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Processing EFF-2.3 with ACER of NJOY to produce an MCNP working Library

by

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Draft final report on task NDB 1.2

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1. Introduction

In the frame of the European Fusion File (EFF) programme, a very important work is the production of derived libraries to be used by the most common neutronics codes in order to: have practical application of the evaluation work and to have an idea of how much the revision done can affect the nuclear responses (e.g.: tritium breeding ratio, nuclear heating, dpa).

In these last years, inside the European Community, the processing work has been undertaken by ENEA: the center of Bologna has the task of producing a multigroup derived library; Frascati center has the one of producing the MCNP (continuous energy Monte Carlo code) derived library. To these aims the well known NJOY system is used.

This paper is a first draft of the final report on the completion of the derived library for MCNP from EFF-2 (part of task NDB 1.2). The work, started in 1992, has gone through steps [ref. 1,2] which follow the release in Europe of the updated versions of NJOY91 : 91.13 in 1992, 91.38 in 1993 , 91.91 in 1994.

2. NJOY91 and ACER

In the NJOY system there are several modules, each of them has a specific function. ACER prepares the data library in a special format (ACE: A Compact ENDF) to be used by MCNP. All of the ENDF representations are included in the ACE library with a sake of space, making use of: pointer arrays, an unionized energy grid on which cross sections are given. A thinning option is available, to reduce the number of energy points, keeping to a choosen value the integral of total and capture cross sections. We have used a 0.5% thinning tolerance, asking for a target number of points dependent on the particular evaluation (maximum for Fe^{56} : 10,000 points).

The main intention of NJOY91 is to treat and make available, to be used by the transport codes, the new ENDF 6 new capabilities, mainly the file 6, in which correlated double differential (angle-energy) distributions (ddx) for outgoing particles are given [ref. 3,4]. This allows a 'direct' kerma factor calculations in HEATR, against the older 'energy balance' method. Moreover the transport codes can take into account the correlation between angle and energy, provided that they have the capability to properly use these informations. In our experience [ref 1.2], only the latest version of ACER of NJOY 91.91 is able to prepare the data with all the new capabilities of the file 6 (as they are present in EFF-2). Only the last version of MCNP, version 4A [ref. 5], looks able to handle the outcome data of ACER.

The processed ddx distributions are grouped in 3 MCNP laws. An energy dependent neutron yield is now admitted (version 91.91) with a special representation in the TYR and DLW blocks of ACE data (see MCNP manual).

law 44 makes use of the Kalbach and Mann systematics formalism (KM).For each incoming energy E an outgoing E' energy is sampled for which a couple of values (a,r) are given and the cosine μ distribution is determined and sampled $f(\mu) = f(E,E',r,a)$. If the original file 6 data are already in the KM format, they are picked as they are by ACER. If they are given as a polynomial Legendre representation, they are translated to the KM formalism, with a,r

calculated by subroutine FNDAR1.
law 66 is a phase space distribution for N bodies, parameters of which are calculated from the Q value of the reaction. Actually it is used only in the D evaluation of EFF 2 (MAT 128) for the MT=16 (n,2n) reaction (origin from ENDF/B VI).
law 67 In this case a table of values are given. For each incoming energy E a set of μ and E' of the outgoing neutron are given with the relative probability. μ is sampled first, then E'. This representation can produce a big amount of output data, compared with the previous laws. It is used when the KM is not an efficient representation (e.g. for light elements). In EFF2 is used in Li^7 (MAT 328) and Be^9 (MAT 425) evaluations.

3. Processing the EFF2 library

At the last EFF meeting in Garching (Dec. 1993) we told that of the 74 evaluations which consitute EFF2, 23 were not processed, due mainly to problems related to file 6 treatment.

With NJOY 91.91 these problems look to be solved. NJOY 91.91 has been compiled in double precision on an IBM 9121/440 machine. We use the verb to look, because beneath we received in March 1994 the MCNP 4A version from RSIC of Oak Ridge on cartridge tape for UNIX, to be installed on an IBM workstation, we could not test these new processed evaluations. This will be done after the meeting of Paris, 7-8 June.

