INTERNATIONAL ATOMIC ENERGY AGENCY
NUCLEAR DATA SERVICES
DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA SECTION

IAEA-NDS-212
17 January 2005

THE SIGACE PACKAGE FOR GENERATING HIGH TEMPERATURE ACE FILES – USER MANUAL

prepared by

Amit R.Sharma
Institute for Plasma Research,
Bhat, Gandhinagar-382428, Gujarat India

S. Ganesan
Reactor Physics Design, Bhabha Atomic Research Center
Mumbai-40085, India

A. Trkov
Nuclear Data Section, International Atomic Energy Agency
A-1400 Vienna, Austria

Nuclear Data Section
International Atomic Energy Agency
P.O. Box 100
A-1400 Vienna
Austria

e-mail: services@iaeand.iaea.org
fax: (43-1)26007
telephone: (43-1)2600-21710
web: http://www-nds.iaea.org

The SIGACE package for
Generating High TemperatureNeutron Source Reactions
ACE files – USER MANUAL

Introduction:

A code package named SIGACE has been developed as a tool for MCNP users within the scope of a research contract awarded by the Nuclear Data Section of the International Atomic Energy Agency (IAEA) (Ref: 302-F4-IND-11566 B5-IND-29641). A new recipe has been evolved for generating high temperature ACE files for use with the MCNP code. Under this scheme the low temperature ACE file is first converted to ENDF formatted file using ACELST code and then Doppler broadened, essentially limited to the data in the resolved resonance region, to any desired higher temperature using SIGMA1. The SIGACE code then generates a high temperature ACE file for use with the MCNP code. A thinning routine has also been introduced in the SIGACE code for reducing the size of the ACE files. The SIGACE code which has been tested with several FENDL/MC files is available, free of cost, upon request, from the Nuclear Data Section of the IAEA.

This brief write-up provides instructions for the installation of the package and a help manual to the users of the SIGACE package. All users are encouraged to send their feedback and suggestions to the IAEA Nuclear Data Section (A. Trkov).

Instructions for installing the SIGACE package on Windows operating system of your computer:

1. Please copy the executable file **ACEDOP.EXE**, **Install.bat** and **Readme.doc** on your hard disk.
2. Execute the **Install.bat** batch script either by double clicking on the file icon from windows folder or by executing the file from the DOS prompt.
3. The file should self-extract to generate a folder '**ACEDOP**' in the present working directory.
4. Under the folder 'ACEDOP' you should see the following folders
    a. **Bin** (Compiled source code)
    b. **Flib** (Source code)
    c. **Test** (Five test cases)
        i. **1** (Test run for ^{239}Pu)
        ii. **2** (Test run for ^{27}Al)
        iii. **3** (Test run for ^{54} Fe)
        iv. **4** (Test run for ^{28}Si)
        v. **5** (Test run for ^{208}Pb)
    d. **PLOT** (COMPLOT - EVALPLOT)
    e. **Docs** (Documentation, progress reports and publications)
    f. Apart from these folders you should see five batch files to run the five test cases.

Package Contents:

Brief description of the folder and its contents

1. The folder '**Flib**' contains the source code of the ACELST, SIGMA1 and SIGACE code.
2. The folder '**bin**' contains the executable of ACELST, SIGACE and SIGMA1 codes.
3. The folder COMPLOT - EVALPLOT contains the executable of COMPLOT and EVALPLOT. This is included for the sake of completeness and to display the output of the test runs.
4. '**Test**' folder has **1, 2, 3, 4 and 5** as the sub-folder that contains the test input files.

To run the test cases execute the **test1.bat** file under the folder 'ACEDOP'. This should run the complete package and generate output that can be viewed through COMPLOT.

Steps involved in the execution of SIGACE:

The following sequence is followed for Doppler Broadening of the ACE file.

1. The ACELST code is first used to convert the ACE file into ENDF file.
2. The SIGMA1 module of the PERPRO code system is used for Doppler broadening of the ENDF file.
3. The SIGACE code is then used to generate the Doppler Broadened ACE file.
4. **OPTIONAL:** The Doppler Broadened ACE file can then again be converted to ENDF file and graphically plotted using EVALPLOT and compared with other ENDF file using COMPLOT routines of the PREPRO code system for validation purposes.

The sequence of execution for the 4 steps mentioned above is the following:

acelst < inp-acelst
sigma1
sigace < inp
acelst < inp2-acelst (Optional)

There are 3 different input decks "inp-acelst", "inp" and "inp2-acelst" that are to be prepared by the user.

Preparation of Input Files:

Apart for the test cases if the user wishes to process ACE files then user should copy the ACE file to desired folder and prepare the 3 input files mentioned above for execution. Step by step descriptions of these 3 input files and code execution are presented below.

Sample input file for Test Run of 239-Pu.

