

$^{157}\text{Gd}(\text{d},2\text{n}\gamma), ^{157}\text{Gd}(\text{p},\text{n}\gamma)$ 1971Wi24

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 132, 1 (2016)	4-Dec-2015

All data are from 1971Wi24 from $^{157}\text{Gd}(\text{d},2\text{n}\gamma)$ with $E(\text{d})=13.5$ MeV and $^{157}\text{Gd}(\text{p},\text{n}\gamma)$ with $E(\text{p})=6.7$ MeV on enriched (93%) target. γ singles and $\gamma\gamma$ coincidences measured with Ge detectors. Higher spin states have been observed by 1976SiZT, but data not given.

Other experimental methods:

1972Sh36: Progress report, $^{158}\text{Gd}(\text{p},2\text{n}\gamma)$ with $E(\text{p})=15$ MeV. No results given.

1976SiZT: $^{154}\text{Sm}(^7\text{Li},4\text{n}\gamma)$ reaction with $E(^7\text{Li})=24$ to 36 MeV. Abstract only. Sees levels up to $(31/2^+)$ in $3/2[411]$ band at 2085 keV and to $(27/2^-)$ in $5/2[532]$ band.

 ^{157}Tb Levels

Additional information 1.

E(level) [†]	J ^π [‡]	Comments
0.0 [#]	3/2 ⁺	
60.8 [#]	5/2 ⁺	
143.8 [#]	7/2 ⁺	
252.4 [#]	9/2 ⁺	
326.4 [@]	5/2 ⁻	
327.3 ^{&}	5/2 ⁺	
357.6 [@]	7/2 ⁻	
377.5 [#]	11/2 ⁺	
407.9 ^{&}	7/2 ⁺	
425.9 [@]	9/2 ⁻	
513.8 ^{&}	9/2 ⁺	
517.6 [@]	11/2 ⁻	
531.9 [#]	13/2 ⁺	
571.7 ^a	7/2 ⁻	J ^π : Assigned 7/2 ⁺ in Adopted Levels.
597 ^b	1/2 ⁺	
636.9 ^b	3/2 ⁺	
643.4 ^{&}	11/2 ⁺	
647.9 [@]	13/2 ⁻	
658.5 ^c	7/2 ⁺	
693.4 [#]	15/2 ⁺	
696.8 ^b	5/2 ⁺	
709.1 ^a	9/2 ⁻	J ^π : Assigned 9/2 ⁺ in Adopted Levels.
782.9 [@]	15/2 ⁻	
793.6 ^b	7/2 ⁺	
860.6 ^a	11/2 ⁻	
890.4 [#]	17/2 ⁺	
974.4 [@]	17/2 ⁻	
1082.8 [#]	19/2 ⁺	
1141.2 [@]	19/2 ⁻	

[†] From fit to γ energies, except the γ 's with questionable placement have been omitted. Uncertainties are not given, but should be

$^{157}\text{Gd}(\text{d},2\text{n}\gamma), ^{157}\text{Gd}(\text{p},\text{n}\gamma)$ **1971Wi24 (continued)** ^{157}Tb Levels (continued)

from 0.1 to 0.4 keV.

‡ From **1971Wi24** and based on systematics of Nilsson states and expected rotational-band structure including Coriolis mixing of the 5/2[532] and 7/2[523] bands. Significant differences from the assignments in Adopted Levels are noted.

Band(A): $K^\pi=3/2^+$ band, based on 3/2[411] state.

@ Band(B): $K^\pi=5/2^-$ band, based on 5/2[532] state with significant mixing of 7/2[523] for states with $J \geq 7/2$.

& Band(C): $K^\pi=5/2^+$ band, based on 5/2[413] state.

^a Band(D): $K^\pi=7/2^-$ band, based on 7/2[523] state with significant mixing of 5/2[532] for states with $J \geq 7/2$.

^b Band(E): $K^\pi=1/2^+$ band, mixture of 1/2[411] and γ -vibration based on 3/2[411] ground state.

^c Band(F): $K^\pi=7/2^+$ band, based on 7/2[404] state.

