 0.2005E+02 0.2252E+02 0.2389E+02 0.2499E+02 0.2609E+02 0.2705E+02

Θ
0.2746E+02
```

```
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  4.0  5.2  7.8  7.0  6.9  6.3  4.7  0.0
  0.0  0.0  0.0  0.0  0.0  8.3 12.7 16.3 16.6 22.8 20.7 20.1 18.5 16.8 12.9
  0.0  0.0  0.0  0.0  9.0 20.3 18.1 19.5 20.0 26.1 22.4 21.3 20.6 19.1 17.4
  0.0  0.0  0.0  8.0 18.3 23.9 19.4 19.4 20.3 27.5 21.8 20.8 19.8 18.8 19.9
  0.0  0.0  7.3 15.9 21.0 22.6 17.2 19.0 19.0 25.4 22.2 19.8 18.5 19.6 19.3
  0.0  6.6 17.0 20.3 20.0 20.0 15.1 16.1 17.3 23.5 20.4 19.6 19.3 18.3 18.9
  0.0 14.9 21.4 23.7 20.5 18.4 13.3 13.7 15.1 22.2 19.2 20.7 20.0 18.8 20.1
  4.8 17.6 20.7 20.3 19.7 16.0 10.1 10.6 11.4 16.7 17.7 17.4 17.7 18.9 17.9
  6.9 20.0 22.0 21.5 19.0 16.9 10.3  9.5 10.1 16.4 15.8 17.8 19.1 19.2 19.1
  7.8 22.0 23.4 22.1 18.9 16.3 10.9  9.4 10.0 14.8 14.7 17.5 19.3 18.8 18.5
  7.8 23.2 24.8 21.9 19.3 16.1 10.2 11.0 10.1 13.8 14.5 15.9 17.1 18.0 16.9
  6.0 17.6 19.2 18.2 15.0 12.7  8.8  8.3  8.7 11.9 10.4 11.1 11.6 11.8 13.5
  5.1 15.9 18.3 17.7 15.3 13.8  8.8  8.5  9.0 12.8 10.3  9.6  9.6 10.7 12.4
  3.5 13.6 16.7 16.7 16.8 14.4  9.2  9.4  9.2 12.2 10.7  9.0  8.9 10.0 11.3
  0.0 14.6 21.7 26.2 24.8 23.2 16.3 14.9 14.4 18.3 14.7 15.3 14.4 14.2 16.6
  0.0  6.4 18.0 23.9 25.6 26.1 17.9 16.7 15.0 18.6 16.3 16.4 16.9 16.2 16.7
  0.0  0.0  8.2 19.5 26.7 27.4 19.0 18.0 16.4 21.5 19.2 18.7 19.0 20.1 18.5
  0.0  0.0  0.0  9.6 20.9 25.4 18.6 17.6 18.5 25.6 21.6 21.9 21.7 20.7 20.6
  0.0  0.0  0.0  0.0  8.8 17.9 15.3 17.3 19.0 27.1 24.6 23.7 22.4 20.5 18.3
  0.0  0.0  0.0  0.0  0.0  6.2 10.1 14.0 16.3 24.8 23.3 22.2 19.6 16.9 12.5
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  3.4  5.0  8.1  7.5  7.2  6.3  4.4  0.0
```

```
  0.0  0.0  0.0  0.0  0.0  0.0
  6.7  0.0  0.0  0.0  0.0  0.0
 17.0  8.0  0.0  0.0  0.0  0.0
 21.0 17.6  9.0  0.0  0.0  0.0
 22.1 23.2 18.9  8.7  0.0  0.0
 23.4 23.8 22.5 17.2  6.8  0.0
 23.3 23.6 22.7 20.0 14.8  0.0
 19.8 19.7 18.7 18.9 16.9  5.0
 19.6 18.5 19.5 20.3 18.5  6.7
 19.8 19.5 20.4 21.0 20.3  7.6
 20.2 21.8 21.2 22.2 21.3  7.7
 16.2 17.4 18.8 18.5 16.5  5.8
 16.2 17.8 19.3 19.3 15.9  5.2
 15.2 18.2 18.7 18.4 15.3  4.0
 21.9 24.8 27.2 25.1 17.7  0.0
 20.8 22.8 23.4 20.0  8.5  0.0
 20.0 20.5 17.6  9.1  0.0  0.0
 19.8 15.2  7.9  0.0  0.0  0.0
 16.5  7.2  0.0  0.0  0.0  0.0
  6.5  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0
```

EX15