Input file #1 : *inp-acelst*. This deck consisting of 3 cards is the input file for the code ACELST, which converts the given ACE file into an ENDF/B formatted file.

```
Card 1:    The name of the ACE file (Input)
Card 2:    Second entry is the LOG file for the ACELST code
          (Output)
Card 3:    Third entry is the name of the ENDF file (Output)
```

A sample input file „inp-acelst" is presented below:

```
pu239.ace
ACELST.LOG
 endf.dat
```

Input file #2 : "*SIGMA1.INP*". This is the input file for the SIGMA1 module of the PREPRO code system used for Doppler Broadening of the ENDF file. We currently use the latest available version of the SIGMA1 code.

```
         0          2 2.99998+02 1.00000-10          1
endf.dat
sigma1.out
          1       9999
                        (BLANK CARD TERMINATES MAT RANGE REQUESTS)
 0.00000+ 0 1.00000-02
                        (BLANK CARD TERMINATES FILE 3 ERROR LAW)
 0.00000+ 0 5.00000-04
 1.00000+ 0 5.00000-04
 2.00000+ 0 5.00000-03
 2.00000+ 7 5.00000-03
```

```
                          (BLANK CARD TERMINATES FILE 3 ERROR LAW)
 0.00000+ 0 1.00000-04
                          (BLANK CARD TERMINATES FILE 3 ERROR LAW)


====(this line and below is not read)=========================
          0          2 1.20000+06 1.00000-10          1
tape.135.RECENT
tape.135.SIGMA1
```

Please refer to the PERPRO code system manual [D.E. Cullen, "PREPRO 2002: 2002 ENDF/B Pre-processing Codes", International Atomic Energy Agency, Vienna, Austria, Report IAEA-NDS-39, Rev. 11, Feb. 5, 2002] for further details.

Input file #3 : *„inp“.* This is the input file for the SIGACE code.

This deck consisting of 5 cards is the input file for the code SIGACE, which converts the output of SIGMA1 into ACE file.

```
Card 1:    The file name of the original ACE file (Input)
Card 2:    The file Name of the Doppler broadened ENDF file (Input)
Card 3:    The file name of the Doppler broadened ACE file (Output)
Card 4:    Material ID flag to be appended for the XSDIR file
Card 5:    (optional)  Thinning  tolerance  in  percentage  for
           generation of new ace file
```

A sample input file is give below:

```
pu239.ace
sigma1.out
ace.out
99c
1.0
```

Input file #4 : inp2-acelst (OPTIONAL)

This step is OPTIONAL. The high temperature ACE file created by the SIGACE approach can be converted to an ENDF file and the so created file can then be graphically visualized using the EVALPLOT code of the PREPRO code system, inter-compared with other ENDF file using COMPLOT routines of the PREPRO code system. The input decks for EVALPLOT and COMPLOT are not shown in order to save space as the user can refer to the manual of the PREPRO code system.

This deck consisting of 3 cards is the input file for the code ACELST, which converts the high temperature ACE file into an ENDF/B formatted file.

```
Card 1:   The name of the high temperature ACE file (Input)
Card 2:   Second entry is the LOG file for the ACELST code (Output)
Card 3:   Third entry is the name of the ENDF file (Output)
          Corresponding to the high temperature

ace.out
ACELST.LOG
endf-1.dat
```

Output displayed on the screen:

