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**To:** Distribution

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**Subject: Dictionary 236 (Quantities) – M+,SIG,,RAB and question on RAB**

The following new quantity code is proposed for compilation of 30856.003. This entry relates the cross section of Zr isotopes with the fast neutron. Zr-89 has both a short-lived metastable state Zr-89m (t1/2=4.161 m) and a ground state Zr-89g (t1/2=78.41 h). The Zr-89m decays to the unstable Zr-89g through IT process with the branching ratio of 93.77%. According to the current rule, M+ is used when there is no contribution from another nuclide and partial feeding via IT is not 100%. However, its combination with RAB is absent in the current Dictionary 236.

**Dictionary 236 (Quantities)**

|  |  |
| --- | --- |
| M+,SIG,,RAB | Cross section times natural isotopic abundance, divided by abundance of target of first term of REACTION sum including isomeric transition |

|  |  |  |  |
| --- | --- | --- | --- |
| **Quantity** | **Reaction Type** | **Dimension** | **Subentry** |
| M+,SIG,,RAB | CS | CS | 30856.003 |

**Possible simplification of REACTION string so far coded with RAB**

A REACTION string relevant to the RAB modifier always becomes a REACTION sum. For example,

REACTION   ((40-ZR-90(N,2N)40-ZR-89-G,M+,SIG,,SPA)+

           (40-ZR-91(N,3N)40-ZR-89-G,M+,SIG,,RAB/SPA)+

           (40-ZR-92(N,4N)40-ZR-89-G,M+,SIG,,RAB/SPA))

for the natZr(n,x)89gZr cross section divided by the 90Zr natural isotopic abundance (a(90Zr)~51%) when production from Zr isotopes other than 90Zr is possible. An evaluator should construct the corresponding evaluated or theoretical cross sections by a theoretical elemental cross section divided by the 90Zr natural isotopic abundance, namely, σ[natZr(n,x)89gZr] / a(90Zr). We propose simplification of the REACTION sum to

REACTION   ((40-ZR-90(N,2N)40-ZR-89-G,M+,SIG,,**OTH**/SPA)

where OTH indicates presence of contribution from a Zr target isotope *oth*er than 90Zr. This solution would be preferable for machine processing.

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