Few modifications to NJOY91.91 have been inserted (table1). They concern: machine depending time and date setting, space and minor numeric problems in ACER.

The contents of each sublibrary of EFF2.3 are in table 2 through 5. These tables give for each element : MAT number, identifier for MCNP (ZAID), the origin of the evaluation. Few comments are added. In the choice of ZAID a simple rule has been applied, giving the year in which the evaluation has been processed, in order to remember the version of NJOY used. Elements with identifiers 92C have been processed with NOY91.13, 93C with the 91.38 version and 94C with 91.91. The elements with 94C (having the file 6 special laws) can be used only with the last version 4A of MCNP.

3.1 sublibrary 200

This sublibrary has been completed with the processing of Mn^{55} (MAT 2525), Cu^{63} (MAT 2925), Cu^{65} (MAT 2931), the only three evaluations making use of file 6. For MT=16,22,28,91 a KM distribution for the outgoing neutron is given (MCNP law 44).

In the past we had problems for Ba^{132} (MAT 5631) which was skipped from the EFF2 list, Ba^{130} (MAT 5625), In^{113} (MAT 4925) and In^{115} (MAT 4931), Zr^{nat} (MAT 4000). Little data revision was needed (done by ECN Petten) .

Negative kermas are found somewhere in some energy range for those evaluations for which the energy balance method is applied, due maybe to the inconsistency between neutron and photon data.

3.2 sublibrary 300

There are no new entries compared to the past (no evaluations with file 6). In 1993, data of the ten thin isotopes were modified by ECN Petten to allow the processing with NJOY (performed by means of 91.38 version).

3.3 sublibrary 103

We have 12 new processed evaluations.

Li^7 (MAT 328) and Be^9 (MAT 425), were revised by evaluators and given to us late in 1993. In Li^7 law 67 of MCNP is used for MT 16,24,25,28. In Be^9 the n,2n reaction has been divided by evaluators in two components: MT 16, with an energy dependent neutron yield and law 67, and MT 51 with a costant yield 2 (to be changed by hand in the TYR block, default is 1).

Al^{27} (MAT 1325) and Si^{28} use law 44 (KM) for MT 16,22 and 28.

For Cr^{52} (MAT 2431), Fe^{56} (MAT 2631), Ni^{58} (MAT 2825), Ni^{60} (MAT 2831) evaluations, the introduction of a lumped reaction of outgoing neutrons (MT 10), made by evaluators, gave a complication to the processing, because MT 10 is not recognized by NJOY

91.91 as a standard MT number. First of all, before the processing, following the instructions written in file 1, we have deleted all the redundant reactions, already included in MT10 (like MT 103, 107, 649,849, 91, 11 ...). But, in order to keep reactions 600, 601 ..... 800, 801 ... (excluding the continuum part), we have used special modified modules of RECONR and ACER. These should be used only for the processing of these 4 evaluations using MT 10. Modifications in UPD format are given in table 6. If this procedure were not applied, an incorrect processing would be performed, evident after a carefull examination of the output of ACER. Morover Ni^{58} and Ni^{60} evaluations needed a special file 12, given apart by ECN Petten, for a proper kerma calculation. For all these four evaluations MT 10 has an energy dependent neutron yield and an outgoing neutron distribution described by law 44 (KM).

Ni^{61} (MAT 2834), Ni^{62} (MAT 2837) and Ni^{64} (MAT 2843) have law 44 for MT 16,22,28 and 91.

Pb^{nat} (MAT 8200) has law 44 for MT 16,17 and 91.

3.4 sublibrary 400

This sublibrary has been released in 1993. The new processed evaluations are eight.

D (MAT 128) has the special law 66, as already mentioned, for MT 16.

