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

Memo CP-D/399

Date: 3 June 2004

To: Distribution

From: O. Schwerer

Subject: **Proposed codes for cross section for heavy/light fission fragment production**

Reference: **Memo CP-A/153**

In this memo the codes

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,SIG,HF        and
,SIG,LF
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are proposed for the formation of heavy or light fragments in the interaction of alphas (0.65 - 12.7 GeV) with Bi. (Todorovic et al., APP/B,34,4205,2003).

The definition of these quantities is not quite clear to me, since in such reactions more than 1 heavy fragment can occur, and in addition, heavy fragments are distinguished from "heavy residues".

In the draft entry O0172 for this work, subentries 2 and 3 are both coded with SIG,HF. The former refers to Figure 4 of the article ("Cross section for production of events with a single heavy fragment"), the latter to Figure 5 ("Cross section for the production of heavy residues"). This difference is not reflected in the proposed EXFOR coding.

Furthermore, the work has additional similar curves, e.g. giving cross sections in mb for "production of thermal fission events" and for "events in violent collisions" (Figure 8). (I am happy that these are not also proposed for compilation - but where is the borderline, and who defines it?)

I hesitate to include the proposed new quantities because

- the definitions are not clear
- the work has additional results which (though even more exotic) are probably - to those who use these data - as interesting as the quantities proposed for compilation

Although the lowest point in this work is below 1 GeV, it raises some typical questions related to "exotic" works (exotic to our "classical" users and many of our compilers):

- Where to draw the borderline what quantities to compile
- Who writes the necessary LEXFOR definitions for new data types? (E.g., I am not competent for high energy data)
- How many new quantities do we want to add to the dictionaries which are relevant only for high energy data? Should they have a special flag?
- What about works spanning an energy range from below 1 GeV up to high energies? (Assuming that the limit for compulsory compilation will be set to 1 GeV).

MEMO CP-A/153

31-Mar-2004

To: **Distribution**
From: **F.E. Chukreev**
Subject**: addition for Dictionary 18 and 36**

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Dictionary 18 (facility), please add:
SRING          (Storage ring)
Or exclude "electron" from ESTRG

