## $^{152}$Gd($\alpha$,7n$\gamma$) 1980Da18,1983JuZY

History

| Type | Author | Citation | Literature Cutoff Date |
|---|---|---|---|
| Full Evaluation | Balraj Singh and Jun Chen | NDS 185, 2 (2022) | 23-Aug-2022 |

1980Da18 (also 1983JuZY): $^{152}$Gd($\alpha$,7n$\gamma$) E=106 MeV, this measurement updates and extends that by 1976St08 at the same laboratory; measured E$\gamma$, I$\gamma$, $\gamma\gamma$-coin, $\gamma(\theta)$, $\gamma\gamma(\theta)$, $\gamma$(t), $\gamma\gamma$(t). $^{136}$Ce($^{16}$O,3n$\gamma$) E=96 MeV $^{16}$O beam from the Emperor Tandem at the MPI Heidelberg on >99% enriched $^{136}$Xe target (in oxide form); measured conversion electrons with a solenoid spectrometer. Deduced levels, $J^{\pi}$, isomer $T_{1/2}$, configurations, conversion coefficients, $\gamma$-ray multipolarities, transition strengths. Systematics of neighboring isotones. See also the $^{152}$Gd($\alpha$,7n$\gamma$) dataset for additional data.

1976St08 (also 1976St01): $^{152}$Gd($\alpha$,7n$\gamma$) E=106 MeV $\alpha$ beam was produced from the Julich cyclotron. Target was 1.2 mg enriched (>99.6%) $^{152}$Gd on a 500 $\mu$g/cm$^2$ mylar backing. $\gamma$ rays were detected with two Ge(Li) detectors. Measured E$\gamma$, I$\gamma$, $\gamma\gamma$-coin, $\gamma(\theta)$, $\gamma\gamma(\theta)$, $\gamma$(t), $\gamma\gamma$(t). Deduced levels, $J^{\pi}$, isomer $T_{1/2}$, $\gamma$-ray multipolarities. 1976St08 extends the measurement of 1976St01 and determines $T_{1/2}$, spin and parity of the isomer.

Level scheme is based on results from 1980Da18 up to 3885 level and from 1983JuZY above that, which is a substantial revision of a tentative scheme proposed by 1981Ha17 in $^{120}$Sn($^{32}$S,3n$\gamma$). However, details of the results from 1983JuZY are not available. The order of the 741$\gamma$-491$\gamma$ cascade tentatively proposed in 1981Ha17, resulting an intermediate level at 6669, has been reversed based on later studies by 1996Gu17 in $^{122}$Sn($^{32}$S,5n$\gamma$) and 2002Go06 in $^{141}$Pr($^{16}$O,p7n$\gamma$), resulting an intermediate level at 6919, instead.

### $^{149}$Dy Levels

| E(level)[†] | J$^{\pi}$[‡] | $T_{1/2}$ | Comments |
|---|---|---|---|
| 0.0 | 7/2$^-$ | | |
| 1073.20 *20* | 13/2$^+$ | 12.5 ns *15* | $T_{1/2}$: from $\gamma$(t) (1980Da18). Other: 13 ns *3* in (1976St01). |
| 2251.81 *23* | 17/2$^+$ | | |
| 2550.41 *25* | 21/2$^+$ | | |
| 2661.2 *5* | 27/2$^-$ | 0.490 s *15* | $T_{1/2}$: adopted value from weighted average of 0.500 s *30* (1976St08), 0.510 s *10* (1980Ja16), 0.47 s *1* (1987BaZV). |
| 3645.5 *5* | 29/2$^+$ | | |
| 3885.5 *6* | 31/2 | | |
| 4084.9 *7* | (33/2$^+$) | | |
| 5222.8 *7* | (35/2$^+$) | | |
| 5478.0 *7* | (37/2$^+$) | | |
| 5747.9 *7* | (39/2$^+$) | | |
| 5929.6? *7* | | | |
| 6178.0 *7* | (41/2$^+$) | | |
| 6919.1 *8* | | | |
| 7242.2? *8* | | | |
| 7410.0 *8* | (43/2$^+$) | | |
| 7410.0+x | (49/2$^+$) | 39 ns *8* | E(level): 1983JuZY suggest x<80. 8520 level in the Adopted Levels. $T_{1/2}$: weighted average of 36 ns *8* (1980Da18) and 50 ns *15* (1976St01). |

[†] From a least-squares fit to $\gamma$-ray energies, assuming $\Delta E\gamma$=0.3 keV where not available.

[‡] As given in 1980Da18 for levels below 4 MeV, based on $\gamma(\theta)$ data in 1980Da18 and 1976St08, and ce data in ($^{16}$O,3n$\gamma$) study by 1980Da18. Above 4 MeV, excitations, the assignments are from the Adopted Levels.

