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ภาคผนวก ก

ก - 1 การใช้คำสั่งของ EDLIN เพื่อแก้ไขโปรแกรม

1. ใส่ชื่อ EDLIN และชื่อไฟล์ที่ต้องการเรียบเรียง (edit) หลัง A> เช่น

A> EDLIN SABP1.FOR

ข้อควรระวัง: ในกรณีที่โปรแกรม EDLIN อยู่รวมกับโปรแกรมอื่น ๆ ในบัญชีแฟ้มข้อมูล (directory) ตรวจดูว่าในบัญชีแฟ้มข้อมูลนั้นมีหน่วยความจำ (memory) เหลือพอที่จะ SAVE โปรแกรมหรือไม่ หากมีหน่วยความจำไม่เพียงพอ ควรกำหนดให้ไฟล์ที่สร้างขึ้นใหม่อยู่ใน drive อื่น เช่น

A> EDLIN B:SABP1.FOR

2. สำหรับไฟล์ที่สร้างขึ้นใหม่ จะปรากฏข้อความ "new file" และเครื่องหมาย "*" ส่วนไฟล์เก่าจะปรากฏข้อความ "end of input file" และเครื่องหมาย "*" การ edit โปรแกรมสำหรับไฟล์ใหม่ จะใช้อักษร I หลังเครื่องหมาย "*" เป็นการบอกว่าจะเริ่มทำการเรียบเรียง และใช้ "CTRL Z" แล้วกด RETURN เมื่อต้องการออกจาก edit mode ส่วนไฟล์เก่าจะใช้อักษรหรับคำสั่งต่าง ๆ ดังต่อไปนี้

2.1 อักษร L ใช้สำหรับแสดงโปรแกรมทางจอภาพ ซึ่งสามารถจะแสดงครั้งละกี่บรรทัดก็ได้ โดยกำหนดเลขบรรทัดแรก และบรรทัดสุดท้ายก่อนอักษร L

*1,50 L

หมายความว่า ต้องการแสดงทางจอภาพ จากบรรทัดที่ 1 ถึงบรรทัดที่ 50

2.2 อักษร D ใช้สำหรับตัดบรรทัดที่ไม่ต้องการออก ซึ่งสามารถตัดออกครั้งละกี่บรรทัดก็ได้ โดยกำหนดเลขบรรทัดแรก และบรรทัดสุดท้ายก่อนอักษร D

*1,3 D

หมายความว่า ต้องการตัดบรรทัดที่ 1 ถึงบรรทัดที่ 3 ออก

2.3 อักษร I ใช้สำหรับการพิมพ์แทรก (insert) บรรทัดใหม่เข้าไป โดยกำหนดเลขบรรทัดหน้าตัวอักษร I

*30 I

หมายความว่า เราต้องการพิมพ์แทรกบรรทัดที่ 30 ลงไป ซึ่งจะไปแทนบรรทัดที่ 30 เดิมที่มีอยู่ หลังจากใส่ข้อความในบรรทัดนั้นเสร็จแล้ว เมื่อกด RETURN เครื่องจะยังคงอยู่ใน insert mode ซึ่งขณะนี้เราจะใช้คำสั่งอื่นไม่ได้ จนกว่าจะออกจาก mode นี้ การออกจาก insert mode เราใช้ "CTRL Z" ซึ่งจะปรากฏในบรรทัดนั้นว่า "^Z" แล้วกด RETURN ก็จะออกจาก insert mode ได้

2.4 เลขบรรทัด และปุ่ม F1 ใช้สำหรับแก้ไขหรือเปลี่ยนแปลงข้อความในบรรทัดใดบรรทัดหนึ่ง โดยใส่เลขบรรทัดหลังเครื่องหมาย "*" แล้วกด RETURN จากนั้นจะปรากฏข้อความเดิมของบรรทัดนั้น และตามด้วยเลขบรรทัดนั้นในบรรทัดต่อมา เมื่อกดปุ่ม F1 จะปรากฏข้อความเหมือนเดิมตั้งแต่ต้นบรรทัดเป็นต้นมา และถ้าต้องการแก้ไขส่วนใด ก็หยุดกดปุ่ม F1 ตรงนั้น แล้วพิมพ์ข้อความใหม่ลงไป การใส่ข้อความใหม่อาจใช้ปุ่ม insert สำหรับพิมพ์แทรกข้อความหรือตัวอักษรครั้งละ 1 ตัว ในทำนองเดียวกัน เราอาจใช้ปุ่ม delete สำหรับตัดข้อความออกก็ได้ เมื่อจบการพิมพ์แทรก หรือ ตัดออกแล้ว และยังไม่จบบรรทัด ให้กดปุ่ม F1 ใหม่ จะได้ข้อความต่อจากส่วนที่พิมพ์แทรก หรือ ส่วนที่ตัดออก จนกระทั่งจบบรรทัดแล้วกด RETURN

2.5 อักษร E ใช้สำหรับการ SAVE โปรแกรม และออกจาก EDLIN โดยใส่อักษร E หลังเครื่องหมาย "*"

2.6 อักษร Q ใช้สำหรับการยกเลิกเรียบเรียงโปรแกรม และออกจาก EDLIN

```
B>A:EDLIN DOSE.FOR
End of input file
*1,10L
      1:*        PROGRAM DQSE
      2: C  PROGRAM FOR COMPUTING DOSE RATES, REACTION RATES ETC.
      3: C  MODIFIED FROM SUBROUTINE DOSE BY LT. TIPVIMOL THONG-ORN
      4: C  NUCLEAR TECHNOLOGY , CHULALONGKORN UNIVERSITY
      5:         DIMENSION FN(220,26),X(220),R(220),NP(20),RR(26,20),IND(220)
      6:         DIMENSION NCHR(22),NSTEP(22),NTNOPI(22),CF(26)
      7:         CHARACTER*4 TIT(15)
      8:         CHARACTER*15 NAME1,NAME2
      9:         WRITE (*,100)
     10:  100    FORMAT (///25X,'  ******  D  O  S  E  ****** ',/13X,' Program for
*9D
*5,10L
      5:         DIMENSION FN(220,26),X(220),R(220),NP(20),RR(26,20),IND(220)
      6:         DIMENSION NCHR(22),NSTEP(22),NTNOPI(22),CF(26)
      7:         CHARACTER*4 TIT(15)
      8:         CHARACTER*15 NAME1,NAME2
      9:* 100    FORMAT (///25X,'  ******  D  O  S  E  ****** ',/13X,' Program for
     10:        1computing Dose Rates, Reaction Rates etc.')
*I9
      9:*        WRITE (*,100)
     10:*^Z
      9:*        WRITE (*,100)
      9:*        WRITE (*,100)
*9
      9:*        WRITE (*,100)
      9:*        WRITE (*,100)
*5,10L
      5:         DIMENSION FN(220,26),X(220),R(220),NP(20),RR(26,20),IND(220)
      6:         DIMENSION NCHR(22),NSTEP(22),NTNOPI(22),CF(26)
      7:         CHARACTER*4 TIT(15)
      8:         CHARACTER*15 NAME1,NAME2
      9:*        WRITE (*,100)
     10:  100    FORMAT (///25X,'  ******  D  O  S  E  ****** ',/13X,' Program for
*Q
Abort edit (Y/N)? Y
```