,SIG,HF   (Cross section of heavy fission fragment production)
,SIG,LF   (Cross section of light fission fragment production.)
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ENTRY            O1072   20040419                             O107200000001
SUBENT        O1072001   20040419                             O107200100001
BIB               11         30                               O107200100002
TITLE      Measurement of cross sections of heavy fragments formedO107200100003
           in the interaction of 0.65-12.7 GeV 4-He with 209-Bi O107200100004
AUTHOR     (Z.Todorovic, A.Djordjevich, S.Savovic)           O107200100005
INSTITUTE  (3YUGYUG) Institute of Physica, Belgrade.         O107200100006
           (3CPRCPR) City University of Hong Kong.           O107200100007
           (3YUGYUG) Faculty of Science, Krgujevac.          O107200100008
REFERENCE  (J,APP/B,34,4205,2003)                            O107200100009
SAMPLE     -  By authors.  A bismuth target was sandwiched betweenO107200100010
           two  Makrofol foils evaporating it onto one of the O107200100011
           foils under high vacuum, pressing the other one onto O107200100012
           it, and bonding the foils together along two opposite O107200100013
           sides using methicloride.  The sandwich packets thus O107200100014
           produced were vacuum-sealed in plastic bags to assure O107200100015
           contact between the target and foils.  The target O107200100016
           thickness (which varied from sandwich to sandwich) was O107200100017
           between 90 and 130 micro-g/cm**2 (measurement accuracy O107200100018
           10 %)                                             O107200100019
DETECTOR   (TRD) The detectors used in this experiment were two O107200100020
            Makrofol foils of the size (40X30X0.2) mm**3.    O107200100021
FACILITY   (SYNCH,2FR SAC) 0.65 and 1.74 GeV, flux 6.E+09 and O107200100022
            4.7E+10 alpha-particles, respectively.           O107200100023
           (SYNCY,4ZZZDUB) 5.1, 8,8 and 12.7 GeV with flux 8E+10 O107200100024
           alpha-particles.                                  O107200100025
METHOD     (SITA) See SAMPLE                                 O107200100026
HISTORY    (20030914C)                                       O107200100027
           (20040419U) Last checking has been done.          O107200100028
ERR-ANALYS (DATA-ERR) The uncertainty is shown on figure without O107200100029
           any analysis.                                     O107200100030
           (ERR-1) The flux accuracy at Dubna.               O107200100031
STATUS     (CURVE) By CAJAD.                                 O107200100032
ENDBIB            30                                          O107200100033
COMMON             1          3                               O107200100034
ERR-1                                                        O107200100035
PER-CENT                                                     O107200100036
      10.                                                    O107200100037
ENDCOMMON          3                                          O107200100038
ENDSUBENT         37                                          O107200199999
SUBENT        O1072002   20040419                             O107200200001
BIB                3          9                               O107200200002
REACTION   (83-BI-209(A,F),,SIG,HF) Figure 4                 O107200200003
           the cross section for the production a single heavy O107200200004
           fragment.                                         O107200200005
ERR-ANALYS (DATA-ERR) The uncertainty is shown on figure without O107200200006
           any analysis.                                     O107200200007
MISC-COL   (MISC) The cross section for the production of events O107200200008
           with a single heavy fragment in correlation with O107200200009
           intermediate mass fragment.                       O107200200010
           (MISC-ERR) The uncertainty of MISC without any analysisO107200200011
ENDBIB             9                                          O107200200012
NOCOMMON                                                     O107200200013
DATA               5          5                               O107200200014
EN         DATA       DATA-ERR   MISC       MISC-ERR         O107200200015
GEV        MB         MB         MB         MB               O107200200016
      0.65        90.        18.        11.         3.       O107200200017
      1.74       190.        40.        50.         7.       O107200200018
       5.1       270.        50.        79.        16.       O107200200019
      8.88       290.        50.        94.        17.       O107200200020
      12.7       310.        60.       124.        21.       O107200200021
ENDDATA            7                                          O107200200022
ENDSUBENT         21                                          O107200299999
SUBENT        O1072003   20040419                             O107200300001
BIB                4          7                               O107200300002
REACTION   (83-BI-209(A,F),,SIG,HF)   Figure 5               O107200300003
ERR-ANALYS (DATA-ERR) The uncertainty is shown on figure without O107200300004
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            any analysis                                             O107200300005
ADD-RES    (COMP) With data for P+Bi-209 reaction.                   O107200300006
REL-REF    (R,O0644004,J.HUDIS+,J,PR/C,13,1961,1976)                 O107200300007
           (R,O0611003,H.A.KHAN+,J,PR/C,29,2199,1984) Data for       O107200300008
           fission cross section of bismuth by protons.              O107200300009
ENDBIB               7                                               O107200300010
NOCOMMON                                                             O107200300011
DATA                 3           5                                   O107200300012
EN         DATA        DATA-ERR                                      O107200300013
GEV         MB          MB                                           O107200300014
       0.67       101.         22.                                   O107200300015
       1.76       230.         40.                                   O107200300016
       5.13       350.         60.                                   O107200300017
       8.85       390.         70.                                   O107200300018
      12.72       430.         80.                                   O107200300019
ENDDATA              7                                               O107200300020
ENDSUBENT           19                                               O107200399999
SUBENT        O1072004   20040419                                   O107200400001
BIB                  3          13                                   O107200400002
REACTION   (83-BI-209(A,F),,SIG)  Fig 8 and fig 9                    O107200400003
COMMENT    - By authors.  Fission events were characterized by theO107200400004
           presence of two heavy fragments in correlation,          O107200400005
           irrespective of the existence of coincident              O107200400006
           intermediate mass fragments (IMF) (8 < z < 20).  The     O107200400007
           number of events with at least one detected IMF in       O107200400008
           addition to two heavy fragments varied from 0.5 percentO107200400009
            (at 1.74 GeV) to 6 percent (at 12.7 GeV) of the numberO107200400010
           of all fission events.                                   O107200400011
MISC-COL   (MISC1) Cross section for the production of thermal       O107200400012
           fission events.                                          O107200400013
           (MISC2) The cross section for the production events in O107200400014
           violent collisions.                                      O107200400015
ENDBIB              13                                               O107200400016
COMMON               1           3                                   O107200400017
EN-ERR                                                              O107200400018
GEV                                                                 O107200400019
     5.E-02                                                         O107200400020
ENDCOMMON            3                                               O107200400021
DATA                 5           5                                   O107200400022
EN         DATA        DATA-ERR   MISC1       MISC2                  O107200400023
GEV         MB          MB          MB          MB                   O107200400024
       0.65       440.         90.        350.         90.          O107200400025
       1.74       410.         80.        240.        170.          O107200400026
        5.1       380.         70.        150.        230.          O107200400027
        8.8       350.         70.        126.        224.          O107200400028
       12.7       310.         60.        111.        199.          O107200400029
ENDDATA              7                                               O107200400030
ENDSUBENT           29                                               O107200499999
ENDENTRY             4                                               O107299999999
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