 $\gamma(^{157}\text{Tb})$

Definitive multipolarity assignments have been made for many of these γ from the ^{157}Dy ε decay data. See Adopted γ radiations or the ^{157}Dy ε decay data for that information.

E_γ †	I_γ ‡	$E_i(\text{level})$	J_i^π	E_f	J_f^π	E_γ †	I_γ ‡	$E_i(\text{level})$	J_i^π	E_f	J_f^π
31. ^{ad}		357.6	7/2 ⁻	326.4	5/2 ⁻	222.2	7.1	647.9	13/2 ⁻	425.9	9/2 ⁻
60.8	20	60.8	5/2 ⁺	0.0	3/2 ⁺	233.7	21	377.5	11/2 ⁺	143.8	7/2 ⁺
^x 65.1	2.6					235.5	3.3	643.4	11/2 ⁺	407.9	7/2 ⁺
68.3	5.8	425.9	9/2 ⁻	357.6	7/2 ⁻	245.3	8.6	571.7	7/2 ⁻	326.4	5/2 ⁻
83.0	42	143.8	7/2 ⁺	60.8	5/2 ⁺	^x 246.1	2.5				
91.7	17	517.6	11/2 ⁻	425.9	9/2 ⁻	^x 249.3	0.7				
99.1 ^d	≈0.8	425.9	9/2 ⁻	326.4	5/2 ⁻	251.1 ^d	1.8	658.5	7/2 ⁺	407.9	7/2 ⁺
^x 105.4	1.6					^x 256.2	3.2				
108.6	44	252.4	9/2 ⁺	143.8	7/2 ⁺	265.1 ^c	5 ^c	517.6	11/2 ⁻	252.4	9/2 ⁺
^x 114.3	0.8					265.1 ^c	6.5 ^c	782.9	15/2 ⁻	517.6	11/2 ⁻
^x 120.1	1.5					266.3	4.6	327.3	5/2 ⁺	60.8	5/2 ⁺
125.0	31	377.5	11/2 ⁺	252.4	9/2 ⁺	270.4	2.3	647.9	13/2 ⁻	377.5	11/2 ⁺
130.3	14	647.9	13/2 ⁻	517.6	11/2 ⁻	279.5	17	531.9	13/2 ⁺	252.4	9/2 ⁺
135.1	9.0	782.9	15/2 ⁻	647.9	13/2 ⁻	282.1	20	425.9	9/2 ⁻	143.8	7/2 ⁺
137.3	1.2	709.1	9/2 ⁻	571.7	7/2 ⁻	^x 287.7	1.8				
^x 139.7	0.7					289 ^{ad}		860.6	11/2 ⁻	571.7	7/2 ⁻
^x 140.9	0.6					296.8	100	357.6	7/2 ⁻	60.8	5/2 ⁺
143.8	6.5	143.8	7/2 ⁺	0.0	3/2 ⁺	300.9	3.9	658.5	7/2 ⁺	357.6	7/2 ⁻
151.2 ^d	0.3	860.6	11/2 ⁻	709.1	9/2 ⁻	316.0	13	693.4	15/2 ⁺	377.5	11/2 ⁺
154.4	20	531.9	13/2 ⁺	377.5	11/2 ⁺	^x 322.5	0.9				
156.2	6	513.8	9/2 ⁺	357.6	7/2 ⁻	326.4	54	326.4	5/2 ⁻	0.0	3/2 ⁺
159.9	3.2	517.6	11/2 ⁻	357.6	7/2 ⁻	327.6	12 [#]	327.3	5/2 ⁺	0.0	3/2 ⁺
161.5	10	693.4	15/2 ⁺	531.9	13/2 ⁺	327.6 ^c	8.1 ^c	974.4	17/2 ⁻	647.9	13/2 ⁻
166.8	1.7	1141.2	19/2 ⁻	974.4	17/2 ⁻	331.1	1.9	658.5	7/2 ⁺	327.3	5/2 ⁺
^x 172.9	3					347.1	11	407.9	7/2 ⁺	60.8	5/2 ⁺
186.3	1.6	513.8	9/2 ⁺	327.3	5/2 ⁺	351.5	5.5	709.1	9/2 ⁻	357.6	7/2 ⁻
191.6	15 [#]	252.4	9/2 ⁺	60.8	5/2 ⁺	358.3 ^c	11 ^c	890.4	17/2 ⁺	531.9	13/2 ⁺
191.6 ^c	4.8 ^c	974.4	17/2 ⁻	782.9	15/2 ⁻	358.3 ^c	3 ^c	1141.2	19/2 ⁻	782.9	15/2 ⁻
191.6 ^c	2 ^c	1082.8	19/2 ⁺	890.4	17/2 ⁺	^x 368.1	1.2				
197	6.3 ^{&}	890.4	17/2 ⁺	693.4	15/2 ⁺	370.0	10	513.8	9/2 ⁺	143.8	7/2 ⁺
^x 212.6	1.1					389.4	5.3	1082.8	19/2 ⁺	693.4	15/2 ⁺
^x 213.9	3.2					391.0	3.6	643.4	11/2 ⁺	252.4	9/2 ⁺
214 ^{ad}		571.7	7/2 ⁻	357.6	7/2 ⁻	^x 398.7	1.1				
^x 215.8	2.3					408.0	2.4	407.9	7/2 ⁺	0.0	3/2 ⁺
217.6	4.3	643.4	11/2 ⁺	425.9	9/2 ⁻	^x 410.7	3.0				

