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IRDF-2002.1

Corrections to the IRDF-2002 Dosimetry Cross-Section Library (Covariance Processing Verification)

Prepared by

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October 2012

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Abstract
A patch for the NJOY data processing system was prepared to enable the correct processing of covariances stored in ENDF File 40, as used in IRDF-2002. This patch has now been included in the official NJOY processing system, release NJOY99.336.

A number of minor corrections were also required to the File 40 covariances in nine evaluations included in IRDF-2002. These corrected pointwise cross section files, designated as IRDF-2002.1, are available from the IAEA website: http://www-nds.iaea.org/irdf2002/.

October 2012

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Appendices

1. Introduction

The IRDF-2002 library [1] containing cross sections for dosimetry was released by the IAEA in 2005. Every effort was made to ensure the library conformed strictly to the ENDF-6 formatting rules [2], but unfortunately the status of the main cross-section processing system NJOY [3] was not capable of handling covariances of partial cross-sections for the excitation of metastable states (i.e. File 40 (MF=40) in ENDF terminology). A set of updates were created to remove this deficiency in NJOY, and these have now been included in the official version NJOY99.336. These updates are listed in Appendix 1. They were originally made available through the OECD/NEA for the benefit of the broader users' community prior to their subsequent acceptance and incorporation into the official distribution of NJOY by the author.

In addition, a few inconsistencies were encountered in the covariance data representation (File 40) of nine evaluations included in the IRDF-2002 library (22-Ti-047, 22-Ti-048, 22-Ti-049, 41-Nb-093, 45-Rh-103, 47-Ag-109, 82-Pb-204, 80-Hg-199, 49-In-115). The ENDF-6 manual did not specify that the IZAP parameter should be specified in File 40 (equivalent to the same parameter in File 10). A change to the manual was approved at the CSEWG Meeting in November 2009 [4]. Without this parameter it is not possible to match the cross sections with the covariances unambiguously when, for example, the data set under MT 5 is identified by the residual product IZAP and its final state LFS. In principle, the content of the IRDF-2002 library is not ambiguous because there is never more than one covariance set for MT 5, but for the sake of consistency and to allow the library to be processed, the list of changes made in the IRDF 2002 library are listed in Appendix 2.

2. Procedures

A batch procedure was prepared to generate NJOY inputs automatically. Group constants in three energy groups were generated with the GROUPR module for cross sections in File 3 and File 10 separately. The energy-group boundaries are given in Table 1. The same generic input was used for all materials, as shown in Appendix 3, with only the MAT number changed as necessary, except for 47-Ag-109 where a number of lines of input needed to be removed (or "commented out") and two additional test lines inserted, as shown in Appendix 4.

Table 1: Energy-group boundaries

Energy	E_{low}	E_{high}
Thermal	10^{-4} eV	0.55 eV
Resonance	0.55 eV	2.0 MeV
Fission & Fusion	2.0 MeV	20 MeV

The three-group covariance matrices were generated with the ERRORR module for covariance data in File 33 and File 40 separately. A small local code GNTOEN for converting ERRORR output into ENDF-6 format was executed. The MERGER code of the PREPRO series [5] was used to combine the two parts together. The ENDF files were then merged into a single file. An ad hoc code ENDDX was used to extract and/or calculate the (i) Westcott g-factor weighted cross section of the group 1 cross section ($2\sigma_1/\sqrt{\pi}$), (ii) the resonance integral across group 2 ($\sigma_2.\ln(E_{high}/E_{low})$) and (iii) the cross section of group 3, σ_3, all with relative uncertainties. The results are given in Appendix 5.

For verification purposes the same procedure was employed, but the source IRDF-2002 file was processed with the SUMF10 code from the ENDVER package [6] to convert File 10 into File 3 equivalent (neglecting the fact that the cross sections are only partial cross sections). Similarly, covariances in File 40 were converted into File 33 equivalent with another ad hoc code MF40TO33. The resulting file could be processed without the new features in the ERRORR module of NJOY. By comparing results generated from the summary table to that in Appendix 5 it was confirmed that the results were identical.