```
      PROGRAM XGVERS
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 15
C
C             THE PROGRAM XGVERS USES THE GENERALIZED INVERSE TO
C        RECONSTRUCT PARALLEL BEAM PROJECTION DATA AND COMPARES
C        THE RESULT WITH THE CONJUGATE GRADIENT METHOD OF RECONS-
C        TRUCTION.
C
      DIMENSION B(144),BE(144),AG(18)
      COMMON/BLANK/WORK(46000)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      EXTERNAL BLL,PLL
C
      LUNOUT=2
      I80132=0
C
C        THE INPUT PARAMETERS ARE
C
      NDIMU=12
      ICIR=0
      IGEOM=0
      NANG=18
      MODANG=2
      KDIMU=12
      IMIT=0
      NWORK=46000
      NFLOAT=2
      ISTORE=0
      IPRINT=7
      LUNATN=0
      PWID=1.
      AXISU=6.5
      RFAN=0.
      CATN=0.
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E15.OUT',FORM='FORMATTED')
C
      CALL SETUP (IPAR,PAR,AG)
C
      IERR=2
C
      CALL GVERS (B,BE,PLL,BLL,CHISQ,IERR)
C
      WRITE (LUNOUT,24) CHISQ
C
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT OF THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      NMAT=NDIMU**2
      KK1=1
      KU=NDIMU/15+1
      DO 12 K=1,KU
          WRITE (LUNOUT,22)
          KK2=MIN(15*K,NDIMU)
          DO 10 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   10         WRITE (LUNOUT,26) (B(I),I=ISUB1,ISUB2)
   12     KK1=KK2+1
C
      CALL ARRAY (BE,NDIMU)
C
C        PRINTOUT THE VALUES FOR THE RECONSTRUCTION ERRORS
C
      KK1=1
      KU=NDIMU/15+1
      DO 16 K=1,KU
          WRITE (LUNOUT,22)
          KK2=MIN(15*K,NDIMU)
          DO 14 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   14         WRITE (LUNOUT,26) (BE(I),I=ISUB1,ISUB2)
   16     KK1=KK2+1
C
C        COMPARE THE GENERALIZED INVERSE METHOD WITH THE CONJUGATE
C          GRADIENT METHOD
C
      ISTP=15
      IRLX=1
      IERR=1
      IZER=0
C
      CALL CONGR (B,PLL,BLL,ISTP,IRLX,IERR,IZER)
C
      CALL ARRAY (B,NDIMU)
C
C        PRINTOUT OF THE VALUES FOR THE RECONSTRUCTED TRANSVERSE SECTION
C
      KK1=1
      KU=NDIMU/15+1
      DO 20 K=1,KU
          WRITE (LUNOUT,22)
          KK2=MIN(15*K,NDIMU)
          DO 18 J=1,NDIMU
              ISUB1=NMAT-J*NDIMU+KK1
              ISUB2=NMAT-J*NDIMU+KK2
   18         WRITE (LUNOUT,26) (B(I),I=ISUB1,ISUB2)
   20     KK1=KK2+1
C
      CLOSE (LUNOUT)
C
C
C
   22 FORMAT(1X///////)
   24 FORMAT(1X//' CHISQ = ',E15.7)
   26 FORMAT(1X,15F5.1)
      END
      SUBROUTINE GETUM (M,DATA,ERR)
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 15
C
C             THE SUBROUTINE GETUM GIVES SIMULATED PROJECTION DATA FOR
C        TWO RECTANGLES.
C
      DIMENSION DATA(*),ERR(*)
      DIMENSION B(144)
      DIMENSION A1(2),B1(2),X1(2),Y1(2),PHI(2),Z(2),ITYPE(2)
C
      COMMON/OUTCOM/LUNOUT,I80132
C
C          LUNOUT  - OUTPUT FILE
C          I80132  - OUTPUT LINE LENGTH FLAG
C                =0    EACH LINE WILL BE WITHIN 80 CHARACTERS
C                        (OTHERWISE 132 CHARACTERS)
C
      COMMON/PARM/IPAR(12),PAR(4)
C
      EQUIVALENCE (NDIMU ,IPAR( 1)),(ICIR  ,IPAR( 2)),(IGEOM ,IPAR( 3)),
     1            (NANG  ,IPAR( 4)),(MODANG,IPAR( 5)),(KDIMU ,IPAR( 6)),
     2            (IMIT  ,IPAR( 7)),(NWORK ,IPAR( 8)),(NFLOAT,IPAR( 9)),
     3            (ISTORE,IPAR(10)),(IPRINT,IPAR(11)),(LUNATN,IPAR(12)),
     4            (PWID  , PAR( 1)),(AXISU , PAR( 2)),(RFAN  , PAR( 3)),
     5            (CATN  , PAR( 4))
C
      DATA ITYPE/2,2/
      DATA A1/3.,5./
      DATA B1/8.,4./
      DATA X1/-3.5,2.5/
      DATA Y1/0.,0./
      DATA PHI/0.,0./
      DATA Z/1.,1./
C
      IF (M.EQ.1) THEN
          IF (IMIT.NE.0) PWIDTH=PWID
          IF (IMIT.EQ.0) PWIDTH=-PWID
          CALL PHAN (2,10,ITYPE,Z,X1,Y1,A1,B1,PHI,B,NDIMU,PWIDTH)
      ENDIF
C
      CALL PHANL (2,ITYPE,Z,X1,Y1,A1,B1,PHI,DATA,M)
C
      DO 12 I=1,12
          IF (DATA(I).GT.0.) THEN
              ERR(I)=SQRT(DATA(I))
          ELSE
              ERR(I)=1.
          ENDIF
   12     CONTINUE
C
      RETURN
      END
```

```
 SSS  EEEEE TTTTT U   U PPPP
S     E       T   U   U P   P
 SSS  EEE     T   U   U PPPP
    S E       T   U   U P
 SSS  EEEEE   T    UUU  P
```

INTEGER PARAMETER ARRAY (IPAR)

I	IPAR(I)		DESCRIPTION
1	12		LINEAR DIMENSION OF THE RECONSTRUCTION ARRAY
2	0		RECONSTRUCT IN A CIRCULAR ARRAY
3	0		GEOMETRY FLAG PARALLEL BEAM GEOMETRY
4	18		NUMBER OF PROJECTION ANGLES
5	2		MODE FOR PROJECTION ANGLE INPUT (SEE FOLLOWING LINES) ANGLES GENERATED BETWEEN ZERO AND PI STARTING AT THE HALF ANGLE
6	12		NUMBER OF RAYS FOR EACH PROJECTION
7	0		EMISSION DATA
8	46000		DIMENSION OF THE FLOATING POINT USERS BLANK COMMON BLOCK
9	2		NUMBER OF WORDS FOR A FLOATING POINT VARIABLE
10	0		EXECUTE THE RECONSTRUCTION (NOT JUST STORAGE SIZE TEST)
11	7		PRINT FLAGS (OPTIONS SELECTED ARE ON THE FOLLOWING LINES) PRINT REQUIRED FLOATING POINT BLANK COMMON WHENEVER CHANGED PRINT PROJECTION DATA AND UNCERTAINTIES PRINT SETUP VALUES FROM IPAR AND PAR ARRAYS
12	0		LOGICAL UNIT NO. FOR ATTENUATION FACTOR STORAGE

FLOATING POINT PARAMETER ARRAY (PAR)

I	PAR(I)		DESCRIPTION
1	1.000		PIXEL WIDTH IN UNITS OF PROJECTION BIN WIDTH
2	6.500		LOCATION OF THE ROTATION AXIS IN THE PROJECTION ARRAY
3	0.000	NA	NOT APPLICABLE (NOT FAN BEAM GEOMETRY)
4	0.000	NA	CONSTANT ATTENUATION COEFFICIENT IN UNITS OF INVERSE PROJECTION BIN WIDTHS

```
BLANK COMMON REQUIRED        18    (    22)

BLANK COMMON REQUIRED        36    (    44)
```

```
BLANK COMMON REQUIRED        54    (    66)


BLANK COMMON REQUIRED        78    (   116)


BLANK COMMON REQUIRED        90    (   132)


A TOTAL OF  12 (  1 THRU  12) OF THE  12 USER PROJECTION BINS WILL BE USED


 16 PROJECTION BINS WILL BE USED OF WHICH   4 HAVE BEEN ZEROED BY THE PROGRAM


        MAXIMUM SIZE OF BLANK COMMON THUS FAR=     90 FLOATING POINT WORDS.