ก - 2 โปรแกรม NEUTRON และ SUBROUTINES ต่าง ๆ ที่ใช้ในการคำนวณฟลักซ์ของนิวตรอน

```
C     N E U T R O N
C     THIS IS THE FIRST PART OF SABINE MODIFIED FROM STEU1. & NEUTRO
C     WRITTEN BY FLT. OFF. TIPVIMOL THONG-ORN 5/02/87
      REAL MUET,MUEE
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGDS,IGSS,IOP,NRM,NAME(18),ZR(22),H(2
     12),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),
     2ETHAI(22),NDNI(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),NRNM,IT
     3NRN,NTNM,NIESC1,NIESC2,ITOH,NGM,ITNG,FRACRN(20),IRNT(20),CF(26),C
     4FG(7),FEENO2(26)
      COMMON/BLREM/SRNO(2),NCHRNR(2),NCRNR(2),ANR(2,10),SRNKAP(2),NCHRN
     1Z(2),NCRNZ(2),ANZ(2,10),SNO1(20),SNO2(20)
      COMMON/BLG/NBU,NBUS,NBUF(22),MUET(22,7),MUEE(22,7),SGO1(7),SGO2(7
     1),NCHGR(2),NCGR(22),AGR(22,10),SGKAP(2),NCHGZ(2),NCGZ(22),AGZ(22,
     210),ASG(22,7,10),CAPPRO(22,7),EKAPPA(22,7),PGFIS(7)
      CHARACTER*4 NAME
      CHARACTER*15 FILIN,FILOUT
      WRITE (*,10)
10    FORMAT (13X,' <<<<<<<<<<<<<< N  E  U  T  R  O  N >>>>>>>>>>>>>>')
      WRITE (*,15)
15    FORMAT (/12X,'  The Calculation of Neutron Flux in Shield Regions
     1')
      WRITE (*,20)
20    FORMAT (13X,'  Written by Lt. Tipvimol Thong-orn, January 1987',/
     1,14X,'  Nuclear Technology,  Chulalongkorn University')
      WRITE (*,70)
70    FORMAT (///'  Filename of input data : ',$)
      READ (*,71) FILIN
      WRITE (*,75)
75    FORMAT (/'  Filename of output data : '$)
      READ (*,71) FILOUT
71    FORMAT (A15)
      WRITE (*,30)
      OPEN (UNIT=5,FILE=FILIN,STATUS='OLD')
      OPEN (UNIT=6,FILE=FILOUT,STATUS='NEW')
      CALL ZERO1 (ANR,22)
      CALL ZERO1 (ANZ,60)
      CALL ZERO1 (MUET,308)
      CALL ZERO1 (SGO1,14)
      CALL ZERO1 (AGR,222)
      CALL ZERO1 (AGZ,2075)
      NERR=0
      NES=0
      CALL PREPRO(NERR)
      CALL MAINNS(NES)
      WRITE (9,40) (SRNO(I),I=1,2),NBU,NBUS
      WRITE (9,45) (NBUF(IR),IR=1,NRM)
35    FORMAT (2A4)
40    FORMAT (2E10.4,2I10)
45    FORMAT (1P7I10)
      CLOSE (9)
      N=NERR+NES
      IF (N) 50,50,55
50    CALL MAINNF
30    FORMAT (///,16X,'   ******  Calculating Please Wait   ****** ')
55    CALL NEUTRO
      CLOSE (6)
      CLOSE (5)
      WRITE (*,25)
25    FORMAT (10X,'  >>>>>>>>>>>> Calculation Completed <<<<<<<<<<<<')
      STOP
      END
```

```
      SUBROUTINE LABEL(T,LP)                                            SAB0037
      CHARACTER*4 T(18)
      LP=LP+1                                                           SAB0039
      WRITE (6,99) T,LP
   99 FORMAT (18A4,10X,'PAGE',I4)
      RETURN                                                            SAB0042
      END                                                               SAB0043
      SUBROUTINE ZERO1(F,N)                                             SAB0044
      DIMENSION F(N)                                                    SAB0045
      DO 2 I=1,N                                                        SAB0046
    2 F(I)=0.                                                           SAB0047
      RETURN                                                            SAB0048
      END                                                               SAB0049
      SUBROUTINE   LSFIT(M,X,Y,N,A)                                     SAB0054
      DIMENSION V( 51),S(18),X( 51),Y( 51),A(10),COMA(10,10),C(10)      SAB0055
      DO 6 K=1,N                                                        SAB0061
    6 A(K)=0.                                                           SAB0062
      DO 5 I=1,M                                                        SAB0063
    5 V(I)=1.                                                           SAB0064
      MG=2*(N-1)                                                        SAB0065
      DO 20 NPK=1,MG                                                    SAB0066
      S(NPK)=0.                                                         SAB0067
      IF(NPK.GT.N) GO TO 10                                             SAB0068
      C(NPK)=0.                                                         SAB0069
      DO 8 I=1,M                                                        SAB0070
    8 C(NPK)=C(NPK)+V(I)*Y(I)                                           SAB0071
   10 DO 18 I=1,M                                                       SAB0072
      V(I)=V(I)*X(I)                                                    SAB0073
   18 S(NPK)=S(NPK)+V(I)                                                SAB0074
   20 CONTINUE                                                          SAB0075
      COMA(1,1)=FLOAT(M)                                                SAB0076
      DO 30 J=2,N                                                       SAB0077
      COMA(J,J)=S(2*J-2)                                                SAB0078
      JM1=J-1                                                           SAB0079
      DO 23 L=1,JM1                                                     SAB0080
      JPL=J+L-2                                                         SAB0081
      COMA(J,L)=S(JPL)                                                  SAB0082
   23 COMA(L,J)=S(JPL)                                                  SAB0083
   30 CONTINUE                                                          SAB0084
      N1 = N-1                                                          SAB0086
      DO 90 J=1,N1                                                      SAB0087
      J1 = J+1                                                          SAB0088
      DO 90 K=J1,N                                                      SAB0089
      Q = COMA(K,J)/COMA(J,J)                                           SAB0090
      DO 110 L=J1,N                                                     SAB0091
  110 COMA(K,L) = COMA(K,L)-Q*COMA(J,L)                                 SAB0092
   90 C(K) = C(K)-Q*C(J)                                                SAB0093
      A(N) = C(N)/COMA(N,N)                                             SAB0095
      I= N                                                              SAB0096
  140 P = 0.0                                                           SAB0097
      DO 120 L=I,N                                                      SAB0098
  120 P = P+COMA(I-1,L)*A(L)                                            SAB0099
      I = I-1                                                           SAB0100
      Q = C(I)-P                                                        SAB0101
      A(I) = Q/COMA(I,I)                                                SAB0102
      IF (I-1) 130,130,140                                              SAB0103
  130 RETURN                                                            SAB0104
      END                                                               SAB0105
      SUBROUTINE PREPRO(NERR)                                           SAB0668
      REAL MUET,MUEE                                                    SAB0670
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGDS,IGSS,IOP,NRM,NAME(18),ZR(22),H(22SAB0673
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ETSAB0674
     2HAI(22),NDNI(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),NRNM,ITNRNSAB0675
     3,NTNM,NIESC1,NIESC2,ITOH,NGM,ITNG,FRACRN(20),IRNT(20),CF(26),CFG(7SAB0676
     4),FEENO2(26)                                                      SAB0677
      COMMON/BLG/NBU,NBUS,NBUF(22),MUET(22,7),MUEE(22,7),SGO1(7),SGO2(7)SAB0678
```

```
     1,NCHGR(2),NCGR(22),AGR(22,10),SGKAP(2),NCHGZ(2),NCGZ(22),AGZ(22,10SABO679
     2),ASG(22,7,10),CAPPRO(22,7),EKAPPA(22,7),PGFIS(7)                SABO680
      DIMENSION EUL(26),EF(21),AAA(18)
      CHARACTER*4 NAME,W1,W2,W3,W4,W5,W6,W7,AAA
      DATA W1,W2,W3,W4/'NREG','MBU ','NEMR','NDIF'/                    SABO682
      DATA W5,W6,W7/'NREM','NPRT',' NGS'/                              SABO683
      LPAGE = 0                                                        SABO684
      READ(5,10) (NAME(I),I=1,18)                                      SABO685
      READ(5,20) IGRC,IGRS,IGDS,IGSS                                   SABO686
      IOP=2                                                            SABO687
      OPEN (UNIT=7,FILE='B:LIBA1')
      READ (7,10) (AAA(I),I=1,11)
      READ (7,910) NTNM,NRNM,NGM,NIESC1,NIESC2,ITOH,ITNRN
      READ (7,910) (IRNT(I),I=1,ITNRN)
      READ (7,920) (EUL(I),I=1,NTNM)
      READ (7,920) (CF(I),I=1,NTNM)
      READ (7,920) (FRACRN(I),I=1,NRNM)
      IFP1=NRNM+1
      READ (7,920) (EF(I),I=1,IFP1)
      CLOSE (7)
  910 FORMAT (7I10)
  920 FORMAT (7E10.3)
      READ (5,20) NRM,ITNG,NBU,NBUS,MOP                                SABO691
      IF(MOP) 25,25,23                                                 SABO692
   23 READ (5,22) (FRACRN(J),J=1,NRNM)                                 SABO693
   25 CONTINUE                                                         SABO694
      DO 30 IR=1,NRM                                                   SABO695
      READ(5,40) IRX,ZR(IRX),H(IRX),TEMP(IRX),DEN(IRX),NCHR(IRX),NBUF(IRSABO696
     1X),NEMR(IRX)                                                     SABO697
   30 CONTINUE                                                         SABO698
      DO 50 IR=1,NRM                                                   SABO699
      READ(5,60) IRX,NTHI(IRX),NRI(IRX),NPSII(IRX),ETHAI(IRX),NDNI(IRX),SABO700
     1NRNI(IRX),NTNOPI(IRX),NGSI(IRX)                                  SABO701
      NTHI(IRX)=MDEF(NTHI(IRX))                                        SABO702
      NRI(IRX)=MDEF(NRI(IRX))                                          SABO703
      NPSII(IRX)=MDEF(NPSII(IRX))                                      SABO704
      IF(ETHAI(IRX).LT.1.0E-4) ETHAI(IRX)=1.E-3                        SABO705
      IF (IR.LE.2) GO TO 50                                            SABO706
      MG=NDNI(IRX)/NGSI(IRX)+1                                         SABO707
      NPSSI(IRX)=MIN0(5,MG)                                            SABO708
   50 CONTINUE                                                         SABO709
      CALL LABEL(NAME,LPAGE)
      WRITE(6,71)                                                      SABO711
      WRITE(6,72)                                                      SABO712
      WRITE(6,73)                                                      SABO713
      WRITE(6,74) IGRC,IGRS,IGDS,IGSS                                  SABO714
      WRITE(6,75)                                                      SABO715
      WRITE(6,80)                                                      SABO716
      WRITE(6,90) NRM,NRNM,NTNM,NGM,ITNG,NBU,NBUS                      SABO717
      CALL INVA(NRM,3,22,W1,NERR)                                      SABO718
      IF(MOP) 27,27,26                                                 SABO719
   26 WRITE (6,24) (FRACRN(J),J=1,NRNM)                                SABO720
   27 CONTINUE                                                         SABO721
      WRITE(6,100)                                                     SABO722
      WRITE(6,110)                                                     SABO723
      DO 120 IR=1,NRM                                                  SABO724
      WRITE(6,130) IR,ZR(IR),H(IR),TEMP(IR),DEN(IR),NCHR(IR),NBUF(IR),NESABO725
     1MR(IR)                                                           SABO726
      CALL INVA(NBUF(IR),1,7,W2,NERR)                                  SABO727
      CALL INVA(NEMR(IR),1,10,W3,NERR)                                 SABO728
  120 CONTINUE                                                         SABO729
      NLINE = 21+(1+NRM)+1+(1+NRM)                                     SABO730
      IF (NLINE-40) 140,140,150                                        SABO731
  140 WRITE(6,160)                                                     SABO732
      GO TO 170                                                        SABO733
  150 CALL LABEL(NAME,LPAGE)                                           SABO734
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```
      NLINE = (1+NRM)+1+(1+NRM)                                         SAB0735
  170 WRITE(6,180)                                                      SAB0736
      DO 190 IR=1,NRM                                                   SAB0737
      IF(IR-2) 191,191,195                                              SAB0738
  191 WRITE(6,200) IR,NTHI(IR),NRI(IR),NPSII(IR),ETHAI(IR)              SAB0739
      GO TO 190                                                         SAB0740
  195 WRITE(6,200) IR,NTHI(IR),NRI(IR),NPSII(IR),ETHAI(IR),NDNI(IR),NRNISAB0741
     1(IR),NTNOPI(IR),NGSI(IR),          NPSSI(IR)                      SAB0742
      CALL INVA (NRNI(IR),1,50,W5,NERR)                                 SAB0743
      IF(NCHR(IR).GT.1) GO TO 190                                       SAB0744
      CALL INVA (NDNI(IR),4,250,W4,NERR)                                SAB0745
  190 CONTINUE                                                          SAB0746
      ND=0                                                              SAB0747
      DO 201 J=3,NRM                                                    SAB0748
  201 ND=ND+NDNI(J)                                                     SAB0749
      IF(ND.GT.1000) CALL CHECK1(W4,NERR)                               SAB0750
      CALL CHECK(NDNI,NRNI,100,100,NRM,W5,NERR)                         SAB0751
      CALL CHECK(NDNI,NTNOPI,200,200,NRM,W6,NERR)                       SAB0752
      CALL CHECK(NDNI,NGSI,50,500,NRM,W7,NERR)                          SAB0753
      CALL MACRO(NRM,DEN,NEMR,NAME,LPAGE,NRNM,NERR)                     SAB0754
      RETURN                                                            SAB0755
   10 FORMAT(18A4)                                                      SAB0756
   20 FORMAT(7I10)                                                      SAB0757
   22 FORMAT(7E10.4)
   24 FORMAT (//'***SOURCE SPECTRUM***'//(1P10E12.4))                   SAB0759
   40 FORMAT(I10,4F10.4,4I5)                                            SAB0760
   60 FORMAT(I10,3I5,5X,E10.4,6I5)
   71 FORMAT(23X,'******* S A B I N E - 3 *******'///)
   72 FORMAT(' ***CONTROL-INDICES***'//)                                SAB0763
   73 FORMAT('   IGRC       IGRS       IGDS       IGSS    ')            SAB0764
   74 FORMAT(4(3X,I3,4X))                                               SAB0765
   75 FORMAT(//'***GROUP-DATA***'//)                                    SAB0766
   80 FORMAT('   NREG',6X,'NRG',7X,'NNG',7X,'NGG',6X,'IFGAM',6X,'NBUC', SAB0767
     16X,'NBUS')                                                        SAB0768
   90 FORMAT (7(I6,4X))
  100 FORMAT(//'***GEOMETRY-DATA***'//)                                 SAB0770
  110 FORMAT('  REGION',6X,'ZR',9X,'H',7X,'TEMP',7X,'DEN',6X,'IGAP',6X, SAB0771
     1'MBU',7X,'NEMR ')
  130 FORMAT(4X,I2,4X,4F10.4,4(I6,4X))
  160 FORMAT(1H )                                                       SAB0774
  180 FORMAT(' REGION',4X,'M(THE)',5X,'M(R)',5X,'M(PSI)',5X,'ETHA',6X,  SAB0775
     1'NDIF',6X,'NREM',6X,'NPRT',6X,'NGS',7X,'NGCF')
  200 FORMAT(4(I6,4X),1PE10.2,6(I6,4X))
      END
      SUBROUTINE MACRO (NRM,DEN,NEMR,NAME,LPAGE,NRNM,N)                 SAB0779
C     MACRO READS THE COMPOSITION OF ALL REGIONS                        SAB0780
C      REAL NAME                                                        SAB0781
      DIMENSION DEN(22),NEMR(22),NAME(14)                               SAB0783
      DIMENSION NOIP(22,10),FREM(22,10)                                 SAB0784
      CHARACTER*4 NAME
      DO 20 IR=1,NRM                                                    SAB0785
      NCARD=(NEMR(IR)-1)/5+1                                            SAB0786
   30 DO 50 L=1,NCARD                                                   SAB0787
      JA=(L-1)*5+1                                                      SAB0788
      JE=L*5                                                            SAB0789
      READ (5,1000) IX,(NOIP(IR,J),FREM(IR,J),J=JA,JE)                  SAB0790
 1000 FORMAT (I5,5(I3,E10.4))
   50 CONTINUE                                                          SAB0792
   20 CONTINUE
      CALL LABEL(NAME,LPAGE)                                            SAB0794
      WRITE (6,1040)                                                    SAB0795
 1040 FORMAT (///' ***MATERIAL-DATA***')                                SAB0796
      WRITE (6,1050)                                                    SAB0797
 1050 FORMAT('REGION',6X,5('ID',9X,'FREM',7X))
      NLINE=10                                                          SAB0799
      DO 70 IR=1,NRM
```

```
      NCARD=NEMR(IR)/5
      IF(NEMR(IR)-5*NCARD)80,80,90
   90 NCARD=NCARD+1
   80 NLINE=NLINE+NCARD
      IF(NLINE-40)100,100,110
  100 DO 120 L=1,NCARD
      JA=(L-1)*5+1
      JE=L*5
      WRITE (6,1060) IR,(NOIP(IR,J),FREM(IR,J),J=JA,JE)
 1060 FORMAT (I5,5X,5(I5,5X,1PE12.4))
  120 CONTINUE
      GO TO 130
  110 CALL LABEL(NAME,LPAGE)
      WRITE (6,1050)
      NLINE=5
      GO TO 80
  130 WRITE (6,1070)
 1070 FORMAT (1H0)
      NLINE=NLINE+2
   70 CONTINUE
      OPEN (UNIT=9,FILE='B:LTGAM',STATUS='NEW')
      DO 140 IR=1,NRM
      NMAX=NEMR(IR)
      DO 140 J=1,NMAX
  140 WRITE(9,901) NOIP(IR,J),FREM(IR,J)
  901 FORMAT (5(I3,E10.3))
      CALL RMACRO (NRM,DEN,NEMR,NOIP,FREM,NRNM,N)
      RETURN
      END
      SUBROUTINE RMACRO (NRM,DEN,NEMR,NOIP,FREM,NRNM,NERR)
C     RMACRO CALCULATES THE MACROSCOPIC REMOVAL CROSS SECTIONS
      DIMENSION DEN(22),NEMR(22),NOIP(22,10),FREM(22,10),ID(50)
      DIMENSION NO(50),ATW(50),SIGREM(50,20),SREM(22,20)
      AVOG=0.602472
      OPEN (UNIT=2,FILE='B:LIBA2',STATUS='OLD')
      READ (2,110) NEL
      DO 120 I=1,NEL
      READ (2,130) NO(I),ATW(I)
  120 READ (2,140) (SIGREM(I,N),N=1,NRNM)
  110 FORMAT (I10)
  130 FORMAT (I9,F13.3)
  140 FORMAT (5E14.4)
      CLOSE (2)
      READ (5,11) NRC
      IF(NRC) 8,8,4
    4 READ (5,11) (ID(J),J=1,NRC)
   11 FORMAT (14I5)
   13 FORMAT (7E10.4)
      WRITE (6,15)
   15 FORMAT (1H0,' REMOVAL CROSS SECTION FROM INPUT')
      DO 7 J=1,NRC
      DO 31 NE=1,NEL
      IF(ID(J)-NO(NE)) 31,32,31
   31 CONTINUE
      WRITE (6,99) ID(J)
      NERR=NERR+1
      READ (5,11)
      READ (5,11)
      READ (5,11)
      GO TO 7
   32 K=NE
      READ (5,13)              (SIGREM(K,N),N=1,NRNM)
    6 WRITE (6,17) NO(K),ATW(K),(SIGREM(K,N),N=1,NRNM)
   17 FORMAT ('   ELEM.',I5,F8.2/(1P10E12.4))
    7 CONTINUE
    8 CONTINUE
```

```
      DO 10 IR=1,NRM                                                    SAB0858
      DO 10 I=1,NRNM                                                    SAB0859
   10 SREM(IR,I)=0.0                                                    SAB0860
      DO 20 IR=1,NRM                                                    SAB0861
      NMAX=NEMR(IR)                                                     SAB0862
      DO 20 I=1,NMAX                                                    SAB0863
      DO 30 NE=1,NEL                                                    SAB0864
      IF(NOIP(IR,I).EQ.NO(NE)) GO TO 40                                 SAB0865
   30 CONTINUE                                                          SAB0866
C     ELEMENT IS NOT IN THE LIBRARY                                     SAB0867
      WRITE (6,100) IR                                                  SAB0868
      WRITE (6,99) NOIP(IR,I)                                           SAB0869
   99 FORMAT (1H0,' ELEMENT',I5,' NOT FOUND IN THE LIBRARY')            SAB0870
  100 FORMAT (1H0//' REGION',I5)                                        SAB0871
      NERR=NERR+1                                                       SAB0872
      GO TO 20                                                          SAB0873
   40 J=NE                                                              SAB0874
      ELUNIT=(AVOG/ATW(J))*DEN(IR)*FREM(IR,I)                           SAB0875
      DO 50 NR=1,NRNM                                                   SAB0876
   50 SREM(IR,NR)=SREM(IR,NR)+ELUNIT*SIGREM(J,NR)                       SAB0877
   20 CONTINUE                                                          SAB0878
      IF (NERR.GT.0) RETURN
      OPEN (UNIT=1,FILE='B:LTDIF',STATUS='NEW')
      DO 60 IR=1,NRM
      WRITE (1,200) (SREM(IR,I),I=1,NRNM)
  60  CONTINUE
      CLOSE (1)
 200  FORMAT (1P5E10.4)
      RETURN                                                            SAB0883
      END                                                               SAB0884
      SUBROUTINE   MAINNS(M)                                            SAB0885
C     CALCULATION OF THE REMOVAL NEUTRON SOURCE DISTRIBUTION IN THE     SAB0886
C     FIRST AND THE SECOND REGION                                       SAB0887
C       REAL NAME                                                       SAB0888
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGDS,IGSS,IOP,NRM,NAME(18),ZR(22),H(22SAB0889
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ETSAB0890
     2HAI(22),NDNI(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),NRNM,ITNRNSAB0891
     3,NTNM,NIESC1,NIESC2,ITOH,NGM,ITNG,FRACRN(20),IRNT(20),CF(26),CFG(7SAB0892
     4),FEENO2(26)                                                      SAB0893
      COMMON/BLREM/SRNO(2),NCHRNR(2),NCRNR(2),ANR(2,10),SRNKAP(2),NCHRNZSAB0894
     1(2),NCRNZ(2),ANZ(2,10),SNO1(20),SNO2(20)                          SAB0895
      DIMENSION NWFRNR(2),YWFRNR(2,51),NWFRNZ(2),YWFRNZ(2,51)           SAB0896
      CHARACTER*4 W1,W2,NAME
      DATA W1,W2/'ISR ','ISZ '/                                         SAB0897
      IGRCX=IGRC+1                                                      SAB0898
      DO 30 IR=1,2                                                      SAB0899
      READ (5,1000) SRNO(IR),NCHRNR(IR),NCRNR(IR),NWFRNR(IR),NCHRNZ(IR),SAB0900
     1NCRNZ(IR),NWFRNZ(IR)                                              SAB0901
 1000 FORMAT (E10.4,6I10)
      IF(SRNO(IR))30,30,40                                              SAB0903
   40 GO TO (70,80,80,80),IGRCX                                         SAB0904
   70 NCHRNR(IR)=1                                                      SAB0905
      NCRNR(IR)=1                                                       SAB0906
      ANR(IR,1)=1.                                                      SAB0907
      GO TO 130                                                         SAB0908
   80 N1=NCHRNR(IR)                                                     SAB0909
      CALL INVA(N1,1,3,W1,M)                                            SAB0910
      IF(M.GT.0) RETURN
      GO TO (90,100,110),N1                                             SAB0912
   90 N2=NCRNR(IR)                                                      SAB0913
      READ (5,1010) (ANR(IR,N),N=1,N2)
 1010 FORMAT (7E10.4)                                                   SAB0915
      GO TO 120                                                         SAB0916
  100 N2=NWFRNR(IR)                                                     SAB0917
      READ (5,1010) (YWFRNR(IR,N),N=1,N2)                               SAB0918
      NCRNR(IR)=MIN0(5,N2)                                              SAB0919
```

```
      GO TO 120                                                         SAB0920
  110 READ (5,1010) SRNKAP(IR)                                          SAB0921
  120 GO TO (130,130,30,130),IGRCX                                      SAB0922
  130 N1=NCHRNZ(IR)                                                     SAB0923
      GO TO (140,150),N1                                                SAB0924
      CALL INVA(N1,1,2,W2,M)                                            SAB0925
      IF(M.GT.0) RETURN
  140 N2=NCRNZ(IR)                                                      SAB0927
      READ (5,1010) (ANZ(IR,N),N=1,N2)
      GO TO 30                                                          SAB0929
  150 N2=NWFRNZ(IR)                                                     SAB0930
      NCRNZ(IR)=MIN0(5,N2)                                              SAB0931
      READ (5,1010) (YWFRNZ(IR,N),N=1,N2)                               SAB0932
   30 CONTINUE                                                          SAB0933
      CALL SNOSP(NRNM,SRNO,FRACRN,SNO1,SNO2)                            SAB0934
      CALL LABEL(NAME,LPAGE)                                            SAB0935
      WRITE (6,1030)                                                    SAB0936
 1030 FORMAT (15X,'*** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIOSAB0937
     1NS ***'//50X,'S(Q)=S*P1(R)*P2(Z)'//)                              SAB0938
      CALL SNCSP(IGRC,NRNM,NCHRNR,NCRNR,NWFRNR,ANR,YWFRNR,SRNKAP,NCHRNZ,SAB0939
     1NCRNZ,NWFRNZ,ANZ,YWFRNZ,ZR,H,SNO1,SNO2,SRNO)                      SAB0940
      DO 160 IR=1,2                                                     SAB0941
      WRITE (6,1040) IR
 1040 FORMAT (22X,' SOURCE DISTRIBUTION OF THE REGION IR = ', I2)       SAB0943
      IF(SRNO(IR))180,180,190                                           SAB0944
  180 WRITE (6,1050)                                                    SAB0945
 1050 FORMAT (' NO SOURCE')                                             SAB0946
      GO TO 160                                                         SAB0947
  190 WRITE (6,1060) SRNO(IR)                                           SAB0948
 1060 FORMAT ('S =',1PE12.4//' P1(R)',' DISTRIBUTION IN RADIAL DIRECTIONSAB0949
     1')                                                                SAB0950
      GO TO (200,210,210,210),IGRCX                                     SAB0951
  200 WRITE (6,1065)                                                    SAB0952
 1065 FORMAT (' THE DISTRIBUTION IS CONSTANT. IGRC = 0 PLANE GEOMETRY') SAB0953
      GO TO 280                                                         SAB0954
  210 N1=NCHRNR(IR)                                                     SAB0955
      GO TO (220,230,240),N1                                            SAB0956
  220 N2=NCRNR(IR)                                                      SAB0957
      WRITE (6,1070) N2
 1070 FORMAT (I2,' COEFFICIENTS OF THE POLYNOM ARE GIVEN')              SAB0959
  225 WRITE (6,1090) (ANR(IR,N),N=1,N2)                                 SAB0960
 1090 FORMAT (4X,1P10E12.4)                                             SAB0961
      GO TO 280                                                         SAB0962
  230 N2=NWFRNR(IR)                                                     SAB0963
      WRITE (6,1100) N2
 1100 FORMAT (I2,' WEIGHTING FACTORS ARE GIVEN')                        SAB0965
  250 WRITE (6,1090) (YWFRNR(IR,N),N=1,N2)                              SAB0966
  270 N2=NCRNR(IR)                                                      SAB0967
      WRITE (6,1150) N2
 1150 FORMAT ('THE CALCULATED COEFFICIENTS ARE ',I2)                    SAB0969
      GO TO 225                                                         SAB0970
  240 WRITE (6,1160) SRNKAP(IR)                                         SAB0971
 1160 FORMAT ('EXPONENTIAL DISTRIBUTION, K=',1PE12.4)                   SAB0972
  280 WRITE (6,1170)                                                    SAB0973
 1170 FORMAT ('P2(Z), DISTRIBUTION IN AXIAL DIRECTION')                 SAB0974
      GO TO (290,290,300,290),IGRCX                                     SAB0975
  290 N1=NCHRNZ(IR)                                                     SAB0976
      GO TO (310,320),N1                                                SAB0977
  300 WRITE (6,1180)                                                    SAB0978
 1180 FORMAT (' IGRC = 2  SPHERICAL GEOMETRY  NO DISTRIBUTION')         SAB0979
      GO TO 160                                                         SAB0980
  310 N2=NCRNZ(IR)                                                      SAB0981
      WRITE (6,1070) N2
  315 WRITE (6,1090) (ANZ(IR,N),N=1,N2)                                 SAB0983
      GO TO 160                                                         SAB0984
  320 N2=NWFRNZ(IR)                                                     SAB0985
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      WRITE (6,1100) N2
      WRITE (6,1090) (YWFRNZ(IR,N),N=1,N2)                         SAB0987
      N2=NCRNZ(IR)                                                 SAB0988
      WRITE (6,1150) N2
      GO TO 315                                                    SAB0990
  160 CONTINUE                                                     SAB0991
  410 RETURN                                                       SAB0992
      END                                                          SAB0993
      FUNCTION MDEF(J)                                             SAB0994
      MDEF=J                                                       SAB0995
      IF(J.EQ.0) MDEF=1
      RETURN                                                       SAB0997
      END                                                          SAB0998
      SUBROUTINE CHECK(NN,ND,N1,N2,NR,WORD,NERR)                   SAB0999
      DIMENSION NN(1),ND(1)                                        SAB1000
      CHARACTER*4 WORD
      NSUM=0                                                       SAB1001
      NC=0                                                         SAB1002
      DO 10 J=3,NR                                                 SAB1003
      M=NN(J)/ND(J)                                                SAB1004
      NSUM=NSUM+M                                                  SAB1005
      IF(MOD(NN(J),ND(J)).NE.0.OR.M.GT.N1) NC=NC+1                 SAB1006
   10 CONTINUE                                                     SAB1007
      IF(NC) 11,11,12                                              SAB1008
   11 IF(NSUM.LE.N2) RETURN                                        SAB1009
C     ENTRY CHECK1(WORD,NERR)                                      SAB1010
   12 WRITE (6,19) WORD
   19 FORMAT (1H0,'WARNING,CHECK INPUT DATA',2X,A4)                SAB1012
      NERR=NERR+1                                                  SAB1013
      RETURN                                                       SAB1014
      END                                                          SAB1015
C  CHANGE ENTRY POINT TO SUBROUTINE
      SUBROUTINE CHECK1(WORD,NERR)                                 SAB1010
      CHARACTER*4 WORD
      WRITE (6,19) WORD
   19 FORMAT (1H0,'WARNING,CHECK INPUT DATA',2X,A4)                SAB1012
      NERR=NERR+1                                                  SAB1013
      RETURN                                                       SAB1014
      END                                                          SAB1015
      SUBROUTINE INVA(M,M1,M2,WORD,NERR)                           SAB1016
      CHARACTER*4 WORD
      IF(M.GE.M1.AND.M.LE.M2) RETURN                               SAB1017
      NERR=NERR+1                                                  SAB1018
      WRITE (6,9) WORD,M                                           SAB1019
    9 FORMAT (1H0,'WARNING, ',A4,'=',I4,'  IS NOT ALLOWED')        SAB1020
      RETURN                                                       SAB1021
      END                                                          SAB1022
      SUBROUTINE   SNOSP(NRNM,SRNO,FRACRN,SNO1,SNO2)               SAB1023
C     CALCULATION OF THE REMOVAL SOURCE AT THE OUTER EDGE OF REGION 1  SAB1024
C     AND 2                                                        SAB1025
      DIMENSION SRNO(2),FRACRN(20),SNO1(20),SNO2(20)               SAB1026
      DO 10 IRN=1,NRNM                                             SAB1027
      SNO1(IRN)=0.0                                                SAB1028
   10 SNO2(IRN)=0.0                                                SAB1029
      DO 20 IRS=1,2                                                SAB1030
      IF(SRNO(IRS))20,20,40                                        SAB1031
   40 DO 50 IRN=1,NRNM                                             SAB1032
      GO TO (60,70),IRS
   60 SNO1(IRN)=SNO1(IRN)+SRNO(IRS)*FRACRN(IRN)*2.46               SAB1034
      GO TO 50                                                     SAB1035
   70 SNO2(IRN)=SNO2(IRN)+SRNO(IRS)*FRACRN(IRN)*2.46               SAB1036
   50 CONTINUE                                                     SAB1037
   20 CONTINUE                                                     SAB1038
      RETURN                                                       SAB1039
      END                                                          SAB1040
      SUBROUTINE   SNCSP(IGRC,NRNM,NCHRNR.NCRNR,NWFRNR,ANR.YWFRNR.SRNKAPSAB1041
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```
     1,NCHRNZ,NCRNZ,NWFRNZ,ANZ,YWFRNZ,ZR,H,SNO1,SNO2,SRNO)              SAB1042
C     CALCULATION OF THE COEFFICIENTS OF THE POLYNOMS                   SAB1043
      DIMENSION NCHRNR(2),NCRNR(2),NWFRNR(2),ANR(2,10),YWFRNR(2,51),SRNKSAB1044
     1AP(2),NCHRNZ(2),NCRNZ(2),NWFRNZ(2),ANZ(2,10),YWFRNZ(2,51),ZR(22),HSAB1045
     2(22),SNO1(20),SNO2(20),SRNO(2)                                    SAB1046
      DIMENSION RHO(51),Y(51),A(10),Z(51)                               SAB1047
      EQUIVALENCE (RHO(1),Z(1))                                         SAB1048
      IGRCX=IGRC+1                                                      SAB1049
      DO 10 IRS=1,2                                                     SAB1050
      I=3-IRS                                                           SAB1051
      IF(SRNO(I))10,10,50                                               SAB1052
   50 N1=NCHRNR(I)                                                      SAB1053
      GO TO (60,70,60),N1                                               SAB1054
   70 GO TO (80,90,90,100),IGRCX                                        SAB1055
   80 NCRNR(I)=1                                                        SAB1056
      ANR(I,1)=1.0                                                      SAB1057
      GO TO 60                                                          SAB1058
   90 T=ZR(I)                                                           SAB1059
      GO TO 110                                                         SAB1060
  100 T=0.5*H(I)                                                        SAB1061
  110 N2=NWFRNR(I)                                                      SAB1062
      DRHO=T/FLOAT(N2-1)                                                SAB1063
      RHO(1)=0.0                                                        SAB1064
      Y(1)=YWFRNR(I,1)                                                  SAB1065
      DO 120 N=2,N2                                                     SAB1066
      RHO(N)=RHO(N-1)+DRHO                                              SAB1067
  120 Y(N)=YWFRNR(I,N)                                                  SAB1068
      N3=NCRNR(I)                                                       SAB1069
      CALL LSFIT(N2,RHO,Y,N3,A)                                         SAB1070
      DO 130 N=1,N3                                                     SAB1071
  130 ANR(I,N)=A(N)                                                     SAB1072
   60 IF(NCHRNZ(I)-1)10,10,65                                           SAB1073
   65 GO TO (140,150,10,140),IGRCX                                      SAB1074
  140 T=ZR(I)                                                           SAB1075
      GO TO 160                                                         SAB1076
  150 T=0.5*H(I)                                                        SAB1077
  160 N2=NWFRNZ(I)                                                      SAB1078
      DZ=T/FLOAT(N2-1)                                                  SAB1079
      Z(1)=0.0                                                          SAB1080
      Y(1)=YWFRNZ(I,1)                                                  SAB1081
      DO 170 N=2,N2                                                     SAB1082
      Z(N)=Z(N-1)+DZ                                                    SAB1083
  170 Y(N)=YWFRNZ(I,N)                                                  SAB1084
      N3=NCRNZ(I)                                                       SAB1085
      CALL LSFIT(N2,Z,Y,N3,A)                                           SAB1086
      DO 180 N=1,N3                                                     SAB1087
  180 ANZ(I,N)=A(N)                                                     SAB1088
   10 CONTINUE                                                          SAB1089
      RETURN                                                            SAB1090
      END                                                               SAB1091


C        S A B I N E 3                                                  SAB0000
      FUNCTION SESP(KAPPA,CONST,X)                                      SAB0116
C     SESP                                                              SAB0117
C     SOURCE DISTRIBUTION WITH EXPONENTIAL FUNCTION                     SAB0118
      REAL KAPPA                                                        SAB0119
      SESP=1.0                                                          SAB0120
      IF(CONST.EQ.0.0)GO TO 10                                          SAB0121
      SESP=EXP(-KAPPA*(CONST-X))                                        SAB0122
      GO TO 20                                                          SAB0123
   10 SESP=EXP(-KAPPA*X)                                                SAB0124
   20 CONTINUE                                                          SAB0125
      RETURN                                                            SAB0126
      END                                                               SAB0127
      FUNCTION SPSP(N,A,C,X)                                            SAB0128
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C     SOURCE DISTRIBUTION WITH POLYNOM                                  SAB0129
      DIMENSION A(10)                                                   SAB0130
      SPSP=A(1)                                                         SAB0131
      IF( N.LE.1.OR. X.EQ.C ) RETURN                                    SAB0132
      P=1.                                                              SAB0133
      IF (C.EQ.0.) GO TO 20                                             SAB0134
      DO 10 I=2,N                                                       SAB0135
      P=P*(C-X)                                                         SAB0136
   10 SPSP=SPSP+A(I)*P                                                  SAB0137
      RETURN                                                            SAB0138
   20 DO 30 I=2,N                                                       SAB0139
      P=P*X                                                             SAB0140
   30 SPSP=SPSP+A(I)*P                                                  SAB0141
      RETURN                                                            SAB0142
      END                                                               SAB0143
      FUNCTION YNUM(N,DX,Y)                                             SAB0144
C     YNUM                                                              SAB0145
C     NUMERICAL INTEGRATION                                             SAB0146
      DIMENSION Y(51)                                                   SAB0147
      YNUM=0.0                                                          SAB0148
      IF(N)120,120,10                                                   SAB0149
   10 M=N/6                                                             SAB0150
      L=N-6*M                                                           SAB0151
      IF(M)40,40,20                                                     SAB0152
   20 DO 30 M1=1,M                                                      SAB0153
      M2=6*(M1-1)                                                       SAB0154
   30 YNUM=YNUM+(6.0*DX/840.0)*(41.0*Y(M2+1)+216.0*Y(M2+2)+27.0*Y(M2+3)+SAB0155
     1272.0*Y(M2+4)+27.0*Y(M2+5)+216.0*Y(M2+6)+41.0*Y(M2+7))            SAB0156
      M2=6*M                                                            SAB0157
      GO TO 50                                                          SAB0158
   40 M2=0                                                              SAB0159
   50 IF(L)120,120,60                                                   SAB0160
   60 GO TO (70,80,90,100,110),L                                        SAB0161
   70 YNUM=YNUM+(DX/2.0)*(Y(M2+1)+Y(M2+2))                              SAB0162
      GO TO 120                                                         SAB0163
   80 YNUM=YNUM+(DX/3.0)*(Y(M2+1)+4.0*Y(M2+2)+Y(M2+3))                  SAB0164
      GO TO 120                                                         SAB0165
   90 YNUM=YNUM+(3.0*DX/8.0)*(Y(M2+1)+3.0*Y(M2+2)+3.0*Y(M2+3)+Y(M2+4))  SAB0166
      GO TO 120                                                         SAB0167
  100 YNUM=YNUM+(4.0*DX/90.0)*(7.0*Y(M2+1)+32.0*Y(M2+2)+12.0*Y(M2+3)+32.SAB0168
     10*Y(M2+4)+7.0*Y(M2+5))                                            SAB0169
      GO TO 120                                                         SAB0170
  110 YNUM=YNUM+(5.0*DX/288.0)*(19.0*Y(M2+1)+75.0*Y(M2+2)+50.0*Y(M2+3)+5SAB0171
     10.0*Y(M2+4)+75.0*Y(M2+5)+19.0*Y(M2+6))                            SAB0172
  120 CONTINUE                                                          SAB0173
      RETURN                                                            SAB0174
      END                                                               SAB0175
      FUNCTION THEOSP(CONST,DP)                                         SAB0176
C     THEOSP                                                            SAB0177
C     CALCULATION OF THE UPPER LIMIT FOR THETA INTEGRATION              SAB0178
      PI=3.1415927                                                      SAB0179
      THEOSP=0.                                                         SAB0180
      IF(CONST.LE.0.) RETURN                                            SAB0181
      IF(ABS(DP-CONST).LT.0.01) GO TO 20                                SAB0182
      IF(DP-CONST)30,20,10                                              SAB0183
   10 X=DP**2-CONST**2                                                  SAB0184
      X=CONST/SQRT(X)                                                   SAB0185
      THEOSP=ATAN(X)                                                    SAB0186
      GO TO 40                                                          SAB0187
   20 THEOSP=PI/2.0                                                     SAB0188
      GO TO 40                                                          SAB0189
   30 THEOSP=PI                                                         SAB0190
   40 RETURN                                                            SAB0191
      END                                                               SAB0192
      FUNCTION RHOS(D,RS,C)                                             SAB0193
      A=D*RS*(1.-C)                                                     SAB0194
```

```
      B=D-RS                                                            SAB0195
      RHOS=SQRT(B*B+A*A)                                                SAB0196
      RETURN                                                            SAB0197
      END                                                               SAB0198
      FUNCTION ROOT(A,D,S)                                              SAB0199
      DS=D*S                                                            SAB0200
      IF(DS-A)2,3,3                                                     SAB0201
    2 ROOT=SQRT(A*A-DS*DS)                                              SAB0202
      RETURN                                                            SAB0203
    3 ROOT=0.                                                           SAB0204
      RETURN                                                            SAB0205
      END                                                               SAB0206
      FUNCTION T2SP(D,S,N,R)                                            SAB0207
      DIMENSION R(22)                                                   SAB0208
      A=(D*S)**2                                                        SAB0209
      T2SP=SQRT(R(N)**2-A)                                              SAB0210
      X=R(N-1)**2-A                                                     SAB0211
      IF(X.GT.0.)T2SP=T2SP-SQRT(X)                                      SAB0212
      RETURN                                                            SAB0213
      END                                                               SAB0214
      FUNCTION T3SP(D,S,C,N,R,J)                                        SAB0215
      DIMENSION R(22)                                                   SAB0216
      K=N-J                                                             SAB0217
      P=-1.                                                             SAB0218
      IF(J.EQ.0)P=-P                                                    SAB0219
      T3SP=D*C                                                          SAB0220
      X=R(K)**2-(D*S)**2                                                SAB0221
      IF(X.GT.0.)T3SP=T3SP+P*SQRT(X)                                    SAB0222
      RETURN                                                            SAB0223
      END                                                               SAB0224
      SUBROUTINE T1ZK(D,S,C,J1,J2,ZR,RAD,T)                             SAB0225
      DIMENSION ZR(22),RAD(22),T(22)                                    SAB0226
      L=J2-1                                                            SAB0227
      IF(J1.GT.L)GO TO 10                                               SAB0228
      DO 5 J=J1,L                                                       SAB0229
    5 T(J)=T2SP(D,S,J,RAD)                                              SAB0230
   10 T(J2)=0.                                                          SAB0231
      IF(D.LE.RAD(L)) RETURN                                            SAB0232
      T(J2)=T3SP(D,S,C,J2,RAD,1)                                        SAB0233
      RETURN                                                            SAB0234
      END                                                               SAB0235
      SUBROUTINE T1PL(D,S,C,N,ZR,RAD,T)                                 SAB0236
C     CALCULATION OF PATH LENGTH IN PLANE SHIELD,SOURCE IN REG1         SAB0237
      REAL L1,L2                                                        SAB0238
      DIMENSION ZR(22),RAD(22),T(22)                                    SAB0239
      IF(N.EQ.2) GO TO 22                                               SAB0240
      T(2)=T2SP(D,S,2,RAD)                                              SAB0241
      IF(N.GT.3)GO TO 10                                                SAB0242
      IF(D-RAD(2))5,5,6
    6 T(3)=T3SP(D,S,C,3,RAD,1)                                          SAB0244
      RETURN                                                            SAB0245
    5 T(3)=0.                                                           SAB0246
      RETURN                                                            SAB0247
   10 SEC=1./C                                                          SAB0248
      NM1=N-1                                                           SAB0249
      A=(D-RAD(3))*SEC                                                  SAB0250
      CALL LSP(ZR(1),D,S,C,L1,L2)                                       SAB0251
      T(3)=L1-T(2)-A                                                    SAB0252
      PR1=D-RAD(NM1)                                                    SAB0253
      IF(PR1)12,12,15                                                   SAB0254
   12 T(N)=0.                                                           SAB0255
      GO TO 16                                                          SAB0256
   15 T(N)=PR1*SEC                                                      SAB0257
   16 IF(N.EQ.4)RETURN                                                  SAB0258
      DO 20 J=4,NM1                                                     SAB0259
   20 T(J)=ZR(J)*SEC                                                    SAB0260
```

```
      RETURN
   22 T(2)=T3SP(D,S,C,2,RAD,1)
      RETURN
      END
      SUBROUTINE T2PL(D,S,C,N,ZR,R,T)
C     PATH LENGTH,SOURCE IN REG 2,PLANE GEOM.
      REAL L1,L2
      DIMENSION ZR(22),R(22),T(22)
      N1=N-1
      IF(N-3)10,10,20
   10 T(N)=0.
      IF(D.LE.R(N1))RETURN
      T(N)=T3SP(D,S,C,N,R,1)
      RETURN
   20 CALL LSP(R(2),D,S,C,L1,L2)
      T(3)=L1-(D-R(3))/C
      IF(N-4)40,40,50
   40 T(N)=0.
      IF(D.LE.R(N1))RETURN
      T(N)=(D-R(N1))/C
      RETURN
   50 DO 51 J=4,N1
   51 T(J)=ZR(J)/C
      GO TO 40
      END
      SUBROUTINE T22P(D,S,C,N,ZR,R,T)
      DIMENSION ZR(22),T(22),R(22)
      CALL LSP(ZR(1),D,S,C,P1,P2)
      T(1)=P2-P1
      T(2)=T2SP(D,S,2,R)
      CALL T2PL(D,S,C,N,ZR,R,T)
      RETURN
      END
      SUBROUTINE LSP(A,D,S,C,R1,R2)
C     R1,R2 ARE LIMITS OF THE R INTEGRATION
      X=0.
      DS=D*S
      DC=D*C
      R1=0.001
      IF(DS.LT.A)X=SQRT(A*A-DS*DS)
      IF(A-D)4,5,6
    4 R1=DC-X
    6 R2=DC+X
      RETURN
    5 R2=DC+DC
      RETURN
      END
      FUNCTION NTEST(M)
C     TEST OF THE NUMBER OF MESHPOINTS
      NTEST=MIN0(20,MAX0(4,M))
      RETURN
      END
      FUNCTION      YMAXG(N,Y)
C     YMAXF    MAXIMUM VALUE OF Y(I)   I=1 TILL 35
      DIMENSION Y(7)
      YMAXG = Y(1)
      DO 10 I=2,N
      IF (YMAXG - Y(I)) 20,10,10
   20 YMAXG = Y(I)
   10 CONTINUE
      RETURN
      END
      FUNCTION NYMIN(N,NY)
C     MINIMUM INTEGER VALUE OF NY(I)
      DIMENSION NY(7)
      NYMIN=NY(1)
```

```
      DO 20 I=2,N
      IF(NYMIN-NY(I))20,20,10
   10 NYMIN=NY(I)
   20 CONTINUE
      RETURN
      END
      FUNCTION MTEST(IG,SGOX,N1IG,N2IG,N3IG,IND)
C     TEST OF THE SOURCE STRENGTH AND THE NUMBERS OF MESHPOINTS
      DIMENSION SGOX(7),N1IG(7),N2IG(7),N3IG(7)
      IF(SGOX(IG))10,10,20
   10 MTEST=0
      GO TO 90
   20 IF(IND)30,30,40
   30 MTEST=1
      GO TO 90
   40 IF(N1IG(IG))50,50,10
   50 IF(IND-1)30,30,60
   60 IF(N2IG(IG))70,70,10
   70 IF(IND-2)30,30,80
   80 IF(N3IG(IG))30,30,10
   90 CONTINUE
      RETURN
      END
      SUBROUTINE   NBRELS(NRNM,N1,N2,SIGMA,X,SNOX,N1IRN,N2IRN,N3IRN,IND,
     1REL,BREL)
C     CALCULATION OF THE RELAXATION LENGTHS AND THE SUM
      DIMENSION SIGMA(22,20),X(22),SNOX(20),N1IRN(20),N2IRN(20),N3IRN(20
     1),REL(22,20),BREL(20)
      DO 10 I=1,NRNM
      DO 20 N=N1,N2
   20 REL(N,I)=0.0
   10 BREL(I)=0.0
      DO 30 I=1,NRNM
      NX=MTEST(I,SNOX,N1IRN,N2IRN,N3IRN,IND)
      IF(NX.LE.0) GO TO 30
      DO 40 N=N1,N2
      REL(N,I)=SIGMA(N,I)*X(N)
   40 BREL(I)=BREL(I)+REL(N,I)
   30 CONTINUE
      RETURN
      END
      SUBROUTINE   MAINNF
C     CALCULATION OF THE REMOVAL NEUTRON FLUXES IN THE SHIELD REGIONS
      REAL LMIN
C      REAL NAME
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGDS,IGSS,IOP,NRM,NAME(18),ZR(22),H(22
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ET
     2HAI(22),NDNI(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),NRNM,ITNRN
     3,NTNM,NIESC1,NIESC2,ITOH,NGM,ITNG,FRACRN(20),IRNT(20),CF(26),CFG(7
     4),FEENO2(26)
      COMMON/BLREM/SRNO(2),NCHRNR(2),NCRNR(2),ANR(2,10),SRNKAP(2),NCHRNZ
     1(2),NCRNZ(2),ANZ(2,10),SNO1(20),SNO2(20)
      COMMON/CRN/ARHO(20),AZ(10),NTHIRN(20),NRIRN(20),NPSIRN(20),TPATH(2
     12),REL(22,20),BREL(20),FFUNCT(51,20),GFUNCT(51,20),Y(51),BRELR(20)
     2,FFUNC1(20)
      DIMENSION SREM(22,20),LMIN(2),FEERN(2,20),SNOX(20),FEERNS(20)
      CHARACTER*4 NAME
      OPEN (UNIT=1,FILE='B:LTDIF',STATUS='OLD')
      DO 10 IR=1,NRM
   10 READ (1,15)  (SREM(IR,I),I=1,NRNM)
   15 FORMAT (5E10.4)
      CLOSE (1)
      IGRCX=IGRC+1
      IGRSX=IGRS+1
C     CALCULATION OF THE MINIMUM RELAXATION LENGTH
      DO 30 IRS=1,2
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      DO 40 IRN=1,NRNM                                                  SAB1114
   40 ARHO(IRN)=SREM(IRS,IRN)                                           SAB1115
  30  LMIN(IRS)=1./YMAXG(NRNM,ARHO)                                     SAB1116
      SUMIR1=ZR(1)                                                      SAB1117
      DP=ZR(1)+ZR(2)                                                    SAB1118
      DPOP=0.0                                                          SAB1119
      IPJSUM=0                                                          SAB1120
      OPEN (UNIT=2,FILE='B:LTREM',STATUS='NEW')
      DO 50 IR=3,NRM                                                    SAB1121
      SUMIR1=SUMIR1+ZR(IR-1)                                            SAB1122
      SUMIR2=SUMIR1+ZR(IR)                                              SAB1123
C     DETERMINATION OF THE POINT OF VIEW                                SAB1124
      IPJ=NDNI(IR)/NRNI(IR)                                             SAB1125
      DDP=ZR(IR)/FLOAT(IPJ)                                             SAB1126
      IF(IR-NRM)80,85,85                                                SAB1127
   85 IPJ=IPJ+1                                                         SAB1128
   80 IPJSUM=IPJSUM+IPJ
      DO 90 IP=1,IPJ                                                    SAB1130
      DO 100 IRS=1,2                                                    SAB1131
      DO 100 IRN=1,NRNM
  100 FEERN(IRS,IRN)=0.0                                                SAB1133
      SUIRS2=0.0                                                        SAB1134
C     SUMMATION OVER THE SOURCE REGIONS                                 SAB1135
      DO 110 IRS=1,2                                                    SAB1136
      SUIRS2=SUIRS2+ZR(IRS)                                             SAB1137
      SUIRS1=SUIRS2-ZR(IRS)                                             SAB1138
      IF(SRNO(IRS))110,110,120                                          SAB1139
  120 GO TO (150,160),IRS                                               SAB1140
  150 DO 170 IRN=1,NRNM
  170 SNOX(IRN)=SNO1(IRN)                                               SAB1142
      GO TO 180                                                         SAB1143
  160 DO 190 IRN=1,NRNM
  190 SNOX(IRN)=SNO2(IRN)                                               SAB1145
  180 ETHA=ETHAI(IRS)                                                   SAB1146
      GO TO (260,270,270,260),IGRCX                                     SAB1147
  260 CALL NCYPLA(IR,SUMIR1,SUMIR2,IRS,SUIRS1,SUIRS2,DP,LMIN,SNOX,ETHA,FSAB1148
     1EERN,SREM)                                                        SAB1149
      GO TO 110                                                         SAB1150
  270 CALL NCYSE(IR,SUMIR1,SUMIR2,IRS,SUIRS1,SUIRS2,DP,LMIN,SNOX,ETHA,FESAB1151
     1ERN,SREM)                                                         SAB1152
  110 CONTINUE                                                          SAB1153
      DO 400 IRN=1,NRNM
  400 FEERN(1,IRN) = FEERN(1,IRN)+FEERN(2,IRN)                          SAB1155
      DO 410 IRN=1,NRNM
  410 FEERNS(IRN)=SREM(IR,IRN)*FEERN(1,IRN)
      WRITE (2,55) (FEERN(1,IRN),IRN=1,NRNM),(FEERNS(IRN),IRN=1,NRNM)
   55 FORMAT (1P5E10.4)
      DP=DP+DDP                                                         SAB1159
      DPOP=DPOP+DDP                                                     SAB1160
   90 CONTINUE                                                          SAB1161
      DO 280 IP=1,IPJ                                                   SAB1162
      DP=DP-DDP                                                         SAB1163
  280 DPOP=DPOP-DDP                                                     SAB1164
   60 DP=DP+ZR(IR)                                                      SAB1165
      DPOP=DPOP+ZR(IR)                                                  SAB1166
   50 CONTINUE
      CLOSE (2)
  290 RETURN
      END                                                               SAB1169
      SUBROUTINE   NHFSP(NPSIM,DPSI,ETHA,NRNM,BREL,SVRHO,SNOX,R,NPZ,AZ,NSAB1170
     1THIRN,NRIRN,FUNCT)                                                SAB1171
C     NUMERICAL INTEGRATION OVER THE HEIGHT OF THE CYLINDRICAL SOURCE   SAB1172
      DIMENSION BREL(20),SVRHO(20),SNOX(20),AZ(10),NTHIRN(20),NRIRN(20),SAB1173
     1FUNCT(20)                                                         SAB1174
      DIMENSION NPSIRN(20),BRLPSI(20),HFUNCT(51,20),Y(51)               SAB1175
      PSI=0.0                                                           SAB1176
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      DO 10 IRN=1,NRNM                                                  SAB1177
   10 NPSIRN(IRN)=0                                                     SAB1178
      DO 20 NPSI=1,NPSIM                                                SAB1179
      SECPSI=1.0/COS(PSI)                                               SAB1180
      Z=R*SIN(PSI)*SECPSI                                               SAB1181
      SVZ=SPSP(NPZ,AZ,0.0,Z)                                            SAB1182
      DO 30 IRN=1,NRNM                                                  SAB1183
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,3)                          SAB1184
      IF(NX)30,30,40                                                    SAB1185
   40 BRLPSI(IRN)=BREL(IRN)*SECPSI                                      SAB1186
      IF(BRLPSI(IRN)-88.0)60,60,70                                      SAB1187
   60 HFUNCT(NPSI,IRN)=SVRHO(IRN)*SVZ*EXP(-BRLPSI(IRN))                 SAB1188
      GO TO 80                                                          SAB1189
   70 HFUNCT(NPSI,IRN)=0.0                                              SAB1190
   80 QUOT=HFUNCT(NPSI,IRN)/HFUNCT(1,IRN)                               SAB1191
      IF(QUOT-ETHA)90,30,30                                             SAB1192
   90 NPSIRN(IRN)=NPSI                                                  SAB1193
   30 CONTINUE                                                          SAB1194
      NPSIRM=NYMIN(NRNM,NPSIRN)                                         SAB1195
      IF(NPSIRM)100,100,110                                             SAB1196
  100 PSI=PSI+DPSI                                                      SAB1197
   20 CONTINUE                                                          SAB1198
      DO 111 IRN=1,NRNM
      IF(NPSIRN(IRN)) 112,112,111                                       SAB1200
  112 NPSIRN(IRN) = NPSIM                                               SAB1201
  111 CONTINUE                                                          SAB1202
  110 DO 120 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                          SAB1204
      IF(NX)120,120,130
  130 NPSIM=NPSIRN(IRN)
      IF(NPSIM-1)140,140,150                                            SAB1207
  140 FUNCT(IRN)=0.0                                                    SAB1208
      GO TO 120                                                         SAB1209
  150 DO 160 NPSI=1,NPSIM                                               SAB1210
  160 Y(NPSI)=HFUNCT(NPSI,IRN)                                          SAB1211
      NPSIM=NPSIM-1                                                     SAB1212
      FUNCT(IRN)=YNUM(NPSIM,DPSI,Y)                                     SAB1213
  120 CONTINUE                                                          SAB1214
      RETURN                                                            SAB1215
      END                                                               SAB1216

C        S A B I N E 3                                                  SAB0000
      SUBROUTINE   NCYSE(IR,SUMIR1,SUMIR2,IRS,SUIRS1,SUIRS2,DP,LMIN,SNOXSAB1217
     1,ETHA,FEERN,SREM)
C     CALCULATION OF THE REMOVAL FLUXES FOR CYLINDRICAL AND SPHERICAL   SAB1219
C     GEOMETRY                                                          SAB1220
      REAL LMIN,L11TH,L12TH,L21TH,L22TH,LLTH,LUTH,KAPPA                 SAB1221
C       NAME
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGDS,IGSS,IOP,NRM,NAME(18),ZR(22),H(22SAB1222
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ETSAB1223
     2HAI(22),NDNI(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),NRNM,ITNRNSAB1224
     3,NTNM,NIESC1,NIESC2,ITOH,NGM,ITNG,FRACRN(20),IRNT(20),CF(26),CFG(7SAB1225
     4),FEENO2(26)                                                      SAB1226
      COMMON/BLREM/SRNO(2),NCHRNR(2),NCRNR(2),ANR(2,10),SRNKAP(2),NCHRNZSAB1227
     1(2),NCRNZ(2),ANZ(2,10),SNO1(20),SNO2(20)                          SAB1228
      COMMON/CRN/ARHO(20),AZ(10),NTHIRN(20),NRIRN(20),NPSIRN(20),TPATH(2SAB1229
     12),REL(22,20),BREL(20),FFUNCT(51,20),GFUNCT(51,20),Y(51),BRELR(20)SAB1230
     2,FFUNC1(20)                                                       SAB1231
      DIMENSION SVRHO(20),BREL1(20),GFUNC1(20),FUNCT(20),DFEERN(20)     SAB1232
      DIMENSION SREM(22,20),LMIN(2),FEERN(2,20),SNOX(20)                SAB1233
      DIMENSION RAD(22)
      CHARACTER*4 NAME
      RAD(1)=ZR(1)                                                      SAB1235
      DO 2 J=2,NRM                                                      SAB1236
    2 RAD(J)=RAD(J-1)+ZR(J)                                             SAB1237
```

```
      IGX=IGRC                                                          SAB1238
      IGY=IGRS                                                          SAB1239
      TREF = .2618/FLOAT(NTHI(IRS))                                     SAB1240
      IF(NCHRNR(IRS)-3)30,40,40                                         SAB1241
   30 NPRHO=NCRNR(IRS)                                                  SAB1242
      DO 50 N=1,NPRHO                                                   SAB1243
   50 ARHO(N)=ANR(IRS,N)                                                SAB1244
      GO TO 60                                                          SAB1245
   40 KAPPA=SRNKAP(IRS)
   60 IF(IGX.EQ.2) GO TO 70                                             SAB1247
      PREF=.2618/FLOAT(NPSII(IRS))                                      SAB1248
   80 IF(H(IRS))90,90,100                                               SAB1249
   90 NPZ=1                                                             SAB1250
      AZ(1)=1.0                                                         SAB1251
      GO TO 70                                                          SAB1252
  100 NPZ=NCRNZ(IRS)                                                    SAB1253
      DO 110 N=1,NPZ                                                    SAB1254
  110 AZ(N)=ANZ(IRS,N)                                                  SAB1255
   70 SUMTH2=0.0                                                        SAB1256
      IRSTHM=IRS                                                        SAB1257
      DO 170 IRN=1,NRNM
  170 DFEERN(IRN)=0.0                                                   SAB1259
      DO 180 IRSTH=1,IRSTHM                                             SAB1260
      IRSTHX=IRSTH                                                      SAB1261
      SUMTH2=SUMTH2+ZR(IRSTHX)                                          SAB1262
      SUMTH1=SUMTH2-ZR(IRSTHX)                                          SAB1263
      IF(IRSTHX-1)210,210,220                                           SAB1264
  210 THETOL=0.0                                                        SAB1265
      GO TO 230                                                         SAB1266
  220 THETOL=THETOU                                                     SAB1267
  230 THETOU=THEOSP(SUMTH2,DP)                                          SAB1268
      MAX = (THETOU-THETOL)/TREF+1.                                     SAB1269
      NTHM=NTEST(MAX)                                                   SAB1270
      DTHETA=(THETOU-THETOL)/FLOAT(NTHM-1)                              SAB1271
      DTHETA=DTHETA*0.999                                               SAB1272
      THETA=THETOL                                                      SAB1273
      PP=+1.0                                                           SAB1274
      DO 310 IRN=1,NRNM
      NTHIRN(IRN)=0                                                     SAB1276
      DO 310 NTH=1,NTHM
  310 FFUNCT(NTH,IRN)=0.0                                               SAB1278
      DO 330 NTH=1,NTHM
      IF(NTH.EQ.NTHM .AND. IRSTH.EQ.IRS) GO TO 330                      SAB1280
      DO 340 IRN=1,NRNM
      BREL(IRN)=0.0                                                     SAB1282
  340 BREL1(IRN)=0.0                                                    SAB1283
      SINTH=SIN(THETA)                                                  SAB1284
      COSTH=COS(THETA)                                                  SAB1285
  360 CALL LSP(SUIRS1,DP,SINTH,COSTH,L11TH,L12TH)                       SAB1286
  350 CALL LSP(SUIRS2,DP,SINTH,COSTH,L21TH,L22TH)                       SAB1287
      IF(IRSTHX-IRSTHM)400,410,410                                      SAB1288
  400 LUTH=L11TH                                                        SAB1289
      GO TO 420                                                         SAB1290
  410 LUTH=L22TH                                                        SAB1291
  420 LLTH=L21TH                                                        SAB1292
      J1=IRS+1                                                          SAB1293
      J2=IR                                                             SAB1294
      IF(LUTH-LLTH)1060,1060,480                                        SAB1295
  480 IF(IGY)490,490,500                                                SAB1296
  490 IF(IRS-2)510,520,520                                              SAB1297
  510 CALL T1PL(DP,SINTH,COSTH,J2,ZR,RAD,TPATH)                         SAB1298
      GO TO 530                                                         SAB1299
  520 CALL T2PL(DP,SINTH,COSTH,J2,ZR,RAD,TPATH)                         SAB1300
      GO TO 530                                                         SAB1301
  500 CALL T1ZK(DP,SINTH,COSTH,J1,J2,ZR,RAD,TPATH)                      SAB1302
  530 CALL NBRELS(NRNM,J1,J2,SREM,TPATH,SNOX,NTHIRN,NRIRN,NPSIRN,1,REL,BSAB1303
```

```
     1REL)                                                              SAB1304
      MAX = IFIX((LUTH-LLTH)/(LMIN(IRS)/FLOAT(NRI(IRS)))) + 1           SAB1305
      NRMAX=NTEST(MAX)                                                  SAB1306
      DR=(LUTH-LLTH)/FLOAT(NRMAX-1)                                     SAB1307
      NFIRST = 1                                                        SAB1308
      R=LLTH                                                            SAB1309
      DO 650 IRN=1,NRNM
  650 NRIRN(IRN)=0                                                      SAB1311
      DO 660 NR=1,NRMAX
      RHO=RHOS(DP,R,COSTH)                                              SAB1313
      RHO=SUIRS2-RHO                                                    SAB1314
      TPATH(1)=R-LLTH                                                   SAB1315
      DO 700 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                          SAB1317
      IF(NX)710,710,720
  710 SVRHO(IRN)=0.0                                                    SAB1319
      GO TO 700                                                         SAB1320
  720 REL(1,IRN)=SREM(IRS,IRN)*TPATH(1)                                 SAB1321
      BRELR(IRN) = BREL(IRN)+REL(1,IRN)                                 SAB1322
      IF(BRELR(IRN)-88.0) 730,730,740                                   SAB1323
  730 IF(NCHRNR(IRS)-3)770,780,780                                      SAB1324
  770 SVRHO(IRN) = SNOX(IRN)*SPSP(NPRHO,ARHO,0.0,RHO)                   SAB1325
      GO TO 700                                                         SAB1326
  780 SVRHO(IRN) = SNOX(IRN)*SESP(KAPPA,0.0,RHO)                        SAB1327
      GO TO 700                                                         SAB1328
  740 IF(NR-1)800,800,810                                               SAB1329
  800 NRIRN(IRN)=NR                                                     SAB1330
      GO TO 700                                                         SAB1331
  810 NRIRN(IRN)=NR-1                                                   SAB1332
  700 CONTINUE                                                          SAB1333
      IF(IGX.EQ.1) GO TO 830                                            SAB1334
      GO TO 920                                                         SAB1335
  830 HX = H(IRS)                                                       SAB1336
      IF(R)840,840,850                                                  SAB1337
  840 DO 860 IRN=1,NRNM
  860 GFUNCT(NR,IRN)=0.0                                                SAB1339
      NFIRST=2                                                          SAB1340
      GO TO 940                                                         SAB1341
  850 IF(HX)870,870,880
  870 PSIO=1.56                                                         SAB1343
      GO TO 890                                                         SAB1344
  880 PSIO=ATAN(HX/(2.0*R))                                             SAB1345
  890 MAX=PSIO/PREF+1.                                                  SAB1346
      NPSIM=NTEST(MAX)                                                  SAB1347
      DPSI=PSIO/FLOAT(NPSIM-1)                                          SAB1348
      CALL NHFSP(NPSIM,DPSI,ETHA,NRNM,BRELR,SVRHO,SNOX,R,NPZ,AZ,NTHIRN,NSAB1349
     1RIRN,FUNCT)                                                       SAB1350
      DO 900 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                          SAB1352
      IF(NX)900,900,910
  910 GFUNCT(NR,IRN)=FUNCT(IRN)                                         SAB1354
  900 CONTINUE                                                          SAB1355
      GO TO 930                                                         SAB1356
  920 DO 950 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                          SAB1358
      IF(NX)950,950,960
  960 IF(BRELR(IRN)-88.0) 970,970,980                                   SAB1360
  980 GFUNCT(NR,IRN)=0.0                                                SAB1361
      GO TO 950                                                         SAB1362
  970 GFUNCT(NR,IRN) = SVRHO(IRN)*EXP(-BRELR(IRN))                      SAB1363
  950 CONTINUE                                                          SAB1364
  930 DO 990 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                          SAB1366
      IF(NX)990,990,1000                                                SAB1367
 1000 QUOT=GFUNCT(NR,IRN)/GFUNCT(NFIRST,IRN)                            SAB1368
      IF(QUOT-ETHA)1010,990,990                                         SAB1369
```

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1010 NRIRN(IRN)=NR                                                    SAB1370
 990 CONTINUE                                                         SAB1371
     NRIRNM=NYMIN(NRNM,NRIRN)                                         SAB1372
     IF(NRIRNM)940,940,1020                                           SAB1373
 940 R=R+DR                                                           SAB1374
 660 CONTINUE                                                         SAB1375
     DO 1011 IRN=1,NRNM                                               SAB1376
     IF(NRIRN(IRN)) 1012,1012,1011                                    SAB1377
1012 NRIRN(IRN) = NRMAX                                               SAB1378
1011 CONTINUE                                                         SAB1379
1020 DO 1030 IRN=1,NRNM                                               SAB1380
     NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,1)                         SAB1381
     IF(NX)1030,1030,1040                                             SAB1382
1040 NRMAX=NRIRN(IRN)                                                 SAB1383
     IF(NRMAX-1)1030,1030,1045                                        SAB1384
1045 GFUNC1(IRN)=GFUNCT(NFIRST,IRN)                                   SAB1385
     NNUM=0                                                           SAB1386
     DO 1050 N=NFIRST,NRMAX                                           SAB1387
     NNUM=NNUM+1                                                      SAB1388
1050 Y(NNUM)=GFUNCT(N,IRN)                                            SAB1389
     NNUM=NNUM-1                                                      SAB1390
     FFUNCT(NTH,IRN)=YNUM(NNUM,DR,Y)                                  SAB1391
1030 CONTINUE                                                         SAB1392
1060 IF(IRSTHX-IRSTHM)1070,1080,1080                                  SAB1393
1070 LUTH=L22TH                                                       SAB1394
     LLTH=L12TH                                                       SAB1395
     J1 = IRSTHX+1                                                    SAB1396
     J2=IRS-1                                                         SAB1397
     IF(LUTH-LLTH)1080,1080,1085                                      SAB1398
1085 IF(J1-J2)1090,1090,1100                                          SAB1399
1100 GO TO 1150                                                       SAB1400
1090 CALL T1ZK(DP,SINTH,COSTH,J1,J2+1,ZR,RAD,TPATH)                   SAB1401
     CALL NBRELS(NRNM,J1,J2,SREM,TPATH,SNOX,NTHIRN,NRIRN,NPSIRN,1,REL,BSAB1402
    1REL)                                                             SAB1403
     DO 1110 IRN=1,NRNM                                               SAB1404
1110 BREL1(IRN)=BREL(IRN)                                             SAB1405
1150 J1=IRSTHX                                                        SAB1406
     J2=IR                                                            SAB1407
     IF(IGY)1180,1180,1170                                            SAB1408
1180 CALL T22P(DP,SINTH,COSTH,J2,ZR,RAD,TPATH)                        SAB1409
     GO TO 1190                                                       SAB1410
1170 TPATH(J1)=2.*ROOT(SUMTH2,DP,SINTH)                               SAB1411
     CALL T1ZK(DP,SINTH,COSTH,J1+1,J2,ZR,RAD,TPATH)                   SAB1412
1190 CALL NBRELS(NRNM,J1,J2,SREM,TPATH,SNOX,NTHIRN,NRIRN,NPSIRN,1,REL,BSAB1413
    1REL)                                                             SAB1414
     DO 1200 IRN=1,NRNM                                               SAB1415
1200 BREL1(IRN)=BREL1(IRN)+BREL(IRN)                                  SAB1416
     MAX = IFIX((LUTH-LLTH)/(LMIN(IRS)/FLOAT(NRI(IRS)))) + 1          SAB1417
     NRMAX=NTEST(MAX)                                                 SAB1418
     DR=(LUTH-LLTH)/FLOAT(NRMAX-1)                                    SAB1419
     R=LLTH                                                           SAB1420
     DO 1250 IRN=1,NRNM                                               SAB1421
1250 NRIRN(IRN)=0                                                     SAB1422
     NFIRST = 1                                                       SAB1423
     DO 1260 NR=1,NRMAX                                               SAB1424
     RHO=RHOS(DP,R,COSTH)                                             SAB1425
     RHO=SUIRS2-RHO                                                   SAB1426
     TPATH(1)=R-LLTH                                                  SAB1427
     DO 1300 IRN=1,NRNM                                               SAB1428
     NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                         SAB1429
     IF(NX)1310,1310,1320                                             SAB1430
1310 SVRHO(IRN)=0.0                                                   SAB1431
     GO TO 1300                                                       SAB1432
1320 REL(1,IRN)=SREM(IRS,IRN)*TPATH(1)                                SAB1433
     BRELR(IRN) = BREL1(IRN)+REL(1,IRN)                               SAB1434
     IF(BRELR(IRN)-88.0) 1330,1330,1340                               SAB1435
```

