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Code GABS: %Iγ calculation when Iγ normalization (NR) is known

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GABS

v11.0 Program Manual

- ***GABS calculates absolute gamma-ray intensities and a decay-scheme normalization factor (NR) for converting relative intensities to absolute values per 100 decays of the parent nucleus***

  (NR also know as the Iγ normalization factor)

GABS

Input, Report

- ***GABS input:***

147CE N **0.73 11**
147CE L 117.711 6(7/2-)
147CE G 117.718 6 100 M1+E2 1.1 0.966 A **Y**

- ***GABS report:***

* * * GABS Version 11c [08-Jan-2017] Report file * * *
Current date: 03/25/2019
ENSDF input file: Ce_b_bgl_gabs.inp
new ENSDF file: Ce_b_bgl_gabs_new

Data Set: 147LA B- DECAY
NR= **0.18 3** BR= 1.00

E= 156.7 1 %IG=0.09 9 per 100 dis.
E= 225.0 1 %IG=0.61 10 per 100 dis.
E= 272.47 3 %IG=0.090 23 per 100 dis.
E= 601.8 1 %IG=0.9 4 per 100 dis.
E= 674.66 5 %IG=0.68 11 per 100 dis.
E= 713.1 1 %IG=0.13 4 per 100 dis.
E= 117.718 6 %IG=18 3 per 100 dis. Compare with 18 3

GABS Output

- ***GABS output:***

147CE N **0.18 3** 1.00

147CE G 117.718 6 100 M1+E2 1.1 0.966 A

147CE2 G **%IG=18 3**

147CEC G **%IG=17.6 17**

GABS keeps adding the "147CE2 G %IG= ***" records for repeated runs instead of deleting the old ones as BrIcc for example does***

- ***NR can be determined by a procedure different from that of GABS:***

*Iγ normalization: absolute photon intensities were calculated from the absolute intensity %I(117.7 in ^{147}Ce)=**18.3 25**, based on %I(315 in ^{147}Pr − decay)=18.2 18 (from known measured ratio)*

GABS should calculate only the <u>absolute gamma-ray intensities</u> accepting the known NR value as input

GTOL

NR=0.1830E+00+-0.25E-01

NT=0.1830E+00+-0.25E-01

BR=0.1000E+01+-0.00E+00

NB=0.1000E+01+-0.00E+00

LEVEL	RI (OUT)	RI (IN)	RI (NET)	TI (OUT)	TI (IN)	TI (NET)	NET FEEDING (CALC)	NET FEEDING (INPUT)
0.0	0.000	287 8	-287 8	0.000	401 8	-401 8	**27 11**	27 11
117.711 6	100.0	117 3	-17 3	196.6 14	136 4	61 4	11.2 17	11.2 17

…

NET FEEDING TO G.S. IS 26.67+-10.11

GABS

- ***GABS should calculate only the <u>absolute gamma-ray intensities</u> accepting the known NR value as input which should give***

```
147CE  N    0.183  25          1.00
147CE  G 117.718   6  100     M1+E2    1.1        0.966          A
147CE2 G %IG=18.3  25
```

- ***However because GABS always determine both NR and %Iγ's, it would recalculate NR and give:***

```
147CE  N    0.18   3           1.00
147CE  G 117.718   6  100     M1+E2    1.1        0.966          A
147CE2 G %IG=18    3
```

- ***It results for %Iγ :***
  - ***^{147}La β$^-$ decay to ^{147}Ce, 117.7γ:* 18.3 *25* → 18 *3* (GABS)***
  - ***^{147}Ba β$^-$ decay to ^{147}La 167.4γ :* 15.9 *16* → 16 4 (GABS)***
- ***Presumed causes:***
  - ***GABS recalculates NR by comparing $\Sigma_{g.s.}(I\gamma_i)$ and $\Sigma_{g.s.}(\%I\gamma_i)$***
  - ***Possible truncation numerical error on $\Sigma_{g.s.}(\%I\gamma_i)$ in GTOL input***

GABS

Proposal:

Allow GABS to run in two scenarios:

- ***1) To calculate NR and %Iγ's (actual).***
- ***2) Allow NR value alone as input and calculate only %Iγ's .***
- ***Delete the pre-existing %Iγ values and replace them with the newly calculated ones as BrIcc does.***

- ***Otherwise one should accept actual situation of slightly different NR and %Iγ;***
- ***However we do not know how big the differences are in all situations***