As regard to He^3 and He^4 (MAT 225 and 228), we had to insert in the original ENDF format evaluations, a very low MT 102 (near to zero), in order to allow the ACER module not to stop. In subroutine UNIONX, infact, ACER is always looking for a capture MT 102 cross section.

The Be^{10} (MAT 525) has been processed as well, together to B^{11} (MAT 528). The latter has law 44 for MT 16,22, 28, 91.

F^{19} (MAT 925), Ar^{36} (MAT 1825) and Ar^{38} (MAT 1831), after a revision by ECN were processed. F^{19} new evaluation was chosen from ENDF/B-VI in place of the older ENDF/B-IV, which gave problems running MCNP with photon generation. Ar^{36} and Ar^{38} needed smaller revision in file 5 MT 22.

4 Conclusion and future work

In table 6 the dictionary of the EFF 2 library for MCNP so produced is shown.

The whole library takes 80 MB, more or less, of memory.

A complete test is going to be performed. For the oldest processed elements (identifier .92C and .93C), a preliminar test has been performed. For the newest (.94C) this should be done in the near future, as alredy said. A more complete report will be written giving also a graphical output of some of the ACE cross sections.

REFERENCES

1) L. Petrizzi "Processing EFF-2.2 with ACER of NJOY91.13 to produce an MCNP library, Status Report" Dec. 1992 (EFF-Doc-198).

2) L. Petrizzi "Processing EFF-2.2 with ACER of NJOY to produce an MCNP library, Status Report" June 1993 (EFF-Doc-236).

3) R.E. Mac Farlane "How to NJOY ENDF-6" International Workshop on NJOY (Evaluated Nuclear Data Processing System) Saclay, France 6-10 April 1992.

4) R.E. Mac Farlane "The NJOY Nuclear Data Processing System, version 91" Manual (draft), 1993.

5) J.F. Briestmeister "MCNP. A General Monte Carlo N-Particle Transport Code" Manual Nov. 1993.