3. Conclusions

A patch for the NJOY data processing system was prepared to enable processing of covariances stored in ENDF File 40. This was necessary for processing dosimetry libraries such as IRDF-2002 and activation libraries that may also include covariance information. Extensive testing confirmed that the IRDF-2002 dosimetry library can be processed correctly with this patch. This patch has now been included in the official NJOY processing system, release NJOY99.336. Additional testing of this new feature in NJOY would be welcomed when more elaborate evaluated data files become available.

A number of very minor corrections were also made to the File 40 covariances in nine evaluations included in IRDF-2002. These corrected pointwise cross section files have been included into an updated library, designated as IRDF-2002.1, available from the IAEA website: http://www-nds.iaea.org/irdf2002/.

It should be noted that no updates to the processed ACE and groupwise files are required, owing to their representation of covariances.

References

[1] O. Bersillon, L.R. Greenwood, P.J. Griffin. W. Mannhart, H.J. Nolthenius, R. Paviotti-Corcuera, K.I. Zolotarev, E.M. Zsolnay, P.K. McLaughlin, A. Trkov, *International Reactor Dosimetry File 2002 (IRDF-2002)*, IAEA Technical Reports Series No. 452, IAEA, Vienna, Austria, (2006).

[2] M. Herman and A. Trkov, *ENDF-6 Formats Manual - Data Formats and Procedures for the Evaluated Nuclear Data File, ENDF/B-VI and ENDF/B-VII*, CSEWG Document ENDF-102: BNL-90365-2009, Brookhaven National Laboratory (2009).

[3] R.E. MacFarlane and D.W. Muir, *The NJOY nuclear data processing system*, LA-12740-M, Los Alamos National Laboratory, (1994); RSICC Code Package PSR-368, (1999).

[4] M. Herman, *CSEWG-USNDP Annual Meetings 2009*, Brookhaven National Laboratory p. 28 (2009).
Available from http://www.nndc.bnl.gov/meetings/csewg2009/.

[5] D.E. Cullen, *PREPRO 2007 ENDF/B Pre-processing Codes*, INDC(NDS)-39, International Atomic Energy Agency (2001).
Available from http://www-nds.iaea.org/ndspub/endf/prepro/.

[6] A. Trkov, *ENDVER (Version 2001-8) The ENDF File Verification Support Package*, INDC(NDS)-77, International Atomic Energy Agency (2001).
Available from http://www-nds.iaea.org/ndspub/endf/endver/.