The output displayed on the screen for the test problem 1 is as follows:

```
D:\ACEDOP>cd TEST\1
```

```
D:\ACEDOP\TEST\1>testrun1.bat

D:\ACEDOP\TEST\1>rename inp-ac~1 inp-acelst

D:\ACEDOP\TEST\1>rename inp2-a~1 inp2-acelst

D:\ACEDOP\TEST\1>..\..\bin\acelst  0<inp-acelst
ACELST - List contents of an ACE-lib
====================================

Default source filename              : lib.ace
         Enter new name to redefine :
Default output filename              : ACELST.LOG
         Enter new name to redefine :
 Enter filename to convert to ENDF-6 :
 Formatting of MF6 not coded for MT 16  Law 44
 Formatting of MF6 not coded for MT 17  Law 44
 Formatting of MF6 not coded for MT 37  Law 44
 Formatting of MF6 not coded for MT 91  Law 44

D:\ACEDOP\TEST\1>..\..\bin\sigma1
Doppler Broaden ENDF/B Cross Sections (SIGMA1 2000-1)
-------------------------------------------------------------------------
Retrieval Criteria-----------        MAT
Monitor Mode-----------------         On
Temperature------------------ 299.998000 KELVIN
Minimum Cross Section-------- 1.00000-10
Negative Cross Section-------  Make = 0 (No Negative Output)
-------------------------------------------------------------------------
ENDF/B Input and Output Data Filenames
endf.dat
sigma1.out
-------------------------------------------------------------------------
Requested MAT Ranges
-------------------------------------------------------------------------
    Minimum    Maximum
-------------------------------------------------------------------------
          1       9999
-------------------------------------------------------------------------
Allowable Uncertainty
-------------------------------------------------------------------------
     Energy Uncertainty   per-cent
-------------------------------------------------------------------------
 0.0         1.000000-2     1.0000
-------------------------------------------------------------------------
ENDF/B Tape Label
-------------------------------------------------------------------------
 Converted form Ace file: endf.dat                                  6000
-------------------------------------------------------------------------
Projectile      MAT  MT ENDF/B     Kelvin     Q-Value Points Points
      Material          Format         In          eV     In    Out
-------------------------------------------------------------------------
n    94-Pu-239 9437   1  VI    2.999980+2  0.0         65035  65035
n    94-Pu-239 9437   2  VI    2.999980+2  0.0         65035  65035
n    94-Pu-239 9437  16  VI    2.999980+2 -5.646700+6    124    124
n    94-Pu-239 9437  17  VI    2.999980+2 -1.264800+7     59     59
n    94-Pu-239 9437  18  VI    2.999980+2  1.999200+8  65035  65035
n    94-Pu-239 9437  37  VI    2.999980+2 -1.850830+7     10     10
n    94-Pu-239 9437  51  VI    2.999980+2 -7.861000+3    399    399
n    94-Pu-239 9437  52  VI    2.999980+2 -5.727600+4    339    339
n    94-Pu-239 9437  53  VI    2.999980+2 -7.570600+4    332    332
n    94-Pu-239 9437  54  VI    2.999980+2 -1.637600+5    314    314
n    94-Pu-239 9437  55  VI    2.999980+2 -1.940000+5    310    310
n    94-Pu-239 9437  56  VI    2.999980+2 -2.855000+5    296    296
n    94-Pu-239 9437  57  VI    2.999980+2 -3.170000+5    292    292
```

```
n    94-Pu-239 9437  58  VI    2.999980+2 -3.301000+5    287    287
n    94-Pu-239 9437  59  VI    2.999980+2 -3.600000+5    283    283
n    94-Pu-239 9437  60  VI    2.999980+2 -3.874000+5    278    278
n    94-Pu-239 9437  61  VI    2.999980+2 -3.916000+5    275    275
n    94-Pu-239 9437  62  VI    2.999980+2 -4.280000+5    270    270
n    94-Pu-239 9437  63  VI    2.999980+2 -4.350000+5    269    269
n    94-Pu-239 9437  64  VI    2.999980+2 -4.520000+5    266    266
n    94-Pu-239 9437  65  VI    2.999980+2 -4.620000+5    264    264
n    94-Pu-239 9437  66  VI    2.999980+2 -4.698000+5    262    262
n    94-Pu-239 9437  67  VI    2.999980+2 -4.820000+5    258    258
n    94-Pu-239 9437  68  VI    2.999980+2 -4.880000+5    257    257
n    94-Pu-239 9437  69  VI    2.999980+2 -4.921000+5    256    256
n    94-Pu-239 9437  70  VI    2.999980+2 -5.055000+5    253    253
n    94-Pu-239 9437  71  VI    2.999980+2 -5.118000+5    252    252
n    94-Pu-239 9437  72  VI    2.999980+2 -5.380000+5    248    248
n    94-Pu-239 9437  73  VI    2.999980+2 -5.561000+5    246    246
n    94-Pu-239 9437  74  VI    2.999980+2 -5.650000+5    242    242
n    94-Pu-239 9437  75  VI    2.999980+2 -5.830000+5    239    239
n    94-Pu-239 9437  76  VI    2.999980+2 -6.200000+5    236    236
n    94-Pu-239 9437  77  VI    2.999980+2 -6.340000+5    235    235
n    94-Pu-239 9437  78  VI    2.999980+2 -9.390000+5    212    212
n    94-Pu-239 9437  79  VI    2.999980+2 -1.001000+6    207    207
n    94-Pu-239 9437  80  VI    2.999980+2 -1.135000+6    200    200
n    94-Pu-239 9437  81  VI    2.999980+2 -1.282000+6    194    194
n    94-Pu-239 9437  91  VI    2.999980+2 -6.340000+5    235    235
n    94-Pu-239 9437 102  VI    2.999980+2  6.533700+6  65035  65035
n    94-Pu-239 9437   4  VI    2.999980+2  0.0           399    399
-----------------------------------------------------------------------
--
No Unresolved Region                        MAT Totals 269238 269238
-----------------------------------------------------------------------
--
=======================================================================
==Total Execution Time                2.48 Seconds
=======================================================================
==
-----------------------------------------------------------------------
--
                                          Tape Totals 269238 269238
-----------------------------------------------------------------------
--
=======================================================================
==
Total Execution Time                2.48 Seconds
=======================================================================
==

D:\ACEDOP\TEST\1>..\..\bin\sigace  0<inp
====================================
              SIGACE
====================================

Default source filename              : ACE.INP
          Enter new name to redefine :
====================================
                     ACE  INPUT FILE : pu239.ace
====================================
Default Doppler broad-nd ENDF filename SIGMA1.OUT
          Enter new name to redefine
====================================
         DOPPLER BROADENED ENDF FILE : sigma1.out
====================================
 Default high temperature ACE filename ACE.OUT
====================================
                     OUPUT ACE  FILE : ace.out
====================================
```

```
 Default ZAID flag                    : 00c
 Enter the XXC as in ZAID.XXC for ACE
 Example 92235.23c if you enter 23c
====================================
  ZAID.XXC                            : 99c
====================================
 Default Thinning Tolerance           : 0.000
 Enter the thinning tolerance for ACE
 Example 0.1 represents 0.1% thinning
====================================
THINNING TOLERANCE                    : 1.000
====================================
THE REACTIONS ARE
     1)  16      2)  17      3)  18      4)  37
     5)  51      6)  52      7)  53      8)  54
     9)  55     10)  56     11)  57     12)  58
    13)  59     14)  60     15)  61     16)  62
    17)  63     18)  64     19)  65     20)  66
    21)  67     22)  68     23)  69     24)  70
    25)  71     26)  72     27)  73     28)  74
    29)  75     30)  76     31)  77     32)  78
    33)  79     34)  80     35)  81     36)  91
    37) 102     38)   4
 DOPPLER BROADENED ENDF FILE sigma1.out
MAT ID =  9437
 THE FOLLOWING FILES ARE PRESENT FOR THIS ISOTOPE
1                                                    GENERAL INFORMATION
3                                                 REACTION CROSS SECTIONS
4                               ANGULAR DISTRIBUTION FOR EMITTED PARTICLES
END OF TAPE

 ZA =  94239
                    END OF FILE 1
_____________________________________________________________
NO RESONANCE PARAMETERS ARE GIVEN EXCEPT THE
SCATTERING RADIUS (AP). IT IS ONLY FOR THE CONVENIENCE
OF THE USER AND HAS NO CONTRIBUTION TO THE SCATTERING
CROSS SECTION REPRESENTED IN FILE 3.
_____________________________________________________________
 ******  NO MF=2 FOUND ***********
1   MT =  1    MAT ID IS  9437
2   MT =  2    MAT ID IS  9437
3   MT =  16    MAT ID IS  9437
4   MT =  17    MAT ID IS  9437
5   MT =  18    MAT ID IS  9437
6   MT =  37    MAT ID IS  9437
7   MT =  51    MAT ID IS  9437
8   MT =  52    MAT ID IS  9437
9   MT =  53    MAT ID IS  9437
10   MT =  54    MAT ID IS  9437
11   MT =  55    MAT ID IS  9437
12   MT =  56    MAT ID IS  9437
13   MT =  57    MAT ID IS  9437
14   MT =  58    MAT ID IS  9437
15   MT =  59    MAT ID IS  9437
16   MT =  60    MAT ID IS  9437
17   MT =  61    MAT ID IS  9437
18   MT =  62    MAT ID IS  9437
19   MT =  63    MAT ID IS  9437
20   MT =  64    MAT ID IS  9437
21   MT =  65    MAT ID IS  9437
22   MT =  66    MAT ID IS  9437
23   MT =  67    MAT ID IS  9437
24   MT =  68    MAT ID IS  9437
25   MT =  69    MAT ID IS  9437
26   MT =  70    MAT ID IS  9437
```