table 1

modifications to NJOY9191 in UPD format

```
*IDENT LPENEA
*/     PER ELIMINARE PROBLEMA TEMPO
*I NJOY.790
      SUBROUTINE GETIDT(HI)
C        PUT THE MACHINE DESIGNATOR, DATE, AND TIME INTO HI
C        IN THE FORM   X MM/DD/YY HH:MM:SS
      CHARACTER HI*19
C
C-----10/1/85--------------------------------------
C-----RADO--BALDI--PILLON---- INSERIMENTO ENEA ----
      CALL DATE(HI)
      DO 1 I=16,9,-1
  1   HI(I+3:I+3)=HI(I:I)
      DO 2 I=8,1,-1
  2   HI(I+1:I+1)=HI(I:I)
      DO 3 I=10,11
  3   HI(I:I)=' '
      HI(1:1)=' '
C
      RETURN
      END
*D IBM.27,34
      CHARACTER*19 HI
      CALL GETIDT(HI)
      HDATE(1:8)=HI(2:9)
*D IBM.37,41
      CHARACTER*19 HI
      CALL GETIDT(HI)
      HTIME(1:8)=HI(12:19)
*D IBM.17
*I ACER.3646
      COMMON/ACE6/SUFF,NOHK,NXTRA
*D ACER.3675
      IF(SUFF.GE.0) ZAID=NINT(ZAID)+SUFF/100.
*/     PER AUMENTARE LA MEMORIA
*D UP25.393
      COMMON/PHOT/NTRP,NF12S,MF12S(250),NF16S,MF16S(250)
*D UP25.395
      COMMON/PHOT/NTRP,NF12S,MF12S(250),NF16S,MF16S(250)
*D UP25.404
      COMMON/PHOT/NTRP,NF12S,MF12S(250),NF16S,MF16S(250)
*D UP25.406
      COMMON/PHOT/NTRP,NF12S,MF12S(250),NF16S,MF16S(250)
*D UP25.413
      COMMON/PHOT/NTRPP,NF12S,MF12S(250),NF16S,MF16S(250)
*D ACER.587
      IF(NF12S.GT.250)
*/     PER ELIMINARE UNDERFLOW IN ACER
*D ACER.2081,2082
C 200 A(L-1+IEXPMU)=A(L-2+IEXPMU)*VARMU
      DO 200 L=2,NEXP
      IF (VARMU.EQ.0..OR.A(L-2+IEXPMU).EQ.0.) THEN
                     A(L-1+IEXPMU)=0.
      ELSE IF (ABS(VARMU).LT.1.E-5.AND.ABS(A(L-2+IEXPMU)).LT.1E-5) THEN
                     A(L-1+IEXPMU)=0.
      ELSE
                A(L-1+IEXPMU)=A(L-2+IEXPMU)*VARMU
      ENDIF
```

```
  200 CONTINUE
*/      PER ELIMINARE SINHX COSHX DIVERGANO IN FNDAR1 X<175 IN IBM
*I UP32.135
      IF(AKAL.GE.87.) AKAL=20.
*/      PER ELIMINARE UNDERFLOW IN CSRMAT DI RECONR
*D RECONR.2424
C 160 AMAG=R(1,1)**2+S(1,1)**2
  160 R11=0.
      S11=0.
      IF(ABS(R(1,1)).GT.1.E-30) R11=ABS(R(1,1))**2.
      IF(ABS(S(1,1)).GT.1.E-30) S11=ABS(S(1,1))**2.
      AMAG=R11+S11
*D RECONR.2433
C     TERMN=GJ*((UNO-U11R)**2+(U11I)**2)
      R11=0.
      S11=0.
      IF(ABS(UNO-U11R).GT.1.E-30) R11=ABS((UNO-U11R))**2.
      IF(ABS(U11I).GT.1.E-30) S11=ABS(U11I)**2.
      TERMN=GJ*(R11+S11)
*/         AUGMENTING THE XSS SIZE
*I ACER.1
§PROCESS DC(XSST)
*D UP25.346
      MAX3=1200000
*D UP25.362
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.364
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.366
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.368
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.370
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.372
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.374
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.376
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.378
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.380
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.382
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.384
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.386
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.388
      COMMON /XSST/ N3,XSS(1200000)
*D UP25.390
      COMMON /XSST/ N3,XSS(1200000)
*I UP68.334
      IF (NEXD.GT.MAX3) CALL ERROR('ACELOD',
     1   'INSUFFICIENT STORAGE LAW-7 DATA',' ')
```

table 2

content of sublibrary 200 of EFF-2, element identifier and processing comments
in *italics* are the new entries in respect to the latest report [ref. 2]

elem.	MAT	ZAID	origin	comments
Ti^{nat}	2200	22000.92c	JENDL-3	O.K.; neg. neutr. kerma .2-11. MeV
V^{nat}	2300	23000.92c	ENDF/B-6	O.K.
Mn^{55}	*2525*	*25055.94c*	*ENDF/B-6*	***MF6** law44 MT16,22,28,91*
Co^{59}	2725	27059.92c	ENDF/B-6	O.K.
Cu^{63}	*2925*	*29063.94c*	*ENDF/B-6*	***MF6**law44 MT16,22,28,91*
Cu^{65}	*2931*	*29065.94c*	*ENDF/B-6*	***MF6** law44 MT16,22,28,91*
Zr^{nat}	4000	40000.93c	JENDL-3	O.K.
Nb^{93}	4125	41093.92c	ENDF/B-6	O.K.,neg. kerma 2.8-12.6 MeV
Mo^{nat}	4200	42000.92c	ENDF/B-6	O.K.,neg. kerma .01-20. MeV; URP
In^{113}	4925	49113.93c	JENDL-3	no γ
In^{115}	4931	49115.93c	JENDL-3	no γ
Ba^{130}	5625	56130.93c	JENDL-3	no γ; URP
Ba^{134}	5637	56134.92c	JEF-2	O.K.; no γ
Ba^{135}	5640	56135.92c	JEF-2	O.K.; no γ
Ba^{136}	5643	56136.92c	JEF-2	O.K.; no γ
Ba^{137}	5646	56137.92c	JEF-2	O.K.; no γ
Ba^{138}	5649	56138.92c	ENDF/B-6	O.K.;neg. neutr. kerma 2.25-9.5 MeV
Ta^{181}	7328	73181.92c	ENDF/B-6	O.K.;neg. neutr. kerma .035-20. MeV; URP