Continued on next page (footnotes at end of table)

$^{157}\text{Gd}(\text{d},2\text{n}\gamma), ^{157}\text{Gd}(\text{p},\text{n}\gamma)$ **1971Wi24** (continued) $\gamma(^{157}\text{Tb})$ (continued)

$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_i(\text{level})$	J_i^π	E_f	J_f^π
$^x415.8$	1.9					x523	3.0				
$^x419.2$	2.2					541	3.7	793.6	$7/2^+$	252.4	$9/2^+$
$^x426.9$	2.8					553	4.5	696.8	$5/2^+$	143.8	$7/2^+$
434.7	4.6	860.6	$11/2^-$	425.9	$9/2^-$	576	4.6	636.9	$3/2^+$	60.8	$5/2^+$
$^x438.5$	2.6					x585	2.5				
$^x450.8$	2.6					597	$\approx 9^\text{@}$	597	$1/2^+$	0.0	$3/2^+$
453.0	2.1	513.8	$9/2^+$	60.8	$5/2^+$	637 ^b	8.6 ^b	636.9	$3/2^+$	0.0	$3/2^+$
$^x473.2$	1.4					637 ^b	8.6 ^b	696.8	$5/2^+$	60.8	$5/2^+$
x515	≈ 4					650	4.7	793.6	$7/2^+$	143.8	$7/2^+$

[†] **1971Wi24** indicate uncertainties in E_γ are between 0.1 and 0.4 keV.

[‡] For (d,2n γ) reaction at 13.5 MeV and 125°, unless otherwise indicated. Uncertainties are typically 10% to 30% and may be larger below 80 keV and above 500 keV (**1971Wi24**). See **1971Wi24** for intensities from (p,n γ) reaction.

From $^{157}\text{Gd}(\text{p},\text{n}\gamma)$ companion experiment.

@ Interference from Ge(n,n').

& Interference from target impurity.

^a γ data not given, but γ placed in level scheme (**1971Wi24**).

^b Multiply placed with undivided intensity.

^c Multiply placed with intensity suitably divided.

^d Placement of transition in the level scheme is uncertain.

