**Nuclear Data Section**

**International Atomic Energy Agency**

**P.O.Box 100, A-1400 Vienna, Austria**

**Memo CP-D/1047**

**Date:** 18 May 2022

**To:** Distribution

**From:** R. Shimizu, N. Otsuka

**Subject: Threshold calculator and its application to REACTION SF3 checking**

We often need to list all contributing target and channels to get a particular product nuclide for comparison of measured production cross sections (*e.g*, activation cross sections) with model prediction etc. One of us (RS) developed a threshold calculator (C++) to show all contributing target nuclides and channels with AME2020 mass evaluation as the mass table. Below are screenshots of an input and output on a web interface of this calculator (<https://www.jcprg.org/tcalc/>).

**Example of input**



**Example of output**



Such a tool is useful to check whether REACTION SF3 follow the following EXFOR compilation rules:

1. SF3 should not be X when only one process is possible.
2. SF3 should be X when several processes are possible.

***Examples***

* (79-AU-197(D,**P**)79-AU-198,,SIG)
rather than

(79-AU-197(D,**X**)79-AU-198,,SIG)
below the 197Au(d,nπ+)198Au threshold (~140 MeV).

* (39-Y-89(D,**X**)38-SR-87,,SIG)
rather than

(39-Y-89(D,**A**)38-SR-87,,SIG)
above the 89Y(d,pt)87Sr threshold (~13 MeV).

It is not always trivial to follow these rules for compilers since there exists variety in expressions adopted in the source articles. We implemented checking against **the first rule** by using the newly developed threshold calculator, and it is added to the JCPRG EXFOR compilation tool (<https://www.jcprg.org/exfor/tool/>) which now gives an additional output **SF3 check output**:



By clicking this link, you can see an output like

SF3=X Checker for ACTIV run on 2022-5-8

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 Input file: ../exfor/tool/./work/trans-584a.txt

 F1456.002: X -> 6N 63-EU-151(A,X)65-TB-149-G,,SIG

 F1458.002: X -> N 6-C-12(D,X)7-N-13,,SIG

 Program terminated normally

The program currently does not check the energy range, and the message should be utilized with caution *when the incident energy is beyond the pion production threshold*. We wish this new function is useful for preparation of your future preliminary tapes.

**Distribution:**

a.koning@iaea.org

abhihere@gmail.com

aloks279@gmail.com

daniela.foligno@oecd-nea.org

dbrown@bnl.gov

draj@barc.gov.in

exfor@oecd-nea.org

fukahori.tokio@jaea.go.jp

ganesan555@gmail.com

gezg@ciae.ac.cn

iwamoto.osamu@jaea.go.jp

jmwang@ciae.ac.cn

kaltchenko@kinr.kiev.ua

kimdh@kaeri.re.kr

kimura.atsushi04@jaea.go.jp

l.vrapcenjak@iaea.org

manuel.bossant@oecd-nea.org

masaaki@nucl.sci.hokudai.ac.jp

marina-03-08@yandex.ru

michael.fleming@oecd-nea.org

mmarina@ippe.ru

nicolas.soppera@oecd-nea.org

n.otsuka@iaea.org

nrdc@jcprg.org

odsurenn@gmail.com

ogritzay@ukr.net

ogrudzevich@ippe.ru

otto.schwerer@aon.at

pikulina@expd.vniief.ru

pritychenko@bnl.gov

s.okumura@iaea.org

scyang@kaeri.re.kr

selyankina@expd.vniief.ru

sonzogni@bnl.gov

stakacs@atomki.mta.hu

stanislav.hlavac@savba.sk

sv.dunaeva@gmail.com

tada@nucl.sci.hokudai.ac.jp

taova@expd.vniief.ru

tarkanyi@atomki.hu

v.devi@iaea.org

v.zerkin@iaea.org

vidyathakur@yahoo.co.in

vsemkova@inrne.bas.bg

vvvarlamov@gmail.com

yolee@kaeri.re.kr

zholdybayev@inp.kz

**cc:**

shimizu\_1515@eis.hokudai.ac.jp