table 3

content of sublibrary 300 of EFF-2, element identifier and processing comments
in *italics* are the new entries in respect to the latest report [ref. 2]

elem.	MAT	ZAID	origin	comments
C^{nat}	600	6000.92c	ENDF/B-6	O.K.
N^{14}	725	7014.92c	ENDF/B-6	O.K.
N^{15}	728	7015.92c	ENDF/B-6	O.K.
O^{16}	825	8016.92c	ENDF/B-6	O.K.
Mg^{nat}	1200	12000.92c	JENDL-3	O.K.; neg. neutr. kerma 1.37-1.57 MeV
P^{31}	1525	15031.92c	ENDF/B-6	O.K.
S^{nat}	1600	16000.92c	ENDF/B-6	O.K.
Ca^{nat}	2000	20000.92c	JENDL-3	O.K.; neg. neutr. kerma .308-1.186 MeV
Sn^{112}	5025	50112.93c	JENDL-3	O.K., no γ; URP
Sn^{114}	5031	50114.93c	JENDL-3	O.K.no γ; URP
Sn^{115}	5034	50115.93c	JENDL-3	O.K.,no γ; URP
Sn^{116}	5037	50116.93c	JENDL-3	O.K.,no γ; URP
Sn^{117}	5040	50117.93c	JENDL-3	O.K.,no γ; URP
Sn^{118}	5043	50118.93c	JENDL-3	O.K.,no γ; URP
Sn^{119}	5046	50119.93c	JENDL-3	O.K.,no γ; URP
Sn^{120}	5049	50120.93c	JENDL-3	O.K.,no γ; URP
Sn^{122}	5055	50122.93c	JENDL-3	O.K.,no γ; URP
Sn^{124}	5061	50124.93c	JENDL-3	O.K.,no γ; URP
W^{nat}	7400	74000.92c	JENDL-3	O.K.,;neg. neutr. kerma .0022-2.87 MeV
Re^{185}	7525	75185.92c	ENDF/B-6	O.K.;no γ production; URP
Re^{187}	7531	75187.92c	ENDF/B-6	O.K.;no γ production; URP

table 4

content of sublibrary 103 of EFF-2, element identifier and processing comments
in *italics* are the new entries in respect to the latest report [ref. 2]

elem.	MAT	ZAID	origin	comments
Li^{7}	*328*	*3007.94c*	*Un. Birm.*	*file 6 law 67 (E,μ,E') for MT 16,24,25,28*
Be^{9}	*425*	*4009.94c*	*Un. Birm.*	*file6 n,2n=MT16+MT51; MT16 variable yield law 67; MT51 (yield 2) law 3*
Al^{27}	*1325*	*13027.94c*	*ENEA Bo*	*file6 law 44 MT 16,22,28*
Si^{28}	*1425*	*14028.94c*	*ENEA Bo*	*file6 law 44 MT 16,22,28*
Cr^{50}	2425	24050.92c	JEF-2	O.K.
Cr^{52}	*2431*	*24052.94c*	*IRK Vienna*	*file6MT10=16+22+28+91+649+849+103+107;eenergy dependent neutron yield; law 44*
Cr^{53}	2434	24053.92c	JEF-2	O.K.
Cr^{54}	2437	24054.92c	JEF-2	O.K.
Fe^{54}	2625	26054.92c	JEF-2	O.K.
Fe^{56}	*2631*	*26056.94c*	*IRK Vienna*	*file6MT10=16+22+28+91+649+849+103+106+107;energy dependent neutron yield;law 44*
Fe^{57}	2634	26057.92c	JEF-2	O.K.
Fe^{58}	2637	26058.92c	JEF-2	O.K.; neg. neutr. kerma .015-.2 MeV;URP
Ni^{58}	*2825*	*28058.94c*	*IRK Vienna*	*file6MT10=16+22+28+91+649+849+103+106+107+108+111+112;energy dependent neutron yield; law 44*
Ni^{59}	2828		ENDF/B-6	no MF4, MF5, MF6
Ni^{60}	*2831*	*28060.94c*	*IRK Vienna*	*file6MT10=16+22+28+91+649+849+106+111+112;energy dependent neutron yield; law 44*
Ni^{61}	*2834*	*28061.94c*	*ENDF/B-6*	*file6MT= 16+28+91 law 44*
Ni^{62}	*2837*	*28062.94c*	*ENDF/B-6*	*file6MT= 16+22+28+91 law 44*
Ni^{64}	*2843*	*28064.94c*	*ENDF/B-6*	*file6MT= 16+22+28+91 law 44*
Pb^{nat}	*8200*	*82000.94c*	*ECN Petten*	*file6MT= 16+17+91 law 44*