          EEEEE N   N DDDD         SSS  EEEEE TTTTT U   U PPPP
          E     NN  N D   D       S     E       T   U   U P   P
          EEE   N N N D   D        SSS  EEE     T   U   U PPPP
          E     N  NN D   D           S E       T   U   U P
          EEEEE N   N DDDD         SSS  EEEEE   T    UUU  P


                     GGG  V   V EEEEE RRRR   SSS
                    G   G V   V E     R   R S
                    G      V V  EEE   RRRR   SSS
                    G  GG  V V  E     R  R      S
                     GGGG   V   EEEEE R   R  SSS


         PARAMETERS FOR SUBROUTINE GVERS

               DESCRIPTION

IERR -       2    USE UNCERTAINTIES AND CALCULATE ERRORS


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION         FAN BEAM
BCK     BACKPROJECTION      LINE LENGTH              NO                NO
PRJ     PROJECTION          LINE LENGTH              NO                NO


BLANK COMMON REQUIRED     32346    ( 77132)


BLANK COMMON REQUIRED     44890    (127532)


BLANK COMMON REQUIRED     44946    (127622)


BLANK COMMON REQUIRED     45058    (130002)


BLANK COMMON REQUIRED     45634    (131102)


BLANK COMMON REQUIRED     45666    (131142)


                       PPPP  H   H  AAA  N   N
                       P   P H   H A   A NN  N
                       PPPP  HHHHH A   A N N N
                       P     H   H AAAAA N  NN
                       P     H   H A   A N   N



PHANTOM GENERATED
  ARRAY SIZE   12 X  12   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    2
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE              X         Y         A         B       PHI      DENS
      2   - RE  @ @      0.00 ,    1.00
                      ( -3.50),(   0.00)(   3.00),(   8.00)        (   1.00)
      2   - RE@ @ @      0.00 ,    1.00
                      (   2.50),(   0.00)(   5.00),(   4.00)        (   1.00)


                  EEEEE N   N DDDD         PPPP  H   H  AAA  N   N
                  E     NN  N D   D        P   P H   H A   A NN  N
                  EEE   N N N D   D        PPPP  HHHHH A   A N N N
                  E     N  NN D   D        P     H   H AAAAA N  NN
                  EEEEE N   N DDDD         P     H   H A   A N   N


BLANK COMMON REQUIRED     45682    (131162)

PROJECTION DATA FOR ANGLE NO.   1     0.087 RADIANS     5.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.167E+00
     0.167E+00   0.446E+00   0.446E+00   0.446E+00   0.446E+00
     0.167E+00   0.167E+00   0.000E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   1
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.409E+00
     0.409E+00   0.668E+00   0.668E+00   0.668E+00   0.668E+00
     0.409E+00   0.409E+00   0.100E+01   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   2     0.262 RADIANS    15.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
     0.334E+00   0.460E+00   0.460E+00   0.460E+00   0.269E+00
     0.173E+00   0.173E+00   0.146E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   2
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.578E+00   0.678E+00   0.678E+00   0.678E+00   0.518E+00
     0.415E+00   0.415E+00   0.382E+00   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   3     0.436 RADIANS    25.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.617E-01
     0.247E+00   0.490E+00   0.490E+00   0.374E+00   0.229E+00
     0.184E+00   0.184E+00   0.180E+00   0.346E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   3
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.248E+00
     0.497E+00   0.700E+00   0.700E+00   0.612E+00   0.479E+00
     0.429E+00   0.429E+00   0.424E+00   0.186E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   4     0.611 RADIANS    35.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.731E-03   0.119E+00
     0.237E+00   0.414E+00   0.446E+00   0.338E+00   0.220E+00
     0.203E+00   0.203E+00   0.194E+00   0.762E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   4
     0.100E+01   0.100E+01   0.100E+01   0.270E-01   0.345E+00
     0.487E+00   0.643E+00   0.667E+00   0.581E+00   0.469E+00
     0.451E+00   0.451E+00   0.441E+00   0.276E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   5     0.785 RADIANS    45.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.500E-01   0.161E+00
     0.272E+00   0.314E+00   0.314E+00   0.314E+00   0.236E+00
     0.236E+00   0.236E+00   0.207E+00   0.960E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   5
     0.100E+01   0.100E+01   0.100E+01   0.224E+00   0.401E+00
     0.522E+00   0.561E+00   0.561E+00   0.561E+00   0.485E+00
     0.485E+00   0.485E+00   0.455E+00   0.310E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   6     0.960 RADIANS    55.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.878E-01   0.206E+00
     0.271E+00   0.271E+00   0.213E+00   0.213E+00   0.255E+00
     0.291E+00   0.291E+00   0.223E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   6
     0.100E+01   0.100E+01   0.100E+01   0.296E+00   0.454E+00
     0.521E+00   0.521E+00   0.462E+00   0.462E+00   0.505E+00
     0.539E+00   0.539E+00   0.473E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   7     1.134 RADIANS    65.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.127E+00   0.245E+00
     0.245E+00   0.245E+00   0.195E+00   0.105E+00   0.200E+00
     0.345E+00   0.394E+00   0.250E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   7
     0.100E+01   0.100E+01   0.100E+01   0.357E+00   0.495E+00
     0.495E+00   0.495E+00   0.442E+00   0.324E+00   0.447E+00
     0.587E+00   0.628E+00   0.500E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   8     1.309 RADIANS    75.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.188E+00   0.230E+00
     0.230E+00   0.230E+00   0.226E+00   0.392E-02   0.134E+00
     0.356E+00   0.460E+00   0.303E+00   0.811E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   8
     0.100E+01   0.100E+01   0.100E+01   0.434E+00   0.480E+00
     0.480E+00   0.480E+00   0.476E+00   0.626E-01   0.366E+00
     0.597E+00   0.678E+00   0.551E+00   0.285E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   9     1.484 RADIANS    85.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.223E+00   0.223E+00
     0.223E+00   0.223E+00   0.223E+00   0.000E+00   0.000E+00
     0.446E+00   0.446E+00   0.446E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   9
     0.100E+01   0.100E+01   0.100E+01   0.472E+00   0.472E+00
     0.472E+00   0.472E+00   0.472E+00   0.100E+01   0.100E+01
     0.668E+00   0.668E+00   0.668E+00   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  10     1.658 RADIANS    95.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.223E+00   0.223E+00
     0.223E+00   0.223E+00   0.223E+00   0.000E+00   0.000E+00
     0.446E+00   0.446E+00   0.446E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  10
     0.100E+01   0.100E+01   0.100E+01   0.472E+00   0.472E+00
     0.472E+00   0.472E+00   0.472E+00   0.100E+01   0.100E+01
     0.668E+00   0.668E+00   0.668E+00   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  11     1.833 RADIANS   105.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.188E+00   0.230E+00
     0.230E+00   0.230E+00   0.226E+00   0.392E-02   0.134E+00
     0.356E+00   0.460E+00   0.303E+00   0.811E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  11
     0.100E+01   0.100E+01   0.100E+01   0.434E+00   0.480E+00
     0.480E+00   0.480E+00   0.476E+00   0.626E-01   0.366E+00
     0.597E+00   0.678E+00   0.551E+00   0.285E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  12     2.007 RADIANS   115.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.127E+00   0.245E+00
     0.245E+00   0.245E+00   0.195E+00   0.105E+00   0.200E+00
     0.345E+00   0.394E+00   0.250E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  12
     0.100E+01   0.100E+01   0.100E+01   0.357E+00   0.495E+00
     0.495E+00   0.495E+00   0.442E+00   0.324E+00   0.447E+00
     0.587E+00   0.628E+00   0.500E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  13     2.182 RADIANS   125.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.878E-01   0.206E+00
     0.271E+00   0.271E+00   0.213E+00   0.213E+00   0.255E+00
     0.291E+00   0.291E+00   0.223E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  13
     0.100E+01   0.100E+01   0.100E+01   0.296E+00   0.454E+00
     0.521E+00   0.521E+00   0.462E+00   0.462E+00   0.505E+00
     0.539E+00   0.539E+00   0.473E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  14     2.356 RADIANS   135.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.500E-01   0.161E+00
     0.272E+00   0.314E+00   0.314E+00   0.314E+00   0.236E+00
     0.236E+00   0.236E+00   0.207E+00   0.960E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  14
     0.100E+01   0.100E+01   0.100E+01   0.224E+00   0.401E+00
     0.522E+00   0.561E+00   0.561E+00   0.561E+00   0.485E+00
     0.485E+00   0.485E+00   0.455E+00   0.310E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  15     2.531 RADIANS   145.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.731E-03   0.119E+00
     0.237E+00   0.414E+00   0.446E+00   0.338E+00   0.220E+00
     0.203E+00   0.203E+00   0.194E+00   0.762E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  15
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     0.100E+01   0.100E+01   0.100E+01   0.270E-01   0.345E+00
     0.487E+00   0.643E+00   0.667E+00   0.581E+00   0.469E+00
     0.451E+00   0.451E+00   0.441E+00   0.276E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  16     2.705 RADIANS   155.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.617E-01
     0.247E+00   0.490E+00   0.490E+00   0.374E+00   0.229E+00
     0.184E+00   0.184E+00   0.180E+00   0.346E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  16
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.248E+00
     0.497E+00   0.700E+00   0.700E+00   0.612E+00   0.479E+00
     0.429E+00   0.429E+00   0.424E+00   0.186E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  17     2.880 RADIANS   165.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
     0.334E+00   0.460E+00   0.460E+00   0.460E+00   0.269E+00
     0.173E+00   0.173E+00   0.146E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  17
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.578E+00   0.678E+00   0.678E+00   0.678E+00   0.518E+00
     0.415E+00   0.415E+00   0.382E+00   0.100E+01   0.100E+01
     0.100E+01