Updates made to NJOY99.304

(Now included in NJOY99.336)

```
*/
*ident upnea062
*/ errorr  A. Trkov, Jan-2010
*/      1. Add MF40 processing capability
*/         WARNING:
*/         The coding was tested on the IRDF-2002 dosimetry library.
*/         If mfcov=40, the GENDF file must contain procesed mf=10 data.
*/         The procedure was tested a single LFS state in MF10
*/         and a single covariance set for that state in MF40.
*/         There may be more final states (e.g. in an activation library)
*/         but there are no suitable examples for testing.
*/      2. Change of convention in GENDF files generated by ERRORR
*/         Originally the C1 and C3 records were zero. For consistency
*/         with GENDF files produced by groupr, C1 was set to ZA and C2
*/         to 10*ZAP+LFS. This allows picking proper group data for MF40
*/         covariance processing.
*/      3. Correction of a trivial typing error correction in up307
*/         (statement beyond column 72)
*/
*/         NOTE: All testing was done with group data on ngout present.
*/               Further modifications might be needed if group data are
*/               to be generated internally.
*/
*d errorj.122
c     *    mfcov   endf covariance file (31, 33, 34, 35 or 40) to be   *
*i up272.28
     & ,mzap(80),lfs
*i up272.37
     & ,mzap(80),lfs
*i up272.50
     & ,mzap(80),lfs
*i up272.69
     & ,mzap(80),lfs
*i up272.73
     & ,mzap(80),lfs
*i up272.102
     & ,mzap(80),lfs
*i up272.108
     & ,mzap(80),lfs
*i up272.110
     & ,mzap(80),lfs
      common/temper/tempin
*i up272.141
     & ,mzap(80),lfs
*i up272.178
     & ,mzap(80),lfs
*i up272.181
     & ,mzap(80),lfs
*i up272.185
     & ,mzap(80),lfs
*i up272.187
     & ,mzap(80),lfs
*i up272.189
     & ,mzap(80),lfs
*i up272.191
     & ,mzap(80),lfs
*i up272.193
     & ,mzap(80),lfs
*i up272.216
     & ,mzap(80),lfs
*i up272.222
```

```
     & ,mzap(80),lfs
*i up272.230
     & ,mzap(80),lfs
*i up272.236
     & ,mzap(80),lfs
*d errorj.424,425
         if(mfcov.ne.31.and.mfcov.ne.33.and.
     &      mfcov.ne.34.and.mfcov.ne.35.and.
     &      mfcov.ne.40) then
*i errorj.620
c
c     *** check if relevant covariance data are available
      nd=nw/6
      icov=0
      do i=1,nd
        mfi=nint(a(idict+2+(i-1)*6))
        if(mfcov.eq.30 .and. (mfi.ge.30 .and. mfi.le.33)) icov=icov+1
        if(mfcov.eq.31 .and.  mfi.eq.31)                  icov=icov+1
        if(mfcov.eq.32 .and.  mfi.eq.32)                  icov=icov+1
        if(mfcov.eq.33 .and. (mfi.eq.32 .or.  mfi.eq.33)) icov=icov+1
        if(mfcov.eq.34 .and.  mfi.eq.34)                  icov=icov+1
        if(mfcov.eq.35 .and.  mfi.eq.35)                  icov=icov+1
        if(mfcov.eq.40 .and.  mfi.eq.40)                  icov=icov+1
      end do
      if(icov.eq.0) then
         write(strng,'(''no data on file for mfcov='',i3)') mfcov
         call mess('errorr',strng,'processing terminated')
c        -- skip remaining errorr input (if any)
         if (ign.eq.1.or.ign.eq.19) then
            read(nsysi,*) ng
            ngp=ng+1
            read(nsysi,*) (dmy,i=1,ngp)
         end if
         go to 330
      end if
*i errorj.685
  330 continue
*i errorj.816
      if (iverf.eq.4) then
         nl=l2h
      else
         nl=n2h
      end if
      izap=0
*d errorj.821,824
      elseif (mfcov.eq.40) then
         za=c1h
         awr=c2h
         nl=n1h
         call contio(nendf,0,0,a(iscr),nb,nw)
         izap=10*l1h+l2h
*i errorj.1480
      else if (mfcov.eq.40) then
         call sigc(ngn,a(isum),a(icflx),a(iscr),a(iun),a(iflx),a(isig))
*i errorj.1566
         izap=mzap(ix)
*d errorj.1576
            a(iscr+1)=izap
*d errorj.1590
         a(iscr+1)=izap
*d errorj.1873
               if (mfcov.eq.31.or.mfcov.eq.33.or.mfcov.eq.35.or.
     &             mfcov.eq.40) then
*i errorj.3793
