**Nuclear Data Section**

**International Atomic Energy Agency**

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

**Memo CP-D/969**

**Date:** 10 January 2019

**To:** Distribution

**From:** N. Otsuka

**Subject: Ternary/binary and binary/ternary ratio with charged particle specified**

**Reference:** CP-D/600 (Rev.)

When a ternary fission product (e.g., long range α) is specified, the ternary-binary fission yield ratio (e.g., LRA/B) must be coded with the charged particle in SF4 and SF5-SF6=TER,FY. Some EXFOR entries do not follow this rule, and proposed corrections are summarized in Appendix 1 of this memo.

We also found that the binary-long range α fission yield ratios (B/LRA) in 10831.002., 21529.003, 005, 008 and 21752.004 are coded without specification of the α particle in their REACTION codes (See Appendix 2 of this memo). Use of SF4=2-HE-4 and SF5-SF6=BIN/TER,FY/RAT for this quantity is proposed in Appendix 2 of this memo.

**Dictionary 236 (Quantities)**

BIN/TER,FY/RAT Binary/ternary fission yield ratio

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**Appendix 1**

Ternary/binary fission yield ratios requiring charged particle specification in REACTION SF4

|  |  |  |  |
| --- | --- | --- | --- |
| **Data set** | **REACTION (current)** | **Should be** | **See also** |
| 20127.002 | 92-U-235(N,F),TER/BIN,SIG/RAT,,RES | 92-U-235(N,F)2-HE-4,TER,FY,,RES | PART-DET |
| 20381.002 | 92-U-235(N,F),TER/BIN,SIG/RAT,,RES/REL | 92-U-235(N,F)2-HE-4,TER,FY,,RES/REL | PART-DET |
| 20381.003 | 92-U-235(N,F),TER/BIN,SIG/RAT,,RES/REL | 92-U-235(N,F)2-HE-4,TER,FY,,RES/REL | PART-DET |
| 20384.002 | 94-PU-239(N,F),TER/BIN,SIG/RAT,,RES/REL | 94-PU-239(N,F)2-HE-4,TER,FY,,RES/REL | PART-DET |
| 20384.003 | 94-PU-239(N,F),TER/BIN,SIG/RAT,,REL | 94-PU-239(N,F)2-HE-4,TER,FY,,REL | PART-DET |
| 20585.002 | 94-PU-241(N,F),TER/BIN,SIG/RAT,,RES | 94-PU-241(N,F)2-HE-4,TER,FY,,RES | PART-DET |
| 21705.013 | 92-U-235(N,F),TER/BIN,FY/RAT,A,MXW | 92-U-235(N,F)2-HE-4,TER,FY,,MXW |  |
| 22005.016 | 92-U-233(N,F)2-HE-4,TER/BIN,SIG/RAT,,MXW | 92-U-233(N,F)2-HE-4,TER,FY,,MXW |  |
| 22005.017 | 92-U-235(N,F)2-HE-4,TER/BIN,SIG/RAT,,MXW | 92-U-235(N,F)2-HE-4,TER,FY,,MXW |  |
| 22005.018 | 94-PU-239(N,F)2-HE-4,TER/BIN,SIG/RAT,,MXW | 94-PU-239(N,F)2-HE-4,TER,FY,,MXW |  |
| 22005.019 | 94-PU-241(N,F)2-HE-4,TER/BIN,SIG/RAT,,MXW | 94-PU-241(N,F)2-HE-4,TER,FY,,MXW |  |
| 22005.020 | 92-U-233(N,F)1-H-3,TER/BIN,SIG/RAT,,MXW | 92-U-233(N,F)1-H-3,TER,FY,,MXW |  |
| 22005.021 | 92-U-235(N,F)1-H-3,TER/BIN,SIG/RAT,,MXW | 92-U-235(N,F)1-H-3,TER,FY,,MXW |  |
| 22005.022 | 94-PU-239(N,F)1-H-3,TER/BIN,SIG/RAT,,MXW | 94-PU-239(N,F)1-H-3,TER,FY,,MXW |  |
| 22005.023 | 94-PU-241(N,F)1-H-3,TER/BIN,SIG/RAT,,MXW | 94-PU-241(N,F)1-H-3,TER,FY,,MXW |  |
| 22232.002 | 94-PU-239(N,F),TER/BIN,SIG/RAT | 94-PU-239(N,F)2-HE-4,TER,FY | Abstract |
| 22432.002 | 94-PU-238(0,F)2-HE-4,TER/BIN,SIG/RAT | 94-PU-238(0,F)2-HE-4,TER,FY |  |
| 22432.003 | 94-PU-240(0,F)2-HE-4,TER/BIN,SIG/RAT | 94-PU-240(0,F)2-HE-4,TER,FY |  |
| 22432.004 | 94-PU-242(0,F)2-HE-4,TER/BIN,SIG/RAT | 94-PU-242(0,F)2-HE-4,TER,FY |  |
| 22432.005 | 94-PU-244(0,F)2-HE-4,TER/BIN,SIG/RAT | 94-PU-244(0,F)2-HE-4,TER,FY |  |
| 22896.019.1 | 94-PU-238(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-238(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.019.2 | 94-PU-238(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-238(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.020.1 | 94-PU-240(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-240(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.020.2 | 94-PU-240(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-240(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.021.1 | 94-PU-242(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-242(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.021.2 | 94-PU-242(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-242(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.022.1 | 94-PU-244(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-244(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.022.2 | 94-PU-244(0,F),TER/BIN,FY/RAT,A,,DERIV | 94-PU-244(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.023.1 | 96-CM-242(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-242(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.023.2 | 96-CM-242(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-242(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.024.1 | 96-CM-244(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-244(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.024.2 | 96-CM-244(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-244(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.025.1 | 96-CM-246(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-246(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.025.2 | 96-CM-246(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-246(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.026.1 | 96-CM-248(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-248(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.026.2 | 96-CM-248(0,F),TER/BIN,FY/RAT,A,,DERIV | 96-CM-248(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.027.1 | 98-CF-250(0,F),TER/BIN,FY/RAT,A,,DERIV | 98-CF-250(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.027.2 | 98-CF-250(0,F),TER/BIN,FY/RAT,A,,DERIV | 98-CF-250(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.028.1 | 98-CF-252(0,F),TER/BIN,FY/RAT,A,,DERIV | 98-CF-252(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.028.2 | 98-CF-252(0,F),TER/BIN,FY/RAT,A,,DERIV | 98-CF-252(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.029.1 | 100-FM-257(0,F),TER/BIN,FY/RAT,A,,DERIV | 100-FM-257(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 22896.029.2 | 100-FM-257(0,F),TER/BIN,FY/RAT,A,,DERIV | 100-FM-257(0,F)2-HE-4,TER,FY,,,DERIV |  |
| 30093.011 | 92-U-235(N,F),TER/BIN,SIG/RAT | 92-U-235(N,F)2-HE-4,TER,FY | PART-DET |