table 5

content of sublibrary 400 of EFF-2.3, element identifier and processing comments
in *italics* are the new entries in respect to the latest report [ref. 2]

elem.	MAT	ZAID	origin	comments
H	125	1001.93c	ENDF/B-5	O.K.
D	*128*	*1002.94c*	*ENDF/B-6*	*in file 6 MT16 law 66*
T	131	1003.93c	ENDF/B-4	it was necessary to add MT102=0. to make it pass subroutine UNIONX of ACER
He^3	*225*	*2003.94c*	*ENDF/B-5*	*it was necessary to add MT102=0. to make it pass subroutine UNIONX of ACER; no γ*
He^4	*228*	*2004.94c*	*ENDF/B-6*	" " "
Li^6	325	3006.93c	ENDF/B-5	O.K.
B^{10}	*525*	*5010.94c*	*ENDF/B-6*	
B^{11}	*528*	*5011.94c*	*ENDF/B-6*	*file 6 MT= 16,22,28,91; law 44*
F^{19}	*925*	*9019.94c*	*ENDF/B-6*	*running MCNP some problems in generating photons*
Na^{23}	1125	11023.93c	JENDL-3	O.K.
Cl	1700	17000.93c	ENDF/B-4	O.K.
Ar^{36}	*1825*	*18036.94c*	*RCN-2*	*no γ*
Ar^{38}	*1831*	*18038.94c*	*RCN-2*	*no γ*
Ar^{40}	1837	18040.93c	RCN-2	O.K.; no γ
K	1900	19000.93c	ENDF/B-4	O.K.
Bi^{209}	8325	83209.93c	BRC	O.K.; no γ

table 6

modifications to NJOY9191 in UPD format to process correctly MT 10

```
*IDENT LPMT10
*/      PER PROCESSARE I MATERIALI FE56 MAT 2631 , CR52 MAT 2431
*/                                 NI58 MAT 2825 , NI60 MAT 2831
*D RECONR.1226,1232
*D RECONR.3511
*D RECONR.3514
*D UP25.393
      COMMON/PHOT/NTRP,NF12S,MF12S(500),NF16S,MF16S(500)
*D UP25.395
      COMMON/PHOT/NTRP,NF12S,MF12S(500),NF16S,MF16S(500)
*D UP25.404
      COMMON/PHOT/NTRP,NF12S,MF12S(500),NF16S,MF16S(500)
*D UP25.406
      COMMON/PHOT/NTRP,NF12S,MF12S(500),NF16S,MF16S(500)
*D UP25.413
      COMMON/PHOT/NTRPP,NF12S,MF12S(500),NF16S,MF16S(500)
*D ACER.587
      IF(NF12S.GT.500)
*D ACER.1381
*D ACER.1409
*D ACER.3700
*D ACER.3832
*D UP25.421
CLP   IF (IF12S.EQ.0.AND.IF16S.EQ.0) XSS(IT+J)=XSS(IT+J)+S
      IF (IF12S.EQ.0.AND.IF16S.EQ.0) THEN
            XSS(IH+J)=XSS(IH+J)*XSS(IT+J)
            XSS(IT+J)=XSS(IT+J)+S
            XSS(IH+J)=XSS(IH+J)/XSS(IT+J)
      ENDIF
CLPE
```