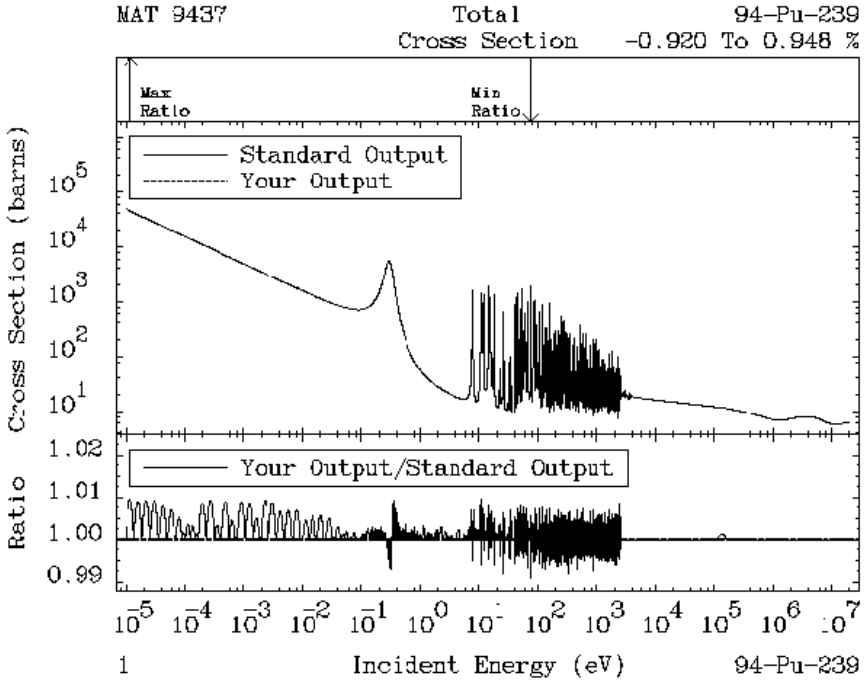
```
27   MT =  71    MAT ID IS  9437
28   MT =  72    MAT ID IS  9437
29   MT =  73    MAT ID IS  9437
30   MT =  74    MAT ID IS  9437
31   MT =  75    MAT ID IS  9437
32   MT =  76    MAT ID IS  9437
33   MT =  77    MAT ID IS  9437
34   MT =  78    MAT ID IS  9437
35   MT =  79    MAT ID IS  9437
36   MT =  80    MAT ID IS  9437
37   MT =  81    MAT ID IS  9437
38   MT =  91    MAT ID IS  9437
39   MT =  102    MAT ID IS  9437
40   MT =  4    MAT ID IS  9437
                  END OF FILE 3
      **************            ***************
            UNIONIZING GRID
++++++++++++++++++++++++++++++++++++++++
                  MT
++++++++++++++++++++++++++++++++++++++++
                  2
                  16
                  17
                  18
                  37
                  51
                  52
                  53
                  54
                  55
                  56
                  57
                  58
                  59
                  60
                  61
                  62
                  63
                  64
                  65
                  66
                  67
                  68
                  69
                  70
                  71
                  72
                  73
                  74
                  75
                  76
                  77
                  78
                  79
                  80
                  81
                  91
                  102
                  4
 Thinning Tolerance = 1.000000000000000 %
 ------------------------------------------------------------------------
     MAT        MT         Points    Points
                             In        Out
 ------------------------------------------------------------------------
  94239.99c      1          65035      9791
  94239.99c  Tot. Abs.      65035     21560
```

