**Nuclear Data Section**

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**Date:** 19 January 2022

**To:** Distribution

**From:** N. Otsuka, S. Dunaeva

**Subject: Usage of ERR-HL and ERR-IDD**

The uncertainty in a decay parameter (e.g., gamma intensity, half-life) is sometimes coded under ERR-HL or ERR-IDD even if the uncertainty propagated to the cross section is coded as a partial uncertainty under ERR-1 etc. This could introduce double counting of the same uncertainty and should be avoided.

***Example*: EXFOR 23267.004**

SUBENT 23267004 20150801

BIB 7 27

REACTION 1(76-OS-190(N,G)76-OS-191,,SIG,,SPA)

…

DECAY-DATA (76-OS-191-G,15.4D,DG,129.4,0.2650)

…

ERR-ANALYS (ERR-T) Total uncertainty.

Sources of uncertainties:

Isotopic abundance - negligible

(ERR-2) Detector efficiency

**(ERR-3) Gamma-ray intensity**

(ERR-4,0.10,0.20) Gamma-ray self-absorption

(ERR-5,0.07,0.12) Time factor fb

**(ERR-6) Half-life**

(ERR-S,0.14,0.22) Counting statistics

(ERR-7) Stoichiometry.

STATUS (TABLE) Tables V(data),VI(uncertainties) of

PR/C,90,065801,2014.

ENDBIB 27

COMMON 8 6

EN-MEAN EN-MAX ERR-2 **ERR-3**  **ERR-6** ERR-7

**ERR-HL** **ERR-IDD**

KEV KEV PER-CENT PER-CENT PER-CENT PER-CENT

D NO-DIM

25. 106. 2.00 0.15 0.65 3.13

0.1 0.0004

ENDCOMMON 6

…

Table VI of the source article (J.Marganiec et al., Phys.Rev.C90(2014)065801) gives the following error budget table:

|  |  |  |
| --- | --- | --- |
| **Source** | **Uncertainty (%)** | **Heading in EXFOR** |
| Au cross section | 1.40 | ERR-1 (coded in 001) |
| Isotopic abundance | Negligible |  |
| Detector efficiency | 2.00 | ERR-2 |
| γ-ray intensity | 0.15 | ERR-3 |
| γ-ray self absorption | 0.10-0.20 | ERR-4 |
| Time factor fb | 0.07-0.12 | ERR-5 |
| Half-life | 0.65 | ERR-6 |
| Counting statistics | 0.14-0.22 | ERR-S |
| Stoichiometry | 3.13 | ERR-7 |

The quadrature sum of these partial uncertainties give ~4.0% which agrees with the “Total uncertainty” in the last line of Table VI. Table II of the article gives the half-life uncertainty (0.1 d) and gamma intensity uncertainty (0.04 γs per 100 decays) and the original compiler of this entry provided these uncertainties under ERR-HL and ERR-IDD The corresponding fractional uncertainties propagated to the cross section and listed in the error budget table (0.1/15.4=0.65% for half-life and 0.04/26.50=0.15% for gamma intensity) are coded under ERR-6 and ERR-3, respectively, and should not be coded again under ERR-HL and ERR-IDD.

Coding of ERR-HL and ERR-IDD should be allowed only when they are propagated to the total uncertainty (ERR-T) and also not coded as fractional (%) partial uncertainties of the quantity measured under ERR-1 etc.

Note that the “uncertainty in the half-life” is usually different from the “uncertainty in the activation cross section propagated from the uncertainty in the half-life” since the activation cross section is not proportional to the half-life. In this regard, it is questionable to see the half-live uncertainty (0.1 d /15.4 d =0.65%) in the error budget table (Table VI). I sent several questions to the first author but without any response. When we can ignore the uncertainty in the irradiation, cooling and measurement time, the half-life uncertainty can be propagated to the activation cross section uncertainty rather simply. See Eq.(47) of N. Otuka et al. Radiat.Phys.Chem.**140**(2017)502 for further details.

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