```
 1330 IF(NCHRNR(IRS)-3)1400,1410,1410
 1400 SVRHO(IRN) = SNOX(IRN)*SPSP(NPRHO,ARHO,0.0,RHO)
      GO TO 1300
 1410 SVRHO(IRN) = SNOX(IRN)*SESP(KAPPA,0.0,RHO)
      GO TO 1300
 1340 IF(NR-1)1350,1350,1360
 1350 NRIRN(IRN)=NR
      GO TO 1300
 1360 NRIRN(IRN)=NR-1
 1300 CONTINUE
      IF(IGX.EQ.1) GO TO 1430
      GO TO 1440
 1430 HX = H(IRS)
      IF(R)1450,1450,1460
 1450 DO 1470 IRN=1,NRNM
 1470 GFUNCT(NR,IRN)=0.0
      NFIRST=2
      GO TO 1480
 1460 IF(HX)1490,1490,1500
 1490 PSIO=1.56
      GO TO 1510
 1500 PSIO=ATAN(HX/(2.0*R))
 1510 MAX=PSIO/PREF+1.
      NPSIM=NTEST(MAX)
      DPSI=PSIO/FLOAT(NPSIM-1)
      CALL NHFSP(NPSIM,DPSI,ETHA,NRNM,BRELR,SVRHO,SNOX,R,NPZ,AZ,NTHIRN,N
     1RIRN,FUNCT)
      DO 1520 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)
      IF(NX)1520,1520,1530
 1530 GFUNCT(NR,IRN)=FUNCT(IRN)
 1520 CONTINUE
      GO TO 1540
 1440 DO 1550 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)
      IF(NX)1550,1550,1560
 1560 IF(BRELR(IRN)-88.0) 1570,1570,1580
 1580 GFUNCT(NR,IRN)=0.0
      GO TO 1550
 1570 GFUNCT(NR,IRN) = SVRHO(IRN)*EXP(-BRELR(IRN))
 1550 CONTINUE
 1540 DO 1590 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)
      IF(NX)1590,1590,1620
 1620 QUOT=GFUNCT(NR,IRN)/GFUNC1(IRN)
 1630 IF(QUOT-ETHA)1640,1590,1590
 1640 NRIRN(IRN)=NR
 1590 CONTINUE
      NRIRNM=NYMIN(NRNM,NRIRN)
      IF(NRIRNM)1480,1480,1650
 1480 R=R+DR
 1260 CONTINUE
      DO 1641 IRN=1,NRNM
      IF(NRIRN(IRN)) 1642,1642,1641
 1642 NRIRN(IRN) = NRMAX
 1641 CONTINUE
 1650 DO 1660 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,1)
      IF(NX)1660,1660,1670
 1670 NRMAX=NRIRN(IRN)
      IF(NRMAX-1)1660,1660,1680
 1680 DO 1690 N=1,NRMAX
 1690 Y(N)=GFUNCT(N,IRN)
      NRMAX=NRMAX-1
      FFUNCT(NTH,IRN)=FFUNCT(NTH,IRN)+YNUM(NRMAX,DR,Y)
 1660 CONTINUE
```

```
 1080 CONTINUE
      DO 1740 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,1)
      IF(NX)1740,1740,1750
 1750 IF(NTH-1)1760,1760,1770
 1760 IF(IRSTH-1)1780,1780,1770
 1780 FFUNC1(IRN)=FFUNCT(NTH,IRN)
 1770 QUOT=FFUNCT(NTH,IRN)/FFUNC1(IRN)
      IF(IGX.EQ.1) GO TO 1700
 1710 FFUNCT(NTH,IRN) = FFUNCT(NTH,IRN)*SINTH
 1700 IF(QUOT-ETHA) 1790,1740,1740
 1790 NTHIRN(IRN)=NTH
 1740 CONTINUE
      NTHIRM=NYMIN(NRNM,NTHIRN)
      IF(NTHIRM)1800,1800,1810
 1800 THETA=THETA+PP*DTHETA
  330 CONTINUE
      DO 1811 IRN=1,NRNM
      IF(NTHIRN(IRN)) 1812,1812,1811
 1812 NTHIRN(IRN) = NTHM
 1811 CONTINUE
 1810 DO 1820 IRN=1,NRNM
      IF(SNOX(IRN))1880,1880,1840
 1840 NTHM=NTHIRN(IRN)
      IF(NTHM-1)1880,1880,1850
 1850 DO 1860 N=1,NTHM
 1860 Y(N)=FFUNCT(N,IRN)
      NTHM=NTHM-1
      DFEERN(IRN)=YNUM(NTHM,DTHETA,Y)
 1870 FEERN(IRS,IRN)=FEERN(IRS,IRN)+DFEERN(IRN)
      QUOT=DFEERN(IRN)/FEERN(IRS,IRN)
      IF(QUOT-ETHA)1880,1820,1820
 1880 DFEERN(IRN)=0.0
 1820 CONTINUE
      DFEERM=YMAXG(NRNM,DFEERN)
      IF(DFEERM)1890,1890,180
  180 CONTINUE
 1890 IF(IGX.EQ.1) GO TO 1910
 1900 P=0.5
      GO TO 1920
 1910 P=1.0/3.1415927
 1920 DO 1930 IRN=1,NRNM
      IF(SNOX(IRN))1930,1930,1940
 1940 FEERN(IRS,IRN)=P*FEERN(IRS,IRN)
 1930 CONTINUE
      RETURN
      END
      SUBROUTINE   NCYPLA(IR,SUMIR1,SUMIR2,IRS,SUIRS1,SUIRS2,DP,LMIN,SNO
     1X,ETHA,FEERN,SREM)
C     CALCULATION OF THE REMOVAL FLUXES FOR CYLINDRICAL DISKS AND PLANE
C     GEOMETRY
      REAL LMIN,LLTH,LUTH,KAPPA
C     REAL  NAME
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGDS,IGSS,IOP,NRM,NAME(18),ZR(22),H(22
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ET
     2HAI(22),NDNI(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),NRNM,ITNRN
     3,NTNM,NIESC1,NIESC2,ITOH,NGM,ITNG,FRACRN(20),IRNT(20),CF(26),CFG(7
     4),FEENO2(26)
      COMMON/BLREM/SRNO(2),NCHRNR(2),NCRNR(2),ANR(2,10),SRNKAP(2),NCHRNZ
     1(2),NCRNZ(2),ANZ(2,10),SNO1(20),SNO2(20)
      COMMON/CRN/ARHO(20),AZ(10),NTHIRN(20),NRIRN(20),NPSIRN(20),TPATH(2
     12),REL(22,20),BREL(20),FFUNCT(51,20),GFUNCT(51,20),Y(51),BRELR(20)
     2,FFUNC1(20)
      DIMENSION SREM(22,20),LMIN(2),FEERN(2,20),SNOX(20)
      CHARACTER*4 NAME
      AA=DP
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```
      IGX=IGRC                                                          SAB1566
      NPZ=NCRNZ(IRS)                                                    SAB1567
      DO 30 N=1,NPZ                                                     SAB1568
   30 AZ(N)=ANZ(IRS,N)                                                  SAB1569
      IF(IGRC)40,40,50                                                  SAB1570
   40 NPRHO=1                                                           SAB1571
      ARHO(1)=1.0                                                       SAB1572
      GO TO 80                                                          SAB1573
   50 IF(NCHRNR(IRS)-3) 60,70,70                                        SAB1574
   60 NPRHO=NCRNR(IRS)                                                  SAB1575
      DO 65 N=1,NPRHO                                                   SAB1576
   65 ARHO(N)=ANR(IRS,N)                                                SAB1577
      GO TO 80                                                          SAB1578
   70 KAPPA=SRNKAP(IRS)
   80 TREF=0.2618/FLOAT(NTHI(IRS))                                      SAB1580
      IF(DP.LE.SUIRS2) DP=DP+0.1                                        SAB1581
      H2=H(IRS)/2.                                                      SAB1582
      THETO2=1.5708                                                     SAB1583
      IF(IGX.GT.0) THETO2=ATAN2(H2,DP-SUIRS2)                           SAB1584
      M=THETO2/TREF+1.                                                  SAB1585
      NTHM=MAXO(4,M)                                                    SAB1586
      NTHM=MINO(NTHM,18)                                                SAB1587
      DTHETA=THETO2/FLOAT(NTHM-1)                                       SAB1588
      IF(IGX.LE.0) GO TO 25                                             SAB1589
      THETO1=ATAN2(H2,DP-SUIRS1)                                        SAB1590
      IF(THETO2-THETO1-DTHETA/2.) 20,25,25                              SAB1591
   20 DTHETA=THETO1/FLOAT(NTHM-1)                                       SAB1592
      IGX=4                                                             SAB1593
   25 THETA=0.                                                          SAB1594
      DO 270 IRN=1,NRNM
  270 NTHIRN(IRN)=0                                                     SAB1596
      DO 280 NTH=1,NTHM
      IF(NTH-1)105,105,110                                              SAB1598
  110 IF(NTH-NTHM)120,115,115                                           SAB1599
  105 DO 107 J=1,NRNM                                                   SAB1600
  107 FFUNCT(NTH,J)=0.                                                  SAB1601
      GO TO 810                                                         SAB1602
  115 IF(IGX-4)105,120,120                                              SAB1603
  120 CONTINUE                                                          SAB1604
      COSTH=COS(THETA)                                                  SAB1605
      SINTH=SIN(THETA)                                                  SAB1606
      J1=IRS+1                                                          SAB1607
      J2=IR-1                                                           SAB1608
      IF(J1-J2)320,320,330                                              SAB1609
  320 DO 340 J=J1,J2                                                    SAB1610
  340 TPATH(J)=ZR(J)/COSTH                                              SAB1611
  330 TPATH(IR)=(DP-SUMIR1)/COSTH                                       SAB1612
      CALL NBRELS(NRNM,J1,IR,SREM,TPATH,SNOX,NTHIRN,NRIRN,NPSIRN,1,REL,BSAB1613
     1REL)                                                              SAB1614
      LLTH=(DP-SUIRS2)/COSTH                                            SAB1615
      IF(IGX)370,370,380                                                SAB1616
  380 IF(THETA-THETO1)370,390,390                                       SAB1617
  390 LUTH=H2/SINTH                                                     SAB1618
      GO TO 400                                                         SAB1619
  370 LUTH=(DP-SUIRS1)/COSTH                                            SAB1620
  400 MAX = IFIX((LUTH-LLTH)/(LMIN(IRS)/FLOAT(NRI(IRS)))) + 1           SAB1621
      NRMAX=NTEST(MAX)                                                  SAB1622
      DR=(LUTH-LLTH)/FLOAT(NRMAX-1)                                     SAB1623
      R=LLTH                                                            SAB1624
      DO 540 IRN=1,NRNM
  540 NRIRN(IRN)=0                                                      SAB1626
      DO 550 NR=1,NRMAX
      TPATH(1)=R-LLTH                                                   SAB1628
      RHO=R*SINTH                                                       SAB1629
      IF(NCHRNR(IRS)-3)570,580,580                                      SAB1630
  570 SVRHO = SPSP(NPRHO,ARHO,0.0,RHO)                                  SAB1631
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      GO TO 590                                                          SAB1632
  580 SVRHO = SESP(KAPPA,0.0,RHO)                                        SAB1633
  590 Z=DP-R*COSTH-SUIRS1                                                SAB1634
      Z=ZR(IRS)-Z                                                        SAB1635
  640 DO 650 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,2)                           SAB1637
      IF(NX)650,650,660
  660 REL(1,IRN)=SREM(IRS,IRN)*TPATH(1)                                  SAB1639
      BRELR(IRN) = BREL(IRN)+REL(1,IRN)                                  SAB1640
      IF(BRELR(IRN)-88.0) 670,670,680                                    SAB1641
  670 SVZ = SNOX(IRN)*SPSP(NPZ,AZ,0.0,Z)                                 SAB1642
      SV=SVRHO*SVZ                                                       SAB1643
      GFUNCT(NR,IRN) = SV*EXP(-BRELR(IRN))                               SAB1644
      GO TO 720                                                          SAB1645
  680 GFUNCT(NR,IRN)=0.0                                                 SAB1646
  720 QUOT=GFUNCT(NR,IRN)/GFUNCT(1,IRN)                                  SAB1647
      IF(QUOT-ETHA)730,650,650                                           SAB1648
  730 NRIRN(IRN)=NR                                                      SAB1649
  650 CONTINUE                                                           SAB1650
      NRIRNM=NYMIN(NRNM,NRIRN)                                           SAB1651
      IF(NRIRNM)740,740,750                                              SAB1652
  740 R=R+DR                                                             SAB1653
  550 CONTINUE                                                           SAB1654
      DO 751 IRN=1,NRNM
      IF(NRIRN(IRN)) 752,752,751                                         SAB1656
  752 NRIRN(IRN) = NRMAX                                                 SAB1657
  751 CONTINUE                                                           SAB1658
  750 DO 760 IRN=1,NRNM
      NX=MTEST(IRN,SNOX,NTHIRN,NRIRN,NPSIRN,1)                           SAB1660
      IF(NX)760,760,770
  770 NRMAX=NRIRN(IRN)                                                   SAB1662
      DO 780 NR=1,NRMAX
  780 Y(NR)=GFUNCT(NR,IRN)                                               SAB1664
      NRMAX=NRMAX-1                                                      SAB1665
      FFUNCT(NTH,IRN)=YNUM(NRMAX,DR,Y)*SINTH                             SAB1666
      IF(NTH-2)781,781,782                                               SAB1667
  781 FFUNC1(IRN)=FFUNCT(NTH,IRN)                                        SAB1668
      GO TO 760                                                          SAB1669
  782 QUOT = FFUNCT(NTH,IRN)/FFUNC1(IRN)                                 SAB1670
      IF(QUOT-ETHA)790,760,760                                           SAB1671
  790 NTHIRN(IRN)=NTH                                                    SAB1672
  760 CONTINUE                                                           SAB1673
  800 NTHIRM=NYMIN(NRNM,NTHIRN)                                          SAB1674
      IF(NTHIRM)810,810,820                                              SAB1675
  810 THETA=THETA+DTHETA                                                 SAB1676
  280 CONTINUE                                                           SAB1677
      DO 821 IRN=1,NRNM
      IF(NTHIRN(IRN)) 822,822,821                                        SAB1679
  822 NTHIRN(IRN) = NTHM                                                 SAB1680
  821 CONTINUE                                                           SAB1681
  820 DO 830 IRN=1,NRNM
      IF(SNOX(IRN))830,830,840                                           SAB1683
  840 NTHM=NTHIRN(IRN)                                                   SAB1684
      DO 850 NTH=1,NTHM
  850 Y(NTH)=FFUNCT(NTH,IRN)                                             SAB1686
      NTHM=NTHM-1                                                        SAB1687
      FEERN(IRS,IRN)=FEERN(IRS,IRN)+0.5*YNUM(NTHM,DTHETA,Y)              SAB1688
  830 CONTINUE                                                           SAB1689
      DP=AA                                                              SAB1690
      RETURN                                                             SAB1691
      END                                                                SAB1692