### $\gamma$($^{149}$Dy)

| E$_\gamma$[†] | I$_\gamma$[†] | E$_i$(level) | J$_i^{\pi}$ | E$_f$ | J$_f^{\pi}$ | Mult.[‡] | $\alpha$[@] | Comments |
|---|---|---|---|---|---|---|---|---|
| 110.8 *4* | ≈3 | 2661.2 | 27/2$^-$ | 2550.41 | 21/2$^+$ | E3 | 27.3 *7* | Mult.: from $\alpha$(L)exp in $^{16}$O,3n$\gamma$) (1980Da18). I$_\gamma$: estimated from $\gamma\gamma$-coin (1980Da18). |
| 167.8[#] | | 7410.0 | (43/2$^+$) | 7242.2? | | | | |
| 199.4 *3* | 20 *6* | 4084.9 | (33/2$^+$) | 3885.5 | 31/2 | D | | A$_2$=−0.19 *4*; A$_4$=−0.05 *5* (1980Da18) |

Continued on next page (footnotes at end of table)

## $^{152}$Gd($\alpha$,7n$\gamma$) 1980Da18,1983JuZY (continued)

### $\gamma(^{149}Dy)$ (continued)

| $E_\gamma$[†] | $I_\gamma$[†] | $E_i$(level) | $J_i^\pi$ | $E_f$ | $J_f^\pi$ | Mult.[‡] | Comments |
|---|---|---|---|---|---|---|---|
| 240.0 *3* | 39 *6* | 3885.5 | 31/2 | 3645.5 | 29/2$^+$ | D | $A_2$=−0.20 *5*; $A_4$=0.00 *6* (1980Da18) |
| 248.4[#] | | 6178.0 | (41/2$^+$) | 5929.6? | | | |
| 255.0 *2* | ≈6 | 5478.0 | (37/2$^+$) | 5222.8 | (35/2$^+$) | | $I_\gamma$: estimated from $\gamma\gamma$. I$\gamma$(255$\gamma$)/I$\gamma$(1393$\gamma$)=1.07 *30* in ($^{16}$O,3n$\gamma$) (1980Da18). |
| 270.0 *2* | 15 *3* | 5747.9 | (39/2$^+$) | 5478.0 | (37/2$^+$) | D | $A_2$=−0.04 *5*; $A_4$=−0.01 *8* (1980Da18) |
| 298.6 *1* | 83 *8* | 2550.41 | 21/2$^+$ | 2251.81 | 17/2$^+$ | | $A_2$=0.00 *2*; $A_4$=−0.04 *3* (1976St01) |
| 430.3 *2* | 18 *6* | 6178.0 | (41/2$^+$) | 5747.9 | (39/2$^+$) | | |
| 451.7[#] | | 5929.6? | | 5478.0 | (37/2$^+$) | | |
| 491.0[#] | | 7410.0 | (43/2$^+$) | 6919.1 | | | |
| 525.1[#] | | 5747.9 | (39/2$^+$) | 5222.8 | (35/2$^+$) | | |
| 699.8[#] | | 6178.0 | (41/2$^+$) | 5478.0 | (37/2$^+$) | | |
| 741.1[#] | | 6919.1 | | 6178.0 | (41/2$^+$) | | |
| 984.3 *2* | 61 *6* | 3645.5 | 29/2$^+$ | 2661.2 | 27/2$^-$ | D | $A_2$=−0.18 *3*; $A_4$=0.00 *4* (1980Da18) |
| [x]1006 | | | | | | | $E_\gamma$: from 1979Ha29 only. |
| 1064.2[#] | | 7242.2? | | 6178.0 | (41/2$^+$) | | |
| 1073.2 *2* | 100 | 1073.20 | 13/2$^+$ | 0.0 | 7/2$^-$ | | $A_2$=+0.01 *3*; $A_4$=+0.02 *4* (1976St01)<br>Mult=E3 in Adopted Gammas. |
| 1137.8[#] | | 5222.8 | (35/2$^+$) | 4084.9 | (33/2$^+$) | | |
| 1178.6 *1* | 91 *9* | 2251.81 | 17/2$^+$ | 1073.20 | 13/2$^+$ | | $A_2$=+0.01 *3*; $A_4$=−0.03 *4* (1976St01)<br>(298.6$\gamma$)(1178.6$\gamma$)($\theta$): $A_2$=+0.05 *7* (1976St08). |
| 1231.8[#] | | 7410.0 | (43/2$^+$) | 6178.0 | (41/2$^+$) | (D,E2) | Mult.: from $\alpha$(exp) in 1983JuZY, but value is not available. |
| 1337.2 *4* | 18 *3* | 5222.8 | (35/2$^+$) | 3885.5 | 31/2 | (Q) | $A_2$=+0.19 *9*; $A_4$=−0.02 *9* (1980Da18) |
| 1393.7 *5* | 18 *4* | 5478.0 | (37/2$^+$) | 4084.9 | (33/2$^+$) | | |

[†] From 1980Da18, unless otherwise stated. Intensities are obtained in-beam (1 $\mu$s pulse).
[‡] Assigned by evaluators from $\gamma(\theta)$ data in 1980Da18.
[#] Reported by 1983JuZY only.
[@] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on $\gamma$-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[x] $\gamma$ ray not placed in level scheme.