**Appendix 2**

Binary/ternary fission yield ratios requiring charged particle specification in REACTION SF4

Binary/ternary fission yield ratios where the light-charged particle must be specified in REACTION SF4

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| --- | --- | --- | --- |
| **Data set** | **REACTION (current)** | **Should be** | **See also** |
| 10831.002 | 94-PU-239(N,F),BIN/TER,SIG/RAT,,SPA | 94-PU-239(N,F)2-HE-4,BIN/TER,FY/RAT,,SPA | Title |
| 21529.003 | 92-U-233(N,F),BIN/TER,SIG/RAT,,MXW | 92-U-233(N,F)2-HE-4,BIN/TER,FY/RAT,,MXW | PART-DET |
| 21529.005 | 92-U-235(N,F),BIN/TER,SIG/RAT,,MXW | 92-U-235(N,F)2-HE-4,BIN/TER,FY/RAT,,MXW | PART-DET |
| 21529.008 | 94-PU-239(N,F),BIN/TER,SIG/RAT,,MXW | 94-PU-239(N,F)2-HE-4,BIN/TER,FY/RAT,,MXW | PART-DET |
| 21752.004 | 93-NP-237(N,F),BIN/TER,SIG/RAT,,MXW | 93-NP-237(N,F)2-HE-4,BIN/TER,FY/RAT,,MXW | PART-DET |