BLANK COMMON REQUIRED     45666    (131142)

PROJECTION DATA FOR ANGLE NO.  18     3.054 RADIANS   175.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.167E+00
     0.167E+00   0.446E+00   0.446E+00   0.446E+00   0.446E+00
     0.167E+00   0.167E+00   0.000E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  18
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.409E+00
     0.409E+00   0.668E+00   0.668E+00   0.668E+00   0.668E+00
     0.409E+00   0.409E+00   0.100E+01   0.100E+01   0.100E+01
     0.100E+01


BLANK COMMON REQUIRED     13410    ( 32142)


BLANK COMMON REQUIRED       866    (  1542)


BLANK COMMON REQUIRED       810    (  1452)


BLANK COMMON REQUIRED       698    (  1272)


BLANK COMMON REQUIRED       666    (  1232)


BLANK COMMON REQUIRED        90    (   132)

         MAXIMUM SIZE OF BLANK COMMON THUS FAR=  45682 FLOATING POINT WORDS.


           EEEEE N   N DDDD         GGG  V   V EEEEE RRRR   SSS
           E     NN  N D   D       G   G V   V E     R   R S
           EEE   N N N D   D       G     V V  EEE   RRRR   SSS
           E     N  NN D   D       G  GG  V V  E     R  R      S
           EEEEE N   N DDDD         GGGG   V   EEEEE R   R  SSS


CHISQ =   0.1014746E-11

XMIN =  -0.37E-05     XMAX =   0.10E+01     XSUM =   0.4400E+02


                              **************
                              *            *
                              *            *
                              *            *
                              *            *
                              *            *
                              *            *
                              *            *
                              **************

                    -         =         +         )         1         Z
-.3688E-05 0.7500E-01 0.1850E+00 0.2350E+00 0.2700E+00 0.3100E+00 0.3500E+00

Z         X         A         M         Θ         Θ         Θ         Θ
0.3850E+00 0.4100E+00 0.4350E+00 0.4900E+00 0.5450E+00 0.5800E+00 0.6200E+00

Θ         Θ         Θ         Θ         Θ         Θ         Θ         Θ
0.6550E+00 0.7300E+00 0.8200E+00 0.8700E+00 0.9100E+00 0.9500E+00 0.9850E+00

Θ
0.1000E+01

  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  1.0  1.0  1.0  1.0  1.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  1.0  1.0  1.0  1.0  1.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  1.0  1.0  1.0  1.0  1.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  1.0  1.0  1.0  1.0  1.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  1.0  1.0  1.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0

XMIN =   0.00E+00     XMAX =   0.29E+02     XSUM =   0.8535E+03


                              **************
                              *  -=----=-  *
                              * -+)1111)+-  *
                              *--))+▀▀+1)--*
                              *-=)11)))Z)--*
                              *--))+▀▀+1)--*
                              *-=)11)))Z)--*
                              * -+)1111)+-  *
                              *  -=----=-  *
                              **************


                    -         =         +         )         1         Z
0.0000E+00 0.2154E+01 0.5314E+01 0.6750E+01 0.7756E+01 0.8905E+01 0.1005E+02

Z         X         A         M         Θ         Θ         Θ         Θ
0.1106E+02 0.1178E+02 0.1250E+02 0.1408E+02 0.1566E+02 0.1666E+02 0.1781E+02

Θ         Θ         Θ         Θ         Θ         Θ         Θ         Θ
0.1882E+02 0.2097E+02 0.2355E+02 0.2499E+02 0.2614E+02 0.2729E+02 0.2829E+02