      SUBROUTINE NEUTRO
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGEP,IGSS,IOP,IRM,NAME(18),ZR(22),H(22SAB3350
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ETSAB3351
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```
     2HAI(22),NSTEP(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),IFMAX,NOBSAB3352
     3R,IMAX,IFROM,ITO,ITOH,NGM,IG,CHI(20),IRNT(20),CF(26),CFG(7),BFLUX(SAB3353
     426)                                                              SAB3354
      DIMENSION E(26)                                                  SAB3355
      COMMON/LIBE1/MM,NIDRO,NEL                                        SAB3356
      COMMON /LIBE2/ETACS,TRCS,SIG,TMH,TM                              SAB3357
      DIMENSION ETACS(50),TRCS(50),SIG(50),TMH(10,5),TM(8,50)          SAB3358
      COMMON/STOCK/BOX,S,PHI                                           SAB3359
C     REAL NAME
      DIMENSION NCODE(50),ISH(50),A(50),BUCK(22),FF(220)
      DIMENSION MAT(22,10),C(22,10),NOIP(22,10),FREM(22,10)            SAB3362
      DIMENSION TRAM(10,20),TOUT(20),ABS(20),D(20),SIGMA(20)           SAB3363
      DIMENSION S(1020),BOX(1020),PHI(1020),SREM(22,20)
      DIMENSION RAD(20),KRGAP(3),F(3),G(3)                             SAB3365
      DIMENSION IND(220),X(220)
      CHARACTER*4 NAME,TITLE(18)
      DATA AVO,ZERO/.602472,.0/
      OPEN (UNIT=1,FILE='B:LIBA1',STATUS='OLD')
      READ (1,10) (TITLE(I),I=1,18)
      READ (1,12)  IMAX,IFMAX,NGM,IFROM,ITO,ITOH,NOBR
      READ (1,12) (IRNT(I),I=1,NOBR)
      READ (1,14) (E(I),I=1,IMAX)
      READ (1,14) (CF(I),I=1,IMAX)
      CLOSE (1)
   10 FORMAT (18A4)
   12 FORMAT (7I10)
   14 FORMAT (7E10.3)
   16 FORMAT (I10)
   18 FORMAT (I9,F13.3)
   20 FORMAT (5E14.4)
   22 FORMAT (14I5)
   24 FORMAT (I9)
      OPEN (UNIT=2,FILE='B:LIBA2',STATUS='OLD')
      READ (2,16)  NEL
      DO 17 N=1,NEL
      READ (2,18) NCODE(N),A(N)
   17 READ (2,20) (D(J),J=1,IFMAX)
      READ (2,24)  NIDRO
      READ (2,22) (ISH(N),N=1,NEL)
      CLOSE (2)
      OPEN (UNIT=3,FILE='B:LTDIF',STATUS='OLD')
      DO 600 IR=1,IRM
  600 READ (3,610) (SREM(IR,I),I=1,IFMAX)
  610 FORMAT (5E10.4)
      CLOSE (3)
      OPEN (UNIT=4,FILE='B:LTDIFF',STATUS='NEW')
      N=0
      DO 620 IR=1,IRM
      DO 620 I=1,IFMAX
      N=N+1
      BOX(N)=SREM(IR,I)
  620 CONTINUE
      WRITE (4,630) (BOX(J),J=1,N)
  630 FORMAT (1P7E10.4)
      CLOSE (4)                                                        SAB3376
      KRM=IRM-2                                                        SAB3377
      READ (5,101) (BUCK(KR),KR=1,KRM)                                 SAB3378
      WRITE (6,104) (IR,BUCK(IR-2),IR=3,IRM)                           SAB3379
  101 FORMAT (7E10.3)                                                  SAB3380
  104 FORMAT (/10X,'REGION  BUCKLING'//(10X,I4,1PE13.3))
      ZRMIN=ZR(1)+ZR(2)                                                SAB3382
      RAD(1)=ZRMIN+ZR(3)                                               SAB3383
      NAG=0                                                            SAB3384
      IF(IRM.LE.3) GO TO 80                                            SAB3385
      DO 30 JR=4,IRM                                                   SAB3386
   30 RAD(JR-2)=RAD(JR-3)+ZR(JR)
```

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      DO 77 IR=4,IRM                                                    SAB3387
      IF(NCHR(IR).LE.2) GO TO 77                                        SAB3388
      NAG=NAG+1                                                         SAB3389
      KRGAP(NAG)=IR-2                                                   SAB3390
   77 CONTINUE                                                          SAB3391
  80  CONTINUE                                                          SAB3392
      OPEN (UNIT=3,FILE='B:LTGAM',STATUS='OLD')
      DO 51 IR=1,IRM                                                    SAB3394
      NE=NEMR(IR)                                                       SAB3395
      DO 51 J=1,NE
   51 READ(3,410) NOIP(IR,J),FREM(IR,J)
      CLOSE (3)
 410  FORMAT (I3,E10.3)
C     TEST COMPOSITION PROGRAM                                          SAB3397
      NOGO=0                                                            SAB3398
      DO 50 IR=1,IRM                                                    SAB3399
      IF(NCHR(IR).GE.2) GO TO 50                                        SAB3400
      NE=NEMR(IR)                                                       SAB3401
      DO 48 J=1,NE                                                      SAB3402
      DO 41 K=1,NEL                                                     SAB3403
      IF(NCODE(K)-NOIP(IR,J))41,42,41                                   SAB3404
   41 CONTINUE                                                          SAB3405
      WRITE (6,99) NOIP(IR,J)                                           SAB3406
   99 FORMAT (5X,'THE ELEMENT ',I5,' IS NOT IN THE LIBRARY' )           SAB3407
      NOGO=1                                                            SAB3408
      GO TO 48                                                          SAB3409
   42 MAT(IR,J)=K                                                       SAB3410
      C(IR,J)=DEN(IR)*FREM(IR,J)*AVO/A(K)                               SAB3411
   48 CONTINUE                                                          SAB3412
   50 CONTINUE                                                          SAB3413
      IF(NOGO.EQ.1) RETURN                                              SAB3414
C     INPUT E CORRETTO                                                  SAB3415
      CALL TRANS                                                        SAB3416
C                    MAIN LOOP ON THE GROUPS  I   FOR THE               SAB3417
C                         DIFFUSION   CALCULATION                       SAB3418
      CALL LABEL(NAME,LPAGE)                                            SAB3420
      WRITE (6,100)                                                     SAB3421
  100 FORMAT (/24X,'BOUNDARY CONDITIONS'//10X,'B1',10X,'B2',10X,'A0'    SAB3422
     1,10X,'A1',10X,'A2'/)                                              SAB3423
      OPEN (UNIT=1,FILE='B:LTREM',STATUS='OLD')
      OPEN (UNIT=2,FILE='B:LTDIFF',STATUS='OLD')
      OPEN (UNIT=7,FILE='B:LIBA3',STATUS='OLD')
      DO 300 I=1,IMAX                                                   SAB3424
      IF (I-2) 455,450,455
 455  CLOSE (2)
      OPEN (UNIT=2,FILE='B:LTDIFF',STATUS='OLD')
 450  IF(NAG.LE.0) GO TO 75
      READ (5,101) (F(J),G(J),J=1,NAG)                                  SAB3429
      DO 76 J=1,NAG                                                     SAB3430
      KR=KRGAP(J)                                                       SAB3431
      D(KR)=F(J)                                                        SAB3432
   76 TOUT(KR)=G(J)                                                     SAB3433
   75 CONTINUE                                                          SAB3434
      IM1=I-1                                                           SAB3435
      JM=MIN0(ITOH,IM1)
      JM1=MIN0(ITO,IM1)
      J1=MAX0(1,I-IFROM)                                                SAB3438
      IGO1=1                                                            SAB3439
      IF(I.LE.(IFROM+ITO)) IGO1=2                                       SAB3440
      IGO2=1                                                            SAB3441
      IF(IM1.GT.IFROM)IGO2=2                                            SAB3442
      IGO3=1                                                            SAB3443
      IF(I.EQ.1)IGO3=2                                                  SAB3444
      CALL LIBE(J1,JM,JM1,IGO1,IGO2,IGO3)                               SAB3445
      CALL ZERO1 (TRAM,200)                                             SAB3446
      DO 150 IR=3,IRM                                                   SAB3447
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      KR=IR-2                                                           SAB3448
C                   CALCOLO FATTORI DI RACCORDO PER AIR GAPS            SAB3449
      IF(NCHR(IR)-2)135,132,150                                         SAB3450
  132 R2SUR1=RAD(KR)/RAD(KR-1)                                          SAB3451
      CALL AIRGAP(R2SUR1,IGEP,D(KR),TOUT(KR))                           SAB3452
      GO TO 150                                                         SAB3453
  135 CONTINUE                                                          SAB3454
      TR=0.                                                             SAB3455
      TOUT(KR)=0.                                                       SAB3456
      ABS (KR)=0.                                                       SAB3457
      NE=NEMR(IR)                                                       SAB3458
      DO 140 J=1,NE                                                     SAB3459
      K=MAT(IR,J)                                                       SAB3460
      TR=TR+C(IR,J)*TRCS(K)                                             SAB3461
      TOUT(KR)=TOUT(KR)+C(IR,J)*SIG(K)                                  SAB3462
      GO TO(106,105),IGO3                                               SAB3463
  105 ABS(KR)=ABS(KR)+C(IR,J)*ETACS(K)                                  SAB3464
      GO TO 140                                                         SAB3465
  106 IF(ISH(K).EQ.0)GO TO 110                                          SAB3466
      LH=ISH(K)                                                         SAB3467
      DO 120 JUMP=1,JM                                                  SAB3468
  120 TRAM(JUMP,KR)=TRAM(JUMP,KR)+C(IR,J)*TMH(JUMP,LH)                  SAB3469
      GO TO 140                                                         SAB3470
  110 GO TO(112,113),IGO1                                               SAB3471
  112 TRAM(1,KR)=TRAM(1,KR)+ETACS(K)*C(IR,J)                            SAB3472
      GO TO 140                                                         SAB3473
  113 CONTINUE                                                          SAB3474
      DO 130 JUMP=J1,JM1                                                SAB3475
  130 TRAM(JUMP,KR)=TRAM(JUMP,KR)+TM(JUMP,K)*C(IR,J)                    SAB3476
      GO TO(140,112),IGO2                                               SAB3477
  140 CONTINUE                                                          SAB3478
      T=TEMP(IR)+273.                                                   SAB3479
      AKO=2321./T                                                       SAB3480
      BKO= SQRT(3.141593)/2.                                            SAB3481
      TKORR=SQRT(300./T)*1.1255*((BKO-SQRT(AKO)*EXP(-AKO))/(1.-EXP(-AKO)SAB3482
     1*(AKO+1.)))                                                       SAB3483
      IF(I.EQ.IMAX) TOUT(KR)=TOUT(KR)*TKORR                             SAB3484
      D(KR)=.33333/TR                                                   SAB3485
  150 CONTINUE                                                          SAB3486
      IF(I-2)201,202,203
  201 READ (1,415) (S(M),M=1,MM)
      READ (1,415) (BOX(M),M=1,MM)
 415  FORMAT (7E10.4)
      CALL ESSE(BOX,ABS,-1.,S)                                          SAB3490
      GO TO 222                                                         SAB3491
  202 CALL ZERO1(S,MM)                                                  SAB3492
      DO 210 KR=1,KRM                                                   SAB3493
  210 SIGMA(KR)=TRAM(1,KR)                                              SAB3494
      CALL ESSE(PHI,SIGMA,1.,S)                                         SAB3495
      GO TO 222                                                         SAB3496
  203 CALL ZERO1(S,MM)                                                  SAB3497
      DO 220 J=1,IM1                                                    SAB3498
      READ (2,420) (BOX(M),M=1,MM)
 420  FORMAT (7E10.4)
      IF (I-2) 720,710,720
 710  WRITE (2,421) (BOX(M),M=1,MM)
 421  FORMAT (1P7E10.4)
 720  IF((J+ITOH).LT.I) GO TO 220
      JUMP=I-J                                                          SAB3501
      DO 215 KR=1,KRM                                                   SAB3502
  215 SIGMA(KR)=TRAM(JUMP,KR)                                           SAB3503
      CALL ESSE(BOX,SIGMA,1.,S)                                         SAB3504
  220 CONTINUE                                                          SAB3505
      IF(I-NOBR)222,225,225                                             SAB3506
  225 PHI(1)=ZERO                                                       SAB3507
      GO TO 233                                                         SAB3508
```

```
  222 CONTINUE                                                            SAB3509
      READ (1,415) (BOX(M),M=1,MM)
      DO 230 M=1,MM                                                       SAB3511
  230 S(M)=S(M)+BOX(M)                                                    SAB3512
      READ (1,415) (BOX(M),M=1,MM)
      CALL ESSE(BOX,TOUT,-1.,S)                                           SAB3514
      PHI(1)=BOX(1)                                                       SAB3515
 233  DO 231 KR=1,KRM                                                     SAB3516
  231 TOUT(KR)=TOUT(KR)+D(KR)*BUCK(KR)                                    SAB3517
      CALL ELENA(IGEP,KRM,NSTEP(3),NCHR(3),RAD   ,D,TOUT,S,PHI,ZRMIN)     SAB3518
      IF(I.GE.NOBR)GO TO 244                                              SAB3519
      DO 240 M=1,MM                                                       SAB3520
  240 PHI(M)=PHI(M)+BOX(M)
  244 WRITE (2,425) (PHI(M),M=1,MM)
      BFLUX(I)=PHI(1)                                                     SAB3523
  300 CONTINUE
      CLOSE (7)
      CLOSE (4)
      CLOSE (2)
      CLOSE (1)
 425  FORMAT (1P7E10.4)
      M=0                                                                 SAB3529
      X1=ZERO                                                             SAB3530
      N=0                                                                 SAB3531
      DO 310 IR=3,IRM                                                     SAB3532
      IF(NCHR(IR).GT.1) GO TO 308                                         SAB3533
      NPR=NSTEP(IR)/NTNOPI(IR)                                            SAB3534
      DX=ZR(IR)/FLOAT(NPR)                                                SAB3535
      N=N+1                                                               SAB3536
      M=M+1                                                               SAB3537
      X(N)=X1                                                             SAB3538
      IND(N)=M                                                            SAB3539
      DO 305 J=1,NPR                                                      SAB3540
      N=N+1                                                               SAB3541
      M=M+NTNOPI(IR)                                                      SAB3542
      IND(N)=M                                                            SAB3543
  305 X(N)=X(N-1)+DX                                                      SAB3544
      X1=X(N)                                                             SAB3545
      GO TO 310                                                           SAB3546
  308 X1=X1+ZR(IR)                                                        SAB3547
  310 CONTINUE                                                            SAB3548
      NMAX=N                                                              SAB3549
      OPEN (UNIT=2,FILE='B:LTTEM',STATUS='NEW')
      WRITE (2,500) NMAX,MM,IMAX,IRM
      WRITE (2,505) (X(N),N=1,NMAX)
      WRITE (2,510) (IND(N),N=1,NMAX)
 500  FORMAT (6I10)
 505  FORMAT (1P7E10.4)
 510  FORMAT (1P7I10)
      WRITE (2,505) (CF(I),I=1,IMAX)
      WRITE (2,515) (NSTEP(IR),NTNOPI(IR),NCHR(IR),IR=1,IRM)
 515  FORMAT (3I10)
      CLOSE (2)
      OPEN (UNIT=1,FILE='B:LTDIFF',STATUS='OLD')
      OPEN (UNIT=2,FILE='B:LTREM',STATUS='NEW')
      DO 551 I=1,IMAX
      READ (1,552) (PHI(M),M=1,MM)
 552  FORMAT (7E10.4)
      WRITE (6,553) I
 553  FORMAT (1H0/40X,23H NEUTRON FLUX OF GROUP ,I5//7X,1HX,10X,3HPHI,1
     10X,1HX,10X,3HPHI,10X,1HX,10X,3HPHI,10X,1HX,10X,3HPHI,10X,1HX,10X,
     23HPHI/)
      DO 554 N=1,NMAX
      M=IND(N)
 554  FF(N)=PHI(M)
      WRITE (6,555) (X(N),FF(N),N=1,NMAX)
```

```
      WRITE (2,556) (FF(N),N=1,NMAX)
  556 FORMAT (1P7E10.4)
  555 FORMAT (5(0PF11.2,1X,1PE12.3))
  551 CONTINUE
      CLOSE (1)
      CLOSE (2)
      RETURN                                                            SAB3555
      END                                                               SAB3556
      SUBROUTINE TRANS                                                  SAB3557
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGEP,IGSS,IOP,IRM,NAME(18),ZR(22),H(22SAB3561
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ETSAB3562
     2HAI(22),NSTEP(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),IFMAX,NOBSAB3563
     3R,IMAX,IFROM,ITO,ITOH,NGM,IG,CHI(20),IRNT(20),CF(26),CFG(7),BFLUX(SAB3564
     426)                                                               SAB3565
      COMMON/LIBE1/MM,NIDRO,NEL                                         SAB3566
      DIMENSION F(20,100),FR(20,100)                                    SAB3567
      DIMENSION BF(1020),BRF(1020)                                      SAB3568
      DIMENSION P(50)                                                   SAB3569
      DIMENSION THR(20),RR(35,20)
      COMMON/STOCK/BF,BRF,PHI                                           SAB3570
      DIMENSION PHI(1020)                                               SAB3571
       COMMON/STOCK2/F,FR                                               SAB3572
C     CALCOLO MM(NUMERO PUNTI DA SCRIVERE)E MMR(NUMERO DI PUNTI DA      SAB3574
C     LEGGERE)                                                          SAB3575
      CHARACTER*4 NAME,TIT(15)
      MM=0                                                              SAB3576
      MMR=1                                                             SAB3577
      KRM=IRM-2                                                         SAB3578
      DO 10 IR=3,IRM                                                    SAB3579
      MMR=MMR+NSTEP(IR)/NRNI(IR)                                        SAB3580
      IF(NCHR(IR).GT.1)GO TO 10                                         SAB3581
      MM=MM+NSTEP(IR)+1
   10 CONTINUE                                                          SAB3583
      OPEN (UNIT=2,FILE='B:LTREM',STATUS='OLD')
      DO 20 NP=1,MMR
   20 READ (2,430) (F(IFG,NP),IFG=1,IFMAX),(FR(IFG,NP),IFG=1,IFMAX)
      CLOSE (2)
  430 FORMAT (5E10.4)
      CALL ZERO1(RR,700)
      READ (5,101) NTH,NFRD                                             SAB3591
      NRD=NTH+NFRD                                                      SAB3592
      OPEN (UNIT=7,FILE='B:L2REM',STATUS='NEW')
      WRITE (7,435) NRD
  435 FORMAT (I10)
      IF(NTH.LE.0)GO TO 31                                              SAB3594
      I1=1                                                              SAB3595
      I2=NOBR-1                                                         SAB3596
      DO 30 NT=1,NTH                                                    SAB3597
      READ (5,103) TIT                                                  SAB3598
      READ (5,102) (THR(J),J=1,IFMAX)                                   SAB3599
  102 FORMAT (7E10.3)                                                   SAB3600
      CALL LABEL (NAME,LPAGE)                                           SAB3601
      WRITE(6,96)NT,(THR(J),J=1,IFMAX)                                  SAB3602
   96 FORMAT (/10X,'THRESH.REACT. ',I3//(1P10E12.3))                    SAB3603
      MR1=1                                                             SAB3604
      DO 27 IR=3,IRM                                                    SAB3605
      NPR=NSTEP(IR)/NRNI(IR)                                            SAB3606
      IF(NCHR(IR).GT.1)GO TO 26                                         SAB3607
      MR=MR1+NPR/2                                                      SAB3608
      L1=1                                                              SAB3609
      DO 25 IBR=2,NOBR                                                  SAB3610
      L2=IRNT(IBR)                                                      SAB3611
      IBG=IBR-1                                                         SAB3612
      CALL MEDIA(THR( 1),F( 1,MR),L1,L2,RR(IBG,IR-2))                   SAB3613
   25 L1=L2+1                                                           SAB3614
   26 MR1=MR1+NPR                                                       SAB3615
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```
   27 CONTINUE                                                          SAB3616
      WRITE (6,94)                                                      SAB3617
      DO 36 KR=1,KRM                                                    SAB3618
   36 WRITE (6,95) KR,(RR(I,KR),I=I1,I2)                                SAB3619
      WRITE (7,450) I1,I2
      DO 451 KR=1,KRM
 451  WRITE (7,452) (RR(I,KR),I=I1,I2)
  30  WRITE (7,103) TIT
 450  FORMAT (2I10)
 452  FORMAT (1P7E10.3)
   95 FORMAT (I9,(1P10E12.3))                                           SAB3621
   94 FORMAT (/' AVERAGE OVER THE REMOVAL SPECTRA'//10X,'GROUP'/7X,'REG'SAB3622
     1/)                                                                SAB3623
   31 CONTINUE                                                          SAB3624
  101 FORMAT (14I5)                                                     SAB3625
  103 FORMAT (15A4)                                                     SAB3626
      IF(NFRD.LE.0)GO TO 23                                             SAB3627
      DO 22 J=1,NFRD                                                    SAB3628
      CALL LABEL (NAME,LPAGE)                                           SAB3629
      WRITE (6,104) J                                                   SAB3630
  104 FORMAT (10X,'REGION DEPENDENT RESPONSE FUNCTION NO.', I2//12X,    SAB3631
     1'GROUP'/7X,'REG')
      READ (5,97) I1,I2,TIT                                             SAB3633
      DO 38 KR=1,KRM                                                    SAB3634
   21 READ (5,102) (RR(I,KR),I=I1,I2)                                   SAB3635
   38 WRITE (6,105) KR,(RR(I,KR),I=I1,I2)                               SAB3636
  105 FORMAT (I9/(9X,1P10E12.3))                                        SAB3637
      WRITE (7,450) I1,I2
      DO 455 KR=1,KRM
 455  WRITE (7,452) (RR(I,KR),I=I1,I2)
  22  WRITE (7,103) TIT
   23 CONTINUE                                                          SAB3639
      CLOSE (7)
   97 FORMAT (2I5,15A4)
C     CICLO SUI BROAD REM. GROUPS                                       SAB3641
C     PER OGNI BROAD R. G. CALCOLA E SCRIVE SU LTREM                    SAB3642
C     FLUSSI E FLUSSI RIMOSSI                                           SAB3643
      L1=1                                                              SAB3645
      OPEN (UNIT=1,FILE='B:LTREM',STATUS='NEW')
      DO 100 IBR=1,NOBR
      L2=IRNT(IBR)                                                      SAB3647
      CALL ZERO1 (BRF,MM)                                               SAB3648
      CALL ZERO1 (BF,MM)                                                SAB3649
      SP=0.                                                             SAB3650
      DO 5 L=L1,L2                                                      SAB3651
  5   SP=SP+CHI(L)                                                      SAB3652
      IF(SP.LE.0.) GO TO 91                                             SAB3653
      M=0                                                               SAB3654
      NP=0                                                              SAB3655
      DO 90 IR=3,IRM                                                    SAB3656
      NR=NRNI(IR)                                                       SAB3657
      IGO=2                                                             SAB3658
      IF(NR.EQ.1)IGO=1                                                  SAB3659
      NPR=NSTEP(IR)/NR                                                  SAB3660
      ESP=1./FLOAT(NR)
      IF(NCHR(IR)-2)33,32,32                                            SAB3662
   32 NP=NP+NPR                                                         SAB3663
      GO TO 90                                                          SAB3664
   33 DO 70 JP=1,NPR                                                    SAB3665
      NP=NP+1                                                           SAB3666
      M1=M                                                              SAB3667
      DO 60 L=L1,L2                                                     SAB3668
      IF(CHI(L).LE.0.) GO TO 60                                         SAB3669
      P(1)=1.                                                           SAB3670
      GO TO(42,35),IGO                                                  SAB3671
   35 FACTOR=(F(L,NP+1)/F(L,NP))**ESP                                   SAB3672
```

```
      DO 40 K=2,NR
   40 P(K)=P(K-1)*FACTOR
   42 DO 50 JM=1,NR
      M=M1+JM
      BRF(M)=BRF(M)+FR(L,NP)*P(JM)
      BF(M)=BF(M)+F(L,NP)*P(JM)
   50 CONTINUE
   60 CONTINUE
   70 CONTINUE
      M=M1+NR+1
      NP1=NP+1
      DO 80 L=L1,L2
      IF(CHI(L).LE.0.) GO TO 80
      BRF(M)=BRF(M)+F(L,NP1)*FR(L,NP)/F(L,NP)
      BF(M)=BF(M)+F(L,NP1)
  80  CONTINUE
   90 CONTINUE
  91  CONTINUE
      WRITE (1,460) (BRF(M),M=1,MM)
      WRITE (1,460) (BF(M),M=1,MM)
 460  FORMAT (1P7E10.3)
      L1=L2+1
  100 CONTINUE
      CLOSE (1)
      RETURN
      END
      SUBROUTINE LIBE(J1,JM,JM1,L1,L2,L3)
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGEP,IGSS,IOP,IRM,NAME(18),ZR(22),H(2
     12),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),
     2ETHAI(22),NSTEP(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),IFMAX,
     3NOBR,IMAX,IFROM,ITO,ITOH,NGM,IG,CHI(20),IRNT(20),CF(26),CFG(7),BF
     4LUX(26)
      COMMON/LIBE1/MM,NIDRO,NEL
      COMMON /LIBE2/ETACS,TRCS,SIG,TMH,TM
      DIMENSION ETACS(50),TRCS(50),SIG(50),TMH(10,5),TM(8,50)
      DIMENSION NCODE(50),ISH(50),A(50),D(20)
      GO TO (2,1),L3
  1   OPEN (UNIT=3,FILE='B:LIBA2',STATUS='OLD')
      READ (3,110) NEL
      DO 120 I=1,NEL
      READ (3,130) NCODE(I),A(I)
 120  READ (3,140) (D(J),J=1,IFMAX)
      READ (3,150) NIDRO
      READ (3,160) (ISH(N),N=1,NEL)
      READ (3,170) (ETACS(N),TRCS(N),SIG(N),N=1,NEL)
      CLOSE (3)
 110  FORMAT (I10)
 130  FORMAT (I9,F13.3)
 140  FORMAT (5E14.4)
 150  FORMAT (I9)
 160  FORMAT (14I5)
 170  FORMAT (3E16.6)
 180  FORMAT (5E12.4)
      RETURN
  2   DO 185 LH=1,NIDRO
 185  READ (7,180) ( TMH(J,LH),J=1,JM)
      GO TO (4,3),L1
C     MATRICE NON DI TIPO H
  3   DO 195 N=1,NEL
  195 READ (7,180) ( TM(J,N),J=J1,JM1)
      GO TO (5,4),L2
    4 READ (7,180) (ETACS(N),N=1,NEL)
    5 READ (7,190) (TRCS(N),SIG(N),N=1,NEL)
 190  FORMAT (2E16.6)
      RETURN
      END
```

```
      SUBROUTINE ESSE(F,SIGMA,SIGN,S)                                   SAB3899
C      REAL NAME
      DIMENSION F(1020),SIGMA(20),S(1020)                               SAB3900
      COMMON/BLGF/LPAGE,IGRC,IGRS,IGEP,IGSS,IOP,IRM,NAME(18),ZR(22),H(22SAB3901
     1),TEMP(22),DEN(22),NCHR(22),NEMR(22),NTHI(22),NRI(22),NPSII(22),ETSAB3902
     2HAI(22),NSTEP(22),NRNI(22),NTNOPI(22),NGSI(22),NPSSI(22),IFMAX,NOBSAB3903
     3R,IMAX,IFROM,ITO,ITOH,NGM,IG,CHI(20),IRNT(20),CF(26),CFG(7),BFLUX(SAB3904
     426)                                                               SAB3905
C     REAL NAME                                                         SAB3906
      CHARACTER*4 NAME
      M=0                                                               SAB3907
      DO 10 IR=3,IRM                                                    SAB3908
      IF(NCHR(IR).GT.1) GO TO 10                                        SAB3909
      NP=NSTEP(IR)+1                                                    SAB3910
      KR=IR-2                                                           SAB3911
      DO 5 N=1,NP                                                       SAB3912
      M=M+1                                                             SAB3913
    5 S(M)=S(M)+SIGN*F(M)*SIGMA(KR)                                     SAB3914
   10 CONTINUE                                                          SAB3915
      RETURN                                                            SAB3916
      END                                                               SAB3917
      SUBROUTINE AIRGAP(RSR,IGEP,R,Q)                                   SAB3948
C   COMPUTES PARAMETERS FOR P1 TREATMENT OF GAPS                        SAB3949
      Q2=1./RSR                                                         SAB3950
      S=SQRT(1.-Q2**2)                                                  SAB3951
      IF(IGEP-1)2,3,4                                                   SAB3952
    2 R=1.                                                              SAB3953
      Q=0.                                                              SAB3954
      RETURN                                                            SAB3955
    3 F=.6366198*(ATAN2(Q2,S)/Q2+S)                                     SAB3956
      R=RSR                                                             SAB3957
      GO TO 5                                                           SAB3958
    4 F=1.-S**3                                                         SAB3959
      R=RSR**2                                                          SAB3960
    5 Q=1.-F/R                                                          SAB3961
      RETURN                                                            SAB3962
      END                                                               SAB3963
      SUBROUTINE MEDIA(V,F,I1,I2,Q)                                     SAB3964
C     CALCOLA LA MEDIA DI V SUF(E CHIAMATA DA TRANS)                    SAB3965
      DIMENSION V(1),F(1)                                               SAB3966
      DEN=0.                                                            SAB3967
      S=0.                                                              SAB3968
      DO 5 J=I1,I2                                                      SAB3969
      S=S+V(J)*F(J)                                                     SAB3970
    5 DEN=DEN+F(J)                                                      SAB3971
      Q=S/DEN                                                           SAB3972
      RETURN                                                            SAB3973
      END                                                               SAB3974
      FUNCTION COEFB(L,C,T)                                             SAB3975
      U=1.                                                              SAB3976
      P=U                                                               SAB3977
      IND=L+1                                                           SAB3978
      GO TO (1,2,3,4),IND                                               SAB3979
    1 COEFB=P*(U+C)/(U-C)                                               SAB3980
      RETURN                                                            SAB3981
    2 COEFB=(BK1(T)+C*BK0(T))/(BI1(T)-C*BI0(T))                         SAB3982
      RETURN                                                            SAB3983
    3 COEFB=P*(T*(U+C)+U)/(T*(U-C)-U)                                   SAB3984
      RETURN                                                            SAB3985
    4 X=.125/T                                                          SAB3986
      COEFB=P*(U+3.*X+C*(U-X))/(U-3.*X-C*(U+X))                         SAB3987
      RETURN                                                            SAB3988
      END                                                               SAB3989

C         S A B I N E 3                                                 SAB0000
```

```
      FUNCTION BIO(X)                                                   SAB0368
      CALL BESI(X,0,Y,IER)                                              SAB0369
      IF (IER-2) 11,10,11                                               SAB0370
   10 WRITE (6,100)                                                     SAB0371
      BIO=0.                                                            SAB0372
      GO TO 111                                                         SAB0373
   11 BIO=Y                                                             SAB0374
  111 RETURN                                                            SAB0375
  100 FORMAT (' X IS NEGATIVE')                                         SAB0376
      END                                                               SAB0377
      FUNCTION BI1(X)                                                   SAB0378
      CALL BESI(X,1,Y,IER)                                              SAB0379
      IF (IER-2) 11,10,11                                               SAB0380
   10 WRITE (6,100)                                                     SAB0381
      BI1=0.                                                            SAB0382
      GO TO 111                                                         SAB0383
   11 BI1=Y                                                             SAB0384
  111 RETURN                                                            SAB0385
  100 FORMAT (' X IS NEGATIVE')                                         SAB0376
      END                                                               SAB0387
      FUNCTION BKO(X)                                                   SAB0388
      CALL BESK(X,0,Y,IER)                                              SAB0389
      BKO=Y                                                             SAB0390
      IF (IER-2) 11,10,11                                               SAB0391
   10 WRITE (6,100)                                                     SAB0392
   11 RETURN                                                            SAB0393
  100 FORMAT (' X IS NEGATIVE OR ZERO')                                 SAB0394
      END                                                               SAB0395
      FUNCTION BK1(X)                                                   SAB0396
      CALL BESK(X,1,Y,IER)                                              SAB0397
      BK1=Y                                                             SAB0398
      IF (IER-2) 11,10,11                                               SAB0399
   10 WRITE (6,100)                                                     SAB0400
   11 RETURN                                                            SAB0401
  100 FORMAT (' X IS NEGATIVE OR ZERO')                                 SAB0394
      END
      SUBROUTINE BESI(X,N, BI,IER)                                      SAB0438
      CXXC=1.E-38
      IER=0                                                             SAB0442
      BI=1.0                                                            SAB0443
      IF(N)150,15,10                                                    SAB0444
   10 IF(X)160,20,20                                                    SAB0445
   15 IF(X)160,17,20                                                    SAB0446
   17 RETURN                                                            SAB0447
   20 TOL=1.E-6                                                         SAB0451
      IF(X-12.)40,40,30
   30 IF(X-FLOAT(N))40,40,110                                           SAB0456
   40 XX=X/2.                                                           SAB0460
   50 TERM=1.0                                                          SAB0461
      IF(N) 70,70,55                                                    SAB0462
   55 DO 60 I=1,N                                                       SAB0463
      FI=I                                                              SAB0464
      IF(ABS(TERM)-CXXC)56,60,60                                        SAB0465
   56 IER=3                                                             SAB0466
      BI=0.0                                                            SAB0467
      RETURN                                                            SAB0468
   60 TERM=TERM*XX/FI                                                   SAB0469
   70 BI=TERM                                                           SAB0470
      XX=XX*XX                                                          SAB0471
      DO 90 K=1,1000                                                    SAB0476
      IF(ABS(TERM)-ABS(BI*TOL))100,100,80                               SAB0477
   80 FK=K*(N+K)                                                        SAB0478
      TERM=TERM*(XX/FK)
   90 BI=BI+TERM                                                        SAB0480
  100 RETURN                                                            SAB0484
  110 FN=4*N*N                                                          SAB0488
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```
      IF(X-170.0)115,111,111                                             SAB0489
  111 IER=4                                                              SAB0490
      RETURN                                                             SAB0491
  115 XX=1./(8.*X)                                                       SAB0492
      TERM=1.                                                            SAB0493
      BI=1.                                                              SAB0494
      DO 130 K=1,30                                                      SAB0495
      IF(ABS(TERM)-ABS(TOL*BI))140,140,120                               SAB0496
  120 FK=(2*K-1)**2                                                      SAB0497
      TERM=TERM*XX*(FK-FN)/FLOAT(K)                                      SAB0498
  130 BI=BI+TERM                                                         SAB0499
      GO TO 40                                                           SAB0503
  140 PI=3.141592653                                                     SAB0504
      BI=BI*EXP(X)/SQRT(2.*PI*X)                                         SAB0505
      GO TO 100                                                          SAB0506
  150 IER=1                                                              SAB0507
      GO TO 100                                                          SAB0508
  160 IER=2                                                              SAB0509
      GO TO 100                                                          SAB0510
      END                                                                SAB0511
      SUBROUTINE BESK(X,N,BK,IER)                                        SAB0552
      DIMENSION T(12)                                                    SAB0553
      BK=.0                                                              SAB0554
      IF(N)10,11,11                                                      SAB0555
   10 IER=1                                                              SAB0556
      RETURN                                                             SAB0557
   11 IF(X)12,12,20                                                      SAB0558
   12 IER=2                                                              SAB0559
      RETURN                                                             SAB0560
   20 IF(X-170.0)22,22,21                                                SAB0561
   21 IER=3                                                              SAB0562
      RETURN                                                             SAB0563
   22 IER=0                                                              SAB0564
      IF(X-1.)36,36,25                                                   SAB0565
   25 A=EXP(-X)                                                          SAB0566
      B=1./X                                                             SAB0567
      C=SQRT(B)                                                          SAB0568
      T(1)=B                                                             SAB0569
      DO 26 L=2,12                                                       SAB0570
   26 T(L)=T(L-1)*B                                                      SAB0571
      IF(N-1)27,29,27                                                    SAB0572
   27 G0=A*(1.25331414-.15666418*T(1)+.088111278*T(2)-.091390954*T(3)    SAB0576
     2+.13445962*T(4)-.22998503*T(5)+.37924097*T(6)-.52472773*T(7)       SAB0577
     3+.55753684*T(8)-.42626329*T(9)+.21845181*T(10)-.066809767*T(11)    SAB0578
     4+.009189383*T(12))*C                                               SAB0579
      IF(N)20,28,29                                                      SAB0580
   28 BK=G0                                                              SAB0581
      RETURN                                                             SAB0582
   29 G1=A*(1.2533141+.46999270*T(1)-.14685830*T(2)+.12804266*T(3)       SAB0586
     2-.17364316*T(4)+.28476181*T(5)-.45943421*T(6)+.62833807*T(7)       SAB0587
     3-.66322954*T(8)+.50502386*T(9)-.25813038*T(10)+.078800012*T(11)    SAB0588
     4-.010824177*T(12))*C                                               SAB0589
      IF(N-1)20,30,31                                                    SAB0590
   30 BK=G1                                                              SAB0591
      RETURN                                                             SAB0592
   31 DO 35 J=2,N                                                        SAB0596
      GJ=2.*(FLOAT(J)-1.)*G1/X+G0                                        SAB0597
      IF(GJ-1.0E38)33,33,32                                              SAB0598
   32 IER=4                                                              SAB0599
      GO TO 34                                                           SAB0600
   33 G0=G1                                                              SAB0601
   35 G1=GJ                                                              SAB0602
   34 BK=GJ                                                              SAB0603
      RETURN                                                             SAB0604
   36 B=X/2.                                                             SAB0605
      A=.57721566+ALOG(B)                                                SAB0606
```

```
      C=B*B                                                             SAB0607
      IF(N-1)37,43,37                                                   SAB0608
   37 G0=-A                                                             SAB0612
      X2J=1.                                                            SAB0613
      FACT=1.                                                           SAB0614
      HJ=.0                                                             SAB0615
      DO 40 J=1,6                                                       SAB0616
      RJ=1./FLOAT(J)                                                    SAB0617
      X2J=X2J*C                                                         SAB0618
      FACT=FACT*RJ*RJ                                                   SAB0619
      HJ=HJ+RJ                                                          SAB0620
   40 G0=G0+X2J*FACT*(HJ-A)                                             SAB0621
      IF(N)43,42,43                                                     SAB0622
   42 BK=G0                                                             SAB0623
      RETURN                                                            SAB0624
   43 X2J=B                                                             SAB0628
      FACT=1.                                                           SAB0629
      HJ=1.                                                             SAB0630
      G1=1./X+X2J*(.5+A-HJ)                                             SAB0631
      DO 50 J=2,8                                                       SAB0632
      X2J=X2J*C                                                         SAB0633
      RJ=1./FLOAT(J)                                                    SAB0634
      FACT=FACT*RJ*RJ                                                   SAB0635
      HJ=HJ+RJ                                                          SAB0636
   50 G1=G1+X2J*FACT*(.5+(A-HJ)*FLOAT(J))                               SAB0637
      IF(N-1)31,52,31                                                   SAB0638
   52 BK=G1                                                             SAB0639
      RETURN                                                            SAB0640
      END                                                               SAB0641
      SUBROUTINE ELENA(IGEP,IRM,NSTEP,ISAGAP,ZR,D,SIG,S,PHI,ZRMIN)      SAB3697
C     DIFFUSION CALCULATION                                             SAB3698
      DIMENSION D(20),SIG(20),CK(20),DK(20),NSTEP(20),ZR(20),TIN(20),TOUSAB3699
     1T(20),HT(20),IGE(20)                                              SAB3700
      DIMENSION FINTV(250),PHINT(250),STPN(250),VSN(250)                SAB3701
      DIMENSION FN(1020),S(1020),V(1020),PHI(1020)                      SAB3702
      EQUIVALENCE (FINTV(1),PHINT(1)),(VSN(1),STPN(1))
      DIMENSION ISAGAP(20)                                              SAB3704
      DIMENSION U1(3),U2(3)                                             SAB3705
       COMMON/STOCK2/STORE1,STORE2                                      SAB3706
       DIMENSION STORE1(20,100) ,STORE2(20,100)                         SAB3707
      EQUIVALENCE(FN(1),STORE1(1,1)),(V(1),STORE2(1,1))
      PRODN=1.E-7                                                       SAB3709
      DTM=110.                                                          SAB3710
      READ (5,93) A1OUT,A2OUT,AIN,A1IN,A2IN,DOP                         SAB3711
   93 FORMAT (7E10.3)                                                   SAB3712
      WRITE (6,151) A1OUT,A2OUT,AIN,A1IN,A2IN                           SAB3713
  151 FORMAT (4X,1P6E12.4)                                              SAB3714
      IF(DOP) 155,155,152                                               SAB3715
  152 READ (5,93) (DK(J),J=1,IRM)                                       SAB3716
      DO 153 J=1,IRM                                                    SAB3717
      IF(DK(J).GT.0.) D(J)=DK(J)                                        SAB3718
  153 CONTINUE                                                          SAB3719
      WRITE (6,156) (D(J),J=1,IRM)                                      SAB3720
  156 FORMAT (12F10.6)                                                  SAB3721
  155 CONTINUE                                                          SAB3722
      NGAP=0                                                            SAB3723
C                                                                       SAB3724
      UOUT=A1OUT                                                        SAB3725
      VOUT=A2OUT                                                        SAB3726
      IPM=IRM                                                           SAB3727
      CK(1)=SQRT (SIG(1)/D(1))                                          SAB3728
      DK(1)=D(1)*CK(1)                                                  SAB3729
      TIN(1)=ZRMIN*CK(1)                                                SAB3730
      TOUT(1)=ZR(1)*CK(1)                                               SAB3731
      HT(1)=(TOUT(1)-TIN(1))/FLOAT (NSTEP(1))                           SAB3732
      IPM=IPM+NSTEP(1)                                                  SAB3733
```

```
      IF(IRM-1)106,106,102                                              SAB3734
  102 DO 105 IR=2,IRM                                                   SAB3735
      IF(ISAGAP(IR)-2)103,104,107                                       SAB3736
  104 NGAP=NGAP+1                                                       SAB3737
  107 IPM=IPM-1                                                         SAB3738
      GO TO 105                                                         SAB3739
  103 CK(IR)=SQRT (SIG(IR)/D(IR))                                       SAB3740
      DK(IR)=D(IR)*CK(IR)                                               SAB3741
      TIN(IR)=ZR(IR-1)*CK(IR)                                           SAB3742
      TOUT(IR)=ZR(IR)*CK(IR)                                            SAB3743
      HT(IR)=(TOUT(IR)-TIN(IR))/FLOAT (NSTEP(IR))                       SAB3744
      IPM=IPM+NSTEP(IR)
  105 CONTINUE                                                          SAB3746
  106 CONTINUE                                                          SAB3747
C     GEOMETRICAL INDEXES(GROUP DEPENDENT)                              SAB3748
      IF(IGEP-1)3,2,3                                                   SAB3749
    2 DO 60 IR=1,IRM                                                    SAB3750
      IF(TIN(IR)-3.)50,50,51                                            SAB3751
   50 IGE(IR)=IGEP                                                      SAB3752
      GO TO 60                                                          SAB3753
   51 IGE(IR)=3                                                         SAB3754
   60 CONTINUE                                                          SAB3755
      GO TO 70                                                          SAB3756
    3 DO 61 IR=1,IRM                                                    SAB3757
   61 IGE(IR)=IGEP                                                      SAB3758
   70 CONTINUE                                                          SAB3759
C     CALCOLO FN(M)                                                     SAB3760
      NG=NGAP+1                                                         SAB3761
      M=IPM+1                                                           SAB3762
      DO 10 JB=1,IRM                                                    SAB3763
      IRB=IRM+1-JB                                                      SAB3764
      IF(ISAGAP(IRB)-2)81,79,80                                         SAB3765
   79 NG=NG-1                                                           SAB3766
      U2(NG)=UOUT                                                       SAB3767
      U1(NG)=D(IRB)*UOUT/(1.+2.*D(IRB)*SIG(IRB)*UOUT)                   SAB3768
      UOUT=U1(NG)                                                       SAB3769
      GO TO 10                                                          SAB3770
   80 UOUT=UOUT*D(IRB)/SIG(IRB)                                         SAB3771
      GO TO 10                                                          SAB3772
   81 NP=NSTEP(IRB)+1                                                   SAB3773
      TM=TOUT(IRB)                                                      SAB3774
      IF((TM-TIN(IRB)).LE.DTM) GO TO 82                                 SAB3775
      UOUT=DK(IRB)*(1.+FLOAT(IGEP)/(2.*TIN(IRB)))                       SAB3776
      M=M-NP                                                            SAB3777
      GO TO 10                                                          SAB3778
   82 HTB=HT(IRB)                                                       SAB3779
    5 BCN=-UOUT/DK(IRB)
    7 B=COEFB(IGE(IRB),BCN,TM)                                          SAB3781
      DO 8 JP=1,NP                                                      SAB3782
      M=M-1                                                             SAB3783
      T=TM-FLOAT (JP-1)*HTB                                             SAB3784
      FN(M)=ENNE(IGE(IRB),B,T,TM,PRODN)                                 SAB3785
    8 CONTINUE                                                          SAB3786
      UOUT=-DK(IRB)*FDERN(IGE(IRB),B,T,TM,PRODN)/FN(M)                  SAB3787
   10 CONTINUE                                                          SAB3788
      UIN=UOUT                                                          SAB3789
C     CALC.OF V(M)                                                      SAB3790
      NG=NGAP+1                                                         SAB3791
      M=IPM+1                                                           SAB3792
      DO 21 JB=1,IRM                                                    SAB3793
      IRB=IRM+1-JB                                                      SAB3794
      NS=NSTEP(IRB)                                                     SAB3795
      IF(ISAGAP(IRB)-2)85,83,84                                         SAB3796
   83 NG=NG-1                                                           SAB3797
      V1=D(IRB)*VOUT/(1.+2.*D(IRB)*SIG(IRB)*U2(NG))                     SAB3798
      VOUT=V1                                                           SAB3799
```

```
      GO TO 21                                                          SAB3800
   84 VOUT=VOUT/SIG(IRB)                                                SAB3801
      GO TO 21                                                          SAB3802
   85 NP=NS+1                                                           SAB3803
      IF((TOUT(IRB)-TIN(IRB)).LE.DTM) GO TO 86                          SAB3804
      M=M-NP                                                            SAB3805
      VOUT=-S(M)/CK(IRB)                                                SAB3806
      GO TO 21                                                          SAB3807
   86 M=M-1                                                             SAB3808
      V(M)=VOUT                                                         SAB3809
      A=V(M)*FN(M)*TOUT(IRB)**IGEP                                      SAB3810
      H=HT(IRB)                                                         SAB3811
      H3=H/3.                                                           SAB3812
      T=TOUT(IRB)+H                                                     SAB3813
      DO 22 L=1,NP                                                      SAB3814
      L1=M+1-L                                                          SAB3815
      FINTV(L)=S(L1)*FN(L1)                                             SAB3816
      IF(IGEP-1)22,23,23                                                SAB3817
   23 T=T-H                                                             SAB3818
      FINTV(L)=FINTV(L)*T**IGEP                                         SAB3819
   22 CONTINUE                                                          SAB3820
      STPN(1)=(FINTV(1)+FINTV(2))*H/2.                                  SAB3821
      STPN(2)=(FINTV(1)+4.*FINTV(2)+FINTV(3))*H3                        SAB3822
      STPN(3)=(FINTV(1)+3.*FINTV(2)+3.*FINTV(3)+FINTV(4))*H*.375        SAB3823
      T=TOUT(IRB)                                                       SAB3824
      DO 20 J=4,NS                                                      SAB3825
   20 STPN(J)=STPN(J-2)+(FINTV(J-1)+4.*FINTV(J)+FINTV(J+1))*H3          SAB3826
      DO 24 I=1,NS                                                      SAB3827
      M=M-1                                                             SAB3828
      V(M)=(A-STPN(I)/CK(IRB))/FN(M)                                    SAB3829
      IF(IGEP-1)24,25,25                                                SAB3830
   25 T=T-H                                                             SAB3831
      V(M)=V(M)/T**IGEP
   24 CONTINUE                                                          SAB3833
      VOUT=V(M)                                                         SAB3834
   21 CONTINUE                                                          SAB3835
C     CALC.OF FLUX                                                      SAB3836
      M=0                                                               SAB3837
      NG=0                                                              SAB3838
      IF(AIN)44,42,44                                                   SAB3839
   42 PHIB=AMAX1(0.,(-A2IN/A1IN-PHI(1)))                                SAB3840
      GO TO 45                                                          SAB3841
   44 PHIB=(AIN*V(1)-A2IN)/(A1IN-AIN*UIN)                               SAB3842
   45 CONTINUE                                                          SAB3843
      DO 38 IR=1,IRM                                                    SAB3844
      NS=NSTEP(IR)                                                      SAB3845
      IF(ISAGAP(IR)-2)88,40,87                                          SAB3846
   40 NG=NG+1                                                           SAB3847
      PHI2=PHIB-2.*SIG(IR)*(U1(NG)*PHIB+V(M))                           SAB3848
      PHIB=PHI2                                                         SAB3849
      GO TO 38                                                          SAB3850
   87 PHIB=PHIB*D(IR )                                                  SAB3851
      GO TO 38                                                          SAB3852
   88 NP=NS+1                                                           SAB3853
      IF((TOUT(IR)-TIN(IR)).LE.DTM) GO TO 89                            SAB3854
      DO 31 J=1,NP                                                      SAB3855
      M=M+1                                                             SAB3856
   31 PHI(M)=S(M)/SIG(IR)                                               SAB3857
      GO TO 39                                                          SAB3858
   89 H=HT(IR)                                                          SAB3859
      H3=H/3.                                                           SAB3860
      DO 35 JP=1,NP                                                     SAB3861
      L1=M+JP                                                           SAB3862
   35 PHINT(JP)=V(L1)/FN(L1)                                            SAB3863
      VSN(1)=(PHINT(1)+PHINT(2))*H/2.                                   SAB3864
      VSN(2)=(PHINT(1)+4.*PHINT(2)+PHINT(3))*H3                         SAB3865
```

```
      VSN(3)=(PHINT(1)+3.*PHINT(2)+3.*PHINT(3)+PHINT(4))*H*.375        SAB3866
      DO 36 J=4,NS                                                     SAB3867
   36 VSN(J)=VSN(J-2)+(PHINT(J-1)+4.*PHINT(J)+PHINT(J+1))*H3           SAB3868
      M=M+1                                                            SAB3869
      A=PHIB/FN(M)                                                     SAB3870
      PHI(M)=PHIB                                                      SAB3871
      DO 37 J=1,NS                                                     SAB3872
      M=M+1                                                            SAB3873
   37 PHI(M)=(A-VSN(J)/DK(IR))*FN(M)                                   SAB3874
   39 PHIB=PHI(M)                                                      SAB3875
   38 CONTINUE                                                         SAB3876
      RETURN                                                           SAB3877
      END                                                              SAB3878
      FUNCTION ENNE(L,B,T,TM,P)                                        SAB4058
      IND=L+1                                                          SAB4059
      E8=1.8048514E-35                                                 SAB4060
      U=1.                                                             SAB4061
      GO TO (1,2,3,4),IND                                              SAB4062
    1 X=EXP(TM-T-40.)                                                  SAB4063
      ENNE=X                                                           SAB4064
      Y=B/X                                                            SAB4065
      IF(ABS(Y).GT.U) ENNE=ENNE+Y*E8                                   SAB4066
      GO TO 5                                                          SAB4067
    2 ENNE=B*BIO (T)+BKO (T)                                           SAB4068
      GO TO 5                                                          SAB4069
    3 X=EXP(TM-T-40.)                                                  SAB4070
      ENNE=X                                                           SAB4071
      Y=B/X                                                            SAB4072
      IF(ABS(Y).GT.U) ENNE=ENNE+Y*E8                                   SAB4073
      ENNE=ENNE/T                                                      SAB4074
      GO TO 5                                                          SAB4075
    4 X=EXP(TM-T-40.)                                                  SAB4076
      C1=.125/T                                                        SAB4077
      ENNE=X*(U-C1)                                                    SAB4078
      Y=B/X                                                            SAB4079
      IF(ABS(Y).GT.U) ENNE=ENNE+Y*E8*(U+C1)                            SAB4080
      ENNE=ENNE/SQRT(T)
    5 ENNE=P*ENNE                                                      SAB4082
      RETURN                                                           SAB4083
      END                                                              SAB4084
      FUNCTION FDERN(L,B,T,TM,P)                                       SAB4085
      IND=L+1                                                          SAB4086
      E8=1.8048514E-35                                                 SAB4087
      U=1.                                                             SAB4088
      GO TO (1,2,3,4),IND                                              SAB4089
    1 Z=EXP(TM-T-40.)                                                  SAB4090
      FDERN=-Z                                                         SAB4091
      Y=B/Z                                                            SAB4092
      IF(ABS(Y).GT.U) FDERN=FDERN+Y*E8                                 SAB4093
      GO TO 5                                                          SAB4094
    2 FDERN=B*BI1 (T)-BK1 (T)                                          SAB4095
      GO TO 5                                                          SAB4096
    3 Z=EXP(T-TM+40.)                                                  SAB4097
      FDERN=-(T+U)/Z                                                   SAB4098
      Y=B*Z*(T-U)                                                      SAB4099
      IF(ABS(Y).GT.U) FDERN=FDERN+Y*E8                                 SAB4100
      FDERN=FDERN/T**2                                                 SAB4101
      GO TO 5                                                          SAB4102
    4 Z=EXP(T-TM+40.)                                                  SAB4103
      C1=.375/T                                                        SAB4104
      FDERN=-(U+C1)/Z                                                  SAB4105
      Y=B*Z                                                            SAB4106
      IF(ABS(Y).GT.U) FDERN=FDERN+Y*E8*(U-C1)                          SAB4107
      FDERN=FDERN/SQRT(T)                                              SAB4108
    5 FDERN=FDERN*P                                                    SAB4109
      RETURN                                                           SAB4110
      END                                                              SAB4111
```

ก - 3 • โปรแกรม DOSE ใช้ในการคำนวณโดสเรท

```
      PROGRAM DOSE
C  PROGRAM FOR COMPUTING DOSE RATES, REACTION RATES ETC.
C  MODIFIED FROM SUBROUTINE DOSE BY LT. TIPVIMOL THONG-ORN
C  NUCLEAR TECHNOLOGY , CHULALONGKORN UNIVERSITY
      DIMENSION FN(220,26),X(220),R(220),NP(20),RR(26,20),IND(220)
      DIMENSION NCHR(22),NSTEP(22),NTNOPI(22),CF(26)
      CHARACTER*4 TIT(15)
      CHARACTER*15 NAME1,NAME2
      WRITE (*,100)
  100 FORMAT (///25X,' ****** D O S E ****** ',/13X,' Program for
     1computing Dose Rates, Reaction Rates etc.')
      WRITE (*,130)
  130 FORMAT (/' Enter your filename for input file : ',$)
  131 FORMAT (/' Enter your filename for output file : ',$)
      READ (*,140) NAME1
      WRITE (*,131)
      READ (*,140) NAME2
  140 FORMAT (A15)
      OPEN (UNIT=5,FILE=NAME1,STATUS='OLD')
      OPEN (UNIT=1,FILE='B:LTTEM',STATUS='OLD')
      READ (1,310) NMAX,MM,IMAX,IRM
      READ (1,315) (X(N),N=1,NMAX)
      READ (1,320) (IND(N),N=1,NMAX)
      READ (1,315) (CF(I),I=1,IMAX)
      READ (1,325) (NSTEP(IR),NTNOPI(IR),NCHR(IR),IR=1,IRM)
      CLOSE (1)
  310 FORMAT (6I10)
  315 FORMAT (7E10.4)
  320 FORMAT (7I10)
  325 FORMAT (3I10)
      OPEN (UNIT=2,FILE='B:LTREM',STATUS='OLD')
      DO 2 I=1,IMAX                                                     SAB4000
    2 READ (2,315) (FN(N,I),N=1,NMAX)
      CLOSE (2)
      OPEN (UNIT=3,FILE='B:L2REM',STATUS='OLD')
      OPEN (UNIT=6,FILE=NAME2,STATUS='NEW')
      READ (3,310) NRD
      IF(NRD.LE.0)GO TO 21                                              SAB4003
      KRM=IRM-2                                                         SAB4004
      DO 5 IR=3,IRM                                                     SAB4005
    5 NP(IR-2)=NSTEP(IR)/NTNOPI(IR)                                     SAB4006
      DO 20 NR=1,NRD                                                    SAB4007
      READ (3,310) I1,I2
      DO 345 KR=1,KRM
  345 READ (3,350) (RR(I,KR),I=I1,I2)
  350 FORMAT (7E10.3)
      READ (3,355) TIT
  355 FORMAT (15A4)
      N=0                                                               SAB4009
      DO 10 KR=1,KRM                                                    SAB4010
      IF(NCHR(KR+2).GT.1) GO TO 10                                      SAB4011
      JM=NP(KR)+1                                                       SAB4012
      DO 9 J=1,JM                                                       SAB4013
      N=N+1                                                             SAB4014
      R(N)=0.                                                           SAB4015
      DO 8 I=I1,I2                                                      SAB4016
    8 R(N)=R(N)+RR(I,KR)*FN(N,I)                                        SAB4017
    9 CONTINUE                                                          SAB4018
   10 CONTINUE                                                          SAB4019
      WRITE (6,99) TIT                                                  SAB4021
      WRITE (6,91) (X(N),R(N),N=1,NMAX)                                 SAB4022
   91 FORMAT (5(0PF11.2,1X,1PE12.3))                                    SAB4023
```

```
   20 CONTINUE
   21 CLOSE (3)
   98 FORMAT (/20X,'TOTAL NEUTRON DOSE RATE (MREM/HR) '//7X,'X',9X,
     1'DOSE',10X,'X',9X,'DOSE',10X,'X',9X,'DOSE',10X,'X',9X,'DOSE',10X,
     2'X',9X,'DOSE'/)
   99 FORMAT (/20X,15A4,' RR(X)'//7X,'X',10X,'RR',11X,'X',10X,'RR',11X,
     1'X',10X,'RR',11X,'X',10X,'RR',11X,'X',10X,'RR'/)
   97 FORMAT (2I5,15A4/(7E10.3))
C  READS FROM INPUT REGION INDEPENDENT CONV.FACTORS
      READ (5,101) NRIR,IFDOSE
  101 FORMAT (14I5)
      IF (IFDOSE.LE.0) GOTO 30
      DO 25 N=1,NMAX
      R(N)=0.
      DO 25 I=1,IMAX
   25 R(N)=R(N)+CF(I)*FN(N,I)
      WRITE (6,98)
      WRITE (6,91) (X(N),R(N),N=1,NMAX)
   30 CONTINUE
      IF(NRIR.LE.0)GO TO 50
      DO 45 NR=1,NRIR
      READ (5,97) I1,I2,TIT,(CF(J),J=I1,I2)
      DO 40 N=1,NMAX
      R(N)=0.
      DO 40 I=I1,I2
   40 R(N)=R(N)+CF(I)*FN(N,I)
      WRITE (6,92) I1,I2,(CF(J),J=I1,I2)
   92 FORMAT (10X,'CONV.FACTORS (GROUP',I3,' TO',I3,')'//(1P10E12.3))
      WRITE (6,99) TIT
   45 WRITE (6,91) (X(N),R(N),N=1,NMAX)
   50 CONTINUE
      CLOSE (5)
      CLOSE (6)
      END
```