table 7

MCNP dictionary for EFF-2.3 library: identifier, atomic mass (in neutron mass) and data handling information

3007.94C	6.955732	EFF231	0	1	1	512150	0	0	2.530E-08
4009.94C	8.934780	EFF231	0	1	128051	176054	0	0	2.530E-08
13027.94C	26.749800	EFF231	0	1	172077	38549	0	0	2.530E-08
14028.94C	27.736600	EFF231	0	1	181727	39957	0	0	2.530E-08
24050.92C	49.516900	EFF231	0	1	191729	96431	0	0	2.530E-08
24052.94C	51.494310	EFF231	0	1	215849	162141	0	0	2.530E-08
24053.92C	52.485400	EFF231	0	1	256397	93679	0	0	2.530E-08
24054.92C	53.475000	EFF231	0	1	279829	54082	0	0	2.530E-08
26054.92C	53.476000	EFF231	0	1	293362	95030	0	0	2.530E-08
26056.94C	55.454430	EFF231	0	1	317132	200647	0	0	2.530E-08
26057.92C	56.446000	EFF231	0	1	367306	112029	0	0	2.530E-08
26058.92C	57.436000	EFF231	0	1	395326	70976	0	0	2.530E-08
28058.94C	57.438000	EFF231	0	1	413082	181174	0	0	2.530E-08
28060.94C	59.416000	EFF231	0	1	458388	157432	0	0	2.530E-08
28061.94C	60.408000	EFF231	0	1	497758	86045	0	0	2.530E-08
28062.94C	61.396000	EFF231	0	1	519282	70398	0	0	2.530E-08
28064.94C	63.379000	EFF231	0	1	536894	57570	0	0	2.530E-08
82000.94C	205.430000	4FF231	0	1	551299	96992	0	0	2.530E-08
22000.92C	47.481800	EFF232	0	1	1	67223	0	0	2.5300E-08
23000.92C	50.504000	EFF232	0	1	16819	128227	0	0	2.5300E-08
25055.94C	54.466100	EFF232	0	1	48888	166325	0	0	2.5300E-08
27059.92C	58.426900	EFF232	0	1	90482	126097	0	0	2.5300E-08
29063.94C	62.389000	EFF232	0	1	122019	104045	0	0	2.5300E-08
29065.94C	64.370000	EFF232	0	1	148043	88230	0	0	2.5300E-08
40000.93C	90.440300	EFF232	0	1	170113	37633	0	0	2.5300E-08
41093.92C	92.105100	EFF232	0	1	179534	70155	0	0	2.5300E-08
42000.92C	95.116000	EFF232	0	1	197085	21453	0	0	2.5300E-08
56130.93C	128.790000	EFF232	0	1	202461	44990	0	0	2.5300E-08
49113.93C	111.934000	EFF232	0	1	213721	44479	0	0	2.5300E-08
49115.93C	113.917000	EFF232	0	1	224853	46880	0	0	2.5300E-08
56134.92C	132.754000	EFF232	0	1	236585	12069	0	0	2.5300E-08
56135.92C	133.747000	EFF232	0	1	239615	12671	0	0	2.5300E-08
56136.92C	134.737000	EFF232	0	1	242795	7558	0	0	2.5300E-08
56137.92C	135.729000	EFF232	0	1	244697	11043	0	0	2.5300E-08
56138.92C	136.715000	EFF232	0	1	247470	7711	0	0	2.5300E-08
73181.92C	179.400000	EFF232	0	1	249410	37419	0	0	2.5300E-08
6000.92C	11.898000	EFF233	0	1	1	23699	0	0	2.5300E-08
7014.92C	13.882780	EFF233	0	1	5938	63364	0	0	2.5300E-08
7015.92C	14.871000	EFF233	0	1	21791	25817	0	0	2.5300E-08
8016.92C	15.853160	EFF233	0	1	28258	66044	0	0	2.5300E-08
12000.92C	24.096300	EFF233	0	1	44781	50124	0	0	2.5300E-08
15031.92C	30.708000	EFF233	0	1	57324	7051	0	0	2.5300E-08
16000.92C	31.788200	EFF233	0	1	59099	94608	0	0	2.5300E-08
20000.92C	39.731900	EFF233	0	1	82763	96105	0	0	2.5300E-08
50112.93C	110.944000	EFF233	0	1	106802	32337	0	0	2.5300E-08
50114.93C	112.925000	EFF233	0	1	114899	32809	0	0	2.5300E-08
50115.93C	113.916000	EFF233	0	1	123114	24525	0	0	2.5300E-08
50116.93C	114.906000	EFF233	0	1	129258	22767	0	0	2.5300E-08
50117.93C	115.899000	EFF233	0	1	134962	39943	0	0	2.5300E-08
50118.93C	116.889000	EFF233	0	1	144960	27456	0	0	2.5300E-08
50119.93C	117.882000	EFF233	0	1	151836	29252	0	0	2.5300E-08
50120.93C	118.872000	EFF233	0	1	159161	44999	0	0	2.5300E-08
50122.93C	120.856000	EFF233	0	1	170423	29325	0	0	2.5300E-08
50124.93C	122.841000	EFF233	0	1	177767	24766	0	0	2.5300E-08
74000.92C	182.269000	EFF233	0	1	183971	109149	0	0	2.5300E-08
74182.92C	180.390000	EFF233	0	1	211271	60739	0	0	2.5300E-08
74183.92C	181.380000	EFF233	0	1	226468	45553	0	0	2.5300E-08
74184.92C	182.370000	EFF233	0	1	237869	50951	0	0	2.5300E-08