Θ
0.2873E+02

  0.0  0.0  0.0  0.0  4.0  3.9  4.3  4.1  0.0  0.0  0.0  0.0
  0.0  0.0  3.9  6.0  5.2  5.2  5.3  5.0  5.6  4.2  0.0  0.0
  0.0  3.7  6.8  7.6  8.6  8.6  8.6  8.2  7.7  6.5  4.3  0.0
  0.0  6.0  8.1  8.1 10.7 10.1  9.8 10.2  8.1  7.9  5.8  0.0
  4.1  5.4  8.2  9.9  9.2  8.4  8.4  8.9 10.7  8.1  5.0  3.8
  3.8  5.3  8.6  8.7  6.8 28.7 28.7  7.0  9.8  8.2  4.9  4.1
  3.8  5.3  8.6  8.7  6.8 28.7 28.7  7.0  9.8  8.2  4.9  4.1
  4.1  5.4  8.2  9.9  9.2  8.4  8.4  8.9 10.2  8.1  5.0  3.8
  0.0  6.0  8.1  8.1 10.7 10.1  9.8 10.2  8.1  7.9  5.8  0.0
  0.0  3.7  6.8  7.6  8.6  8.6  8.6  8.2  7.7  6.5  4.3  0.0
  0.0  0.0  3.9  6.0  5.2  5.2  5.3  5.0  5.6  4.2  0.0  0.0
  0.0  0.0  0.0  0.0  4.0  3.9  4.3  4.1  0.0  0.0  0.0  0.0


                       CCC  OOOOO N   N  GGG  RRRR
                      C   C O   O NN  N G   G R   R
                      C     O   O N N N G     RRRR
                      C   C O   O N  NN G  GG R  R
                       CCC  OOOOO N   N  GGGG R   R


         PARAMETERS FOR SUBROUTINE CONGR

                DESCRIPTION

ISTP -      15    NUMBER OF ITERATION STEPS
IRLX -       1    ITERATIVE RELAXATION METHOD
IERR -       1    USE ERROR ARRAY
IZER -       0    INITIAL SOLUTION IS ZERO


BACKPROJECTION AND PROJECTION/CONVOLUTION/FILTER ROUTINES
PERFORM THE FOLLOWING FUNCTIONS

ARG     FUNCTION            RAY WEIGHTING       ATTENUATION          FAN BEAM
BCK     BACKPROJECTION      LINE LENGTH              NO                   NO
PRJ     PROJECTION          LINE LENGTH              NO                   NO


BLANK COMMON REQUIRED       122    (   172)


BLANK COMMON REQUIRED       234    (   352)


BLANK COMMON REQUIRED       522    (  1012)


BLANK COMMON REQUIRED       634    (  1172)


BLANK COMMON REQUIRED       746    (  1352)


BLANK COMMON REQUIRED       858    (  1532)


                       PPPP  H   H  AAA  N   N
                       P   P H   H A   A NN  N
                       PPPP  HHHHH A   A N N N
                       P     H   H AAAAA N  NN
                       P     H   H A   A N   N



PHANTOM GENERATED
  ARRAY SIZE   12 X  12   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    2
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE          X          Y          A          B        PHI       DENS
      2   - RE  @ @      0.00 ,    1.00
                    (  -3.50),(   0.00)(   3.00),(   8.00)         (   1.00)
      2   - RE@ @ @      0.00 ,    1.00
                    (   2.50),(   0.00)(   5.00),(   4.00)         (   1.00)


              EEEEE N   N DDDD         PPPP  H   H  AAA  N   N
              E     NN  N D   D       P   P H   H A   A NN  N
              EEE   N N N D   D       PPPP  HHHHH A   A N N N
              E     N  NN D   D       P     H   H AAAAA N  NN
              EEEEE N   N DDDD        P     H   H A   A N   N


BLANK COMMON REQUIRED       874    (  1552)

PROJECTION DATA FOR ANGLE NO.   1     0.087 RADIANS     5.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.167E+00
     0.167E+00   0.446E+00   0.446E+00   0.446E+00   0.446E+00
     0.167E+00   0.167E+00   0.000E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   1
```