         nfs =1
*i errorj.3795
         nfs =1
         if(mfcov.eq.40) then
```

```
           nfs=n1h
           nsub=1
           call contio(nendf,0,0,a(iscr),nb,nw)
           lfs=l2h
           izap=10*l1h+l2h
         end if
*i errorj.3815
      mzap(nmt)=izap
*i errorj.3831
      do 310 ilfs=1,nfs
*i errorj.3978
  310 continue
*i errorj.1875
                  if (mfcov.eq.40) write(nsyso,38)lfs
c...              if (mfcov.eq.40) write(nsyso,38)lfs/10,lfs-10*(lfs/10)
*i errorj.2126
   38 format(' final metastable state lfs',i3/)
c..38 format(' final metastable state zap,lfs',i6,i3/)
*/
*/ search gout tape by product identifier
*d errorj.2985
      subroutine rdgout(ngout,matd,mfd,mti,izap,b,sig)
*i errorj.3076
      jzap=0
      if(izap.ne.0) jzap=c2h+0.01
*d errorj.3078
      if (mf.eq.mfd.and.mt.eq.mtd.and.jzap.eq.izap) go to 230
*d errorj.5320
      subroutine rdsig(mat,mt,izap,b,sig)
*i errorj.5329
      izero=0
*d errorj.5342
           call rdgout(ngout,matrd,mfri,mtri,izero,b,sig)
*d errorj.5345
         call rdgout(ngout,matrd,mfrd,mtrd,izap,b,sig)
*i errorj.734
      izero=0
*d errorj.752
      call rdgout(ngout,matd,mfd,mtd,izero,a(ib),a(iegt))
*d errorj.784
      call rdgout(ngout,matd,mfd,mtd,izero,a(ib),a(iflx))
*d errorj.786
      call rdsig(matd,izero,izero,a(ib),a(iscr))
*d errorj.874
         call rdsig(mat,mt,izap,a(ib),a(isig))
*d errorj.986
           if (mt1.lt.851) call rdsig(mat1,mt1,izero,a(ib),a(isig1))
*i errorj.3142
      izero=0
*d errorj.3220
           call rdsig(mats(ix),mtd,izero,b,a(isg))
*d errorj.3226
  250    call rdsig(mats(ix),mts(ix),mzap(ix),b,sig)
*d errorj.3243,3244
         b(1)=za
         b(2)=mzap(ix)
*i errorj.5217
      izero=0
*d errorj.5246
         call rdsig(matd,mtd,izero,a(ib),a(iscr2))
*i errorj.7604
      izero=0
*d errorj.7617
  200 call rdsig(matd,mt1,izero,b,sig)
*d errorj.7628
      call rdsig(matd,mt2,izero,b,sig)
*i errorj.7782
      izero=0
```

```
*d errorj.7841
      call rdsig(mat,mt,izero,b,sig)
*/
*/ add tmeperature to the output tape
*i errorj.3134
      common/temper/tempin
*d errorj.3163
        b(1)=tempin
*i errorj.3520
      tempin=c1h
*/
*/ prevent printing "undefined" cross sections and covariances
*d errorj.1921
*i errorj.1922,1924
                     if(denom.gt.zero) then
                        denom=max(denom,eps)
                        a(iscr+ibase+ip-1)=a(iscr+ibase+ip-1)/denom*
     &                         (egn(ig+1)-egn(ig))*(egn(igp+1)-egn(igp))
                     else
                        a(iscr+ibase+ip-1)=0
                     end if
*d errorj.1926
                     if(denom.gt.zero) then
                        denom=max(denom,eps)
                        a(iscr+ibase+ip-1)=a(iscr+ibase+ip-1)/denom
                     else
                        a(iscr+ibase+ip-1)=0
                     end if
*d errorj.3235
            ff=cflx(ig)
            if(ff.gt.0) then
              csig(ig,ix)=csig(ig,ix)/ff
            else
              csig(ig,ix)=0
            end if
*/
*/ fix record overflow beyond column-72
*/*d up307.6,7
*/                if(irelco.eq.0)write(nsyso,40)mt,mats(ixp),mts(ixp),time
*/                if(irelco.eq.1)write(nsyso,45)mt,mats(ixp),mts(ixp),time
*/
*ident upnea063
*/ reconr  A. Trkov, November 2009
*/         When no MF3 data present (e.g. dosimetry library with MF10)
*/         make sure that the group structure (MF3 MT1)
*/         is written with zero cross sections and that N1, N2
*/         parameters from the CONT record are transferred consistently.
*i reconr.4560
      ns1=n1h
      nr1=n2h
*i reconr.4561
      mf1=mfh
      mfh=3
*i reconr.4623
      mfh=mf1
*i reconr.4635
      ns1=n1h
      nr1=n2h
      mf1=mfh
*i reconr.4617
      if(mfh.ne.mf1) call afend(nout,0)
*d reconr.4655,4656
      a(iscr+4)=ns1
      a(iscr+5)=nr1
      mfh=mf1
```