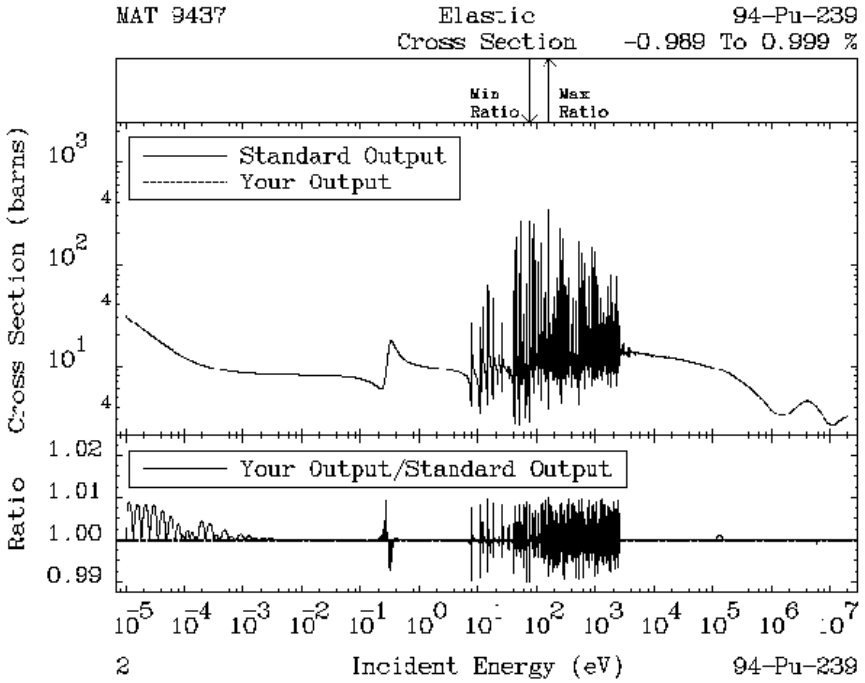
```
  94239.99c      2          65035      6181
  94239.99c  Avg.Heat.Num.  65035     65035
  94239.99c     16            124        23
  94239.99c     17             59        12
  94239.99c     18          65035     12765
  94239.99c     37             10         5
  94239.99c     51            399        25
  94239.99c     52            339        20
  94239.99c     53            332        25
  94239.99c     54            314        21
  94239.99c     55            310        22
  94239.99c     56            296        37
  94239.99c     57            292        34
  94239.99c     58            287        34
  94239.99c     59            283        43
  94239.99c     60            278        35
  94239.99c     61            275        33
  94239.99c     62            270        33
  94239.99c     63            269        35
  94239.99c     64            266        32
  94239.99c     65            264        34
  94239.99c     66            262        38
  94239.99c     67            258        33
  94239.99c     68            257        42
  94239.99c     69            256        37
  94239.99c     70            253        31
  94239.99c     71            252        34
  94239.99c     72            248        35
  94239.99c     73            246        27
  94239.99c     74            242        32
  94239.99c     75            239        33
  94239.99c     76            236        30
  94239.99c     77            235        31
  94239.99c     78            212        20
  94239.99c     79            207        14
  94239.99c     80            200        19
  94239.99c     81            194        14
  94239.99c     91            235        36
  94239.99c    102          65035     21560
  94239.99c      4            399        35
 ---------------------------------------------------------------------
 THE NAME OF THE OUTPUT FILE ace.out

D:\ACEDOP\TEST\1>..\..\bin\acelst  0<inp2-acelst
ACELST - List contents of an ACE-lib
====================================

Default source filename              : lib.ace
         Enter new name to redefine :
Default output filename              : ACELST.LOG
         Enter new name to redefine :
 Enter filename to convert to ENDF-6 :
 Formatting of MF6 not coded for MT 16  Law 44
 Formatting of MF6 not coded for MT 17  Law 44
 Formatting of MF6 not coded for MT 37  Law 44
 Formatting of MF6 not coded for MT 91  Law 44

D:\ACEDOP\TEST\1>copy complot.inp ..\..\plot\
        1 file(s) copied.
D:\ACEDOP\TEST\1>cd ..\..\plot

D:\ACEDOP\PLOT>complot

D:\ACEDOP\PLOT>cd ..
```