```
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.409E+00
     0.409E+00   0.668E+00   0.668E+00   0.668E+00   0.668E+00
     0.409E+00   0.409E+00   0.100E+01   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   2     0.262 RADIANS    15.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
     0.334E+00   0.460E+00   0.460E+00   0.460E+00   0.269E+00
     0.173E+00   0.173E+00   0.146E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   2
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.578E+00   0.678E+00   0.678E+00   0.678E+00   0.518E+00
     0.415E+00   0.415E+00   0.382E+00   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   3     0.436 RADIANS    25.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.617E-01
     0.247E+00   0.490E+00   0.490E+00   0.374E+00   0.229E+00
     0.184E+00   0.184E+00   0.180E+00   0.346E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   3
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.248E+00
     0.497E+00   0.700E+00   0.700E+00   0.612E+00   0.479E+00
     0.429E+00   0.429E+00   0.424E+00   0.186E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   4     0.611 RADIANS    35.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.731E-03   0.119E+00
     0.237E+00   0.414E+00   0.446E+00   0.338E+00   0.220E+00
     0.203E+00   0.203E+00   0.194E+00   0.762E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   4
     0.100E+01   0.100E+01   0.100E+01   0.270E-01   0.345E+00
     0.487E+00   0.643E+00   0.667E+00   0.581E+00   0.469E+00
     0.451E+00   0.451E+00   0.441E+00   0.276E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   5     0.785 RADIANS    45.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.500E-01   0.161E+00
     0.272E+00   0.314E+00   0.314E+00   0.314E+00   0.236E+00
     0.236E+00   0.236E+00   0.207E+00   0.960E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   5
     0.100E+01   0.100E+01   0.100E+01   0.224E+00   0.401E+00
     0.522E+00   0.561E+00   0.561E+00   0.561E+00   0.485E+00
     0.485E+00   0.485E+00   0.455E+00   0.310E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   6     0.960 RADIANS    55.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.878E-01   0.206E+00
     0.271E+00   0.271E+00   0.213E+00   0.213E+00   0.255E+00
     0.291E+00   0.291E+00   0.223E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   6
     0.100E+01   0.100E+01   0.100E+01   0.296E+00   0.454E+00
     0.521E+00   0.521E+00   0.462E+00   0.462E+00   0.505E+00
     0.539E+00   0.539E+00   0.473E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   7     1.134 RADIANS    65.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.127E+00   0.245E+00
     0.245E+00   0.245E+00   0.195E+00   0.105E+00   0.200E+00
     0.345E+00   0.394E+00   0.250E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   7
     0.100E+01   0.100E+01   0.100E+01   0.357E+00   0.495E+00
     0.495E+00   0.495E+00   0.442E+00   0.324E+00   0.447E+00
     0.587E+00   0.628E+00   0.500E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   8     1.309 RADIANS    75.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.188E+00   0.230E+00
     0.230E+00   0.230E+00   0.226E+00   0.392E-02   0.134E+00
     0.356E+00   0.460E+00   0.303E+00   0.811E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   8
     0.100E+01   0.100E+01   0.100E+01   0.434E+00   0.480E+00
     0.480E+00   0.480E+00   0.476E+00   0.626E-01   0.366E+00
     0.597E+00   0.678E+00   0.551E+00   0.285E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.   9     1.484 RADIANS    85.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.223E+00   0.223E+00
     0.223E+00   0.223E+00   0.223E+00   0.000E+00   0.000E+00
     0.446E+00   0.446E+00   0.446E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.   9
     0.100E+01   0.100E+01   0.100E+01   0.472E+00   0.472E+00
     0.472E+00   0.472E+00   0.472E+00   0.100E+01   0.100E+01
     0.668E+00   0.668E+00   0.668E+00   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  10     1.658 RADIANS    95.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.223E+00   0.223E+00
     0.223E+00   0.223E+00   0.223E+00   0.000E+00   0.000E+00
     0.446E+00   0.446E+00   0.446E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  10
     0.100E+01   0.100E+01   0.100E+01   0.472E+00   0.472E+00
     0.472E+00   0.472E+00   0.472E+00   0.100E+01   0.100E+01
     0.668E+00   0.668E+00   0.668E+00   0.100E+01   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  11     1.833 RADIANS   105.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.188E+00   0.230E+00
     0.230E+00   0.230E+00   0.226E+00   0.392E-02   0.134E+00
     0.356E+00   0.460E+00   0.303E+00   0.811E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  11
     0.100E+01   0.100E+01   0.100E+01   0.434E+00   0.480E+00
     0.480E+00   0.480E+00   0.476E+00   0.626E-01   0.366E+00
     0.597E+00   0.678E+00   0.551E+00   0.285E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  12     2.007 RADIANS   115.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.127E+00   0.245E+00
     0.245E+00   0.245E+00   0.195E+00   0.105E+00   0.200E+00
     0.345E+00   0.394E+00   0.250E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  12
     0.100E+01   0.100E+01   0.100E+01   0.357E+00   0.495E+00
     0.495E+00   0.495E+00   0.442E+00   0.324E+00   0.447E+00
     0.587E+00   0.628E+00   0.500E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  13     2.182 RADIANS   125.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.878E-01   0.206E+00
     0.271E+00   0.271E+00   0.213E+00   0.213E+00   0.255E+00
     0.291E+00   0.291E+00   0.223E+00   0.105E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  13
     0.100E+01   0.100E+01   0.100E+01   0.296E+00   0.454E+00
     0.521E+00   0.521E+00   0.462E+00   0.462E+00   0.505E+00
     0.539E+00   0.539E+00   0.473E+00   0.324E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  14     2.356 RADIANS   135.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.500E-01   0.161E+00
     0.272E+00   0.314E+00   0.314E+00   0.314E+00   0.236E+00
     0.236E+00   0.236E+00   0.207E+00   0.960E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  14
     0.100E+01   0.100E+01   0.100E+01   0.224E+00   0.401E+00
     0.522E+00   0.561E+00   0.561E+00   0.561E+00   0.485E+00
     0.485E+00   0.485E+00   0.455E+00   0.310E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  15     2.531 RADIANS   145.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.731E-03   0.119E+00
     0.237E+00   0.414E+00   0.446E+00   0.338E+00   0.220E+00
     0.203E+00   0.203E+00   0.194E+00   0.762E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  15
     0.100E+01   0.100E+01   0.100E+01   0.270E-01   0.345E+00
     0.487E+00   0.643E+00   0.667E+00   0.581E+00   0.469E+00
     0.451E+00   0.451E+00   0.441E+00   0.276E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  16     2.705 RADIANS   155.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.617E-01
     0.247E+00   0.490E+00   0.490E+00   0.374E+00   0.229E+00
     0.184E+00   0.184E+00   0.180E+00   0.346E-01   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  16
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.248E+00
     0.497E+00   0.700E+00   0.700E+00   0.612E+00   0.479E+00
     0.429E+00   0.429E+00   0.424E+00   0.186E+00   0.100E+01
     0.100E+01

PROJECTION DATA FOR ANGLE NO.  17     2.880 RADIANS   165.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
     0.334E+00   0.460E+00   0.460E+00   0.460E+00   0.269E+00
     0.173E+00   0.173E+00   0.146E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  17
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.100E+01
     0.578E+00   0.678E+00   0.678E+00   0.678E+00   0.518E+00
     0.415E+00   0.415E+00   0.382E+00   0.100E+01   0.100E+01
     0.100E+01


BLANK COMMON REQUIRED       858    (  1532)

PROJECTION DATA FOR ANGLE NO.  18     3.054 RADIANS   175.000 DEGREES
     0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.167E+00
     0.167E+00   0.446E+00   0.446E+00   0.446E+00   0.446E+00
     0.167E+00   0.167E+00   0.000E+00   0.000E+00   0.000E+00
     0.000E+00
PROJECTION DATA UNCERTAINTY FOR ANGLE NO.  18
     0.100E+01   0.100E+01   0.100E+01   0.100E+01   0.409E+00
     0.409E+00   0.668E+00   0.668E+00   0.668E+00   0.668E+00
     0.409E+00   0.409E+00   0.100E+01   0.100E+01   0.100E+01
     0.100E+01

FOR CONGR AND GRADY FCN IS THE VALUE OF THE CHI-SQUARE
FOR ENTPY FCN IS EVALUATED BY THE SUBROUTINE DULFC
ITER  0     FCN   0.441E+02
ITER  1     FCN   0.540E+01
ITER  2     FCN   0.193E+01
ITER  3     FCN   0.378E+00
ITER  4     FCN   0.135E+00
ITER  5     FCN   0.845E-01
ITER  6     FCN   0.387E-01
ITER  7     FCN   0.150E-01
ITER  8     FCN   0.613E-02
ITER  9     FCN   0.318E-02
ITER 10     FCN   0.216E-02
ITER 11     FCN   0.194E-02
ITER 12     FCN   0.130E-02
ITER 13     FCN   0.896E-03
ITER 14     FCN   0.730E-03
ITER 15     FCN   0.536E-03


BLANK COMMON REQUIRED       826    (  1472)


BLANK COMMON REQUIRED       714    (  1312)


BLANK COMMON REQUIRED       426    (   652)


BLANK COMMON REQUIRED       314    (   472)


BLANK COMMON REQUIRED       202    (   312)


BLANK COMMON REQUIRED        90    (   132)

        MAXIMUM SIZE OF BLANK COMMON THUS FAR=  45682 FLOATING POINT WORDS.