ก - 4 โปรแกรมเตรียม LIBRARY

```
C THIS PROGRAM READS PARAMETERS AND GROUP CONSTANTS AND PREPARES IN THE
C     SUITABLE WAY THE LIBRARY FOR SABINE, WHICH IS PRINTED AND WRITTEN
C     AS BINARY TAPE ON UNIT 9
      CHARACTER*4 TITLE,LABEL
      INTEGER CODE
      REAL NGCS
      DIMENSION LABEL(3)
      DIMENSION ET(28,50),RCS(50,20),CHI(20),EF(21)
      DIMENSION SIG(35,50),TRCS(35,50)
      DIMENSION NGCS(35),E(35),CF(35),DU(35)
      DIMENSION TM(8,15,50),TMH(10,35,5)
      DIMENSION CS(10,30),TTM(30,34)
      DIMENSION ISH(50),CODE(50),A(50),ACS(50)
      DIMENSION IRNT(10)
      DIMENSION TITLE(180)
      OPEN(5,FILE='FLIBA')
      OPEN(6,FILE='OUTP')
      OPEN(9,FILE='LIBRARY',FORM='UNFORMATTED',RECL=1050)
      READ (5,106) TITLE
      WRITE (6,185) TITLE
      WRITE (6,184)
      WRITE(1,7000)
 7000 FORMAT(' ****** READ INPUT DATA *******')
      READ (5,102) IMAX,IFMAX,NGMAX,IFROM,ITO,ITOH,NRMAX
      READ (5,102)(IRNT(I),I=1,NRMAX)
      READ (5,101) (E(J),J=1,IMAX)
      READ (5,101) (CF(J),J=1,IMAX)
      READ (5,101) (CHI(N),N=1,IFMAX)
      IFP1=IFMAX+1
      IM1=IMAX-1
      READ (5,101) (EF(N),N=1,IFP1)
      READ (5,102) NEL
      DO 10 K=1,25
   10 DU(K)=ALOG(E(K)/E(K+1))
      FH2=E(26)/E(25)
      FH1=1.-FH2
      ZERO=0.
      IFPIT=IFROM+ITO
      MET=IMAX-IFROM-2
      NET=MET+1
      KH=0
      DO 89 N=1,NEL
      DO 89 I=2,IFPIT
      DO 89 J=1,ITO
      TM(J,I,N)=ZERO
   89 CONTINUE
C     FOR ANY ELEMENT OR MATERIAL
      DO 50 NE=1,NEL
      READ (5,103) ISH(NE),CODE(NE),A(NE),ACS(NE),ET(19,NE),N1,N2,N3,N4,
     1LABEL
      WRITE (6,183) LABEL,CODE(NE)
      READ (5,101) SIG(25,NE),SIG(26,NE),TRCS(25,NE),TRCS(26,NE),NGCS(25
     1),NGCS(26)
   72 READ (5,101) (RCS(NE,N),N=1,IFMAX)
      DO 5 K=1,25
    5 READ (5,105) (TTM(J,K),J=1,10)
      DO 6 K=11,25
    6 READ (5,105) (TTM(J,K),J=11,20)
      DO 7 K=21,25
    7 READ (5,105) (TTM(J,K),J=21,24)
```

```
      READ (5,104) ((CS(I,J),I=1,5),J=1,24)
      IF(N4.LE.5)GO TO 9
      DO 8 J=1,24
    8 READ (5,104) (CS(I,J),I=6,N4)
    9 CONTINUE
C     FINITE LETTURE ELEMENTO. INIZIO CALCOLO.
      DO 12 J=1,24
      TRCS(J,NE)=CS(N2,J)
      SIG(J,NE)=CS(N3,J)
      IF(N1.EQ.0) GO TO 11
      NGCS(J)=CS(N1,J)
      GO TO 12
   11 NGCS(J)=0.
   12 CONTINUE
      IF(ISH(NE).GT.0) GO TO 18
C QUESTO ELEMENTO NON E DEL TIPO DELL IDROGENO
      DO 24 I=2,IFPIT
      JM1=MINO(ITO,I-1)
      J1 =MAXO(1,I-IFROM)
      DO 24 J=J1,JM1
      IMJ=I-J
   24 TM(J,I,NE)=TTM(IMJ,I)
      DO 22 M=1,MET
      MP6=M+IFROM
   22 ET(M,NE)=TTM(MP6,MP6+1)
      GO TO 50
C QUESTO ELEMENTO E DEL TIPO DELL IDROGENO
   18 KH=KH+1
      ISH(NE)=KH
      DO 20 I=2,24
      JM=MINO(ITOH,I-1)
      DO 20 J=1,JM
      IMJ=I-J
   20 TMH(J,I,KH)=TTM(IMJ,I)
      DO 30 K=1,9
      K1=25-K
      TMH(K,25,KH)=TTM(K1,25)*FH1
   30 TMH(K+1,26,KH)=TTM(K1,25)*FH2
      TMH(ITOH,25,KH)=TTM(25-ITOH,25)
      TMH(1,26,KH)=ET(NET,NE)
   50 CONTINUE
      WRITE(1,7001)
 7001 FORMAT(' REWIND TAPE 9 & WRITE UNFORMATTED DATA')
      NIDRO=KH
      REWIND 9
      WRITE (9) (TITLE(I),I=1,18)
      WRITE (9) IMAX,IFMAX,NGMAX,IFROM,ITO,ITOH,NRMAX,(IRNT(I),I=1,NRMAX
     1),(E(I),I=1,IMAX),(CF(I),I=1,IMAX),(CHI(J),J=1,IFMAX),EF
      WRITE (9) NEL
      WRITE (9) (CODE(N),A(N),(RCS(N,IF),IF=1,IFMAX),N=1,NEL)
      WRITE (9) NIDRO,(ISH(N),N=1,NEL)
C     SCRIVO SU LTLIB I PARAM NEUTRONICI  GRUPPO PER GRUPPO
      WRITE (9) (ACS(N),TRCS(1,N),SIG(1,N),N=1,NEL)
      DO 60 I=2,IMAX
      IM1=I-1
      JM=MINO(ITOH,IM1)
      WRITE (9) ((TMH(J,I,LH),J=1,JM),LH=1,NIDRO)
      IF(I.GT.IFPIT) GO TO 51
      JM1=MINO(ITO,IM1)
      J1 =MAXO(1,I-IFROM)
```

```
      WRITE (9) ((TM(J.I.N),J=J1,JM1),N=1,NEL)
      IF(IM1.LE.IFROM) GO TO 60
   51 M=IM1-IFROM
      WRITE (9) (ET(M.N),N=1,NEL)
   60 WRITE (9) (TRCS(I,N),SIG(I,N),N=1,NEL)
C     XX LETTURA TAPE E STAMPE PER CONTROLLO XX
      WRITE(1,7003)
 7003 FORMAT(' REWIND TAPE 9 & READ UNFORMATTED DATA')
      REWIND 9
      READ  (9) (TITLE(J),J=1,18)
      READ (9) IMAX,IFMAX,NGMAX,IFROM,ITO,ITOH,NRMAX,(IRNT(I),I=1,NRMAX)
     1,(E(I),I=1,IMAX),(CF(I),I=1,IMAX),(CHI(J),J=1,IFMAX),EF
      READ (9) NEL
      READ (9) (CODE(N),A(N),(RCS(N,IF),IF=1,IFMAX),N=1,NEL)
      READ (9) NIDRO,(ISH(N),N=1,NEL)
      READ (9) (ACS(N),TRCS(1,N),SIG(1,N),N=1,NEL)
      DO 65 I=2,IMAX
      IM1=I-1
      JM=MINO(ITOH,IM1)
      READ (9) ((TMH(J,I,LH),J=1,JM),LH=1,NIDRO)
      IF(I.GT.IFPIT) GO TO 56
      JM1=MINO(ITO,IM1)
      J1 =MAXO(1,I-IFROM)
      READ (9) ((TM(J,I,N),J=J1,JM1),N=1,NEL)
      IF(IM1.LE.IFROM) GO TO 65
   56 M=IM1-IFROM
      READ (9) (ET(M,N),N=1,NEL)
   65 READ (9) (TRCS(I,N),SIG(I,N),N=1,NEL)
C     STAMPE
      WRITE(1,7004)
 7004 FORMAT('  ********** WRITE OUTPUT ******')
      WRITE (6,199)
      WRITE (6,198) (I,E(I),E(I+1),DU(I),CF(I),I=1,25)
      WRITE (6,198) IMAX,E(IMAX),ZERO,ZERO,CF(IMAX)
      WRITE (6,197)
      DO 14 N=1,19
   14 WRITE (6,198) N,EF(N),EF(N+1),CHI(N)
C     STAMPA DELLA LIBRERIA
      DO 80 NE=1,NEL
      WRITE (6,196) CODE(NE),A(NE)
      WRITE (6,195) (RCS(NE,N),N=1,IFMAX)
      WRITE (6,194) ACS(NE)
      WRITE (6,193) (J,TRCS(J,NE),SIG(J,NE),J=1,IMAX)
      WRITE (6,192)
      WRITE (6,190)
      IF(ISH(NE).GT.0) GO TO 75
C
      IMA=IFROM+1
      DO 74 I=2,IMA
      IM1=I-1
   74 WRITE (6,187) I,(TM(J,I,NE),J=1,IM1)
      II=IMA+1
      M=0
      DO 76 I=II,IFPIT
      M=M+1
   76 WRITE (6,187) I,ET(M,NE),(TM(J,I,NE),J=2,ITO)
      III=IFPIT+1
      DO 78 I=III,IMAX
      M=M+1
   78 WRITE (6,187) I,ET(M,NE)
```

```
      GO TO 80
   75 CONTINUE
C
      LH=ISH(NE)
      DO 82 I=2, IMAX
      JM=MINO(ITOH, I-1)
   82 WRITE (6, 187) I, (TMH(J, I, LH), J=1, JM)
   80 CONTINUE
  101 FORMAT (7E10.3)
  102 FORMAT (7I10)
  103 FORMAT (2I5, 3E10.3, 4I5, 3A4)
  104 FORMAT (5E12.7)
  105 FORMAT (6E12.6)
  106 FORMAT (18A4)
  199 FORMAT (10X, 'DIFFUSION  GROUPS  STRUCTURE '//5X, 'GROUP', 5X,
     1'ENERGY  INTERVAL (EV) ', 5X, 'LETHARGY INT.  ', 4X, 'CONVERSION FACT
     2ORS (N/CM**2*SEC TO MREM/HR) '/)
  198 FORMAT (I8, 1P4E16.5)
  197 FORMAT (10X, 'FISSION  GROUPS  STRUCTURE '//5X, 'GROUP', 6X, 'E',
     1'NERGY  INTERVAL (MEV) ', 6X, 'FISSION SOURCE'/)
  196 FORMAT (22X, 'IDENT. NO.  ', 4X, 'MASS'//20X, I9, F13.3)
  195 FORMAT (//10X, 'REMOVAL C.S. '//(1P5E14.4))
  194 FORMAT (10X, 'FAST ABSORPTION=', F6.3, ' BARNS')
  193 FORMAT (5X, 'GROUP', 4X, 'TRANSPORT', 8X, '  OUT '               //(
     1I9, 1P2E16.6))
  192 FORMAT (/10X, 'TOTAL TRANSFER MATRIX'//10X, 'FROM GROUP I-J TO
     1 I '//)
  190 FORMAT (13X, 'J'/       13X, '1', 12X, '2', 12X, '3', 12X, '4', 12X, '5', 12X,
     1'6', 12X, '7', 12X, '8', 12X, '9'/4X, 'I')
  187 FORMAT (I5, 1P10E12.4)
  185 FORMAT (/(10X, 18A4))
  184 FORMAT (10X, 'ELEMENT ', 4X, 'IDENT. NO.  '//)
  183 FORMAT (8X, 3A4, I9)
      WRITE(1, 7005)
 7005 FORMAT(' *****END OF NEUTRON LIBRARY******')
      CALL GAMMA(9, NGMAX, IMAX)
      CLOSE (5)
      CLOSE (6)
      CLOSE (9)
      STOP
      END
      SUBROUTINE GAMMA(LIB, NGM, NTNM)
      CHARACTER*1 NALYES, EEEE
      DIMENSION GMACT(7), GMACE(7), PGAM(7), CFG(7), PGFIS(7), JJ(7)
      DIMENSION SIGNG(26), CCS(7, 26)
      DIMENSION ALFA(7, 7, 7), BETA(7, 7, 7), B(7, 7, 7)
      DATA NALYES/'Y'/
      NREC = 0                                                       PROL 120
      LTAPE=LIB
      WRITE(1, 7000)
 7000 FORMAT(' READ GAMMA DATA FROM FORMATTED DATA')
      READ (5, 1000) NELIB                                           PROL 130
      WRITE (6, 2) NELIB
    2 FORMAT (1H1, I10, ' ELEMENTS', ///' IDENT.  NPGAM')
    3 FORMAT (I5, I6)
 1000 FORMAT (7I10)                                                  PROL 140
 1010 FORMAT (I10, E10.0, 2I10)                                      PROL 380
 1020 FORMAT (7E10.0)                                                PROL 420
      WRITE(1, 7001)
 7001 FORMAT(' WRITE GAMMA UNFORMATTED DATA TO TAPE 9')
```

```
      WRITE (LTAPE) NELIB
      NREC = NREC+1                                                     PROL 150
      DO 10 NE=1,NELIB                                                  PROL 160
      READ (5,1010) NO,ATW,NPGAM                                        PROL 170
      WRITE (6,3) NO,NPGAM
      READ (5,1020) (GMACT(IG),IG=1,NGM)
      READ (5,1020) (GMACE(IG),IG=1,NGM)                                PROL 410
      WRITE (LIB) NO,ATW,NPGAM,GMACT,GMACE                              PROL 450
      NREC = NREC+1
      IF(NPGAM.EQ.2) GO TO 70                                           PROL 470
      READ (5,1020) (PGAM(IG),IG=1,NGM)
      READ (5,1020) (SIGNG(ITN),ITN=1,NTNM)                             PROL 490
      WRITE (LIB) PGAM,SIGNG                                            PROL 520
      NREC = NREC+1
      GO TO 10                                                          PROL 540
   70 READ (5,1020) CCS
      WRITE (LIB) CCS
      NREC = NREC+1
   10 CONTINUE                                                          PROL 580
      READ (5,1020) (CFG(IG),IG=1,NGM)                                  PROL 750
      READ (5,1020) (PGFIS(IG),IG=1,NGM)                                PROL 751
      WRITE (LIB) CFG,PGFIS                                             PROL 754
      NREC=NREC+1
      READ (5,1030) NMLIB,XMAX,DX,NX                                    PROL 756
 1030 FORMAT (I10,2E10.0,I10)
      WRITE (LIB) NMLIB,XMAX,DX,NX                                      PROL 770
      NREC = NREC+1
      DO 540 NM=1,NMLIB                                                 PROL 790
      READ (5,1000) MAT
      READ (5,1020) ((ALFA(MAT,MAT1,IG),IG=1,NGM),MAT1=1,NMLIB)
      READ (5,1020) ((BETA(MAT,MAT1,IG),IG=1,NGM),MAT1=1,NMLIB)
      READ (5,1020) ((B(MAT,MAT1,IG),IG=1,NGM),MAT1=1,NX)
  540 CONTINUE
      WRITE (LIB) ALFA,BETA,B
      NREC = NREC+1
      WRITE(1,7003)                                                     PROL 970
 7003 FORMAT('******LIBRARY TAPE IS COMPLETELY WRITTEN*****'/
     1 ' NOW READ TAPE 9 & WRITE OUTPUT')
      WRITE(1,7114)NREC
 7114 FORMAT(' NUMBER OF RECORD =',I5)
      WRITE(1,7112)
 7112 FORMAT(' WRITE GAMMA DATA OR NOT? ENTER YES OR NO')
      READ(1,7111)EEEE
 7111 FORMAT(A1)
      IF(EEEE.NE.NALYES)GOTO 8000
C     LIBRARY TAPE IS NOW COMPLETELY WRITTEN. THE FOLLOWING
C     SECTION BACKSPACE AND READS THE TAPE AND PRINTS ITS CONTENT.
      DO 130 NR=1,NREC
  130 BACKSPACE LTAPE                                                   PROL1100
      LPAGE = 1                                                         PROL1110
      WRITE (6,1040) LPAGE                                              PROL1120
 1040 FORMAT (45X,' ***** GAMMA-LIBRARY FOR SABINE *****',40X,I2)       PROL1140
      READ (LTAPE) NELIB                                                PROL1150
      WRITE (6,1050) NELIB,NGM,NTNM                                     PROL1160
 1050 FORMAT (///' NUMBER OF ELEMENTS =',I3//' NUMBER OF GAMMA-GROUPS ='PROL1190
     1,I2//' NUMBER OF NEUTRON-GROUPS =',I2)
      DO 140 NE=1,NELIB
      LPAGE = LPAGE+1
      WRITE (6,1040) LPAGE                                              PROL1240
      READ (LTAPE) NO,ATW,NPGAM,GMACT,GMACE                             PROL1250
```

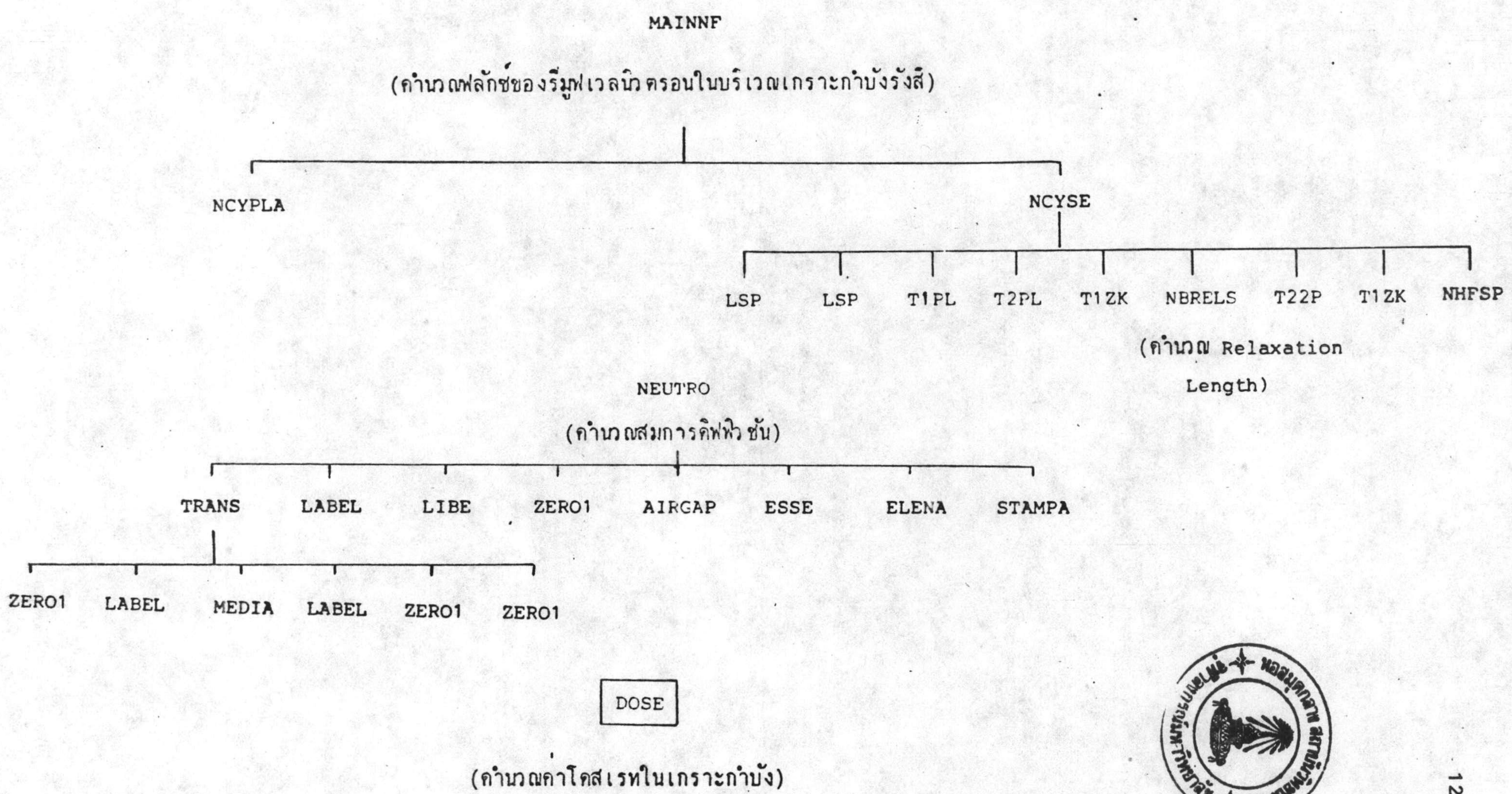
```
      WRITE (6,1060) NO,ATW,NPGAM
 1060 FORMAT (/10X,' NO =',I3,10X,' ATW =',1PE12.4,10X,' NPGAM =',I2)
      WRITE (6,1070) NGM                                                PROL1330
 1070 FORMAT ('  MASS-ABSORPTION-COEFFICIENTS IN CM**2/GR FOR GAMMA-GROUPPROL1340
     1P 1 TILL',I3)                                                     PROL1350
      WRITE (6,1080) (GMACT(IG),IG=1,NGM)                               PROL1360
 1080 FORMAT (1H0,1P10E12.4)                                            PROL1370
      WRITE (6,1090) NGM                                                PROL1380
 1090 FORMAT (/' ENERGY-ABSORPTION-COEFFICIENTS IN CM**2/GR FOR  GAMMA-GRPROL1390
     1OUP 1 TILL',I3)                                                   PROL1400
      WRITE (6,1080) (GMACE(IG),IG=1,NGM)                               PROL1430
      IF(NPGAM.EQ.2) GO TO 150
      READ (LIB) PGAM,SIGNG
      WRITE (6,1100) NGM                                                PROL1470
 1100 FORMAT (/' GAMMA-ESCAPE-PROBABILITY IN  MEV/ABSORBED NEUTRON FOR GPROL1480
     1AMMA-GROUP 1 TILL',I3)                                            PROL1490
      WRITE (6,1080) (PGAM(IG),IG=1,NGM)                                PROL1500
      WRITE (6,1110) NTNM                                               PROL1530
 1110 FORMAT (/' NEUTRON-GAMMA CROSS-SECTION IN  BARNS  FOR NEUTRON-GROUPROL1540
     1P 1 TILL',I3)
      WRITE (6,1120) (SIGNG(ITN),ITN=1,NTNM)                            PROL1560
 1120 FORMAT (/(1P10E12.4))                                             PROL1570
      GO TO 140
C     THE COMPLETE (N,G) MATRIX IS READ IN.
  150 READ (LIB) CCS
      DO 151 I=1,7
  151 JJ(I)=I
      WRITE (6,1001) JJ
 1001 FORMAT (20X,'(N,G)CROSS SECTIONS',//1H ,'NEUTRON',3X,'GAMMA GR
     1OUPS',/2X,'GROUP',I7,6I13)
      DO 152 N=1,NTNM
  152 WRITE (6,1002) N,(CCS(IG,N),IG=1,7)
 1002 FORMAT (I5,1P7E13.3)
  140 CONTINUE
      LPAGE = LPAGE+1                                                   PROL2100
      WRITE (6,1040) LPAGE                                              PROL2110
      READ (LIB) CFG,PGFIS
      WRITE (6,1205) NGM,(CFG(IG),IG=1,NGM)                             PROL2113
 1205 FORMAT (///' CONVERSION-FACTORS FOR THE GAMMA-GROUPS 1 TILL',I3,  PROL2114
     1' IN (MR/H)/(MEV/SEC*CM**2)'/1P10E12.4)                           PROL2115
      WRITE (6,1206) NGM,(PGFIS(IG),IG=1,NGM)                           PROL2118
 1206 FORMAT (///' GAMMA-EMISSION PER FISSION IN (MEV/FISSION)  FOR THE GPROL2119
     1AMMA-GROUPS 1 TILL',I3/1P10E12.4)                                 PROL2120
      READ (LTAPE) NMLIB,XMFPM,DXMFP,NMFP                               PROL2121
      WRITE (6,1210)                                                    PROL2140
 1210 FORMAT (///' BUILD-UP FACTORS FOR DIFFERENT MATERIALS')           PROL2150
      WRITE (6,1220) NMLIB                                              PROL2160
 1220 FORMAT (//' NUMBER OF MATERIALS =',I3)                            PROL2170
      WRITE (6,1230) NGM                                                PROL2180
 1230 FORMAT (' NUMBER OF GAMMA-GROUPS =',I3)                           PROL2190
      WRITE (6,1240) XMFPM                                              PROL2200
 1240 FORMAT (' MAXIMUM MFP-VALUE =',1PE12.4)                           PROL2210
      WRITE (6,1250) DXMFP                                              PROL2220
 1250 FORMAT (' PATH-LENGTH  IN MFP =',1PE12.4)                         PROL2230
      WRITE (6,1260) NMFP                                               PROL2240
 1260 FORMAT (' NUMBER OF TABULATED VALUES  FOR THE BUILD-UP FACTOR OF EPROL2250
     1ACH MATERIAL =',I3)                                               PROL2260
      READ (LIB) ALFA,BETA,B
      DO 195 MTYP=1,NMLIB
      LPAGE = LPAGE+1                                                   PROL2300
```

```
      WRITE (6,1040) LPAGE                                              PROL2310
      WRITE (6,1270) MTYP                                               PROL2320
 1270 FORMAT (////' MATERIAL-TYP =',I2)                                 PROL2330
      WRITE (6,1280) NGM                                                PROL2340
 1280 FORMAT (///' ALFA-VALUES FOR GAMMA-GROUP 1 TILL ',I2)             PROL2350
      WRITE (6,1290)                                                    PROL2360
 1290 FORMAT (1H0,'LMAT RMAT       1               2               3               4
     1         5               6               7')
      DO 210 MTYPX=1,NMLIB                                              PROL2400
      WRITE (6,1300) MTYP,MTYPX,(ALFA(MTYP,MTYPX,IG),IG=1,NGM)          PROL2430
 1300 FORMAT (I3,2X,I3,2X,1P10E12.4)                                    PROL2440
  210 CONTINUE                                                          PROL2450
      WRITE (6,1310) NGM                                                PROL2460
 1310 FORMAT (///' BETA-VALUES FOR GAMMA-GROUP 1 TILL ',I2)             PROL2470
      WRITE (6,1290)                                                    PROL2480
      DO 220 MTYPX=1,NMLIB                                              PROL2490
      WRITE (6,1300) MTYP,MTYPX,(BETA(MTYP,MTYPX,IG),IG=1,NGM)          PROL2520
  220 CONTINUE                                                          PROL2530
      WRITE (6,1320) NGM                                                PROL2540
 1320 FORMAT (////' BUILD-UP FACTORS FOR GAMMA-GROUP 1 TILL ',I2)       PROL2550
      WRITE (6,1330)                                                    PROL2560
 1330 FORMAT (1H0,'XMFP / IG       1               2               3               4
     1         5               6               7')
      DO 230 MFP=1,NMFP
      XMFP = DXMFP*FLOAT(MFP-1)                                         PROL2610
      WRITE (6,1340) XMFP,(B(MTYP,MFP,IG),IG=1,NGM)                     PROL2640
 1340 FORMAT (1PE10.2,1P10E12.4)                                        PROL2650
  230 CONTINUE                                                          PROL2660
  195 CONTINUE                                                          PROL2670
      WRITE (6,1350) NREC
 1350 FORMAT (////' NUMBER OF RECORDS =',I4)                            PROL2710
 3000 ENDFILE LIB
      RETURN                                                            PROL2721
      END                                                               PROL2730
```

ก – 5 ผังการทำงานของโปรแกรม NEUTRON และ DOSE

- NEUTRON (คำนวณฟลักซ์ของนิวตรอนในเกราะกำบัง)
  - ZERO1
  - ZERO1
  - ZERO1
  - ZERO1
  - ZERO1
  - ZERO1
  - PREPRO (Read data)
    - LABEL
    - INVA
    - INVA
    - INVA
    - LABEL
    - INVA
    - INVA
    - CHECK
    - CHECK
    - CHECK
    - MACRO (Read composition of all region)
      - LABEL
      - RMACRO (คำนวณ Macroscopic removal cross section)
  - MAINNS
  - MAINNF
  - NEUTRO

- MAINNS (คำนวณการกระจายของรีมูฟเวลนิวตรอนในแหล่งกำเนิดบริเวณที่ 1 และ 2)
  - INVA
  - INVA
  - SNOSP (คำนวณนิวตรอนของแหล่งกำเนิดที่ขอบนอกของบริเวณที่ 1 และ 2)
  - LABEL
  - SNCSP (คำนวณ ส.ป.ส.ของโพลิโนเมียล)
    - LSFIT
    - LSFIT


MAINNF
(คำนวณฟลักซ์ของรีมูฟเวลนิวตรอนในบริเวณเกราะกำบังรังสี)
NCYPLA
NCYSE
LSP
LSP
T1PL
T2PL
T1ZK
NBRELS
T22P
T1ZK
NHFSP
(คำนวณ Relaxation Length)
NEUTRO
(คำนวณสมการดิฟฟิวชัน)
TRANS
LABEL
LIBE
ZERO1
AIRGAP
ESSE
ELENA
STAMPA
ZERO1
LABEL
MEDIA
LABEL
ZERO1
ZERO1
DOSE
(คำนวณค่าโดสเรทในเกราะกำบัง)

ภาคผนวก ข

ตารางที่ ข - 1 Test Case - Input Data

SHEET OF

TITLE CAL.DAT	PROGRAMMER	DATE

```
  ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE   (LIBRARY A)
         2         2         2         2
         4         1         1         1
         1  2.                            5.          1    1    1
         2  3.                            0.001       1    1    1
         3 10.                 20.        1.          1    2    1
         4 100.                20.        2.5         1    3    7
         1
         2
         3                                 30   15    6    6
         4                                100   10    5    5
    1 26  1.
    2  8  1.
    3 18  1.
    4  8  0.22     18  0.10     16  0.23     26  0.12     29  0.05
    4 30  0.20     82  0.08
    0
  1.213 +7         1         1
  1.0
  0.

    0    0
  0.5       .0       1.0
  0.5       .0       1.0
  0.5       .0       1.0
```

GENERAL CODING FORM SHEET OF

TITLE CAL.DAT

PROGRAMMER

DATE

```
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
```

GENERAL CODING FORM SHEET OF

TITLE CAL.DSI PROGRAMMER DATE

1	2	3	4	5	6	7	8	9	10	11
				0					1	

ตารางที่ ข - 2 Test Case - Output Report (IBM PC)

ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A)

******* S A B I N E - 3 *******

CONTROL-INDICES

IGRC	IGRS	IGDS	IGSS
2	2	2	2

GROUP-DATA

NREG	NRG	NNG	NGG	IFGAM	NBUC	NBUS
4	19	26	7	1	1	1

GEOMETRY-DATA

REGION	ZR	H	TEMP	DEN	IGAP	MBU	NEMR
1	2.0000	.0000	.0000	5.0000	1	1	1
2	3.0000	.0000	.0000	.0010	1	1	1
3	10.0000	.0000	20.0000	1.0000	1	2	1
4	100.0000	.0000	20.0000	2.5000	1	3	7

REGION	M(THE)	M(R)	M(PSI)	ETHA	NDIF	NREM	NPRT	NGS	NGCF
1	1	1	1	1.00E-03					
2	1	1	1	1.00E-03					
3	1	1	1	1.00E-03	30	15	6	6	5
4	1	1	1	1.00E-03	100	10	5	5	5

```
***MATERIAL-DATA***
REGION      ID       FREM          ID      FREM          ID      FREM          ID      FREM          ID      FREM
    1       26       1.0000E+00     0      .0000E+00      0      .0000E+00      0      .0000E+00      0      .0000E+00
0
    2        8       1.0000E+00     0      .0000E+00      0      .0000E+00      0      .0000E+00      0      .0000E+00
0
    3       18       1.0000E+00     0      .0000E+00      0      .0000E+00      0      .0000E+00      0      .0000E+00
0
    4        8       2.2000E-01    14      1.0000E-01    16      2.3000E-01    26      1.2000E-01    29      5.0000E-02
    4       30       2.0000E-01    82      8.0000E-02     0      .0000E+00      0      .0000E+00      0      .0000E+00
0
 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE    (LIBRARY A)
              *** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

                                   S(Q)=S*P1(R)*P2(Z)


                  SOURCE DISTRIBUTION OF THE REGION IR =  1
S =  1.2130E+07

 P1(R) DISTRIBUTION IN RADIAL DIRECTION
 1 COEFFICIENTS OF THE POLYNOM ARE GIVEN
     1.0000E+00
P2(Z), DISTRIBUTION IN AXIAL DIRECTION
 IGRC = 2  SPHERICAL GEOMETRY  NO DISTRIBUTION
                  SOURCE DISTRIBUTION OF THE REGION IR =  2
NO SOURCE

        REGION  BUCKLING

           3     .000E+00
           4     .000E+00
```

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.127E+04	2.00	2.867E+04	4.00	1.366E+04	6.00	7.401E+03	8.00	4.510E+03
10.00	2.797E+03	10.00	2.797E+03	15.00	1.330E+03	20.00	6.500E+02	25.00	3.597E+02
30.00	2.014E+02	35.00	1.190E+02	40.00	7.076E+01	45.00	4.336E+01	50.00	2.668E+01
55.00	1.673E+01	60.00	1.053E+01	65.00	6.714E+00	70.00	4.293E+00	75.00	2.773E+00
80.00	1.796E+00	85.00	1.172E+00	90.00	7.663E-01	95.00	5.043E-01	100.00	3.323E-01
105.00	2.197E-01	110.00	1.449E-01						

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.898E+05	2.00	1.302E+05	4.00	5.993E+04	6.00	3.134E+04	8.00	1.840E+04
10.00	1.109E+04	10.00	1.109E+04	15.00	5.319E+03	20.00	2.631E+03	25.00	1.446E+03
30.00	8.050E+02	35.00	4.683E+02	40.00	2.746E+02	45.00	1.649E+02	50.00	9.962E+01
55.00	6.115E+01	60.00	3.769E+01	65.00	2.351E+01	70.00	1.472E+01	75.00	9.304E+00
80.00	5.901E+00	85.00	3.771E+00	90.00	2.417E+00	95.00	1.556E+00	100.00	1.001E+00
105.00	6.414E-01	110.00	4.016E-01						

0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.090E+05	2.00	2.700E+05	4.00	1.251E+05	6.00	6.619E+04	8.00	3.924E+04
10.00	2.466E+04	10.00	2.466E+04	15.00	1.348E+04	20.00	7.659E+03	25.00	4.632E+03
30.00	2.844E+03	35.00	1.787E+03	40.00	1.131E+03	45.00	7.247E+02	50.00	4.665E+02
55.00	3.024E+02	60.00	1.966E+02	65.00	1.285E+02	70.00	8.415E+01	75.00	5.529E+01
80.00	3.638E+01	85.00	2.398E+01	90.00	1.579E+01	95.00	1.037E+01	100.00	6.744E+00
105.00	4.284E+00	110.00	2.566E+00						

0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.019E+05	2.00	2.968E+05	4.00	1.323E+05	6.00	6.731E+04	8.00	3.855E+04
10.00	2.420E+04	10.00	2.420E+04	15.00	1.440E+04	20.00	8.851E+03	25.00	5.670E+03
30.00	3.674E+03	35.00	2.415E+03	40.00	1.596E+03	45.00	1.062E+03	50.00	7.089E+02
55.00	4.749E+02	60.00	3.187E+02	65.00	2.144E+02	70.00	1.444E+02	75.00	9.731E+01
80.00	6.559E+01	85.00	4.416E+01	90.00	2.963E+01	95.00	1.972E+01	100.00	1.289E+01
105.00	8.075E+00	110.00	4.556E+00						

0

NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.622E+05	2.00	2.776E+05	4.00	1.221E+05	6.00	6.009E+04	8.00	3.327E+04
10.00	2.134E+04	10.00	2.134E+04	15.00	1.358E+04	20.00	8.774E+03	25.00	5.769E+03
30.00	3.826E+03	35.00	2.556E+03	40.00	1.715E+03	45.00	1.155E+03	50.00	7.804E+02
55.00	5.282E+02	60.00	3.580E+02	65.00	2.429E+02	70.00	1.649E+02	75.00	1.120E+02
80.00	7.595E+01	85.00	5.140E+01	90.00	3.458E+01	95.00	2.296E+01	100.00	1.478E+01
105.00	8.809E+00	110.00	4.131E+00						

0

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.139E+05	2.00	2.358E+05	4.00	1.107E+05	6.00	5.679E+04	8.00	3.282E+04
10.00	2.318E+04	10.00	2.318E+04	15.00	1.791E+04	20.00	1.343E+04	25.00	9.943E+03
30.00	7.283E+03	35.00	5.297E+03	40.00	3.831E+03	45.00	2.757E+03	50.00	1.977E+03
55.00	1.413E+03	60.00	1.007E+03	65.00	7.150E+02	70.00	5.065E+02	75.00	3.576E+02
80.00	2.514E+02	85.00	1.758E+02	90.00	1.216E+02	95.00	8.264E+01	100.00	5.418E+01
105.00	3.283E+01	110.00	1.614E+01						

0

NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.768E+05	2.00	1.225E+05	4.00	6.619E+04	6.00	3.547E+04	8.00	2.064E+04
10.00	1.417E+04	10.00	1.417E+04	15.00	1.045E+04	20.00	7.814E+03	25.00	5.842E+03
30.00	4.346E+03	35.00	3.213E+03	40.00	2.361E+03	45.00	1.725E+03	50.00	1.254E+03
55.00	9.073E+02	60.00	6.537E+02	65.00	4.692E+02	70.00	3.354E+02	75.00	2.388E+02
80.00	1.691E+02	85.00	1.189E+02	90.00	8.264E+01	95.00	5.617E+01	100.00	3.646E+01
105.00	2.117E+01	110.00	8.351E+00						

0

NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.351E+05	2.00	9.828E+04	4.00	5.601E+04	6.00	3.103E+04	8.00	1.845E+04
10.00	1.311E+04	10.00	1.311E+04	15.00	1.012E+04	20.00	7.810E+03	25.00	5.998E+03
30.00	4.575E+03	35.00	3.463E+03	40.00	2.602E+03	45.00	1.941E+03	50.00	1.439E+03
55.00	1.060E+03	60.00	7.767E+02	65.00	5.660E+02	70.00	4.104E+02	75.00	2.959E+02
80.00	2.119E+02	85.00	1.505E+02	90.00	1.053E+02	95.00	7.192E+01	100.00	4.674E+01
105.00	2.717E+01	110.00	1.123E+01						

0

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.538E+05	2.00	1.123E+05	4.00	6.429E+04	6.00	3.580E+04	8.00	2.159E+04
10.00	1.658E+04	10.00	1.658E+04	15.00	1.500E+04	20.00	1.280E+04	25.00	1.058E+04
30.00	8.567E+03	35.00	6.829E+03	40.00	5.374E+03	45.00	4.183E+03	50.00	3.225E+03
55.00	2.465E+03	60.00	1.869E+03	65.00	1.407E+03	70.00	1.052E+03	75.00	7.798E+02
80.00	5.731E+02	85.00	4.162E+02	90.00	2.969E+02	95.00	2.056E+02	100.00	1.345E+02
105.00	7.755E+01	110.00	2.996E+01						

0

NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.514E+05	2.00	1.121E+05	4.00	6.503E+04	6.00	3.645E+04	8.00	2.192E+04
10.00	1.552E+04	10.00	1.552E+04	15.00	1.347E+04	20.00	1.170E+04	25.00	1.006E+04
30.00	8.539E+03	35.00	7.162E+03	40.00	5.936E+03	45.00	4.867E+03	50.00	3.949E+03
55.00	3.174E+03	60.00	2.529E+03	65.00	1.997E+03	70.00	1.562E+03	75.00	1.211E+03
80.00	9.279E+02	85.00	7.010E+02	90.00	5.189E+02	95.00	3.724E+02	100.00	2.533E+02
105.00	1.550E+02	110.00	7.218E+01						

0

NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.216E+05	2.00	9.224E+04	4.00	5.464E+04	6.00	3.096E+04	8.00	1.865E+04
10.00	1.264E+04	10.00	1.264E+04	15.00	1.031E+04	20.00	8.732E+03	25.00	7.486E+03
30.00	6.422E+03	35.00	5.682E+03	40.00	4.645E+03	45.00	3.903E+03	50.00	3.250E+03
55.00	2.683E+03	60.00	2.194E+03	65.00	1.777E+03	70.00	1.426E+03	75.00	1.132E+03
80.00	8.867E+02	85.00	6.832E+02	90.00	5.143E+02	95.00	3.735E+02	100.00	2.548E+02
105.00	1.529E+02	110.00	6.321E+01						

0

NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.084E+05	2.00	8.398E+04	4.00	5.080E+04	6.00	2.911E+04	8.00	1.755E+04
10.00	1.126E+04	10.00	1.126E+04	15.00	8.873E+03	20.00	7.352E+03	25.00	6.238E+03
30.00	5.346E+03	35.00	4.592E+03	40.00	3.935E+03	45.00	3.355E+03	50.00	2.843E+03
55.00	2.391E+03	60.00	1.994E+03	65.00	1.648E+03	70.00	1.349E+03	75.00	1.092E+03
80.00	8.709E+02	85.00	6.825E+02	90.00	5.216E+02	95.00	3.838E+02	100.00	2.650E+02
105.00	1.616E+02	110.00	7.030E+01						

0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.019E+05	2.00	8.048E+04	4.00	4.970E+04	6.00	2.880E+04	8.00	1.737E+04
10.00	1.097E+04	10.00	1.097E+04	15.00	8.150E+03	20.00	6.501E+03	25.00	5.390E+03
30.00	4.562E+03	35.00	3.899E+03	40.00	3.343E+03	45.00	2.863E+03	50.00	2.443E+03
55.00	2.073E+03	60.00	1.747E+03	65.00	1.460E+03	70.00	1.208E+03	75.00	9.880E+02
80.00	7.964E+02	85.00	6.297E+02	90.00	4.845E+02	95.00	3.576E+02	100.00	2.459E+02
105.00	1.461E+02	110.00	5.533E+01						

0

NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	9.686E+04	2.00	7.766E+04	4.00	4.889E+04	6.00	2.866E+04	8.00	1.726E+04
10.00	1.018E+04	10.00	1.018E+04	15.00	7.316E+03	20.00	5.659E+03	25.00	4.577E+03
30.00	3.804E+03	35.00	3.214E+03	40.00	2.739E+03	45.00	2.342E+03	50.00	2.002E+03
55.00	1.707E+03	60.00	1.448E+03	65.00	1.219E+03	70.00	1.018E+03	75.00	8.396E+02
80.00	6.827E+02	85.00	5.443E+02	90.00	4.222E+02	95.00	3.142E+02	100.00	2.184E+02
105.00	1.330E+02	110.00	5.660E+01						

0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	9.268E+04	2.00	7.525E+04	4.00	4.823E+04	6.00	2.859E+04	8.00	1.724E+04
10.00	1.048E+04	10.00	1.048E+04	15.00	7.348E+03	20.00	5.562E+03	25.00	4.416E+03
30.00	3.618E+03	35.00	3.025E+03	40.00	2.559E+03	45.00	2.180E+03	50.00	1.861E+03
55.00	1.587E+03	60.00	1.349E+03	65.00	1.139E+03	70.00	9.547E+02	75.00	7.910E+02
80.00	6.458E+02	85.00	5.167E+02	90.00	4.015E+02	95.00	2.985E+02	100.00	2.054E+02
105.00	1.206E+02	110.00	4.167E+01						