Corrections made to the IRDF-2002 library, included in IRDF-2002.1

22-Ti-047

```
MF40 MT   5 NS2 should be: IZAP=21046, LFS=0
```

22-Ti-048

```
MF40 MT   5 NS2 should be: IZAP=21047, LFS=0
```

22-Ti-049

```
MF40 MT   5 NS2 should be: IZAP=21048, LFS=0
```

41-Nb-093

```
MF40 MT   4 NS2 should be: IZAP=41093, LFS=0
MF40 MT  16 NS2 should be: IZAP=41092, LFS=0
```

45-Rh-103

```
MF40 MT   4 NS2 should be: IZAP=45103, LFS=0
```

47-Ag-109

```
MF40 MT 102 NS2 should be: IZAP=47110, LFS=2
```

49-In-115

```
MF40 MT   4 NS2 should be: IZAP=49115, LFS=0
MF40 MT  16 NS2 should be: IZAP=49114, LFS=1
MF40 MT 102 NS2 should be: IZAP=49116, LFS=1
```

80-Hg-199

```
MF40 MT   4 NS2 should be: IZAP=80199, LFS=0
```

82-Pb-204

```
MF40 MT   4 NS2 should be: IZAP=82204, LFS=0
```

Generic NJOY input

```
moder / Extract/convert neutron evaluated data
1 -21
'95-Am-241 from IRDF-2002'/
20 9543
0/
moder / Make an ASCII copy for test purposes
-21 41 /
reconr / Reconstruct XS for neutrons
 41  42
'PENDF for 95-Am-241'/
9543 2/
0.001 0. 0.003/
'95-Am-241 from IRDF-2002'/
'Processed with NJOY99.304+/
0/
broadr / Doppler broaden XS
 41  42  43
9543 1 0 0 0./
0.001 2.0e6 0.003/
300.
0/
groupr / Spectrum averaged cross sections
 41  43 0 38 /
 9543 15 0 4 0 1 1 1 /
'95-Am-241 from IRDF-2002 with NJOY99.304+/
 300. /
 1.e10 /
0.25 0.0253 2.0e6 1.35e6
 3 /
 0/
 0/
errorr / Spectrum averaged cross sections
 41  43 38 48/
 9543 1 4 1 1 /
 0 33 /
 3 /
 1.e-4 0.55 2.0e6 20.e6 /
0.25 0.0253 2.0e6 1.35e6
groupr / Spectrum averaged cross sections
 41  43 0 39 /
 9543 15 0 4 0 1 1 1 /
'95-Am-241 from IRDF-2002 with NJOY99.304+/
 300. /
 1.e10 /
0.25 0.0253 2.0e6 1.35e6
 10 /
 0/
 0/
errorr / Spectrum averaged cross sections
 41  43 39 49/
 9543 1 4 1 1 /
 0 40 /
 3 /
 1.e-4 0.55 2.0e6 20.e6 /
0.25 0.0253 2.0e6 1.35e6
stop
```