           EEEEE N   N DDDD         CCC  OOOOO N   N  GGG  RRRR
           E     NN  N D   D       C   C O   O NN  N G   G R   R
           EEE   N N N D   D       C     O   O N N N G     RRRR
           E     N  NN D   D       C   C O   O N  NN G  GG R  R
           EEEEE N   N DDDD         CCC  OOOOO N   N  GGGG R   R


XMIN =  -0.31E-01     XMAX =   0.10E+01     XSUM =   0.4402E+02



                              **************
                              *            *
                              * ▒▒▒        *
                              * ▒▒▒  ▒▒▒▒▒ *
                              * ▒▒▒  ▒▒▒▒▒ *
                              * ▒▒▒  ▒▒▒▒▒ *
                              * ▒▒▒        *
                              *            *
                              **************


                     -         =         +         )         1         Z
-.3104E-01 0.4853E-01 0.1652E+00 0.2183E+00 0.2554E+00 0.2979E+00 0.3403E+00


Z         X         A         M         Θ         Θ         Θ         Θ
0.3774E+00 0.4040E+00 0.4305E+00 0.4889E+00 0.5472E+00 0.5843E+00 0.6268E+00


Θ         Θ         Θ         ▒         ▒         ▒         ▒         ▒
```

0.6639E+00 0.7435E+00 0.8390E+00 0.8920E+00 0.9345E+00 0.9769E+00 0.1014E+01

0.1030E+01

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EX16

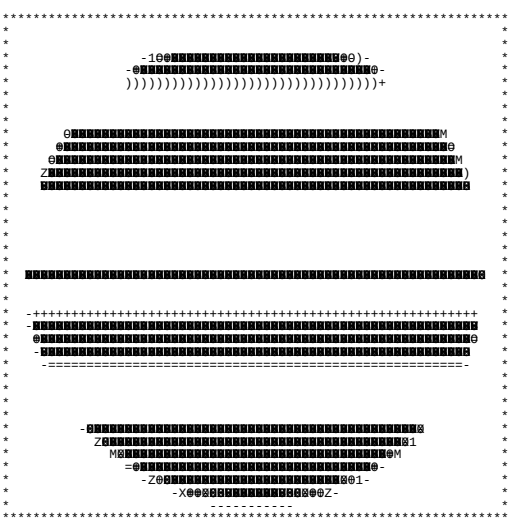
```
      PROGRAM XCBARP
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 16
C
C              THE PROGRAM XCBARP GENERATES A CIRCULAR BAR PHANTOM.
C
      COMMON/OUTCOM/LUNOUT,I80132
C
      DIMENSION B(4096)
C
      LUNOUT=2
      I80132=0
C
      NDIMU=64
      R=30.
      X1=0.
      Y1=0.
      Z=1.
      INTFAC=10
      NBAR=5
      NREPS=2
      IDIREC=1
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E16.OUT',FORM='FORMATTED')
C
      CALL CBARP (B,NDIMU,R,X1,Y1,Z,INTFAC,NBAR,NREPS,IDIREC)
C
      CALL ARRAY (B,NDIMU)
C
      CLOSE (LUNOUT)
C
      END
```

```
 CCC  BBBB   AAA  RRRR  PPPP
C    C B   B A   A R   R P   P
C      BBBB  A   A RRRR  PPPP
C    C B   B AAAAA R  R  P
 CCC  BBBB  A   A R   R P
```

```
BAR PATTERN PHANTOM GENERATED
ARRAY SIZE   64X 64
CIRCLE RADIUS   30.00  AT  ( 0., 0.)
INT FACTOR   10
NO. OF BARS    5
```

```
     EEEEE N   N DDDD         CCC  BBBB   AAA  RRRR  PPPP
     E     NN  N D   D       C   C B   B A   A R   R P   P
     EEE   N N N D   D       C     BBBB  A   A RRRR  PPPP
     E     N  NN D   D       C   C B   B AAAAA R  R  P
     EEEEE N   N DDDD         CCC  BBBB  A   A R   R P
```

```
XMIN =   0.00E+00     XMAX =   0.10E+01     XSUM =   0.1313E+04
```



```
                    -           =           +           )           1           Z
0.0000E+00 0.7500E-01 0.1850E+00 0.2350E+00 0.2700E+00 0.3100E+00 0.3500E+00

Z           X           A           M           9           8           7           6
0.3850E+00 0.4100E+00 0.4350E+00 0.4900E+00 0.5450E+00 0.5800E+00 0.6200E+00

5           4           3           2           1           0           /           .
0.6550E+00 0.7300E+00 0.8200E+00 0.8700E+00 0.9100E+00 0.9500E+00 0.9850E+00

,
0.1000E+01
```

EX17

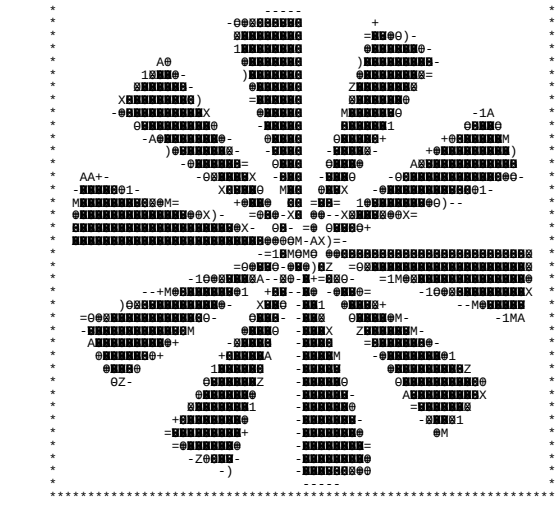
```
      PROGRAM XPIE
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 17
C
C             THE PROGRAM XPIE SHOWS HOW TO GENERATE A PIE PHANTOM.
C
      DIMENSION B(4096)
      COMMON/OUTCOM/LUNOUT,I80132
C
      LUNOUT=2
      I80132=0
C
      NDIMU=64
      R=30.
      X1=0.
      Y1=0.
      Z=1.
      INTFAC=10
      NSLIPI=10
      ISTART=0
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E17.OUT',FORM='FORMATTED')
C
      CALL PIE (B,NDIMU,R,X1,Y1,Z,INTFAC,NSLIPI,ISTART)
C
      CALL ARRAY (B,NDIMU)
C
      CLOSE (LUNOUT)
C
      END
```

