Proposal to use non-integer numbers to define FLAG and DECAY-FLAG

(V. Devi, N. Otsuka, 2023-02-17, Memo CP-D/1069))

EXFOR Formats Manual Sect. 7 “DECAY-DATA” provides:

Flag. The general format of the code is an integer (n), where n has a numerical value that also appears in the data section under the data heading DECAY-FLAG.

We suggest allowing non-integer values in DECAY-FLAG (and also FLAG) to avoid the confusion caused by several definitions for the same nuclide's gamma lines.

Few References:

```
H.Naik et al., NSE,196,16,2022   (EXFOR 33169)
H.Naik et al., NSE,196,433,2022  (EXFOR 33173)
H.Naik et al., NSE,196,694,2022  (EXFOR 33174)
H.Naik et al., NSE,196,824,2022  (EXFOR 33178)
H.Naik et al., NSE,196,982,2022  (EXFOR 33179)
H.Naik et al., NSE,197,25,2023   (EXFOR 33185)
```

Below is a table providing multiple definition for gamma lines of the same nuclide (H.Naik+, J,NSE,196,982,2022, EXFOR 33179).

TABLE I (Continued)

Nuclide	Half-Life	Gamma-Ray Energy (keV)	Gamma-Ray Intensity (%)	Cumulative Yield, Y_C, or Independent Yield, Y_I (%)	Evaluated Yield ENDF/B-VIII.0	Mass Chain Yield, Y_A (%)
$^{130}Sn^{m+g}$	—	—	—	0.553±0.045	0.579±0.262	2.348±0.191
$^{130}Sb^{m}$	6.3 min	182.4	41.0	0.943±0.048	0.921±0.589	—
		793.5	100.0	0.954±0.021		
		839.5	100.0	0.755±0.032		
$^{130}Sb^{g}$	39.5 min	182.4	65.0	0.845±0.022	0.753±0.482	—
		330.9	78.0	0.724±0.053		
		793.4	100.0	0.764±0.038		
		839.5	100.0	0.617±0.083		
$^{130}Sb^{m+g}$	—	—	—	1.622±0.089	1.674±0.761	1.798±0.099
^{131}Sb	23.03 min	943.4	47.1	2.392±0.177	2.833±0.652	3.503±0.259
$^{131}Te^{m}$	33.25 h	852.2	19.9	1.381±0.292	1.193±0.274	—
		149.7	4.975	1.009±0.085#S	0.995±0.318#	
$^{131}Te^{g}$	25.0 min	149.7	68.8	0.442±0.067#S	0.296±0.190#	—
$^{131}Te^{m+g}$	—	—	—	1.446±0.108#S	1.291±0.370#	—
^{131}I	8.0252 d	364.5	81.5	4.276±0.121	4.168±0.250	4.278±0.121
$^{132}Sb^{m}$	2.79 min	973.9	99.0	1.123±0.037	0.812±0.365	—
		696.8	86.0	0.934±0.057		
$^{132}Sb^{g}$	4.1 min	973.9	100.0	0.843±0.143#	0.910±0.409#	—
		696.8	100.0	0.810±0.104#		

Example:

1. **Coding within the current rule**

```
DECAY-DATA    ((1301.)51-SB-130-G,39.5MIN,DG,330.9,0.780)
              ((1302.)51-SB-130-G,39.5MIN,DG,793.4,1.000)
              ((1303.)51-SB-130-G,39.5MIN,DG,839.5,1.000)
```

The flags must be represented as integer values, although the compiler attempted to use flags identical to the mass number of the specific nuclide (=130).

2. **Coding with the proposed rule**

```
DECAY-DATA    ((130.1)51-SB-130-G,39.5MIN,DG,330.9,0.780)
              ((130.2)51-SB-130-G,39.5MIN,DG,793.4,1.000)
              ((130.3)51-SB-130-G,39.5MIN,DG,839.5,1.000)
```

Utilizing non-integer values makes it easier to compile and verify data, which helps to solve the problem.

Therefore, we propose that the FLAG and DECAY-FLAG be defined using non-integer values.