74186.92C	184.360000	EFF233	0	1	250619	51748	0	0	2.5300E-08
75185.92C	183.364000	EFF233	0	1	263568	37515	0	0	2.5300E-08
75187.92C	185.350000	EFF233	0	1	272959	38111	0	0	2.5300E-08
1001.93C	0.999170	EFF234	0	1	1	2336	0	0	2.530E-08
1002.94C	1.996800	EFF234	0	1	597	2431	0	0	2.530E-08
1003.93C	2.990140	EFF234	0	1	1217	3072	0	0	2.530E-08
2003.94C	2.990100	EFF234	0	1	1997	2000	0	0	2.530E-08
2004.94C	4.001500	EFF234	0	1	2509	3263	0	0	2.530E-08
3006.93C	5.963400	EFF234	0	1	3337	10559	0	0	2.530E-08
5010.94C	9.926920	EFF234	0	1	5989	20442	0	0	2.530E-08
5011.94C	10.914700	EFF234	0	1	11112	109417	0	0	2.530E-08
9019.94C	18.835000	EFF234	0	1	38479	52632	0	0	2.530E-08
11023.93C	22.792300	EFF234	0	1	51649	49551	0	0	2.530E-08
17000.93C	35.148000	EFF234	0	1	64049	33781	0	0	2.530E-08
18036.94C	35.658500	EFF234	0	1	72507	5278	0	0	2.530E-08
18038.94C	37.636600	EFF234	0	1	73839	4725	0	0	2.530E-08
18040.93C	39.619300	EFF234	0	1	75033	14032	0	0	2.530E-08
19000.93C	38.766000	EFF234	0	1	78553	19631	0	0	2.530E-08
83209.93C	207.185000	EFF234	0	1	83473	72995	0	0	2.530E-08