```
                              PPPP   III  EEEEE
                              P   P   I   E
                              PPPP    I   EEE
                              P       I   E
                              P      III  EEEEE
```

```
PIE PHANTOM GENERATED
ARRAY SIZE   64X 64
CIRCLE RADIUS   30.00  AT  ( 0., 0.)
INT FACTOR   10
SECTOR WIDTH   0.314
```

```
                    EEEEE N   N DDDD        PPPP   III  EEEEE
                    E     NN  N D   D       P   P   I   E
                    EEE   N N N D   D       PPPP    I   EEE
                    E     N  NN D   D       P       I   E
                    EEEEE N   N DDDD        P      III  EEEEE
```

```
XMIN =   0.00E+00     XMAX =   0.10E+01     XSUM =   0.1413E+04
```



```
          -           =           +           )           1           Z
0.0000E+00 0.7500E-01 0.1850E+00 0.2350E+00 0.2700E+00 0.3100E+00 0.3500E+00

Z           X           A           M           Θ           Θ           Θ           Θ
0.3850E+00 0.4100E+00 0.4350E+00 0.4900E+00 0.5450E+00 0.5800E+00 0.6200E+00

Θ           Θ           Θ           Θ           Θ           Θ           Θ           Θ
0.6550E+00 0.7300E+00 0.8200E+00 0.8700E+00 0.9100E+00 0.9500E+00 0.9850E+00

Θ
0.1000E+01
```

EX18

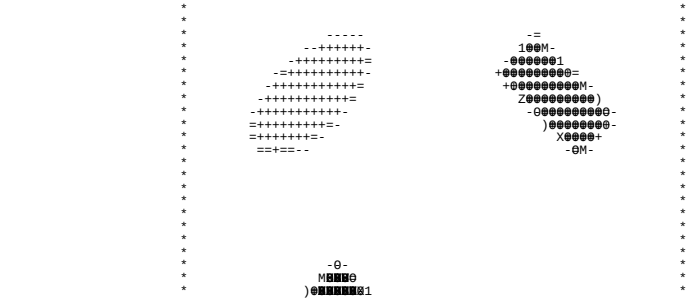
```
      PROGRAM XRECT
C
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
C
      SAVE
C
C     ******************************************************************
C     *       RECLBL    --     DP VERSION 2.0    --         JULY91     *
C     ******************************************************************
C
C        EXAMPLE 18
C
C             THE PROGRAM XRECT SHOWS HOW TO GENERATE RECTANGULAR AND
C        ELLIPICAL PHANTOMS.
C
      DIMENSION B(4096)
      DIMENSION ITYPE(4),A1(4),B1(4),X1(4),Y1(4),PHI(4),Z(4)
      COMMON/OUTCOM/LUNOUT,I80132
C
      DATA ITYPE/1,1,2,2/
      DATA A1/20.,15.,15.,20./
      DATA B1/10.,7.,7.,10./
      DATA X1/-16.,16.,16.,-16./
      DATA Y1/16.,-16.,16.,-16./
      DATA PHI/.785398,2.356194,2.356194,.785398/
      DATA Z/1.,2.,3.,4./
C
      LUNOUT=2
      I80132=0
C
C        OPEN OUTPUT FILE
C
      OPEN (LUNOUT,FILE='E18.OUT',FORM='FORMATTED')
C
      NPHAN=4
      INTG=10
      NDIMU=64
      PWID=1.
      CALL PHAN (NPHAN,INTG,ITYPE,Z,X1,Y1,A1,B1,PHI,B,NDIMU,PWID)
C
      CALL ARRAY (B,NDIMU)
C
      CLOSE (LUNOUT)
C
      END
```

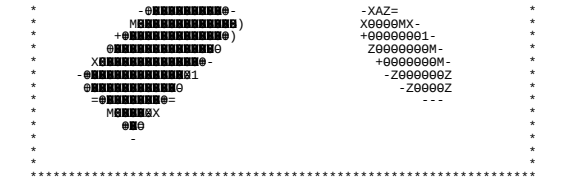
```
PPPP  H   H  AAA  N   N
P   P H   H A   A NN  N
PPPP  HHHHH A   A N N N
P     H   H AAAAA N  NN
P     H   H A   A N   N
```

```
PHANTOM GENERATED
  ARRAY SIZE   64 X  64   INTEGRATION FACTOR =  10   SCALING FACTOR =    1.000
  NUMBER OF ELIPSES AND/OR RECTANGLES =    4
  THE PARAMETERS FOR THE ELLIPSES AND/OR RECTANGLES ARE
       X,Y  - CENTER
       A,B  - LENGTH OF AXIS OR SIDE A AND B
       PHI  - ANGLE OF AXIS OR SIDE A
       DENS - INTENSITY
  THE PARENTHESIS INDICATES THE SCALED VALUE
    ITYPE                X         Y         A         B       PHI      DENS
      1   - EL 0@0@4@$     0.79 ,    1.00
                    ( -16.00),(  16.00)(  20.00),(  10.00)         (   1.00)
      1   - EL@0 0@.@      2.36 ,    2.00
                    (  16.00),( -16.00)(  15.00),(   7.00)         (   2.00)
      2   - RE@0@0@.@      2.36 ,    3.00
                    (  16.00),(  16.00)(  15.00),(   7.00)         (   3.00)
      2   - RE 0 0@4@$     0.79 ,    4.00
                    ( -16.00),( -16.00)(  20.00),(  10.00)         (   4.00)
```

```
             EEEEE N   N DDDD       PPPP  H   H  AAA  N   N
             E     NN  N D   D      P   P H   H A   A NN  N
             EEE   N N N D   D      PPPP  HHHHH A   A N N N
             E     N  NN D   D      P     H   H AAAAA N  NN
             EEEEE N   N DDDD       P     H   H A   A N   N
```

```
XMIN =   0.00E+00     XMAX =   0.40E+01     XSUM =   0.1436E+04
```





```
      -          =          +          )          1          Z
0.0000E+00 0.3000E+00 0.7400E+00 0.9400E+00 0.1080E+01 0.1240E+01 0.1400E+01

Z          X          A          M          @          @          @          @
0.1540E+01 0.1640E+01 0.1740E+01 0.1960E+01 0.2180E+01 0.2320E+01 0.2480E+01

@          @          @          @          @          @          @          @
0.2620E+01 0.2920E+01 0.3280E+01 0.3480E+01 0.3640E+01 0.3800E+01 0.3940E+01

@
0.4000E+01
```