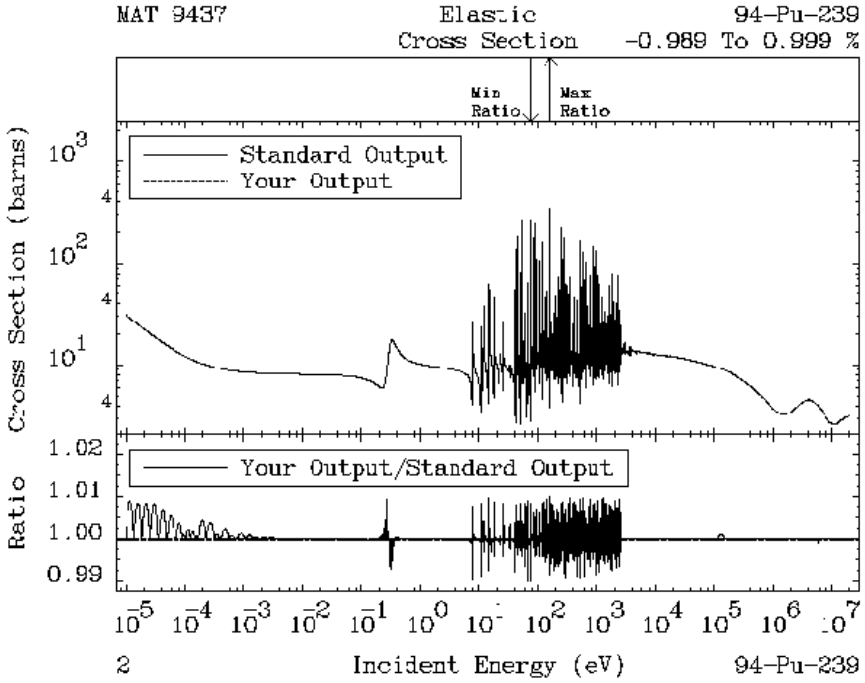
.....END OF SCREEN OUTPUT.....