0

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.936E+04	2.00	7.336E+04	4.00	4.780E+04	6.00	2.865E+04	8.00	1.726E+04
10.00	9.991E+03	10.00	9.991E+03	15.00	7.279E+03	20.00	5.614E+03	25.00	4.490E+03
30.00	3.681E+03	35.00	3.070E+03	40.00	2.589E+03	45.00	2.199E+03	50.00	1.874E+03
55.00	1.597E+03	60.00	1.359E+03	65.00	1.150E+03	70.00	9.667E+02	75.00	8.039E+02
80.00	6.590E+02	85.00	5.297E+02	90.00	4.138E+02	95.00	3.098E+02	100.00	2.163E+02
105.00	1.322E+02	110.00	5.676E+01						

0

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.620E+04	2.00	7.142E+04	4.00	4.726E+04	6.00	2.863E+04	8.00	1.724E+04
10.00	9.747E+03	10.00	9.747E+03	15.00	7.012E+03	20.00	5.377E+03	25.00	4.286E+03
30.00	3.505E+03	35.00	2.916E+03	40.00	2.454E+03	45.00	2.080E+03	50.00	1.771E+03
55.00	1.508E+03	60.00	1.283E+03	65.00	1.087E+03	70.00	9.149E+02	75.00	7.624E+02
80.00	6.266E+02	85.00	5.051E+02	90.00	3.960E+02	95.00	2.978E+02	100.00	2.090E+02
105.00	1.286E+02	110.00	5.547E+01						

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NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.347E+04	2.00	6.973E+04	4.00	4.679E+04	6.00	2.864E+04	8.00	1.724E+04
10.00	9.529E+03	10.00	9.529E+03	15.00	6.752E+03	20.00	5.118E+03	25.00	4.044E+03
30.00	3.285E+03	35.00	2.719E+03	40.00	2.279E+03	45.00	1.927E+03	50.00	1.636E+03
55.00	1.392E+03	60.00	1.183E+03	65.00	1.002E+03	70.00	8.438E+02	75.00	7.037E+02
80.00	5.791E+02	85.00	4.675E+02	90.00	3.672E+02	95.00	2.766E+02	100.00	1.945E+02
105.00	1.198E+02	110.00	5.169E+01						

0

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.037E+04	2.00	5.079E+04	4.00	3.453E+04	6.00	2.134E+04	8.00	1.285E+04
10.00	7.105E+03	10.00	7.105E+03	15.00	4.943E+03	20.00	3.693E+03	25.00	2.886E+03
30.00	2.324E+03	35.00	1.911E+03	40.00	1.594E+03	45.00	1.342E+03	50.00	1.137E+03
55.00	9.650E+02	60.00	8.192E+02	65.00	6.934E+02	70.00	5.835E+02	75.00	4.867E+02
80.00	4.006E+02	85.00	3.235E+02	90.00	2.543E+02	95.00	1.917E+02	100.00	1.349E+02
105.00	8.310E+01	110.00	3.579E+01						

0

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.895E+04	2.00	3.294E+04	4.00	2.261E+04	6.00	1.408E+04	8.00	8.485E+03
10.00	4.725E+03	10.00	4.725E+03	15.00	3.228E+03	20.00	2.377E+03	25.00	1.837E+03
30.00	1.467E+03	35.00	1.199E+03	40.00	9.951E+02	45.00	8.348E+02	50.00	7.051E+02
55.00	5.974E+02	60.00	5.064E+02	65.00	4.282E+02	70.00	3.602E+02	75.00	3.003E+02
80.00	2.471E+02	85.00	1.996E+02	90.00	1.569E+02	95.00	1.183E+02	100.00	8.325E+01
105.00	5.131E+01	110.00	2.212E+01						

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.814E+04	2.00	3.237E+04	4.00	2.238E+04	6.00	1.401E+04	8.00	8.449E+03
10.00	4.668E+03	10.00	4.668E+03	15.00	3.137E+03	20.00	2.277E+03	25.00	1.738E+03
30.00	1.374E+03	35.00	1.114E+03	40.00	9.184E+02	45.00	7.668E+02	50.00	6.452E+02
55.00	5.452E+02	60.00	4.612E+02	65.00	3.894E+02	70.00	3.272E+02	75.00	2.726E+02
80.00	2.242E+02	85.00	1.811E+02	90.00	1.423E+02	95.00	1.073E+02	100.00	7.549E+01
105.00	4.652E+01	110.00	2.001E+01						

0

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.742E+04	2.00	3.187E+04	4.00	2.218E+04	6.00	1.396E+04	8.00	8.423E+03
10.00	4.603E+03	10.00	4.603E+03	15.00	3.032E+03	20.00	2.163E+03	25.00	1.627E+03
30.00	1.271E+03	35.00	1.020E+03	40.00	8.345E+02	45.00	6.924E+02	50.00	5.798E+02
55.00	4.881E+02	60.00	4.118E+02	65.00	3.469E+02	70.00	2.910E+02	75.00	2.422E+02
80.00	1.991E+02	85.00	1.607E+02	90.00	1.262E+02	95.00	9.514E+01	100.00	6.693E+01
105.00	4.121E+01	110.00	1.768E+01						

0

NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.650E+04	2.00	3.117E+04	4.00	2.183E+04	6.00	1.382E+04	8.00	8.338E+03
10.00	4.503E+03	10.00	4.503E+03	15.00	2.905E+03	20.00	2.034E+03	25.00	1.504E+03
30.00	1.158E+03	35.00	9.185E+02	40.00	7.444E+02	45.00	6.128E+02	50.00	5.100E+02
55.00	4.274E+02	60.00	3.592E+02	65.00	3.018E+02	70.00	2.526E+02	75.00	2.099E+02
80.00	1.724E+02	85.00	1.390E+02	90.00	1.091E+02	95.00	8.219E+01	100.00	5.778E+01
105.00	3.554E+01	110.00	1.520E+01						

0

NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.481E+04	2.00	2.980E+04	4.00	2.097E+04	6.00	1.333E+04	8.00	8.048E+03
10.00	4.277E+03	10.00	4.277E+03	15.00	2.704E+03	20.00	1.857E+03	25.00	1.350E+03
30.00	1.023E+03	35.00	8.003E+02	40.00	6.414E+02	45.00	5.233E+02	50.00	4.323E+02
55.00	3.601E+02	60.00	3.013E+02	65.00	2.522E+02	70.00	2.106E+02	75.00	1.746E+02
80.00	1.631E+02	85.00	1.153E+02	90.00	9.042E+01	95.00	6.805E+01	100.00	4.780E+01
105.00	2.936E+01	110.00	1.250E+01						

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NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.761E+04	2.00	5.812E+04	4.00	4.123E+04	6.00	2.638E+04	8.00	1.587E+04
10.00	7.237E+03	10.00	7.237E+03	15.00	4.010E+03	20.00	2.472E+03	25.00	1.650E+03
30.00	1.171E+03	35.00	8.722E+02	40.00	6.739E+02	45.00	5.352E+02	50.00	4.335E+02
55.00	3.559E+02	60.00	2.946E+02	65.00	2.448E+02	70.00	2.031E+02	75.00	1.677E+02
80.00	1.371E+02	85.00	1.101E+02	90.00	8.624E+01	95.00	6.485E+01	100.00	4.555E+01
105.00	2.805E+01	110.00	1.212E+01						

0

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.446E+06	2.00	3.097E+06	4.00	2.375E+06	6.00	1.592E+06	8.00	8.641E+05
10.00	1.742E+05	10.00	1.742E+05	15.00	7.858E+04	20.00	3.800E+04	25.00	1.928E+04
30.00	1.017E+04	35.00	5.559E+03	40.00	3.152E+03	45.00	1.861E+03	50.00	1.148E+03
55.00	7.426E+02	60.00	5.041E+02	65.00	3.578E+02	70.00	2.635E+02	75.00	1.992E+02
80.00	1.529E+02	85.00	1.176E+02	90.00	8.934E+01	95.00	6.577E+01	100.00	4.549E+01
105.00	2.760E+01	110.00	1.148E+01						

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
.00	3.957E+05	2.00	1.881E+05	4.00	9.197E+04	6.00	4.918E+04	8.00	2.830E+04
10.00	1.691E+04	10.00	1.691E+04	15.00	1.074E+04	20.00	7.120E+03	25.00	4.924E+03
30.00	3.461E+03	35.00	2.469E+03	40.00	1.776E+03	45.00	1.287E+03	50.00	9.369E+02
55.00	6.851E+02	60.00	5.026E+02	65.00	3.696E+02	70.00	2.721E+02	75.00	2.003E+02
80.00	1.470E+02	85.00	1.072E+02	90.00	7.721E+01	95.00	5.422E+01	100.00	3.624E+01
105.00	2.178E+01	110.00	9.676E+00						

ตารางที่ ข - 3 Test Case - Output Report (PRIME)

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 1

******* S A B I N E - 3 *******

CONTROL-INDICES

IGRC	IGPS	IGDS	IGSS
2	2	2	2

GROUP-DATA

NREG	NRG	NNG	NGG	IFGAM	NBUC	NBUS
4	17	26	7	1	1	1

GEOMETRY-DATA

REGION	ZR	H	TEMP	DEN	IGAP	MBU	NEMR
1	2.0000	0.0000	0.0000	5.0000	1	1	1
2	3.0000	0.0000	0.0000	0.0010	1	1	1
3	10.0000	0.0000	20.0000	1.0000	1	2	1
4	100.0000	0.0000	20.0000	2.5000	1	3	7

REGION	M(THE)	M(R)	M(PSI)	ETHA	NDIF	NREM	NPRT	NGS	NQCF
1	1	1	1	1.00E-03					
2	1	1	1	1.00E-03					
3	1	1	1	1.00E-03	30	15	6	6	5
4	1	1	1	1.00E-03	100	10	5	5	5

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 2

MATERIAL-DATA

REGION	ID	FREM	ID	FREM	ID	FREM	ID	FREM	ID	FREM
1	26	1.0000E+00	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01
0										
2	8	1.0000E+00	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01
0										
3	18	1.0000E+00	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01
0										
4	8	2.2000E-01	14	1.0000E-01	16	2.3000E-01	26	1.2000E-01	29	5.0000E-02
4	30	2.0000E-01	82	8.0000E-02	0	0.0000E-01	0	0.0000E-01	0	0.0000E-01
0										

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 3

*** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

S(Q)=S*P1(R)*P2(Z)

SOURCE DISTRIBUTION OF THE REGION IR = 1

S = 1.2130E+07

P1(R) DISTRIBUTION IN RADIAL DIRECTION

1 COEFFICIENTS OF THE POLYNOM ARE GIVEN

1.0000E+00

P2(Z), DISTRIBUTION IN AXIAL DIRECTION
IGRC = 2 SPHERICAL GEOMETRY NO DISTRIBUTION

NO SOURCE

SOURCE DISTRIBUTION OF THE REGION IR = 2

REGION	BUCKLING
3	0.000E-01
4	0.000E-01

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01
5.0000E-01	0.0000E-01	1.0000E+00	0.0000E-01	0.0000E-01

0

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	6.126E+04	2.00	2.867E+04	4.00	1.366E+04	6.00	7.402E+03	8.00	4.509E+03
10.00	2.797E+03	10.00	2.797E+03	15.00	1.330E+03	20.00	6.500E+02	25.00	3.597E+02
30.00	2.014E+02	35.00	1.190E+02	40.00	7.076E+01	45.00	4.336E+01	50.00	2.668E+01
55.00	1.673E+01	60.00	1.053E+01	65.00	6.715E+00	70.00	4.293E+00	75.00	2.773E+00
80.00	1.796E+00	85.00	1.172E+00	90.00	7.663E-01	95.00	5.043E-01	100.00	3.322E-01
105.00	2.197E-01	110.00	1.449E-01						

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	2.898E+05	2.00	1.302E+05	4.00	5.993E+04	6.00	3.135E+04	8.00	1.840E+04

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) Page 3

10.00	1.109E+04	10.00	1.109E+04	15.00	5.319E+03	20.00	2.631E+03	25.00	1.446E+03
30.00	8.051E+02	35.00	4.684E+02	40.00	2.746E+02	45.00	1.650E+02	50.00	9.964E+01
55.00	6.115E+01	60.00	3.769E+01	65.00	2.351E+01	70.00	1.472E+01	75.00	9.304E+00
80.00	5.901E+00	85.00	3.771E+00	90.00	2.417E+00	95.00	1.556E+00	100.00	1.001E+00
105.00	6.414E-01	110.00	4.016E-01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 7
0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	6.089E+05	2.00	2.700E+05	4.00	1.251E+05	6.00	6.619E+04	8.00	3.923E+04
10.00	2.466E+04	10.00	2.466E+04	15.00	1.348E+04	20.00	7.659E+03	25.00	4.632E+03
30.00	2.844E+03	35.00	1.787E+03	40.00	1.131E+03	45.00	7.247E+02	50.00	4.665E+02
55.00	3.024E+02	60.00	1.966E+02	65.00	1.285E+02	70.00	8.415E+01	75.00	5.529E+01
80.00	3.639E+01	85.00	2.398E+01	90.00	1.579E+01	95.00	1.037E+01	100.00	6.744E+00
105.00	4.284E+00	110.00	2.566E+00						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 8
0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	7.019E+05	2.00	2.968E+05	4.00	1.323E+05	6.00	6.730E+04	8.00	3.854E+04
10.00	2.420E+04	10.00	2.420E+04	15.00	1.440E+04	20.00	8.851E+03	25.00	5.670E+03
30.00	3.674E+03	35.00	2.415E+03	40.00	1.596E+03	45.00	1.062E+03	50.00	7.089E+02
55.00	4.749E+02	60.00	3.187E+02	65.00	2.144E+02	70.00	1.444E+02	75.00	9.731E+01
80.00	6.559E+01	85.00	4.416E+01	90.00	2.963E+01	95.00	1.972E+01	100.00	1.289E+01
105.00	8.075E+00	110.00	4.556E+00						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 9
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NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	6.622E+05	2.00	2.776E+05	4.00	1.221E+05	6.00	6.010E+04	8.00	3.327E+04
10.00	2.134E+04	10.00	2.134E+04	15.00	1.358E+04	20.00	8.774E+03	25.00	5.769E+03
30.00	3.826E+03	35.00	2.556E+03	40.00	1.715E+03	45.00	1.155E+03	50.00	7.804E+02
55.00	5.282E+02	60.00	3.580E+02	65.00	2.429E+02	70.00	1.649E+02	75.00	1.120E+02
80.00	7.596E+01	85.00	5.140E+01	90.00	3.458E+01	95.00	2.296E+01	100.00	1.478E+01
105.00	8.809E+00	110.00	4.131E+00						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 10
0

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	5.138E+05	2.00	2.358E+05	4.00	1.107E+05	6.00	5.679E+04	8.00	3.282E+04
10.00	2.318E+04	10.00	2.318E+04	15.00	1.791E+04	20.00	1.343E+04	25.00	9.943E+03
30.00	7.283E+03	35.00	5.297E+03	40.00	3.831E+03	45.00	2.757E+03	50.00	1.977E+03
55.00	1.413E+03	60.00	1.007E+03	65.00	7.150E+02	70.00	5.065E+02	75.00	3.576E+02
80.00	2.515E+02	85.00	1.758E+02	90.00	1.216E+02	95.00	8.265E+01	100.00	5.418E+01
105.00	3.284E+01	110.00	1.614E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 11
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NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.768E+05	2.00	1.225E+05	4.00	6.618E+04	6.00	3.547E+04	8.00	2.064E+04

10.00	1.417E+04	10.00	1.417E+04	15.00	1.045E+04	20.00	7.814E+03	25.00	5.842E+03
30.00	4.346E+03	35.00	3.213E+03	40.00	2.361E+03	45.00	1.725E+03	50.00	1.254E+03
55.00	9.073E+02	60.00	6.537E+02	65.00	4.692E+02	70.00	3.354E+02	75.00	2.388E+02
80.00	1.691E+02	85.00	1.189E+02	90.00	8.264E+01	95.00	5.617E+01	100.00	3.646E+01
105.00	2.117E+01	110.00	8.351E+00						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 12
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NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.351E+05	2.00	9.828E+04	4.00	5.601E+04	6.00	3.103E+04	8.00	1.845E+04
10.00	1.311E+04	10.00	1.311E+04	15.00	1.012E+04	20.00	7.810E+03	25.00	5.998E+03
30.00	4.575E+03	35.00	3.463E+03	40.00	2.602E+03	45.00	1.941E+03	50.00	1.439E+03
55.00	1.060E+03	60.00	7.767E+02	65.00	5.660E+02	70.00	4.104E+02	75.00	2.959E+02
80.00	2.119E+02	85.00	1.505E+02	90.00	1.053E+02	95.00	7.192E+01	100.00	4.674E+01
105.00	2.717E+01	110.00	1.123E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 13
0

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.538E+05	2.00	1.123E+05	4.00	6.429E+04	6.00	3.580E+04	8.00	2.159E+04
10.00	1.658E+04	10.00	1.658E+04	15.00	1.500E+04	20.00	1.280E+04	25.00	1.058E+04
30.00	8.567E+03	35.00	6.829E+03	40.00	5.374E+03	45.00	4.183E+03	50.00	3.225E+03
55.00	2.465E+03	60.00	1.869E+03	65.00	1.407E+03	70.00	1.052E+03	75.00	7.798E+02
80.00	5.731E+02	85.00	4.162E+02	90.00	2.969E+02	95.00	2.055E+02	100.00	1.345E+02
105.00	7.755E+01	110.00	2.996E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 14
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NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.514E+05	2.00	1.121E+05	4.00	6.503E+04	6.00	3.645E+04	8.00	2.192E+04
10.00	1.552E+04	10.00	1.552E+04	15.00	1.347E+04	20.00	1.170E+04	25.00	1.005E+04
30.00	8.539E+03	35.00	7.162E+03	40.00	5.936E+03	45.00	4.867E+03	50.00	3.949E+03
55.00	3.174E+03	60.00	2.529E+03	65.00	1.997E+03	70.00	1.562E+03	75.00	1.211E+03
80.00	9.279E+02	85.00	7.010E+02	90.00	5.189E+02	95.00	3.724E+02	100.00	2.533E+02
105.00	1.550E+02	110.00	7.218E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 15
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NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.216E+05	2.00	9.224E+04	4.00	5.464E+04	6.00	3.096E+04	8.00	1.865E+04
10.00	1.264E+04	10.00	1.264E+04	15.00	1.031E+04	20.00	8.732E+03	25.00	7.486E+03
30.00	6.422E+03	35.00	5.482E+03	40.00	4.645E+03	45.00	3.903E+03	50.00	3.250E+03
55.00	2.683E+03	60.00	2.194E+03	65.00	1.777E+03	70.00	1.426E+03	75.00	1.132E+03
80.00	8.867E+02	85.00	6.832E+02	90.00	5.143E+02	95.00	3.735E+02	100.00	2.548E+02
105.00	1.530E+02	110.00	6.321E+01						

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NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.084E+05	2.00	8.398E+04	4.00	5.081E+04	6.00	2.911E+04	8.00	1.755E+04

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) Page 5

10.00	1.126E+04	10.00	1.126E+04	15.00	8.873E+03	20.00	7.352E+03	25.00	6.238E+03
30.00	5.346E+03	35.00	4.592E+03	40.00	3.935E+03	45.00	3.355E+03	50.00	2.843E+03
55.00	2.391E+03	60.00	1.994E+03	65.00	1.648E+03	70.00	1.349E+03	75.00	1.092E+03
80.00	8.709E+02	85.00	6.825E+02	90.00	5.216E+02	95.00	3.838E+02	100.00	2.650E+02
105.00	1.616E+02	110.00	7.030E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 17
0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	1.019E+05	2.00	8.048E+04	4.00	4.970E+04	6.00	2.880E+04	8.00	1.737E+04
10.00	1.097E+04	10.00	1.097E+04	15.00	8.150E+03	20.00	6.501E+03	25.00	5.390E+03
30.00	4.562E+03	35.00	3.899E+03	40.00	3.343E+03	45.00	2.863E+03	50.00	2.443E+03
55.00	2.073E+03	60.00	1.747E+03	65.00	1.460E+03	70.00	1.208E+03	75.00	9.881E+02
80.00	7.964E+02	85.00	6.297E+02	90.00	4.845E+02	95.00	3.576E+02	100.00	2.459E+02
105.00	1.461E+02	110.00	5.534E+01						

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NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	9.686E+04	2.00	7.766E+04	4.00	4.889E+04	6.00	2.866E+04	8.00	1.726E+04
10.00	1.018E+04	10.00	1.018E+04	15.00	7.316E+03	20.00	5.660E+03	25.00	4.577E+03
30.00	3.805E+03	35.00	3.214E+03	40.00	2.739E+03	45.00	2.342E+03	50.00	2.002E+03
55.00	1.707E+03	60.00	1.448E+03	65.00	1.219E+03	70.00	1.018E+03	75.00	8.396E+02
80.00	6.827E+02	85.00	5.443E+02	90.00	4.222E+02	95.00	3.142E+02	100.00	2.184E+02
105.00	1.330E+02	110.00	5.660E+01						

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0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	9.268E+04	2.00	7.526E+04	4.00	4.823E+04	6.00	2.860E+04	8.00	1.724E+04
10.00	1.048E+04	10.00	1.048E+04	15.00	7.349E+03	20.00	5.562E+03	25.00	4.417E+03
30.00	3.618E+03	35.00	3.025E+03	40.00	2.559E+03	45.00	2.180E+03	50.00	1.861E+03
55.00	1.587E+03	60.00	1.349E+03	65.00	1.139E+03	70.00	9.547E+02	75.00	7.910E+02
80.00	6.458E+02	85.00	5.167E+02	90.00	4.016E+02	95.00	2.985E+02	100.00	2.054E+02
105.00	1.205E+02	110.00	4.167E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 20
0

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	8.936E+04	2.00	7.336E+04	4.00	4.780E+04	6.00	2.866E+04	8.00	1.726E+04
10.00	9.992E+03	10.00	9.992E+03	15.00	7.279E+03	20.00	5.614E+03	25.00	4.491E+03
30.00	3.682E+03	35.00	3.070E+03	40.00	2.589E+03	45.00	2.199E+03	50.00	1.874E+03
55.00	1.597E+03	60.00	1.359E+03	65.00	1.150E+03	70.00	9.667E+02	75.00	8.039E+02
80.00	6.591E+02	85.00	5.297E+02	90.00	4.138E+02	95.00	3.098E+02	100.00	2.163E+02
105.00	1.322E+02	110.00	5.676E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 21
0

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	8.620E+04	2.00	7.143E+04	4.00	4.726E+04	6.00	2.863E+04	8.00	1.724E+04

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
10.00	9.747E+03	10.00	9.747E+03	15.00	7.012E+03	20.00	5.377E+03	25.00	4.287E+03
30.00	3.505E+03	35.00	2.916E+03	40.00	2.454E+03	45.00	2.080E+03	50.00	1.771E+03
55.00	1.508E+03	60.00	1.283E+03	65.00	1.087E+03	70.00	9.150E+02	75.00	7.625E+02
80.00	6.267E+02	85.00	5.051E+02	90.00	3.961E+02	95.00	2.978E+02	100.00	2.090E+02
105.00	1.286E+02	110.00	5.547E+01						

NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	8.347E+04	2.00	6.973E+04	4.00	4.679E+04	6.00	2.864E+04	8.00	1.724E+04
10.00	9.529E+03	10.00	9.529E+03	15.00	6.753E+03	20.00	5.118E+03	25.00	4.044E+03
30.00	3.285E+03	35.00	2.719E+03	40.00	2.279E+03	45.00	1.927E+03	50.00	1.636E+03
55.00	1.392E+03	60.00	1.183E+03	65.00	1.002E+03	70.00	8.438E+02	75.00	7.038E+02
80.00	5.791E+02	85.00	4.675E+02	90.00	3.672E+02	95.00	2.766E+02	100.00	1.945E+02
105.00	1.199E+02	110.00	5.170E+01						

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	6.037E+04	2.00	5.080E+04	4.00	3.453E+04	6.00	2.134E+04	8.00	1.285E+04
10.00	7.105E+03	10.00	7.105E+03	15.00	4.943E+03	20.00	3.693E+03	25.00	2.886E+03
30.00	2.324E+03	35.00	1.911E+03	40.00	1.594E+03	45.00	1.342E+03	50.00	1.137E+03
55.00	9.651E+02	60.00	8.192E+02	65.00	6.934E+02	70.00	5.836E+02	75.00	4.867E+02
80.00	4.006E+02	85.00	3.236E+02	90.00	2.543E+02	95.00	1.917E+02	100.00	1.349E+02
105.00	8.310E+01	110.00	3.579E+01						

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	3.895E+04	2.00	3.294E+04	4.00	2.261E+04	6.00	1.408E+04	8.00	8.485E+03
10.00	4.725E+03	10.00	4.725E+03	15.00	3.228E+03	20.00	2.377E+03	25.00	1.837E+03
30.00	1.467E+03	35.00	1.199E+03	40.00	9.952E+02	45.00	8.349E+02	50.00	7.051E+02
55.00	5.975E+02	60.00	5.065E+02	65.00	4.283E+02	70.00	3.602E+02	75.00	3.003E+02
80.00	2.471E+02	85.00	1.996E+02	90.00	1.569E+02	95.00	1.183E+02	100.00	8.325E+01
105.00	5.132E+01	110.00	2.212E+01						

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	3.814E+04	2.00	3.237E+04	4.00	2.238E+04	6.00	1.401E+04	8.00	8.449E+03
10.00	4.668E+03	10.00	4.668E+03	15.00	3.137E+03	20.00	2.277E+03	25.00	1.738E+03
30.00	1.374E+03	35.00	1.114E+03	40.00	9.185E+02	45.00	7.668E+02	50.00	6.452E+02
55.00	5.452E+02	60.00	4.612E+02	65.00	3.894E+02	70.00	3.272E+02	75.00	2.726E+02
80.00	2.242E+02	85.00	1.811E+02	90.00	1.423E+02	95.00	1.073E+02	100.00	7.550E+01
105.00	4.652E+01	110.00	2.001E+01						

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	3.742E+04	2.00	3.187E+04	4.00	2.218E+04	6.00	1.396E+04	8.00	8.423E+03

10.00	4.603E+03	10.00	4.603E+03	15.00	3.033E+03	20.00	2.163E+03	25.00	1.627E+03
30.00	1.271E+03	35.00	1.020E+03	40.00	8.346E+02	45.00	6.925E+02	50.00	5.799E+02
55.00	4.882E+02	60.00	4.118E+02	65.00	3.470E+02	70.00	2.911E+02	75.00	2.422E+02
80.00	1.991E+02	85.00	1.607E+02	90.00	1.263E+02	95.00	9.515E+01	100.00	6.693E+01
105.00	4.121E+01	110.00	1.768E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 27
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NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	3.650E+04	2.00	3.117E+04	4.00	2.183E+04	6.00	1.381E+04	8.00	8.338E+03
10.00	4.503E+03	10.00	4.503E+03	15.00	2.905E+03	20.00	2.034E+03	25.00	1.504E+03
30.00	1.158E+03	35.00	9.186E+02	40.00	7.445E+02	45.00	6.129E+02	50.00	5.101E+02
55.00	4.274E+02	60.00	3.592E+02	65.00	3.018E+02	70.00	2.526E+02	75.00	2.099E+02
80.00	1.724E+02	85.00	1.390E+02	90.00	1.091E+02	95.00	8.220E+01	100.00	5.778E+01
105.00	3.555E+01	110.00	1.520E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 28
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NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	3.481E+04	2.00	2.980E+04	4.00	2.097E+04	6.00	1.333E+04	8.00	8.048E+03
10.00	4.277E+03	10.00	4.277E+03	15.00	2.704E+03	20.00	1.857E+03	25.00	1.350E+03
30.00	1.023E+03	35.00	8.004E+02	40.00	6.415E+02	45.00	5.233E+02	50.00	4.323E+02
55.00	3.601E+02	60.00	3.013E+02	65.00	2.522E+02	70.00	2.106E+02	75.00	1.746E+02
80.00	1.431E+02	85.00	1.153E+02	90.00	9.042E+01	95.00	6.806E+01	100.00	4.780E+01
105.00	2.937E+01	110.00	1.250E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 29
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NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	6.761E+04	2.00	5.812E+04	4.00	4.123E+04	6.00	2.638E+04	8.00	1.586E+04
10.00	7.237E+03	10.00	7.237E+03	15.00	4.010E+03	20.00	2.472E+03	25.00	1.650E+03
30.00	1.171E+03	35.00	8.723E+02	40.00	6.740E+02	45.00	5.352E+02	50.00	4.335E+02
55.00	3.559E+02	60.00	2.947E+02	65.00	2.448E+02	70.00	2.032E+02	75.00	1.677E+02
80.00	1.371E+02	85.00	1.101E+02	90.00	8.625E+01	95.00	6.485E+01	100.00	4.555E+01
105.00	2.805E+01	110.00	1.213E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 30
0

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
0.00	3.446E+06	2.00	3.097E+06	4.00	2.375E+06	6.00	1.592E+06	8.00	8.641E+05
10.00	1.742E+05	10.00	1.742E+05	15.00	7.858E+04	20.00	3.800E+04	25.00	1.928E+04
30.00	1.017E+04	35.00	5.560E+03	40.00	3.152E+03	45.00	1.861E+03	50.00	1.148E+03
55.00	7.426E+02	60.00	5.041E+02	65.00	3.578E+02	70.00	2.635E+02	75.00	1.993E+02
80.00	1.529E+02	85.00	1.176E+02	90.00	8.935E+01	95.00	6.578E+01	100.00	4.550E+01
105.00	2.760E+01	110.00	1.148E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 31

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
0.00	3.956E+05	2.00	1.881E+05	4.00	9.197E+04	6.00	4.918E+04	8.00	2.830E+04

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A)

10.00	1.691E+04	10.00	1.691E+04	15.00	1.074E+04	20.00	7.120E+03	25.00	4.924E+03
30.00	3.461E+03	35.00	2.469E+03	40.00	1.776E+03	45.00	1.287E+03	50.00	9.369E+02
55.00	6.851E+02	60.00	5.026E+02	65.00	3.696E+02	70.00	2.721E+02	75.00	2.003E+02
80.00	1.470E+02	85.00	1.072E+02	90.00	7.722E+01	95.00	5.422E+01	100.00	3.624E+01
105.00	2.178E+01	110.00	9.676E+00						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A)

CONV. FACTORS (GROUP 12 TO 26)

3.430E-04	3.430E-04	3.430E-04	3.430E-04	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.406E-03					

SATURATION ACTIVITY OF CU 63, PHOTONS(1.34MEV)/G OF ORE/SEC RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	4.983E+03	2.00	4.463E+03	4.00	3.407E+03	6.00	2.278E+03	8.00	1.239E+03
10.00	2.596E+02	10.00	2.596E+02	15.00	1.214E+02	20.00	6.203E+01	25.00	3.418E+01
30.00	2.024E+01	35.00	1.287E+01	40.00	8.746E+00	45.00	6.300E+00	50.00	4.752E+00
55.00	3.705E+00	60.00	2.951E+00	65.00	2.378E+00	70.00	1.924E+00	75.00	1.553E+00
80.00	1.243E+00	85.00	9.794E-01	90.00	7.533E-01	95.00	5.569E-01	100.00	3.846E-01
105.00	2.313E-01	110.00	9.294E-02						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A)

CONV. FACTORS (GROUP 12 TO 26)

1.226E-06	1.226E-06	1.226E-06	1.226E-06	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
0.000E-01	0.000E-01	0.000E-01	0.000E-01	4.190E-06					

SATURATION ACTIVITY OF FE 58 RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	1.493E+01	2.00	1.336E+01	4.00	1.019E+01	6.00	6.812E+00	8.00	3.706E+00
10.00	7.824E-01	10.00	7.824E-01	15.00	3.681E-01	20.00	1.900E-01	25.00	1.061E-01
30.00	6.386E-02	35.00	4.135E-02	40.00	2.863E-02	45.00	2.096E-02	50.00	1.603E-02
55.00	1.262E-02	60.00	1.013E-02	65.00	8.202E-03	70.00	6.657E-03	75.00	5.384E-03
80.00	4.314E-03	85.00	3.402E-03	90.00	2.618E-03	95.00	1.936E-03	100.00	1.337E-03
105.00	8.037E-04	110.00	3.226E-04						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A)

CONV. FACTORS (GROUP 12 TO 26)

4.000E-04	4.000E-04	4.000E-04	4.000E-04	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
0.000E-01	0.000E-01	0.000E-01	0.000E-01	2.070E-04					

SATURATION ACTIVITY PHOTONS(1.11MEV)/G OF ORE/SEC ZN 64 RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	8.734E+02	2.00	7.680E+02	4.00	5.707E+02	6.00	3.756E+02	8.00	2.066E+02
10.00	5.321E+01	10.00	5.321E+01	15.00	2.894E+01	20.00	1.790E+01	25.00	1.224E+01
30.00	9.038E+00	35.00	7.043E+00	40.00	5.683E+00	45.00	4.681E+00	50.00	3.897E+00
55.00	3.257E+00	60.00	2.719E+00	65.00	2.261E+00	70.00	1.866E+00	75.00	1.525E+00
80.00	1.230E+00	85.00	9.736E-01	90.00	7.504E-01	95.00	5.553E-01	100.00	3.833E-01
105.00	2.302E-01	110.00	9.194E-02						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A)

CONV. FACTORS (GROUP 1 TO 5)

1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

FLUX ABOVE 0.8 MEV RR(X)

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) Page 9

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	2.324E+06	2.00	1.003E+06	4.00	4.531E+05	6.00	2.323E+05	8.00	1.340E+05
10.00	8.408E+04	10.00	8.408E+04	15.00	4.811E+04	20.00	2.856E+04	25.00	1.788E+04
30.00	1.135E+04	35.00	7.345E+03	40.00	4.788E+03	45.00	3.150E+03	50.00	2.082E+03
55.00	1.383E+03	60.00	9.216E+02	65.00	6.160E+02	70.00	4.124E+02	75.00	2.766E+02
80.00	1.856E+02	85.00	1.245E+02	90.00	8.319E+01	95.00	5.511E+01	100.00	3.574E+01
105.00	2.203E+01	110.00	1.180E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 36

CONV. FACTORS (GROUP 6 TO 24)

1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	

INTERMEDIATE FLUX RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	2.158E+06	2.00	1.514E+06	4.00	9.008E+05	6.00	5.181E+05	8.00	3.098E+05
10.00	1.972E+05	10.00	1.972E+05	15.00	1.499E+05	20.00	1.179E+05	25.00	9.429E+04
30.00	7.615E+04	35.00	6.184E+04	40.00	5.038E+04	45.00	4.110E+04	50.00	3.353E+04
55.00	2.734E+04	60.00	2.225E+04	65.00	1.805E+04	70.00	1.457E+04	75.00	1.168E+04
80.00	9.267E+03	85.00	7.240E+03	90.00	5.526E+03	95.00	4.063E+03	100.00	2.801E+03
105.00	1.696E+03	110.00	7.122E+02						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 37

CONV. FACTORS (GROUP 24 TO 26)

1.000E+00 1.000E+00 0.000E-01

THERMAL FLUX RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	1.024E+05	2.00	8.792E+04	4.00	6.220E+04	6.00	3.971E+04	8.00	2.391E+04
10.00	1.151E+04	10.00	1.151E+04	15.00	6.714E+03	20.00	4.329E+03	25.00	2.999E+03
30.00	2.194E+03	35.00	1.673E+03	40.00	1.315E+03	45.00	1.059E+03	50.00	8.659E+02
55.00	7.161E+02	60.00	5.959E+02	65.00	4.970E+02	70.00	4.137E+02	75.00	3.423E+02
80.00	2.802E+02	85.00	2.254E+02	90.00	1.767E+02	95.00	1.329E+02	100.00	9.336E+01
105.00	5.742E+01	110.00	2.463E+01						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 38

CONV. FACTORS (GROUP 1 TO 26)

3.370E-08	5.349E-08	7.658E-08	1.089E-07	1.521E-07	1.949E-07	2.817E-07.	3.886E-07	4.583E-07	7.707E-07
1.455E-06	2.178E-06	3.027E-06	5.391E-06	1.432E-05	1.043E-05	4.850E-05	2.368E-05	7.820E-04	2.216E-04
1.945E-05	1.466E-05	1.489E-05	1.694E-05	1.674E-05	4.018E-05				

CAPTURES IN SILVER PER G. OF ORE, PER SEC. RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	2.082E+02	2.00	1.828E+02	4.00	1.349E+02	6.00	8.835E+01	8.00	4.940E+01
10.00	1.515E+01	10.00	1.515E+01	15.00	8.812E+00	20.00	5.745E+00	25.00	4.069E+00
30.00	3.060E+00	35.00	2.403E+00	40.00	1.944E+00	45.00	1.604E+00	50.00	1.340E+00
55.00	1.128E+00	60.00	9.515E-01	65.00	8.018E-01	70.00	6.725E-01	75.00	5.594E-01
80.00	4.594E-01	85.00	3.704E-01	90.00	2.907E-01	95.00	2.188E-01	100.00	1.537E-01
105.00	9.457E-02	110.00	4.054E-02						

1 ORE ANALYSIS WITH A CALIFORNIUM NEUTRON SOURCE (LIBRARY A) PAGE 39

CONV. FACTORS (GROUP 18 TO 26)

2.328E-06 2.328E-06 3.489E-06 4.656E-06 4.656E-06 6.984E-06 9.312E-06 1.192E-05 3.245E-05

CAPTURES IN LEAD PER G. OF ORE, PER SEC. RR(X)

X	RR	X	RR	X	RR	X	RR	X	RR
0.00	1.140E+02	2.00	1.024E+02	4.00	7.839E+01	6.00	5.249E+01	8.00	2.854E+01
10.00	5.908E+00	10.00	5.908E+00	15.00	2.710E+00	20.00	1.344E+00	25.00	7.066E-01
30.00	3.921E-01	35.00	2.296E-01	40.00	1.422E-01	45.00	9.322E-02	50.00	6.462E-02
55.00	4.706E-02	60.00	3.568E-02	65.00	2.785E-02	70.00	2.215E-02	75.00	1.777E-02
80.00	1.425E-02	85.00	1.130E-02	90.00	8.776E-03	95.00	6.561E-03	100.00	4.588E-03
105.00	2.812E-03	110.00	1.196E-03						

GAMMA SOURCE DISTRIBUTION IN THE TWO CORE REGIONS

SOURCE DISTRIBUTION OF THE REGION IR = 1

SOURCE DENSITY AT THE OUTER EDGE OF THE REGION IN EACH GAMMA GROUP

SGD(1)	SGD(2)	SGD(3)	SGD(4)	SGD(5)	SGD(6)	SGD(7)
9.6615E+07	4.9441E+07	2.6508E+07	8.7437E+06	2.3758E+06	1.7193E+06	2.2951E+05

DISTRIBUTION IN RADIAL DIRECTION
1 COEFFICIENTS OF THE POLYNOM ARE GIVEN
1.0000E+00
DISTRIBUTION IN AXIAL DIRECTION
IGRC = 2 SPHERICAL GEOMETRY NO DISTRIBUTION

SOURCE DISTRIBUTION OF THE REGION IR = 2

SOURCE DENSITY AT THE OUTER EDGE OF THE REGION IN EACH GAMMA GROUP

SGD(1)	SGD(2)	SGD(3)	SGD(4)	SGD(5)	SGD(6)	SGD(7)
0.0000E-01	0.0000E-01	0.0000E-01	0.0000E-01	0.0000E-01	0.0000E-01	0.0000E-01

DISTRIBUTION IN RADIAL DIRECTION
1 COEFFICIENTS OF THE POLYNOM ARE GIVEN
1.0000E+00
DISTRIBUTION IN AXIAL DIRECTION
IGRC = 2 SPHERICAL GEOMETRY NO DISTRIBUTION

SOURCE DISTRIBUTION OF THE SHIELD REGIONS

S(IG,R,Z)=S(IG)*EXP(K*R)*P1(R)

SOURCE DISTRIBUTION OF THE REGION IR = 3

```
IG  S(IG)      K         THE COEFFICIENTS OF P1(R) ARE

 1 NO SOURCE
 2 NO SOURCE
 3 1.444E+05-2.960E-01   9.979E-01 3.820E-01-5.567E-02 1.418E-02-1.243E-03
 4 NO SOURCE
 5 NO SOURCE
 6 NO SOURCE
 7 NO SOURCE
```

SOURCE DISTRIBUTION OF THE REGION IR = 4

```
IG  S(IG)      K         THE COEFFICIENTS OF P1(R) ARE

 1 8.142E+02-8.009E-02   8.691E-01-1.688E-02-7.451E-04 2.893E-05-1.947E-07
 2 1.692E+03-8.028E-02   8.680E-01-1.789E-02-7.434E-04 2.899E-05-1.944E-07
 3 3.063E+03-8.084E-02   8.718E-01-1.810E-02-6.860E-04 2.752E-05-1.853E-07
 4 7.017E+03-8.098E-02   8.699E-01-1.791E-02-7.213E-04 2.823E-05-1.890E-07
 5 7.758E+03-8.067E-02   8.705E-01-1.777E-02-7.119E-04 2.811E-05-1.889E-07
 6 1.002E+04-8.075E-02   8.652E-01-1.687E-02-8.136E-04 3.021E-05-2.005E-07
 7 7.915E+02-8.268E-02   8.719E-01-1.918E-02-6.828E-04 2.687E-05-1.780E-07
```


GAMMA FLUXES IN MEV/CM**2 SEC

REG. = 4 Z= 1.1000E+01 CM

IRS \ IC	1	2	3	4	5	6	7	SLINE
4	4.4506E+03	1.1206E+04	2.0910E+04	4.8095E+04	5.3293E+04	6.7602E+04	5.2328E+03	2.1079E+05
SCOL	4.4506E+03	1.1206E+04	2.0910E+04	4.8095E+04	5.3293E+04	6.7602E+04	5.2328E+03	2.1079E+05
MR/H	9.0925E+00	1.9812E+01	3.0383E+01	6.4111E+01	6.3739E+01	7.5309E+01	5.6043E+00	2.6805E+02
W/CM**3	6.2725E-11	1.1387E-10	1.9553E-10	4.2858E-10	4.7301E-10	6.1188E-10	4.7984E-11	1.9336E-09

RFG. = 4 Z= 2.0000E+01 CM

IRS \ IC	1	2	3	4	5	6	7	SLINE
4	2.5364E+03	6.6753E+03	1.2667E+04	2.9323E+04	3.2633E+04	4.1062E+04	3.1095E+03	1.2801E+05
SCOL	2.5364E+03	6.6753E+03	1.2667E+04	2.9323E+04	3.2633E+04	4.1062E+04	3.1095E+03	1.2801E+05
MR/H	5.1819E+00	1.1802E+01	1.8405E+01	3.9087E+01	3.9029E+01	4.5743E+01	3.3303E+00	1.6258E+02
W/CM**3	3.5747E-11	6.7835E-11	1.1844E-10	2.6130E-10	2.8963E-10	3.7166E-10	2.8514E-11	1.1731E-09

GAMMA FLUXES IN MEV/CM**2 SEC

REG. = 4 Z= 1.0000E+02 CM

IRS \ IC	1	2	3	4	5	6	7	SLINE
4	1.1673E+01	3.5346E+01	6.8511E+01	1.7289E+02	2.0806E+02	2.6618E+02	1.6446E+01	7.7911E+02
SCOL	1.1673E+01	3.5346E+01	6.8511E+01	1.7289E+02	2.0806E+02	2.6618E+02	1.6446E+01	7.7911E+02
MR/H	2.3848E-02	6.2493E-02	9.9546E-02	2.3047E-01	2.4884E-01	2.9652E-01	1.7614E-02	9.7933E-01
W/CM**3	1.6452E-13	3.5919E-13	6.4063E-13	1.5407E-12	1.8467E-12	2.4092E-12	1.5081E-13	7.1118E-12

1 PROBLEM(S) COMPLÉTED

ตารางที่ ข - 4 Neutron Source - Input Data (Thickness 70 cm.)