47-Ag-109 specific NJOY input

```
moder / Extract/convert neutron evaluated data
1 -21
'47-Ag-109 from IRDF-2002'/
20 4731
0/
moder / Make an ASCII copy for test purposes
-21 41 /
moder / These two extra lines required to allow processing 47-Ag-109
-21 43 /
-- reconr / Reconstruct resonance XS for neutrons
--  41  42
-- 'PENDF for 47-Ag-109'/
-- 4731 2/
-- 0.001 0. 0.003/
-- '47-Ag-109 from IRDF-2002'/
-- 'Processed with NJOY99.360+'/
-- 0/
-- broadr / Doppler broaden XS
--  41  42  43
-- 4731 1 0 0 0./
-- 0.001 2.0e6 0.003/
-- 300.
-- 0/
groupr / Spectrum averaged cross sections
 41  43 0 38 /
 4731 15 0 4 0 1 1 1 /
'47-Ag-109 from IRDF-2002 with NJOY99.360+'/
 300. /
 1.e10 /
0.25 0.0253 2.0e6 1.35e6
 3 /
 0/
 0/
errorr / Spectrum averaged cross sections
 41  43 38 48/
 4731 1 4 1 1 /
 0 33 /
 3 /
 1.e-4 0.55 2.0e6 20.e6 /
0.25 0.0253 2.0e6 1.35e6
groupr / Spectrum averaged cross sections
 41  43 0 39 /
 4731 15 0 4 0 1 1 1 /
'47-Ag-109 from IRDF-2002 with NJOY99.360+'/
 300. /
 1.e10 /
0.25 0.0253 2.0e6 1.35e6
 10 /
 0/
 0/
errorr / Spectrum averaged cross sections
 41  43 39 49/
 4731 1 4 1 1 /
 0 40 /
 3 /
 1.e-4 0.55 2.0e6 20.e6 /
0.25 0.0253 2.0e6 1.35e6
stop
```

<- These lines are "commented out" compared to the generic NJOY input file

Three-group average cross sections with uncertainties from IRDF 2002

```
ENDDX - List group x.s. & uncertainties
 ======================================

 Source cross-section filename        : IRDF-2002.end


 Elo               1.000E-04       5.500E-01       2.000E+06
 Ehi               5.500E-01       2.000E+06       2.000E+07

   MAT MT  ZAP/LFS g*Sig_0  dSig_0      RI     dRI Cross-sect.gr 3
                   [barns]     [%] [barns]     [%] [barns]     [%]
  3006 105       0 9.393E+02  0.14 4.054E+02  0.14 1.466E-01  2.96

  5010 107       0 3.832E+03  0.16 1.644E+03  0.16 2.876E-01 12.26

  9019  16       0 0.000E+00       0.000E+00       1.189E-02  2.96

 11023  16       0 0.000E+00       0.000E+00       1.614E-05  1.20
 11023 102       0 5.271E-01  2.00 3.052E-01  3.00 1.728E-04 17.48

 12024 103       0 0.000E+00       0.000E+00       2.942E-02  2.26

 13027 103       0 0.000E+00       4.344E-06 22.41 1.110E-02  2.07
 13027 107       0 0.000E+00       0.000E+00       2.265E-03  1.36

 15031 103       0 0.000E+00       2.372E-02  9.02 6.960E-02  3.51

 16032 103       0 0.000E+00       2.179E-02 12.48 1.617E-01  3.60

 21045 102       0 2.715E+01  2.79 1.132E+01  1.57 1.488E-03 12.68

 22046  16       0 0.000E+00       0.000E+00       2.384E-05  4.41
 22046 103       0 0.000E+00       0.000E+00       3.312E-02  3.08

 22047 103       0 0.000E+00       5.010E-02  3.04 4.150E-02  3.97
 22047   5  210460 0.000E+00       0.000E+00       9.296E-04  7.96

 22048 103       0 0.000E+00       0.000E+00       1.936E-03  5.14
 22048   5  210470 0.000E+00       0.000E+00       3.704E-04  8.36

 23051 107       0 0.000E+00       0.000E+00       8.213E-05  3.08
```