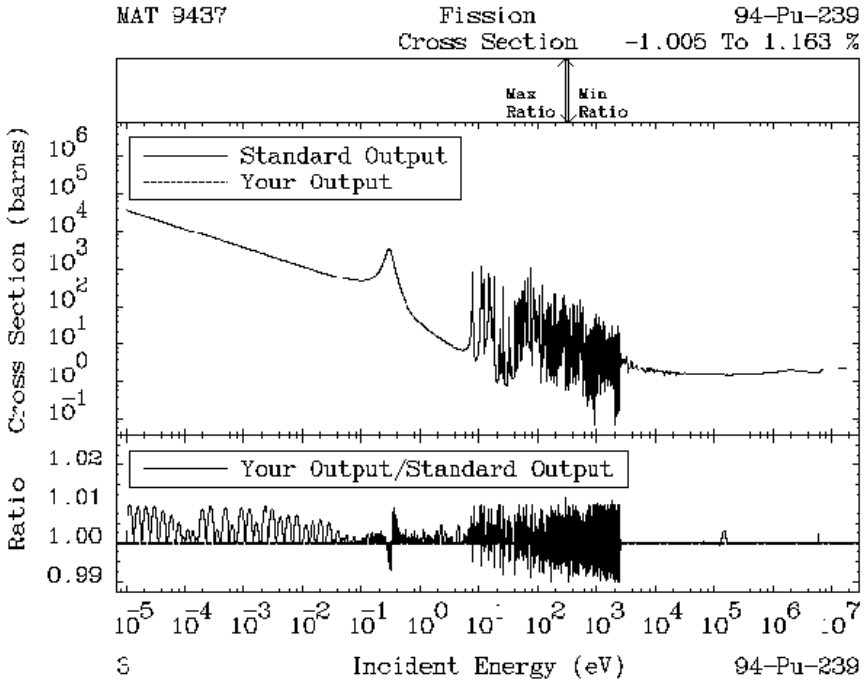
Output of COMPLOT Run

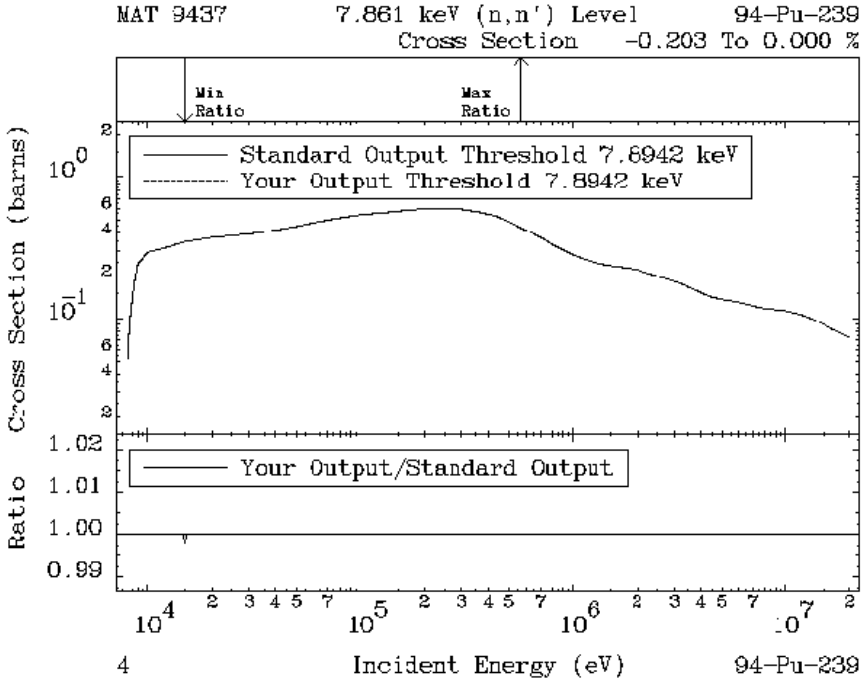
The output of the COMPLOT program of the PREPRO code system generated on the screen by comparing the original ACE file (i.e., generated by using the NJOY code system) high temperature and the Doppler Broadened ACE file (i.e., generated using the SIGACE package) is provided below as illustration of the verification procedure.