SHEET OF

TITLE NUTRON.DAT	PROGRAMMER	DATE

```
 *** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
         2         2         2         2
         3         1         1         3         1
                                                              .076
    .076    .076      .076       .076      .076      .076     .076
    .076    .076      .076       .076      .076
         1       0.7                          3.78    1    7    2
         2       0.7                          3.78    1    7    2
         3       70.        0.       20.      2.37    1    5   10
         1    1    1    1          0.001
         2    1    1    1          0.001
         3    1    1    1          0.001   50   10    5   10
    1238  1.0       4  1.0      0  0.0        0       0.0  0       0.0
    2238  1.0       4  1.0      0  0.0        0       0.0  0       0.0
    3 56  0.42      8  0.3159   16 0.099     26  0.088    20  0.045
    3 14  0.017     13  0.0057    1 0.0043    12  0.0037   11  0.0014
    0
        0.
  1.098 +5         1         1         0
  1.0

    0    0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM SHEET OF

TITLE NUTRON.DAT

PROGRAMMER

DATE

```
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM SHEET OF

TITLE NUTRON.DSI

PROGRAMMER

DATE

1	2	3	4	5	6	7	8	9	10
				0					1

ตารางที่ ข - 5   Neutron Source - Output Report (Thickness 70 cm.)

*** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***

******* S A B I N E - 3 *******

CONTROL-INDICES

IGRC	IGRS	IGDS	IGSS
2	2	2	2

GROUF-DATA

NREG	NRG	NNG	NGG	IFGAM	NBUC	NBUS
3	19	26	7	1	1	3

SOURCE SPECTRUM

.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02
7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	

GEOMETRY-DATA

REGION	ZR	H	TEMF	DEN	IGAP	MBU	NEMR
1	.7000	.0000	.0000	3.7800	1	7	2
2	.7000	.0000	.0000	3.7800	1	7	2
3	70.0000	.0000	20.0000	2.3700	1	5	10

REGION	M(THE)	M(R)	M(FSI)	ETHA	NDIF	NREM	NPRT	NGS	NGCF
1	1	1	1	1.00E-03					
2	1	1	1	1.00E-03					
3	1	1	1	1.00E-03	50	10	5	10	5

MATERIAL-DATA

REGION	ID	FREM	ID	FREM	ID	FREM	ID	FREM	ID	FREM
1	238	1.0000E+00	4	1.0000E+00	0	.0000E+00	0	.0000E+00	0	.0000E+00
0										
2	238	1.0000E+00	4	1.0000E+00	0	.0000E+00	0	.0000E+00	0	.0000E+00
0										
3	56	4.2000E-01	8	3.1590E-01	16	9.9000E-02	26	8.8000E-02	20	4.5000E-02
3	14	1.7000E-02	13	5.7000E-03	1	4.3000E-03	12	3.7000E-03	11	1.4000E-03
0										

*** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***

*** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

S(Q)=S*P1(R)*F2(Z)

SOURCE DISTRIBUTION OF THE REGION IR = 1

NO SOURCE

SOURCE DISTRIBUTION OF THE REGION IR = 2

S = 1.0980E+05

P1(R) DISTRIBUTION IN RADIAL DIRECTION

1 COEFFICIENTS OF THE POLYNOM ARE GIVEN

1.0000E+00

P2(Z), DISTRIBUTION IN AXIAL DIRECTION

IGRC = 2 SPHERICAL GEOMETRY NO DISTRIBUTION

REGION	BUCKLING
3	.000E+00

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.199E+04	7.00	2.668E+03	14.00	2.354E+02	21.00	8.884E+01	28.00	3.579E+01
35.00	1.640E+01	42.00	7.699E+00	49.00	3.805E+00	56.00	1.908E+00	63.00	9.885E-01
70.00	5.223E-01								

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.091E+04	7.00	1.845E+03	14.00	2.485E+02	21.00	9.493E+01	28.00	3.928E+01
35.00	1.782E+01	42.00	8.337E+00	49.00	4.057E+00	56.00	2.006E+00	63.00	1.007E+00
70.00	4.942E-01								

0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.096E+04	7.00	1.809E+03	14.00	4.468E+02	21.00	1.926E+02	28.00	8.994E+01
35.00	4.425E+01	42.00	2.235E+01	49.00	1.149E+01	56.00	5.944E+00	63.00	3.034E+00
70.00	1.437E+00								

0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.179E+04	7.00	1.266E+03	14.00	3.531E+02	21.00	1.517E+02	28.00	7.084E+01
35.00	3.483E+01	42.00	1.761E+01	49.00	9.055E+00	56.00	4.662E+00	63.00	2.318E+00
70.00	9.638E-01								

0

NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.227E+04	7.00	1.430E+03	14.00	3.908E+02	21.00	1.544E+02	28.00	6.888E+01
35.00	3.294E+01	42.00	1.640E+01	49.00	8.349E+00	56.00	4.256E+00	63.00	2.051E+00
70.00	6.773E-01								

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.195E+04	7.00	1.678E+03	14.00	5.582E+02	21.00	2.434E+02	28.00	1.140E+02
35.00	5.579E+01	42.00	2.808E+01	49.00	1.436E+01	56.00	7.308E+00	63.00	3.503E+00
70.00	1.239E+00								

0

NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.939E+03	7.00	8.162E+02	14.00	3.157E+02	21.00	1.394E+02	28.00	6.588E+01
35.00	3.242E+01	42.00	1.637E+01	49.00	8.380E+00	56.00	4.261E+00	63.00	2.010E+00
70.00	5.552E-01								

0

NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.154E+03	7.00	6.367E+02	14.00	2.994E+02	21.00	1.445E+02	28.00	7.140E+01
35.00	3.598E+01	42.00	1.841E+01	49.00	9.488E+00	56.00	4.833E+00	63.00	2.277E+00
70.00	7.212E-01								

0

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.057E+03	7.00	6.364E+02	14.00	3.281E+02	21.00	1.679E+02	28.00	8.610E+01
35.00	4.437E+01	42.00	2.301E+01	49.00	1.195E+01	56.00	6.105E+00	63.00	2.860E+00
70.00	8.325E-01								

0

NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.200E+02	7.00	5.467E+02	14.00	3.076E+02	21.00	1.666E+02	28.00	8.268E+01
35.00	4.684E+01	42.00	2.468E+01	49.00	1.294E+01	56.00	6.641E+00	63.00	3.108E+00
70.00	9.116E-01								

0

NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.577E+02	7.00	4.040E+02	14.00	2.436E+02	21.00	1.380E+02	28.00	7.563E+01
35.00	4.076E+01	42.00	2.176E+01	49.00	1.151E+01	56.00	5.927E+00	63.00	2.766E+00
70.00	7.692E-01								

0

NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	4.213E+02	7.00	3.259E+02	14.00	2.087E+02	21.00	1.232E+02	28.00	6.952E+01
35.00	3.822E+01	42.00	2.069E+01	49.00	1.104E+01	56.00	5.710E+00	63.00	2.662E+00
70.00	7.313E-01								

0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.515E+02	7.00	2.850E+02	14.00	1.918E+02	21.00	1.175E+02	28.00	6.816E+01
35.00	3.822E+01	42.00	2.098E+01	49.00	1.129E+01	56.00	5.872E+00	63.00	2.736E+00
70.00	7.343E-01								

0

NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.012E+02	7.00	2.526E+02	14.00	1.772E+02	21.00	1.124E+02	28.00	6.693E+01
35.00	3.829E+01	42.00	2.132E+01	49.00	1.159E+01	56.00	6.061E+00	63.00	2.827E+00
70.00	7.542E-01								

0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.646E+02	7.00	2.274E+02	14.00	1.649E+02	21.00	1.078E+02	28.00	6.574E+01
35.00	3.833E+01	42.00	2.164E+01	49.00	1.189E+01	56.00	6.251E+00	63.00	2.920E+00
70.00	7.654E-01								

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.369E+02	7.00	2.073E+02	14.00	1.546E+02	21.00	1.038E+02	28.00	6.477E+01
35.00	3.846E+01	42.00	2.203E+01	49.00	1.222E+01	56.00	6.469E+00	63.00	3.027E+00
70.00	7.847E-01								

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.130E+02	7.00	1.889E+02	14.00	1.443E+02	21.00	9.918E+01	28.00	6.325E+01
35.00	3.823E+01	42.00	2.220E+01	49.00	1.245E+01	56.00	6.634E+00	63.00	3.112E+00
70.00	8.351E-01								

NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.939E+02	7.00	1.739E+02	14.00	1.355E+02	21.00	9.518E+01	28.00	6.192E+01
35.00	3.808E+01	42.00	2.243E+01	49.00	1.271E+01	56.00	6.821E+00	63.00	3.211E+00
70.00	8.299E-01								

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.339E+02	7.00	1.210E+02	14.00	9.577E+01	21.00	6.843E+01	28.00	4.525E+01
35.00	2.323E+01	42.00	1.682E+01	49.00	9.620E+00	56.00	5.197E+00	63.00	2.456E+00
70.00	6.469E-01								

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.372E+01	7.00	7.597E+01	14.00	6.072E+01	21.00	4.388E+01	28.00	2.934E+01
35.00	1.849E+01	42.00	1.111E+01	49.00	6.394E+00	56.00	3.471E+00	63.00	1.646E+00
70.00	4.401E-01								

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.976E+01	7.00	7.261E+01	14.00	5.846E+01	21.00	4.263E+01	28.00	2.876E+01
35.00	1.826E+01	42.00	1.105E+01	49.00	6.397E+00	56.00	3.486E+00	63.00	1.658E+00
70.00	4.419E-01								

0

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.611E+01	7.00	6.949E+01	14.00	5.633E+01	21.00	4.142E+01	28.00	2.817E+01
35.00	1.803E+01	42.00	1.099E+01	49.00	6.392E+00	56.00	3.497E+00	63.00	1.667E+00
70.00	4.445E-01								

0

NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.231E+01	7.00	6.620E+01	14.00	5.399E+01	21.00	4.000E+01	28.00	2.743E+01
35.00	1.768E+01	42.00	1.084E+01	49.00	6.342E+00	56.00	3.484E+00	63.00	1.665E+00
70.00	4.435E-01								

0

NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.732E+01	7.00	6.176E+01	14.00	5.065E+01	21.00	3.778E+01	28.00	2.609E+01
35.00	1.693E+01	42.00	1.044E+01	49.00	6.137E+00	56.00	3.383E+00	63.00	1.620E+00
70.00	4.293E-01								

0

NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.129E+02	7.00	1.041E+02	14.00	8.604E+01	21.00	6.486E+01	28.00	4.529E+01
35.00	2.972E+01	42.00	1.850E+01	49.00	1.096E+01	56.00	6.079E+00	63.00	2.918E+00
70.00	7.376E-01								

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.025E+03	7.00	9.613E+02	14.00	8.239E+02	21.00	6.521E+02	28.00	4.818E+02
35.00	3.353E+02	42.00	2.212E+02	49.00	1.379E+02	56.00	7.937E+01	63.00	3.815E+01
70.00	7.296E+00								

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
.00	1.905E+04	7.00	1.525E+03	14.00	3.432E+02	21.00	1.485E+02	28.00	6.970E+01
35.00	3.465E+01	42.00	1.767E+01	49.00	9.165E+00	56.00	4.723E+00	63.00	2.305E+00
70.00	8.532E-01								

ตารางที่ ข - 6 Neutron Source - Input Data (Thickness 100 cm.)

SHEET OF

TITLE NUTRON1.DAT	PROGRAMMER	DATE

```
 *** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
         2         2         2         2
         3         1         1         3         1
                                                              .076
    .076    .076      .076       .076      .076      .076     .076
    .076    .076      .076       .076      .076
         1       0.7                          3.78    1    7    2
         2       0.7                          3.78    1    7    2
         3      100.        0.       20.      2.37    1    5   10
         1    1    1    1          0.001
         2    1    1    1          0.001
         3    1    1    1          0.001   70   10    5   10
    1238  1.0       4  1.0      0  0.0        0       0.0  0        0.0
    2238  1.0       4  1.0      0  0.0        0       0.0  0        0.0
    3 56  0.42      8  0.3159   16 0.099     26  0.088    20  0.045
    3 14  0.017    13  0.0057    1 0.0043    12  0.0037   11  0.0014
    0
        0.
  1.098 +5         1         1         0
  1.0

    0    0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM SHEET OF

TITLE NUTRON1.DAT | PROGRAMMER | DATE

```
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM

SHEET OF

TITLE NUTRON1.DSI

PROGRAMMER

DATE

1	2	3	4	5	6	7	8	9	10
				0					1

ตารางที่ ข - 7 Neutron Source - Output Report (Thickness 100 cm.)

*** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
******* S A B I N E - 3 *******

CONTROL-INDICES

IGRC	IGRS	IGDS	IGSS
2	2	2	2

GROUP-DATA

NREG	NRG	NNG	NGG	IFGAM	NBUC	NBUS
3	19	26	7	1	1	3

SOURCE SPECTRUM

.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02
7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	7.6000E-02	

GEOMETRY-DATA

REGION	ZR	H	TEMP	DEN	IGAP	MBU	NEMR
1	.7000	.0000	.0000	3.7800	1	7	2
2	.7000	.0000	.0000	3.7800	1	7	2
3	100.0000	.0000	20.0000	2.3700	1	5	10

REGION	M(THE)	M(R)	M(PSI)	ETHA	NDIF	NREM	NPRT	NGS	NGCF
1	1	1	1	1.00E-03					
2	1	1	1	1.00E-03					
3	1	1	1	1.00E-03	70	10	5	10	5

```
 ***MATERIAL-DATA***
REGION      ID         FREM        ID          FREM        ID          FREM        ID          FREM        ID          FREM
    1       238       1.0000E+00    4       1.0000E+00     0         .0000E+00     0         .0000E+00     0         .0000E+00
0
    2       238       1.0000E+00    4       1.0000E+00     0         .0000E+00     0         .0000E+00     0         .0000E+00
0
    3        56       4.2000E-01    8       3.1590E-01    16        9.9000E-02    26        8.8000E-02    20        4.5000E-02
    3        14       1.7000E-02   13       5.7000E-03     1        4.3000E-03    12        3.7000E-03    11        1.4000E-03
0
 *** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
              *** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

                                   S(Q)=S*P1(R)*P2(Z)


                  SOURCE DISTRIBUTION OF THE REGION IR =  1
 NO SOURCE
                  SOURCE DISTRIBUTION OF THE REGION IR =  2
S =  1.0980E+05

 P1(R) DISTRIBUTION IN RADIAL DIRECTION
 1 COEFFICIENTS OF THE POLYNOM ARE GIVEN
     1.0000E+00
P2(Z), DISTRIBUTION IN AXIAL DIRECTION
 IGRC = 2  SPHERICAL GEOMETRY  NO DISTRIBUTION

         REGION  BUCKLING

            3     .000E+00
```

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00

0

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.200E+04	7.14	2.607E+03	14.29	2.280E+02	21.43	8.512E+01	28.57	3.395E+01
35.71	1.538E+01	42.86	7.139E+00	50.00	3.487E+00	57.14	1.726E+00	64.29	8.797E-01
71.43	4.525E-01	78.57	2.375E-01	85.71	1.255E-01	92.86	6.735E-02	100.00	3.636E-02

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.093E+04	7.14	1.810E+03	14.29	2.425E+02	21.43	9.145E+01	28.57	3.739E+01
35.71	1.675E+01	42.86	7.746E+00	50.00	3.728E+00	57.14	1.827E+00	64.29	9.180E-01
71.43	4.672E-01	78.57	2.418E-01	85.71	1.260E-01	92.86	6.582E-02	100.00	3.305E-02

0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.100E+04	7.14	1.789E+03	14.29	4.402E+02	21.43	1.876E+02	28.57	8.659E+01
35.71	4.211E+01	42.86	2.104E+01	50.00	1.073E+01	57.14	5.547E+00	64.29	2.899E+00
71.43	1.526E+00	78.57	8.079E-01	85.71	4.267E-01	92.86	2.207E-01	100.00	1.044E-01

0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.183E+04	7.14	1.256E+03	14.29	3.482E+02	21.43	1.477E+02	28.57	6.822E+01
35.71	3.317E+01	42.86	1.660E+01	50.00	8.483E+00	57.14	4.396E+00	64.29	2.303E+00
71.43	1.215E+00	78.57	6.436E-01	85.71	3.384E-01	92.86	1.707E-01	100.00	7.087E-02

0

NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.232E+04	7.14	1.419E+03	14.29	3.839E+02	21.43	1.500E+02	28.57	6.615E+01
35.71	3.131E+01	42.86	1.544E+01	50.00	7.823E+00	57.14	4.035E+00	64.29	2.108E+00
71.43	1.111E+00	78.57	5.873E-01	85.71	3.073E-01	92.86	1.508E-01	[illegible]	[illegible]

0

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.200E+04	7.14	1.672E+03	14.29	5.511E+02	21.43	2.373E+02	28.57	1.098E+02
35.71	5.315E+01	42.86	2.650E+01	50.00	1.351E+01	57.14	6.993E+00	64.29	3.663E+00
71.43	1.934E+00	78.57	1.023E+00	85.71	5.337E-01	92.86	2.603E-01	100.00	9.214E-02

0

NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.968E+03	7.14	8.174E+02	14.29	3.120E+02	21.43	1.360E+02	28.57	6.351E+01
35.71	3.090E+01	42.86	1.545E+01	50.00	7.888E+00	57.14	4.087E+00	64.29	2.141E+00
71.43	1.131E+00	78.57	5.981E-01	85.71	3.116E-01	92.86	1.497E-01	100.00	4.139E-02

0

NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.174E+03	7.14	6.409E+02	14.29	2.973E+02	21.43	1.415E+02	28.57	6.902E+01
35.71	3.437E+01	42.86	1.742E+01	50.00	8.955E+00	57.14	4.661E+00	64.29	2.449E+00
71.43	1.296E+00	78.57	6.856E-01	85.71	3.566E-01	92.86	1.708E-01	100.00	5.411E-02

0

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.076E+03	7.14	6.420E+02	14.29	3.267E+02	21.43	1.649E+02	28.57	8.343E+01
35.71	4.247E+01	42.86	2.181E+01	50.00	1.131E+01	57.14	5.916E+00	64.29	3.119E+00
71.43	1.653E+00	78.57	8.755E-01	85.71	4.549E-01	92.86	2.162E-01	100.00	6.293E-02

0

NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.359E+02	7.14	5.527E+02	14.29	3.072E+02	21.43	1.641E+02	28.57	8.614E+01
35.71	4.494E+01	42.86	2.345E+01	50.00	1.228E+01	57.14	6.468E+00	64.29	3.424E+00
71.43	1.820E+00	78.57	9.650E-01	85.71	5.011E-01	92.86	2.373E-01	100.00	6.951E-02

0

NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.690E+02	7.14	4.092E+02	14.29	2.438E+02	21.43	1.362E+02	28.57	7.362E+01
35.71	3.917E+01	42.86	2.071E+01	50.00	1.094E+01	57.14	5.796E+00	64.29	3.080E+00
71.43	1.641E+00	78.57	8.711E-01	85.71	4.521E-01	92.86	2.130E-01	100.00	5.914E-02

0

NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	4.302E+02	7.14	3.306E+02	14.29	2.092E+02	21.43	1.218E+02	28.57	6.781E+01
35.71	3.681E+01	42.86	1.973E+01	50.00	1.052E+01	57.14	5.607E+00	64.29	2.992E+00
71.43	1.598E+00	78.57	8.495E-01	85.71	4.408E-01	92.86	2.070E-01	100.00	5.670E-02

0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.591E+02	7.14	2.894E+02	14.29	1.926E+02	21.43	1.165E+02	28.57	6.661E+01
35.71	3.688E+01	42.86	2.005E+01	50.00	1.079E+01	57.14	5.790E+00	64.29	3.103E+00
71.43	1.662E+00	78.57	8.850E-01	85.71	4.593E-01	92.86	2.150E-01	100.00	5.745E-02

0

NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.078E+02	7.14	2.568E+02	14.29	1.782E+02	21.43	1.116E+02	28.57	6.554E+01
35.71	3.701E+01	42.86	2.041E+01	50.00	1.111E+01	57.14	6.001E+00	64.29	3.232E+00
71.43	1.737E+00	78.57	9.267E-01	85.71	4.811E-01	92.86	2.247E-01	100.00	5.962E-02

0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.705E+02	7.14	2.313E+02	14.29	1.661E+02	21.43	1.072E+02	28.57	6.450E+01
35.71	3.712E+01	42.86	2.077E+01	50.00	1.142E+01	57.14	6.216E+00	64.29	3.366E+00
71.43	1.815E+00	78.57	9.703E-01	85.71	5.040E-01	92.86	2.349E-01	100.00	6.119E-02

0

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.423E+02	7.14	2.110E+02	14.29	1.559E+02	21.43	1.033E+02	28.57	6.366E+01
35.71	3.733E+01	42.86	2.113E+01	50.00	1.177E+01	57.14	6.460E+00	64.29	3.517E+00
71.43	1.904E+00	78.57	1.020E+00	85.71	5.305E-01	92.86	2.469E-01	100.00	6.350E-02

0

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.179E+02	7.14	1.924E+02	14.29	1.456E+02	21.43	9.893E+01	28.57	6.227E+01
35.71	3.717E+01	42.86	2.140E+01	50.00	1.203E+01	57.14	6.654E+00	64.29	3.645E+00
71.43	1.981E+00	78.57	1.065E+00	85.71	5.542E-01	92.86	2.577E-01	100.00	6.603E-02

0

NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.984E+02	7.14	1.771E+02	14.29	1.369E+02	21.43	9.506E+01	28.57	6.107E+01
35.71	3.710E+01	42.86	2.167E+01	50.00	1.231E+01	57.14	6.872E+00	64.29	3.789E+00
71.43	2.069E+00	78.57	1.115E+00	85.71	5.813E-01	92.86	2.702E-01	100.00	6.908E-02

0

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.370E+02	7.14	1.233E+02	14.29	9.682E+01	21.43	6.843E+01	28.57	4.469E+01
35.71	2.755E+01	42.86	1.628E+01	50.00	9.346E+00	57.14	5.256E+00	64.29	2.914E+00
71.43	1.598E+00	78.57	8.638E-01	85.71	4.510E-01	92.86	2.098E-01	100.00	5.457E-02

0

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.565E+01	7.14	7.745E+01	14.29	6.141E+01	21.43	4.391E+01	28.57	2.901E+01
35.71	1.806E+01	42.86	1.077E+01	50.00	6.224E+00	57.14	3.520E+00	64.29	1.960E+00
71.43	1.078E+00	78.57	5.840E-01	85.71	3.052E-01	92.86	1.421E-01	100.00	3.751E-02

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.162E+01	7.14	7.404E+01	14.29	5.915E+01	21.43	4.268E+01	28.57	2.845E+01
35.71	1.786E+01	42.86	1.073E+01	50.00	6.236E+00	57.14	3.543E+00	64.29	1.980E+00
71.43	1.092E+00	78.57	5.928E-01	85.71	3.102E-01	92.86	1.446E-01	100.00	3.801E-02

0

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.789E+01	7.14	7.087E+01	14.29	5.702E+01	21.43	4.149E+01	28.57	2.790E+01
35.71	1.765E+01	42.86	1.067E+01	50.00	6.242E+00	57.14	3.563E+00	64.29	1.999E+00
71.43	1.105E+00	78.57	6.011E-01	85.71	3.149E-01	92.86	1.469E-01	100.00	3.857E-02

0

NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.400E+01	7.14	6.752E+01	14.29	5.467E+01	21.43	4.010E+01	28.57	2.718E+01
35.71	1.733E+01	42.86	1.055E+01	50.00	6.203E+00	57.14	3.557E+00	64.29	2.003E+00
71.43	1.111E+00	78.57	6.051E-01	85.71	3.174E-01	92.86	1.481E-01	100.00	3.885E-02

0

NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.889E+01	7.14	6.301E+01	14.29	5.131E+01	21.43	3.789E+01	28.57	2.587E+01
35.71	1.661E+01	42.86	1.017E+01	50.00	6.012E+00	57.14	3.462E+00	64.29	1.956E+00
71.43	1.087E+00	78.57	5.935E-01	85.71	3.117E-01	92.86	1.455E-01	100.00	3.794E-02

0

NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.156E+02	7.14	1.062E+02	14.29	8.720E+01	21.43	6.510E+01	28.57	4.496E+01
35.71	2.918E+01	42.86	1.806E+01	50.00	1.077E+01	57.14	6.246E+00	64.29	3.549E+00
71.43	1.982E+00	78.57	1.086E+00	85.71	5.714E-01	92.86	2.666E-01	100.00	6.623E-02

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.049E+03	7.14	9.820E+02	14.29	8.371E+02	21.43	6.575E+02	28.57	4.817E+02
35.71	3.329E+02	42.86	2.193E+02	50.00	1.390E+02	57.14	8.533E+01	64.29	5.103E+01
71.43	2.981E+01	78.57	1.692E+01	85.71	9.110E+00	92.86	4.212E+00	100.00	7.868E-01

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
.00	1.908E+04	7.14	1.506E+03	14.29	3.379E+02	21.43	1.446E+02	28.57	6.715E+01
35.71	3.303E+01	42.86	1.670E+01	50.00	8.634E+00	57.14	4.519E+00	64.29	2.391E+00
71.43	1.271E+00	78.57	6.770E-01	85.71	3.554E-01	92.86	1.751E-01	100.00	6.346E-02

ตารางที่ ข - 8 Neutron Source - Input Data (Thickness 70 cm.)

SHEET OF

TITLE NEUDOS.DAT	PROGRAMMER	DATE

```
 *** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
         2         2         2         2
         3         1         1         3         1
                                                              7.437E-3
  1.752E-2  3.821E-2  5.770E-2  7.437E-2  1.423E-1  6.232E-2  1.162E-1
  7.232E-2  1.069E-1  7.873E-2  8.899E-2  1.369E-1
         1       0.7                          3.78    1    7    2
         2       0.7                          3.78    1    7    2
         3       70.        0.       20.      2.37    1    5   10
         1    1    1    1          0.001
         2    1    1    1          0.001
         3    1    1    1          0.001   50   10    5   10
    1238  1.0       4  1.0     0  0.0         0       0.0  0       0.0
    2238  1.0       4  1.0     0  0.0         0       0.0  0       0.0
    3 56  0.42      8  0.3159   16 0.099     26  0.088    20  0.045
    3 14  0.017    13  0.0057    1 0.0043    12  0.0037   11  0.0014
    0
        0.
  1.585 +5         1         1         0
  1.0

    0    0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM SHEET OF

TITLE NEUDOS. DAT PROGRAMMER DATE

0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0
0.5	0.0	1.0

GENERAL CODING FORM SHEET OF

TITLE NEUDOS.DSI	PROGRAMMER	DATE

1	2	3	4	5	6	7	8	9	10
				0					1

176

ตารางที่ ข - 9 Neutron Source - Output Report (Thickness 70 cm.)

*** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
******* S A B I N E - 3 *******

CONTROL-INDICES

IGRC	IGRS	IGDS	IGSS
2	2	2	2

GROUF-DATA

NREG	NRG	NNG	NGG	IFGAM	NBUC	NBUS
3	19	26	7	1	1	3

SOURCE SPECTRUM

.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	7.4370E-03	1.7520E-02	3.8210E-02	5.7700E-02
7.4370E-02	1.4230E-01	6.2320E-02	1.1620E-01	7.2320E-02	1.0690E-01	7.8730E-02	8.8990E-02	1.3690E-01	

GEOMETRY-DATA

REGION	ZR	H	TEMF	DEN	IGAP	MBU	NEMR
1	.7000	.0000	.0000	3.7800	1	7	2
2	.7000	.0000	.0000	3.7800	1	7	2
3	70.0000	.0000	20.0000	2.3700	1	5	10

REGION	M(THE)	M(R)	M(FSI)	ETHA	NDIF	NREM	NPRT	NGS	NGCF
1	1	1	1	1.00E-03					
2	1	1	1	1.00E-03					
3	1	1	1	1.00E-03	50	10	5	10	5

MATERIAL-DATA

REGION	ID	FREM	ID	FREM	ID	FREM	ID	FREM	ID	FREM
1	238	1.0000E+00	4	1.0000E+00	0	.0000E+00	0	.0000E+00	0	.0000E+00
0										
2	238	1.0000E+00	4	1.0000E+00	0	.0000E+00	0	.0000E+00	0	.0000E+00
0										
3	56	4.2000E-01	8	3.1590E-01	16	9.9000E-02	26	8.8000E-02	20	4.5000E-02
3	14	1.7000E-02	13	5.7000E-03	1	4.3000E-03	12	3.7000E-03	11	1.4000E-03
0										

*** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***

*** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

S(Q)=S*P1(R)*F2(Z)

SOURCE DISTRIBUTION OF THE REGION IR = 1

NO SOURCE

SOURCE DISTRIBUTION OF THE REGION IR = 2

S = 1.5850E+05

P1(R) DISTRIBUTION IN RADIAL DIRECTION

1 COEFFICIENTS OF THE POLYNOM ARE GIVEN

1.0000E+00

P2(Z). DISTRIBUTION IN AXIAL DIRECTION

IGRC = 2 SPHERICAL GEOMETRY NO DISTRIBUTION

REGION	BUCKLING
3	.000E+00

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00

0

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.837E+04	7.00	1.969E+03	14.00	1.710E+02	21.00	6.457E+01	28.00	2.600E+01
35.00	1.193E+01	42.00	5.611E+00	49.00	2.781E+00	56.00	1.398E+00	63.00	7.268E-01
70.00	3.848E-01								

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.190E+04	7.00	3.343E+03	14.00	3.597E+02	21.00	1.325E+02	28.00	5.250E+01
35.00	2.324E+01	42.00	1.060E+01	49.00	5.070E+00	56.00	2.466E+00	63.00	1.229E+00
70.00	6.053E-01								

0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.539E+04	7.00	2.964E+03	14.00	6.943E+02	21.00	2.921E+02	28.00	1.333E+02
35.00	6.429E+01	42.00	3.186E+01	49.00	1.612E+01	56.00	8.211E+00	63.00	4.142E+00
70.00	1.951E+00								

0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.750E+04	7.00	1.837E+03	14.00	5.053E+02	21.00	2.154E+02	28.00	9.967E+01
35.00	4.850E+01	42.00	2.425E+01	49.00	1.233E+01	56.00	6.278E+00	63.00	3.093E+00
70.00	1.280E+00								

0

NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.011E+04	7.00	2.160E+03	14.00	5.659E+02	21.00	2.198E+02	28.00	9.651E+01
35.00	4.554E+01	42.00	2.238E+01	49.00	1.126E+01	56.00	5.678E+00	63.00	2.710E+00
70.00	8.903E-01								

0

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.849E+04	7.00	3.107E+03	14.00	9.032E+02	21.00	3.748E+02	28.00	1.692E+02
35.00	8.056E+01	42.00	3.964E+01	49.00	1.990E+01	56.00	9.975E+00	63.00	4.726E+00
70.00	1.662E+00								

0

NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.601E+03	7.00	1.422E+03	14.00	5.131E+02	21.00	2.154E+02	28.00	9.814E+01
35.00	4.693E+01	42.00	2.316E+01	49.00	1.163E+01	56.00	5.824E+00	63.00	2.715E+00
70.00	7.452E-01								

0

NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.013E+03	7.00	1.078E+03	14.00	4.864E+02	21.00	2.257E+02	28.00	1.078E+02
35.00	5.281E+01	42.00	2.637E+01	49.00	1.332E+01	56.00	6.673E+00	63.00	3.106E+00
70.00	9.777E-01								

0

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.862E+03	7.00	1.079E+03	14.00	5.339E+02	21.00	2.639E+02	28.00	1.311E+02
35.00	6.573E+01	42.00	3.327E+01	49.00	1.693E+01	56.00	8.501E+00	63.00	3.932E+00
70.00	1.138E+00								

0

NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.430E+03	7.00	9.227E+02	14.00	5.013E+02	21.00	2.630E+02	28.00	1.360E+02
35.00	6.996E+01	42.00	3.600E+01	49.00	1.849E+01	56.00	9.324E+00	63.00	4.308E+00
70.00	1.256E+00								

NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	9.648E+02	7.00	6.798E+02	14.00	3.973E+02	21.00	2.185E+02	28.00	1.166E+02
35.00	6.123E+01	42.00	3.194E+01	49.00	1.654E+01	56.00	8.372E+00	63.00	3.857E+00
70.00	1.066E+00								

0

NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.204E+02	7.00	5.457E+02	14.00	3.403E+02	21.00	1.956E+02	28.00	1.076E+02
35.00	5.772E+01	42.00	3.054E+01	49.00	1.596E+01	56.00	8.113E+00	63.00	3.734E+00
70.00	1.020E+00								

0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.954E+02	7.00	4.751E+02	14.00	3.125E+02	21.00	1.870E+02	28.00	1.058E+02
35.00	5.798E+01	42.00	3.112E+01	49.00	1.642E+01	56.00	8.389E+00	63.00	3.859E+00
70.00	1.030E+00								

0

NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.062E+02	7.00	4.194E+02	14.00	2.885E+02	21.00	1.790E+02	28.00	1.042E+02
35.00	5.831E+01	42.00	3.177E+01	49.00	1.694E+01	56.00	8.705E+00	63.00	4.009E+00
70.00	1.063E+00								

0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	4.419E+02	7.00	3.760E+02	14.00	2.682E+02	21.00	1.718E+02	28.00	1.026E+02
35.00	5.857E+01	42.00	3.239E+01	49.00	1.744E+01	56.00	9.023E+00	63.00	4.161E+00
70.00	1.085E+00								

0

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.935E+02	7.00	3.416E+02	14.00	2.512E+02	21.00	1.655E+02	28.00	1.013E+02
35.00	5.895E+01	42.00	3.309E+01	49.00	1.802E+01	56.00	9.381E+00	63.00	4.335E+00
70.00	1.117E+00								

0

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.522E+02	7.00	3.104E+02	14.00	2.341E+02	21.00	1.583E+02	28.00	9.908E+01
35.00	5.875E+01	42.00	3.347E+01	49.00	1.842E+01	56.00	9.663E+00	63.00	4.479E+00
70.00	1.152E+00								

0

NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.194E+02	7.00	2.848E+02	14.00	2.195E+02	21.00	1.519E+02	28.00	9.713E+01
35.00	5.865E+01	42.00	3.392E+01	49.00	1.888E+01	56.00	9.978E+00	63.00	4.642E+00
70.00	1.193E+00								

0

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.200E+02	7.00	1.978E+02	14.00	1.549E+02	21.00	1.092E+02	28.00	7.105E+01
35.00	4.356E+01	42.00	2.551E+01	49.00	1.434E+01	56.00	7.628E+00	63.00	3.565E+00
70.00	9.337E-01								

0

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.372E+02	7.00	1.240E+02	14.00	9.814E+01	21.00	7.000E+01	28.00	4.610E+01
35.00	2.856E+01	42.00	1.687E+01	49.00	9.550E+00	56.00	5.107E+00	63.00	2.395E+00
70.00	6.369E-01								

0

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.305E+02	7.00	1.184E+02	14.00	9.443E+01	21.00	6.799E+01	28.00	4.519E+01
35.00	2.824E+01	42.00	1.681E+01	49.00	9.569E+00	56.00	5.139E+00	63.00	2.417E+00
70.00	6.411E-01								

0

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.244E+02	7.00	1.132E+02	14.00	9.093E+01	21.00	6.605E+01	28.00	4.429E+01
35.00	2.791E+01	42.00	1.673E+01	49.00	9.577E+00	56.00	5.165E+00	63.00	2.436E+00
70.00	6.461E-01								

0

NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.180E+02	7.00	1.077E+02	14.00	8.710E+01	21.00	6.379E+01	28.00	4.314E+01
35.00	2.739E+01	42.00	1.653E+01	49.00	9.517E+00	56.00	5.154E+00	63.00	2.437E+00
70.00	6.460E-01								

0

NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.098E+02	7.00	1.004E+02	14.00	8.165E+01	21.00	6.024E+01	28.00	4.104E+01
35.00	2.624E+01	42.00	1.593E+01	49.00	9.222E+00	56.00	5.013E+00	63.00	2.376E+00
70.00	6.265E-01								

0

NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.838E+02	7.00	1.688E+02	14.00	1.386E+02	21.00	1.034E+02	28.00	7.128E+01
35.00	4.610E+01	42.00	2.828E+01	49.00	1.651E+01	56.00	9.032E+00	63.00	4.291E+00
70.00	1.080E+00								

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.654E+03	7.00	1.549E+03	14.00	1.320E+03	21.00	1.037E+03	28.00	7.586E+02
35.00	5.224E+02	42.00	3.407E+02	49.00	2.101E+02	56.00	1.197E+02	63.00	5.710E+01
70.00	1.088E+01								

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
.00	2.654E+04	7.00	2.173E+03	14.00	4.982E+02	21.00	2.118E+02	28.00	9.793E+01
35.00	4.798E+01	42.00	2.416E+01	49.00	1.237E+01	56.00	6.302E+00	63.00	3.038E+00
70.00	1.098E+00								

ตารางที่ ข - 10 Neutron Source - Input Data (Thickness 100 cm.)

SHEET OF

TITLE NEUDOS1.DAT	PROGRAMMER	DATE