24052	16	0	0.000E+00		0.000E+00		1.740E-01	2.71
25055	102	0	1.339E+01	6.49	1.148E+01	5.28	1.428E-03	17.00
26054	16	0	0.000E+00		0.000E+00		6.399E-06	4.93
26054	103	0	0.000E+00		4.393E-02	7.84	2.006E-01	2.10
26054	107	0	0.000E+00		0.000E+00		2.469E-03	3.22
26056	103	0	0.000E+00		0.000E+00		5.572E-03	2.62
26058	102	0	1.298E+00	12.58	1.329E+00	8.87	8.845E-04	6.04
27059	1	0	4.398E+01	0.40	8.670E+02	0.40	2.000E+00	0.42
27059	16	0	0.000E+00		0.000E+00		8.411E-04	2.74
27059	102	0	3.711E+01	0.65	7.502E+01	0.77	2.088E-03	8.43
27059	107	0	0.000E+00		1.074E-08	96.28	4.847E-04	3.62
28058	16	0	0.000E+00		0.000E+00		1.752E-05	2.73
28058	103	0	0.000E+00		8.408E-02	3.56	2.627E-01	1.76
28060	103	0	0.000E+00		0.000E+00		8.446E-03	10.17
29063	16	0	0.000E+00		0.000E+00		4.016E-04	4.27
29063	102	0	4.460E+00	4.12	4.886E+00	3.88	5.394E-03	9.08
29063	107	0	0.000E+00		0.000E+00		1.542E-03	2.84
29065	16	0	0.000E+00		0.000E+00		2.730E-01	1.86
30064	103	0	0.000E+00		1.161E-02	7.13	9.629E-02	4.87
33075	16	0	0.000E+00		0.000E+00		3.061E-01	5.90
39089	16	0	0.000E+00		0.000E+00		4.124E-01	1.42
40090	16	0	0.000E+00		0.000E+00		3.723E-01	1.58
41093	1	0	8.302E+00	1.60	1.176E+02	1.36	2.150E+00	0.47
41093	2	0	7.147E+00		1.077E+02	1.92	2.144E+00	2.98
41093	102	0	1.155E+00	10.00	9.891E+00	9.83	6.211E-03	14.64
41093	4	410930	0.000E+00		3.848E-01	4.43	2.432E-01	2.74
41093	16	410920	0.000E+00		0.000E+00		1.598E-03	1.04

47109	102	471102	4.243E+00	5.10	6.840E+01	6.96	2.742E-03	30.41
53127	16	0	0.000E+00		0.000E+00		5.184E-01	0.58
57139	102	0	9.008E+00	3.85	1.192E+01	5.55	4.060E-03	6.67
59141	16	0	0.000E+00		0.000E+00		5.378E-01	11.32
69169	16	0	0.000E+00		0.000E+00		6.626E-01	2.29
73181	102	0	2.070E+01	3.00	6.595E+02	3.79	2.575E-02	7.95
74186	102	0	3.845E+01	2.29	4.762E+02	3.33	1.505E-02	7.74
79197	1	0	1.068E+02		1.953E+03	0.03	4.362E+00	0.38
79197	16	0	0.000E+00		0.000E+00		1.210E-02	4.23
79197	102	0	9.905E+01	0.14	1.560E+03	0.17	2.340E-02	7.35
90232	18	0	0.000E+00		3.694E-02	5.51	1.456E-01	5.14
90232	102	0	7.374E+00	4.03	8.580E+01	10.92	3.058E-02	20.62
92235	18	0	5.697E+02	0.19	2.652E+02	0.27	1.213E+00	0.38
92238	18	0	1.177E-05	25.04	1.758E-01	3.54	5.706E-01	1.91
92238	102	0	2.718E+00	1.35	2.780E+02	1.24	1.955E-02	6.89
93237	18	0	2.119E-02	10.00	2.618E+00	3.81	1.654E+00	1.87
94239	18	0	7.912E+02	0.67	2.817E+02	4.16	1.878E+00	2.09
95241	18	0	3.085E+00	2.00	8.652E+00	1.73	1.876E+00	3.01

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