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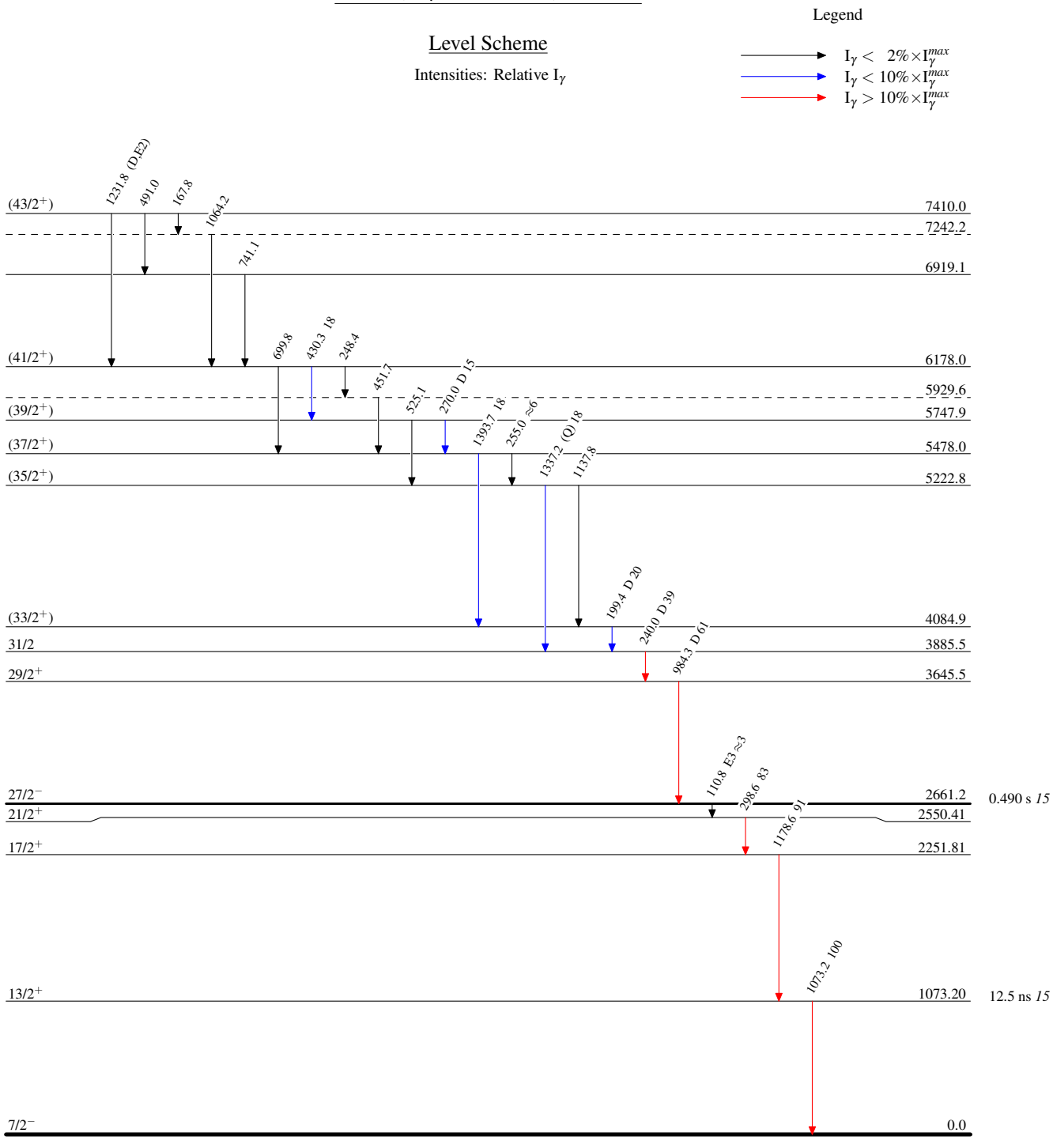
Level Scheme

Intensities: Relative $I_\gamma$




$^{149}_{66}Dy_{83}$