```
  *** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
         2         2         2         2
         3         1         1         3         1
                                                              7.437E-3
  1.752E-2  3.821E-2  5.770E-2  7.437E-2  1.423E-1  6.232E-2  1.162E-1
  7.232E-2  1.069E-1  7.879E-2  8.899E-2  1.369E-1
         1       0.7                           3.78    1    7    2
         2       0.7                           3.78    1    7    2
         3      100.         0.        20.      2.37    1    5   10
         1    1    1    1          0.001
         2    1    1    1          0.001
         3    1    1    1          0.001   70     10    5   10
    1238  1.0       4  1.0      0  0.0        0       0.0  0       0.0
    2238  1.0       4  1.0      0  0.0        0       0.0  0       0.0
    3 56  0.42      8  0.3159   16 0.099     26  0.088    20  0.045
    3 14  0.017    13  0.0057    1 0.0043    12  0.0037   11  0.0014
    0
        0.
 1.585  +5         1         1         0
 1.0

    0    0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM SHEET OF

TITLE NEUDOS1.DAT	PROGRAMMER	DATE

```
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
       0.5       0.0       1.0
```

GENERAL CODING FORM

SHEET OF

TITLE NEUDOS1.DSI	PROGRAMMER	DATE

0	1

ตารางที่ ข - 11 Neutron Source - Output Report (Thickness 100 cm.)

```
*** TEST DATA FOR THE CALCULATION OF NEUTRON FLUX AND DOSE ***
                ******* S A B I N E - 3 *******


***CONTROL-INDICES***

  IGRC      IGRS      IGDS      IGSS
    2         2         2         2


***GROUP-DATA***

  NREG      NRG       NNG       NGG      IFGAM      NBUC      NBUS
    3        19        26         7         1         1         3


***SOURCE SPECTRUM***

  .0000E+00   .0000E+00   .0000E+00   .0000E+00   .0000E+00   .0000E+00  7.4370E-03  1.7520E-02  3.8210E-02  5.7700E-02
 7.4370E-02  1.4230E-01  6.2320E-02  1.1620E-01  7.2320E-02  1.0690E-01  7.8730E-02  8.8990E-02  1.3690E-01


***GEOMETRY-DATA***

  REGION       ZR          H        TEMP        DEN      IGAP      MBU      NEMR
     1       .7000      .0000       .0000     3.7800      1         7         2
     2       .7000      .0000       .0000     3.7800      1         7         2
     3    100.0000      .0000     20.0000     2.3700      1         5        10

  REGION    M(THE)     M(R)     M(FSI)      ETHA      NDIF      NREM      NPRT      NGS      NGCF
     1         1         1         1      1.00E-03
     2         1         1         1      1.00E-03
     3         1         1         1      1.00E-03    70        10         5        10         5
```

MATERIAL-DATA

REGION	ID	FREM	ID	FREM	ID	FREM	ID	FREM	ID	FREM
1	238	1.0000E+00	4	1.0000E+00	0	.0000E+00	0	.0000E+00	0	.0000E+00
0										
2	238	1.0000E+00	4	1.0000E+00	0	.0000E+00	0	.0000E+00	0	.0000E+00
0										
3	56	4.2000E-01	8	3.1590E-01	16	9.9000E-02	26	8.8000E-02	20	4.5000E-02
3	14	1.7000E-02	13	5.7000E-03	1	4.3000E-03	12	3.7000E-03	11	1.4000E-03
0										

*** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

S(Q)=S*P1(R)*P2(Z)

SOURCE DISTRIBUTION OF THE REGION IR = 1

NO SOURCE

SOURCE DISTRIBUTION OF THE REGION IR = 2

S = 1.5850E+05

P1(R) DISTRIBUTION IN RADIAL DIRECTION

1 COEFFICIENTS OF THE POLYNOM ARE GIVEN

1.0000E+00

P2(Z), DISTRIBUTION IN AXIAL DIRECTION

IGRC = 2 SPHERICAL GEOMETRY NO DISTRIBUTION

REGION	BUCKLING
3	.000E+00

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.838E+04	7.14	1.924E+03	14.29	1.656E+02	21.43	6.186E+01	28.57	2.466E+01
35.71	1.119E+01	42.86	5.204E+00	50.00	2.549E+00	57.14	1.266E+00	64.29	6.476E-01
71.43	3.343E-01	78.57	1.763E-01	85.71	9.361E-02	92.86	5.049E-02	100.00	2.738E-02

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.192E+04	7.14	3.270E+03	14.29	3.494E+02	21.43	1.271E+02	28.57	4.977E+01
35.71	2.176E+01	42.86	9.802E+00	50.00	4.638E+00	57.14	2.236E+00	64.29	1.112E+00
71.43	5.604E-01	78.57	2.891E-01	85.71	1.505E-01	92.86	7.907E-02	100.00	4.043E-02

0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.545E+04	7.14	2.930E+03	14.29	6.834E+02	21.43	2.840E+02	28.57	1.281E+02
35.71	6.104E+01	42.86	2.992E+01	50.00	1.500E+01	57.14	7.627E+00	64.29	3.927E+00
71.43	2.040E+00	78.57	1.066E+00	85.71	5.571E-01	92.86	2.857E-01	100.00	1.347E-01

0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.755E+04	7.14	1.822E+03	14.29	4.980E+02	21.43	2.097E+02	28.57	9.591E+01
35.71	4.613E+01	42.86	2.282E+01	50.00	1.152E+01	57.14	5.900E+00	64.29	3.054E+00
71.43	1.594E+00	78.57	8.347E-01	85.71	4.346E-01	92.86	2.174E-01	100.00	8.989E-02

0

NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.017E+04	7.14	2.140E+03	14.29	5.555E+02	21.43	2.132E+02	28.57	9.259E+01
35.71	4.322E+01	42.86	2.104E+01	50.00	1.053E+01	57.14	5.366E+00	64.29	2.771E+00
71.43	1.444E+00	78.57	7.554E-01	85.71	3.915E-01	92.86	1.906E-01	100.00	6.271E-02

0

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.858E+04	7.14	3.083E+03	14.29	8.893E+02	21.43	3.645E+02	28.57	1.626E+02
35.71	7.654E+01	42.86	3.731E+01	50.00	1.866E+01	57.14	9.500E+00	64.29	4.904E+00
71.43	2.554E+00	78.57	1.335E+00	85.71	6.893E-01	92.86	3.334E-01	100.00	1.175E-01

NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.651E+03	7.14	1.421E+03	14.29	5.059E+02	21.43	2.096E+02	28.57	9.436E+01
35.71	4.461E+01	42.86	2.180E+01	50.00	1.091E+01	57.14	5.559E+00	64.29	2.870E+00
71.43	1.495E+00	78.57	7.811E-01	85.71	4.027E-01	92.86	1.918E-01	100.00	5.281E-02

NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.047E+03	7.14	1.084E+03	14.29	4.820E+02	21.43	2.205E+02	28.57	1.040E+02
35.71	5.030E+01	42.86	2.487E+01	50.00	1.252E+01	57.14	6.400E+00	64.29	3.310E+00
71.43	1.726E+00	78.57	9.018E-01	85.71	4.640E-01	92.86	2.204E-01	100.00	6.950E-02

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.895E+03	7.14	1.087E+03	14.29	5.307E+02	21.43	2.586E+02	28.57	1.267E+02
35.71	6.274E+01	42.86	3.144E+01	50.00	1.595E+01	57.14	8.189E+00	64.29	4.245E+00
71.43	2.217E+00	78.57	1.159E+00	85.71	5.952E-01	92.86	2.805E-01	100.00	8.130E-02

NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.457E+03	7.14	9.320E+02	14.29	4.997E+02	21.43	2.585E+02	28.57	1.318E+02
35.71	6.693E+01	42.86	3.408E+01	50.00	1.747E+01	57.14	9.022E+00	64.29	4.694E+00
71.43	2.456E+00	78.57	1.285E+00	85.71	6.594E-01	92.86	3.096E-01	100.00	9.030E-02

0

NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	9.839E+02	7.14	6.879E+02	14.29	3.970E+02	21.43	2.153E+02	28.57	1.132E+02
35.71	5.869E+01	42.86	3.030E+01	50.00	1.566E+01	57.14	8.132E+00	64.29	4.245E+00
71.43	2.226E+00	78.57	1.165E+00	85.71	5.976E-01	92.86	2.791E-01	100.00	7.714E-02

0

NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	7.352E+02	7.14	5.531E+02	14.29	3.407E+02	21.43	1.932E+02	28.57	1.047E+02
35.71	5.544E+01	42.86	2.902E+01	50.00	1.514E+01	57.14	7.910E+00	64.29	4.145E+00
71.43	2.178E+00	78.57	1.141E+00	85.71	5.851E-01	92.86	2.723E-01	100.00	7.426E-02

0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.081E+02	7.14	4.822E+02	14.29	3.135E+02	21.43	1.850E+02	28.57	1.032E+02
35.71	5.579E+01	42.86	2.964E+01	50.00	1.562E+01	57.14	8.210E+00	64.29	4.320E+00
71.43	2.276E+00	78.57	1.194E+00	85.71	6.121E-01	92.86	2.839E-01	100.00	7.555E-02

0

NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.172E+02	7.14	4.261E+02	14.29	2.899E+02	21.43	1.775E+02	28.57	1.019E+02
35.71	5.623E+01	42.86	3.032E+01	50.00	1.615E+01	57.14	8.553E+00	64.29	4.522E+00
71.43	2.389E+00	78.57	1.256E+00	85.71	6.438E-01	92.86	2.979E-01	100.00	7.871E-02

0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	4.517E+02	7.14	3.824E+02	14.29	2.699E+02	21.43	1.706E+02	28.57	1.005E+02
35.71	5.659E+01	42.86	3.098E+01	50.00	1.668E+01	57.14	8.899E+00	64.29	4.730E+00
71.43	2.507E+00	78.57	1.321E+00	85.71	6.772E-01	92.86	3.127E-01	100.00	8.109E-02

0

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	4.023E+02	7.14	3.476E+02	14.29	2.530E+02	21.43	1.646E+02	28.57	9.939E+01
35.71	5.707E+01	42.86	3.171E+01	50.00	1.727E+01	57.14	9.290E+00	64.29	4.965E+00
71.43	2.642E+00	78.57	1.395E+00	85.71	7.156E-01	92.86	3.299E-01	100.00	8.448E-02

0

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.602E+02	7.14	3.160E+02	14.29	2.360E+02	21.43	1.576E+02	28.57	9.738E+01
35.71	5.699E+01	42.86	3.215E+01	50.00	1.771E+01	57.14	9.608E+00	64.29	5.167E+00
71.43	2.761E+00	78.57	1.461E+00	85.71	7.505E-01	92.86	3.456E-01	100.00	8.818E-02

0

NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.267E+02	7.14	2.901E+02	14.29	2.216E+02	21.43	1.515E+02	28.57	9.563E+01
35.71	5.701E+01	42.86	3.265E+01	50.00	1.820E+01	57.14	9.963E+00	64.29	5.393E+00
71.43	2.895E+00	78.57	1.536E+00	85.71	7.904E-01	92.86	3.639E-01	100.00	9.261E-02

0

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.250E+02	7.14	2.016E+02	14.29	1.565E+02	21.43	1.091E+02	28.57	7.005E+01
35.71	4.241E+01	42.86	2.460E+01	50.00	1.385E+01	57.14	7.646E+00	64.29	4.163E+00
71.43	2.244E+00	78.57	1.194E+00	85.71	6.153E-01	92.86	2.835E-01	100.00	7.341E-02

0

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.404E+02	7.14	1.264E+02	14.29	9.920E+01	21.43	6.997E+01	28.57	4.549E+01
35.71	2.784E+01	42.86	1.630E+01	50.00	9.245E+00	57.14	5.131E+00	64.29	2.806E+00
71.43	1.518E+00	78.57	8.093E-01	85.71	4.175E-01	92.86	1.925E-01	100.00	5.057E-02

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.336E+02	7.14	1.207E+02	14.29	9.549E+01	21.43	6.801E+01	28.57	4.464E+01
35.71	2.756E+01	42.86	1.625E+01	50.00	9.278E+00	57.14	5.175E+00	64.29	2.841E+00
71.43	1.541E+00	78.57	8.232E-01	85.71	4.251E-01	92.86	1.962E-01	100.00	5.134E-02

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.273E+02	7.14	1.153E+02	14.29	9.198E+01	21.43	6.611E+01	28.57	4.379E+01
35.71	2.726E+01	42.86	1.619E+01	50.00	9.300E+00	57.14	5.213E+00	64.29	2.873E+00
71.43	1.562E+00	78.57	8.363E-01	85.71	4.324E-01	92.86	1.997E-01	100.00	5.221E-02

NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.208E+02	7.14	1.098E+02	14.29	8.814E+01	21.43	6.388E+01	28.57	4.268E+01
35.71	2.678E+01	42.86	1.602E+01	50.00	9.256E+00	57.14	5.214E+00	64.29	2.884E+00
71.43	1.573E+00	78.57	8.436E-01	85.71	4.367E-01	92.86	2.018E-01	100.00	5.268E-02

NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.123E+02	7.14	1.023E+02	14.29	8.266E+01	21.43	6.035E+01	28.57	4.063E+01
35.71	2.568E+01	42.86	1.546E+01	50.00	8.982E+00	57.14	5.082E+00	64.29	2.821E+00
71.43	1.542E+00	78.57	8.289E-01	85.71	4.296E-01	92.86	1.986E-01	100.00	5.153E-02

NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.881E+02	7.14	1.722E+02	14.29	1.404E+02	21.43	1.037E+02	28.57	7.064E+01
35.71	4.517E+01	42.86	2.749E+01	50.00	1.612E+01	57.14	9.190E+00	64.29	5.133E+00
71.43	2.820E+00	78.57	1.521E+00	85.71	7.898E-01	92.86	3.649E-01	100.00	9.024E-02

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.693E+03	7.14	1.581E+03	14.29	1.340E+03	21.43	1.044E+03	28.57	7.573E+02
35.71	5.173E+02	42.86	3.365E+02	50.00	2.104E+02	57.14	1.274E+02	64.29	7.512E+01
71.43	4.327E+01	78.57	2.424E+01	85.71	1.291E+01	92.86	5.917E+00	100.00	1.101E+00

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
.00	2.658E+04	7.14	2.147E+03	14.29	4.902E+02	21.43	2.061E+02	28.57	9.425E+01
35.71	4.568E+01	42.86	2.279E+01	50.00	1.163E+01	57.14	6.018E+00	64.29	3.147E+00
71.43	1.656E+00	78.57	8.726E-01	85.71	4.536E-01	92.86	2.212E-01	100.00	7.855E-02

ตารางที่ ข - 12 Neutron Generator - Input Data

SHEET OF

TITLE SPHSH.DAT

PROGRAMMER

DATE

```
    SHIELDED PROBLEM : SPHERICAL CORE & SHIELD : NEUTRON GENERATOR
         2         2         2         2
         7         1         1         3         1
                                     1.0


         1 1.5                            2.7         1    3    1
         2 1.0                            0.001       1    1    1
         3 76.2                           0.001       1    1    1
         4 76.2                           0.001       1    1    1
         5 76.2                           0.001       1    1    1
         6 76.2                           0.001       1    1    1
         7 70.0                           2.350       1    5   10
         1
         2
         3                                102   34   34   34
         4                                102   34   34   34
         5                                102   34   34   34
         6                                102   34   34   34
         7                                 35    7    7    7
    1 13  1.
    2  8  1.
    3  8  1.
    4  8  1.
    5  8  1.
```

GENERAL CODING FORM SHEET OF

TITLE SPHSH.DAT | PROGRAMMER | DATE

```
    6  8  1.
    7 56  0.42      8  0.3159   16   0.099   26  0.088    20  0.045
    7 14  0.017    13  0.0057    1   0.0043  12  0.0037   11  0.0014
    0
  2.875 +7         1         1
  1.0
  0.

    0    0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
```

GENERAL CODING FORM SHEET OF

TITLE SPHSH.DAT

PROGRAMMER

DATE

```
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
  0.5      .0        1.0
```

200

GENERAL CODING FORM

SHEET OF

TITLE SPHSH.DSI

PROGRAMMER

DATE

1	2	3	4	5	6	7	8	9	10	11
				0					1	

ตารางที่ ข - 13 Neutron Generator - Output Report

SHIELDED FROBLEM : SPHERICAL CORE
******* S A B I N E - 3 *******

CONTROL-INDICES

IGRC	IGRS	IGDS	IGSS
2	2	2	2

GROUP-DATA

NREG	NRG	NNG	NGG	IFGAM	NBUC	NBUS
7	19	26	7	1	1	3

SOURCE SPECTRUM

.0000E+00	.0000E+00	.0000E+00	1.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00
.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	

GEOMETRY-DATA

REGION	ZR	H	TEMP	DEN	IGAP	MBU	NEMR
1	1.5000	.0000	.0000	2.7000	1	3	1
2	1.0000	.0000	.0000	.0010	1	1	1
3	76.2000	.0000	.0000	.0010	1	1	1
4	76.2000	.0000	.0000	.0010	1	1	1
5	76.2000	.0000	.0000	.0010	1	1	1
6	76.2000	.0000	.0000	.0010	1	1	1
7	70.0000	.0000	.0000	2.3500	1	5	10

```
REGION   M(THE)    M(R)    M(PSI)    ETHA      NDIF    NREM    NPRT    NGS    NGCF
   1       1        1        1     1.00E-03
   2       1        1        1     1.00E-03
   3       1        1        1     1.00E-03   102      34      34      34      4
   4       1        1        1     1.00E-03   102      34      34      34      4
   5       1        1        1     1.00E-03   102      34      34      34      4
   6       1        1        1     1.00E-03   102      34      34      34      4
   7       1        1        1     1.00E-03    35       7       7       7      5
   SHIELDED PROBLEM : SPHERICAL CORE


 ***MATERIAL-DATA***
REGION     ID        FREM       ID        FREM       ID        FREM       ID        FREM       ID        FREM
    1      13     1.0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00
0
    2       8     1.0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00
0
    3       8     1.0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00
0
    4       8     1.0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00
0
    5       8     1.0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00
0
    6       8     1.0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00     0     .0000E+00
0
    7      56     4.2000E-01     8     3.1590E-01   16     9.9000E-02   26     8.8000E-02   20     4.5000E-02
    7      14     1.7000E-02    13     5.7000E-03    1     4.3000E-03   12     3.7000E-03   11     1.4000E-03
0
   SHIELDED PROBLEM : SPHERICAL CORE
             *** REMOVAL SOURCE DISTRIBUTION OF THE TWO CORE REGIONS ***

                              S(Q)=S*P1(R)*P2(Z)


                   SOURCE DISTRIBUTION OF THE REGION IR =  1
S =  2.8750E+07

 P1(R) DISTRIBUTION IN RADIAL DIRECTION
 1 COEFFICIENTS OF THE POLYNOM ARE GIVEN
     1.0000E+00
P2(Z), DISTRIBUTION IN AXIAL DIRECTION
 IGRC = 2  SPHERICAL GEOMETRY  NO DISTRIBUTION
                   SOURCE DISTRIBUTION OF THE REGION IR =  2
```

REGION	BUCKLING
3	.000E+00
4	.000E+00
5	.000E+00
6	.000E+00
7	.000E+00

SHIELDED PROBLEM : SPHERICAL CORE

BOUNDARY CONDITIONS

B1	B2	A0	A1	A2
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00
5.0000E-01	.0000E+00	1.0000E+00	.0000E+00	.0000E+00

NEUTRON FLUX OF GROUP 1

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.149E+07	25.40	8.393E+04	50.80	2.309E+04	76.20	1.068E+04	76.20	1.068E+04
101.60	6.166E+03	127.00	4.042E+03	152.40	2.875E+03	152.40	2.875E+03	177.80	2.165E+03
203.20	1.702E+03	228.60	1.384E+03	228.60	1.384E+03	254.00	1.155E+03	279.40	9.852E+02
304.80	8.559E+02	304.80	8.559E+02	318.80	3.806E+02	332.80	1.612E+02	346.80	6.631E+01
360.80	2.664E+01	374.80	1.006E+01						

0

NEUTRON FLUX OF GROUP 2

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.508E+02	25.40	1.501E+02	50.80	1.499E+02	76.20	1.499E+02	76.20	1.499E+02
101.60	1.499E+02	127.00	1.499E+02	152.40	1.499E+02	152.40	1.499E+02	177.80	1.499E+02
203.20	1.498E+02	228.60	1.498E+02	228.60	1.498E+02	254.00	1.498E+02	279.40	1.498E+02
304.80	1.498E+02	304.80	1.498E+02	318.80	1.026E+02	332.80	5.278E+01	346.80	2.419E+01
360.80	1.023E+01	374.80	3.388E+00						

0

NEUTRON FLUX OF GROUP 3

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.636E+02	25.40	1.638E+02	50.80	1.641E+02	76.20	1.642E+02	76.20	1.642E+02
101.60	1.640E+02	127.00	1.641E+02	152.40	1.641E+02	152.40	1.641E+02	177.80	1.641E+02
203.20	1.641E+02	228.60	1.641E+02	228.60	1.641E+02	254.00	1.641E+02	279.40	1.641E+02
304.80	1.641E+02	304.80	1.641E+02	318.80	1.283E+02	332.80	7.492E+01	346.80	3.796E+01
360.80	1.712E+01	374.80	5.533E+00						

0

NEUTRON FLUX OF GROUP 4

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.540E+02	25.40	1.539E+02	50.80	1.538E+02	76.20	1.538E+02	76.20	1.538E+02
101.60	1.538E+02	127.00	1.538E+02	152.40	1.538E+02	152.40	1.538E+02	177.80	1.538E+02
203.20	1.538E+02	228.60	1.538E+02	228.60	1.538E+02	254.00	1.538E+02	279.40	1.538E+02
304.80	1.538E+02	304.80	1.538E+02	318.80	1.151E+02	332.80	6.511E+01	346.80	3.236E+01
360.80	1.432E+01	374.80	3.982E+00						

0

NEUTRON FLUX OF GROUP 5

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.573E+02	25.40	1.571E+02	50.80	1.570E+02	76.20	1.570E+02	76.20	1.570E+02
101.60	1.570E+02	127.00	1.570E+02	152.40	1.570E+02	152.40	1.570E+02	177.80	1.570E+02
203.20	1.570E+02	228.60	1.570E+02	228.60	1.570E+02	254.00	1.570E+02	279.40	1.570E+02
304.80	1.570E+02	304.80	1.570E+02	318.80	1.155E+02	332.80	6.418E+01	346.80	3.149E+01
360.80	1.375E+01	374.80	2.986E+00						

0

NEUTRON FLUX OF GROUP 6

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	2.030E+02	25.40	2.031E+02	50.80	2.031E+02	76.20	2.031E+02	76.20	2.031E+02
101.60	2.031E+02	127.00	2.030E+02	152.40	2.030E+02	152.40	2.030E+02	177.80	2.030E+02
203.20	2.030E+02	228.60	2.030E+02	228.60	2.030E+02	254.00	2.030E+02	279.40	2.030E+02
304.80	2.030E+02	304.80	2.030E+02	318.80	1.578E+02	332.80	9.232E+01	346.80	4.680E+01
360.80	2.067E+01	374.80	4.751E+00						

0

NEUTRON FLUX OF GROUP 7

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.188E+02	25.40	1.188E+02	50.80	1.187E+02	76.20	1.187E+02	76.20	1.187E+02
101.60	1.187E+02	127.00	1.187E+02	152.40	1.187E+02	152.40	1.187E+02	177.80	1.187E+02
203.20	1.187E+02	228.60	1.187E+02	228.60	1.187E+02	254.00	1.187E+02	279.40	1.187E+02
304.80	1.187E+02	304.80	1.187E+02	318.80	9.194E+01	332.80	5.377E+01	346.80	2.726E+01
360.80	1.202E+01	374.80	2.147E+00						

0

NEUTRON FLUX OF GROUP 8

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.168E+02	25.40	1.168E+02	50.80	1.168E+02	76.20	1.168E+02	76.20	1.168E+02
101.60	1.168E+02	127.00	1.168E+02	152.40	1.168E+02	152.40	1.168E+02	177.80	1.168E+02
203.20	1.168E+02	228.60	1.168E+02	228.60	1.168E+02	254.00	1.168E+02	279.40	1.168E+02
304.80	1.168E+02	304.80	1.168E+02	318.80	9.290E+01	332.80	5.587E+01	346.80	2.884E+01
360.80	1.278E+01	374.80	2.591E+00						

0

NEUTRON FLUX OF GROUP 9

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.304E+02	25.40	1.305E+02	50.80	1.305E+02	76.20	1.305E+02	76.20	1.305E+02
101.60	1.305E+02	127.00	1.305E+02	152.40	1.305E+02	152.40	1.305E+02	177.80	1.305E+02
203.20	1.305E+02	228.60	1.305E+02	228.60	1.305E+02	254.00	1.305E+02	279.40	1.305E+02
304.80	1.305E+02	304.80	1.305E+02	318.80	1.064E+02	332.80	6.553E+01	346.80	3.436E+01
360.80	1.531E+01	374.80	2.830E+00						

0

NEUTRON FLUX OF GROUP 10

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.287E+02	25.40	1.286E+02	50.80	1.286E+02	76.20	1.286E+02	76.20	1.286E+02
101.60	1.286E+02	127.00	1.286E+02	152.40	1.286E+02	152.40	1.286E+02	177.80	1.286E+02
203.20	1.286E+02	228.60	1.286E+02	228.60	1.286E+02	254.00	1.286E+02	279.40	1.286E+02
304.80	1.286E+02	304.80	1.286E+02	318.80	1.058E+02	332.80	6.654E+01	346.80	3.540E+01
360.80	1.585E+01	374.80	2.939E+00						

0

NEUTRON FLUX OF GROUP 11

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	1.067E+02	25.40	1.065E+02	50.80	1.065E+02	76.20	1.065E+02	76.20	1.065E+02
101.60	1.065E+02	127.00	1.065E+02	152.40	1.065E+02	152.40	1.065E+02	177.80	1.065E+02
203.20	1.065E+02	228.60	1.065E+02	228.60	1.065E+02	254.00	1.065E+02	279.40	1.065E+02
304.80	1.065E+02	304.80	1.065E+02	318.80	8.829E+01	332.80	5.637E+01	346.80	3.034E+01
360.80	1.364E+01	374.80	2.390E+00						

0

NEUTRON FLUX OF GROUP 12

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	9.526E+01	25.40	9.523E+01	50.80	9.523E+01	76.20	9.523E+01	76.20	9.523E+01
101.60	9.523E+01	127.00	9.523E+01	152.40	9.523E+01	152.40	9.523E+01	177.80	9.523E+01
203.20	9.523E+01	228.60	9.523E+01	228.60	9.523E+01	254.00	9.523E+01	279.40	9.523E+01
304.80	9.523E+01	304.80	9.523E+01	318.80	7.986E+01	332.80	5.171E+01	346.80	2.814E+01
360.80	1.271E+01	374.80	2.191E+00						

0

NEUTRON FLUX OF GROUP 13

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	9.134E+01	25.40	9.140E+01	50.80	9.135E+01	76.20	9.136E+01	76.20	9.136E+01
101.60	9.137E+01	127.00	9.135E+01	152.40	9.136E+01	152.40	9.136E+01	177.80	9.137E+01
203.20	9.135E+01	228.60	9.136E+01	228.60	9.136E+01	254.00	9.136E+01	279.40	9.136E+01
304.80	9.136E+01	304.80	9.136E+01	318.80	7.744E+01	332.80	5.081E+01	346.80	2.794E+01
360.80	1.267E+01	374.80	2.127E+00						

0

NEUTRON FLUX OF GROUP 14

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.907E+01	25.40	8.897E+01	50.80	8.898E+01	76.20	8.899E+01	76.20	8.899E+01
101.60	8.899E+01	127.00	8.899E+01	152.40	8.900E+01	152.40	8.900E+01	177.80	8.900E+01
203.20	8.900E+01	228.60	8.900E+01	228.60	8.900E+01	254.00	8.900E+01	279.40	8.900E+01
304.80	8.900E+01	304.80	8.900E+01	318.80	7.555E+01	332.80	5.018E+01	346.80	2.788E+01
360.80	1.269E+01	374.80	2.114E+00						

0

NEUTRON FLUX OF GROUP 15

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.665E+01	25.40	8.665E+01	50.80	8.665E+01	76.20	8.665E+01	76.20	8.665E+01
101.60	8.665E+01	127.00	8.665E+01	152.40	8.665E+01	152.40	8.665E+01	177.80	8.665E+01
203.20	8.665E+01	228.60	8.665E+01	228.60	8.665E+01	254.00	8.665E+01	279.40	8.665E+01
304.80	8.665E+01	304.80	8.665E+01	318.80	7.402E+01	332.80	4.970E+01	346.80	2.788E+01
360.80	1.275E+01	374.80	2.082E+00						

0

NEUTRON FLUX OF GROUP 16

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.499E+01	25.40	8.503E+01	50.80	8.497E+01	76.20	8.499E+01	76.20	8.499E+01
101.60	8.500E+01	127.00	8.498E+01	152.40	8.499E+01	152.40	8.499E+01	177.80	8.500E+01
203.20	8.499E+01	228.60	8.499E+01	228.60	8.499E+01	254.00	8.500E+01	279.40	8.499E+01
304.80	8.499E+01	304.80	8.499E+01	318.80	7.296E+01	332.80	4.950E+01	346.80	2.803E+01
360.80	1.288E+01	374.80	2.074E+00						

0

NEUTRON FLUX OF GROUP 17

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.310E+01	25.40	8.317E+01	50.80	8.311E+01	76.20	8.309E+01	76.20	8.309E+01
101.60	8.311E+01	127.00	8.310E+01	152.40	8.309E+01	152.40	8.309E+01	177.80	8.310E+01
203.20	8.310E+01	228.60	8.309E+01	228.60	8.309E+01	254.00	8.310E+01	279.40	8.309E+01
304.80	8.309E+01	304.80	8.309E+01	318.80	7.146E+01	332.80	4.895E+01	346.80	2.797E+01
360.80	1.291E+01	374.80	2.070E+00						

0

NEUTRON FLUX OF GROUP 18

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	8.153E+01	25.40	8.160E+01	50.80	8.155E+01	76.20	8.153E+01	76.20	8.153E+01
101.60	8.155E+01	127.00	8.154E+01	152.40	8.153E+01	152.40	8.153E+01	177.80	8.154E+01
203.20	8.153E+01	228.60	8.153E+01	228.60	8.153E+01	254.00	8.154E+01	279.40	8.153E+01
304.80	8.153E+01	304.80	8.153E+01	318.80	7.035E+01	332.80	4.862E+01	346.80	2.802E+01
360.80	1.299E+01	374.80	2.079E+00						

0

NEUTRON FLUX OF GROUP 19

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	5.935E+01	25.40	5.939E+01	50.80	5.939E+01	76.20	5.938E+01	76.20	5.938E+01
101.60	5.938E+01	127.00	5.938E+01	152.40	5.938E+01	152.40	5.938E+01	177.80	5.938E+01
203.20	5.938E+01	228.60	5.938E+01	228.60	5.938E+01	254.00	5.938E+01	279.40	5.938E+01
304.80	5.938E+01	304.80	5.938E+01	318.80	5.173E+01	332.80	3.601E+01	346.80	2.091E+01
360.80	9.735E+00	374.80	1.588E+00						

0

NEUTRON FLUX OF GROUP 20

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.885E+01	25.40	3.883E+01	50.80	3.883E+01	76.20	3.883E+01	76.20	3.883E+01
101.60	3.883E+01	127.00	3.883E+01	152.40	3.883E+01	152.40	3.883E+01	177.80	3.883E+01
203.20	3.883E+01	228.60	3.883E+01	228.60	3.883E+01	254.00	3.883E+01	279.40	3.883E+01
304.80	3.883E+01	304.80	3.883E+01	318.80	3.372E+01	332.80	2.360E+01	346.80	1.377E+01
360.80	6.431E+00	374.80	1.068E+00						

0

NEUTRON FLUX OF GROUP 21

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.823E+01	25.40	3.821E+01	50.80	3.821E+01	76.20	3.822E+01	76.20	3.822E+01
101.60	3.822E+01	127.00	3.822E+01	152.40	3.822E+01	152.40	3.822E+01	177.80	3.822E+01
203.20	3.822E+01	228.60	3.822E+01	228.60	3.822E+01	254.00	3.822E+01	279.40	3.822E+01
304.80	3.822E+01	304.80	3.822E+01	318.80	3.322E+01	332.80	2.334E+01	346.80	1.368E+01
360.80	6.404E+00	374.80	1.061E+00						

0

NEUTRON FLUX OF GROUP 22

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.743E+01	25.40	3.743E+01	50.80	3.744E+01	76.20	3.745E+01	76.20	3.745E+01
101.60	3.744E+01	127.00	3.744E+01	152.40	3.745E+01	152.40	3.745E+01	177.80	3.744E+01
203.20	3.744E+01	228.60	3.745E+01	228.60	3.745E+01	254.00	3.744E+01	279.40	3.744E+01
304.80	3.744E+01	304.80	3.744E+01	318.80	3.272E+01	332.80	2.307E+01	346.80	1.358E+01
360.80	6.373E+00	374.80	1.056E+00						

0

NEUTRON FLUX OF GROUP 23

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.669E+01	25.40	3.669E+01	50.80	3.669E+01	76.20	3.669E+01	76.20	3.669E+01
101.60	3.669E+01	127.00	3.669E+01	152.40	3.669E+01	152.40	3.669E+01	177.80	3.669E+01
203.20	3.669E+01	228.60	3.669E+01	228.60	3.669E+01	254.00	3.669E+01	279.40	3.669E+01
304.80	3.669E+01	304.80	3.669E+01	318.80	3.203E+01	332.80	2.267E+01	346.80	1.339E+01
360.80	6.301E+00	374.80	1.043E+00						

0

NEUTRON FLUX OF GROUP 24

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	3.495E+01	25.40	3.497E+01	50.80	3.497E+01	76.20	3.497E+01	76.20	3.497E+01
101.60	3.497E+01	127.00	3.497E+01	152.40	3.497E+01	152.40	3.497E+01	177.80	3.497E+01
203.20	3.497E+01	228.60	3.497E+01	228.60	3.497E+01	254.00	3.497E+01	279.40	3.497E+01
304.80	3.497E+01	304.80	3.497E+01	318.80	3.063E+01	332.80	2.175E+01	346.80	1.289E+01
360.80	6.081E+00	374.80	1.002E+00						

NEUTRON FLUX OF GROUP 25

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	6.132E+01	25.40	6.128E+01	50.80	6.126E+01	76.20	6.127E+01	76.20	6.127E+01
101.60	6.128E+01	127.00	6.127E+01	152.40	6.128E+01	152.40	6.128E+01	177.80	6.128E+01
203.20	6.128E+01	228.60	6.128E+01	228.60	6.128E+01	254.00	6.128E+01	279.40	6.128E+01
304.80	6.128E+01	304.80	6.128E+01	318.80	5.364E+01	332.80	3.829E+01	346.80	2.283E+01
360.80	1.081E+01	374.80	1.689E+00						

NEUTRON FLUX OF GROUP 26

X	PHI	X	PHI	X	PHI	X	PHI	X	PHI
.00	4.275E+02	25.40	4.373E+02	50.80	4.562E+02	76.20	4.480E+02	76.20	4.480E+02
101.60	4.437E+02	127.00	4.506E+02	152.40	4.472E+02	152.40	4.472E+02	177.80	4.448E+02
203.20	4.490E+02	228.60	4.470E+02	228.60	4.470E+02	254.00	4.452E+02	279.40	4.484E+02
304.80	4.468E+02	304.80	4.468E+02	318.80	5.573E+02	332.80	4.319E+02	346.80	2.696E+02
360.80	1.304E+02	374.80	1.490E+01						

TOTAL NEUTRON DOSE RATE (MREM/HR)

X	DOSE	X	DOSE	X	DOSE	X	DOSE	X	DOSE
.00	1.724E+06	25.40	1.272E+04	50.80	3.591E+03	76.20	1.730E+03	76.20	1.730E+03
101.60	1.053E+03	127.00	7.349E+02	152.40	5.598E+02	152.40	5.598E+02	177.80	4.533E+02
203.20	3.839E+02	228.60	3.362E+02	228.60	3.362E+02	254.00	3.018E+02	279.40	2.764E+02
304.80	2.570E+02	304.80	2.570E+02	318.80	1.554E+02	332.80	8.106E+01	346.80	3.867E+01
360.80	1.673E+01	374.80	4.634E+00						

ประวัติผู้เขียน

เรืออากาศโทหญิง ทิพวิมล ทองอ่อน เกิดวันที่ 18 เมษายน 2497 ที่ตำบลมหานาค กรุงเทพมหานคร สำเร็จการศึกษาวิทยาศาสตร์บัณฑิต สาขาฟิสิกส์ จากมหาวิทยาลัยเกษตรศาสตร์ บางเขน ในปี พ.ศ.2518 ตลอดระยะเวลาที่ศึกษาในระดับปริญญาตรี ได้รับทุนการศึกษาจาก มูลนิธิ จอมพล ป.พิบูลสงคราม เมื่อสำเร็จการศึกษา ได้รับเหรียญทองและประกาศนียบัตรเกียรติยศ จากมูลนิธิ ศาสตราจารย์ ดร.แถบ นีละนิธิ ต่อมาได้เข้าศึกษาต่อที่ ภาควิชานิวเคลียร์เทคโนโลยี คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ในปี พ.ศ.2525 และ ได้รับทุนการศึกษา จากมูลนิธิ นิสิตเก่าจุฬาลงกรณ์มหาวิทยาลัย ในพระบรมราชูปถัมภ์ ปีการศึกษา 2526

ประวัติการทำงาน เมื่อสำเร็จการศึกษาระดับปริญญาตรี ได้ทำการสอนระดับมัธยมศึกษาตอนปลาย ที่โรงเรียนเซนต์ฟรังซิสซาเวียร์ คอนแวนต์ และ วชิราวุธวิทยาลัย เป็นเวลา 7 ปี ปัจจุบันรับราชการทหาร สังกัด กรมยุทธศึกษาทหารอากาศ ตำแหน่งอาจารย์ ประจำภาควิชาฟิสิกส์ กองวิชาวิทยาศาสตร์ กองการศึกษา โรงเรียนนายเรืออากาศ