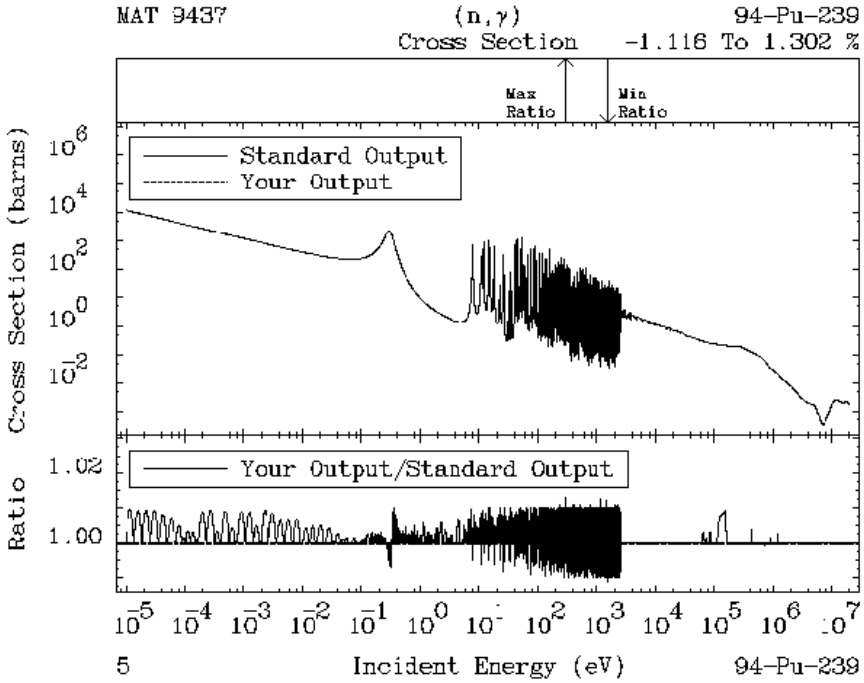

MAT 9437
Total
Cross Section
94-Pu-239
-0.920 To 0.948 %
Max Ratio
Min Ratio
Standard Output
Your Output
Cross Section (barns)
Your Output/Standard Output
Ratio
Incident Energy (eV)
94-Pu-239
1


MAT 9437
Elastic
Cross Section
94-Pu-239
-0.989 To 0.999 %
Min Ratio
Max Ratio
Standard Output
Your Output
Cross Section (barns)
Your Output/Standard Output
Ratio
Incident Energy (eV)
94-Pu-239
2


MAT 9437
Elastic
Cross Section
94-Pu-239
-0.989 To 0.999 %
Min Ratio
Max Ratio
Standard Output
Your Output
Cross Section (barns)
Your Output/Standard Output
Ratio
Incident Energy (eV)
94-Pu-239


MAT 9437
Fission
Cross Section
94-Pu-239
-1.005 To 1.163 %
Max Ratio
Min Ratio
Standard Output
Your Output
Cross Section (barns)
Your Output/Standard Output
Ratio
Incident Energy (eV)
94-Pu-239


MAT 9437
7.861 keV (n,n') Level
94-Pu-239
Cross Section -0.203 To 0.000 %
Min Ratio
Max Ratio
Standard Output Threshold 7.6942 keV
Your Output Threshold 7.8942 keV
Cross Section (barns)
Your Output/Standard Output
Ratio
Incident Energy (eV)
94-Pu-239


MAT 9437
(n,γ)
94-Pu-239
Cross Section -1.116 To 1.302 %
Max Ratio
Min Ratio
Standard Output
Your Output
Cross Section (barns)
Your Output/Standard Output
Ratio
Incident Energy (eV)
94-Pu-239

The graphical intercomparison presented above for ^{239}Pu validates the SIGACE approach. Note that the SIGACE approach is not applicable by design in the unresolved resonance region. A number of actinides FENDL/E nuclides and light elements have also been successfully tested [1-3] by extensive graphical inter-comparison as in the above illustration.

It may be noted [1-3] that the SIGACE code and the recipe for generating ACE files at higher temperatures has been applied to the SEFOR fast reactor benchmark problem (Sodium cooled fast reactor benchmark decribed in ENDF-202/BNL-19302, 1974 document). The calculated Doppler Coefficient is in good agreement with the experimental value. A similar calculation using ACE files generated directly with the NJOY system also agrees with our SIGACE computed results. The SIGACE code and the recipe is further applied to study the numerical benchmark configuration of selected idealized PWR pin cell configurations with five different fuel enrichments as reported by Mosteller and Eisenhart. More details are available in [1-3] for the interested user.

The SIGACE package is meant to satisfy the needs of the users of the MCNP package who prefer to have a simple recipe to get ACE files at higher temperatures instead of becoming a specialist to perform direct nuclear data processing starting from the evaluated nuclear data file. Both the NJOY code and the MCNP package have been evolving. The present software of the SIGACE package has been tested with 2001 versions of the NJOY and the MCNP code systems as was available [2].

All users are encouraged to send their feedback and suggestions to the IAEA Nuclear Data Section (A. Trkov): Nuclear Data Section, International Atomic Energy Agency, A-1400 Vienna, Austria. Email: A.Trkov@iaea.org

References:

1. Amit Raj Sharma, S. Chaturvedi, D. Chandra, S. Ganesan and P.K. Kaw, “Final Report on Integral validation and Use of Improved Nuclear data in Fusion Blanket Studies” Progress Report for the Period 1 March to 28 February 2002, Submitted to the IAEA.
2. S. Ganesan, A. R. Sharma and A. Trkov, Summary Report of a Consultants Meeting (25 November to 6 December 2002), to modify the dedicated code SIGACE for operational use with the PCs and any FENDL-ace file, plus systematic verification of FENDL-ace files according to IAEA-NDS procedures, IAEA Dec. 2002.
3. Amit R. Sharma, S. Ganesan and A. Trkov, “SIGACE Code for Generating High Temperature ACE Files; Validation and Benchmarking,” paper presented at the International Conference on Nuclear Data for Science and Technology, “ND2004”, 26 September to 1 October 2004. Santa Fe, New Mexico, USA proceedings in press.