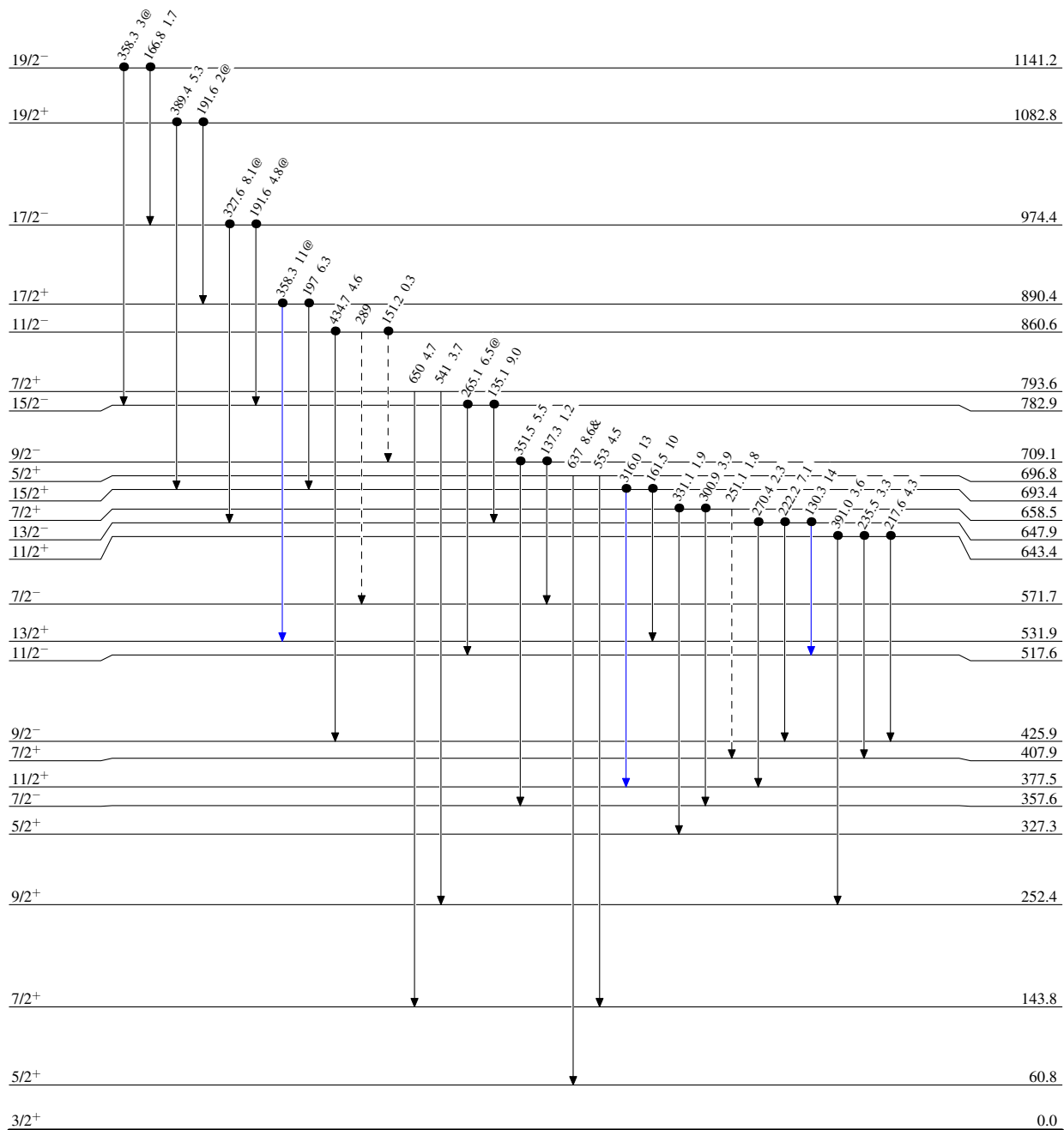
^x γ ray not placed in level scheme.

$^{157}\text{Gd}(\text{d},2\text{n}\gamma), ^{157}\text{Gd}(\text{p},\text{n}\gamma) \quad 1971\text{Wi24}$ Level Scheme

Intensities: Relative I_γ
 & Multiply placed: undivided intensity given
 @ Multiply placed: intensity suitably divided

Legend

- $\longrightarrow$ $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
 $\longrightarrow$ $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
 $\longrightarrow$ $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
 $-\cdots-$ γ Decay (Uncertain)
 $\bullet$ Coincidence

 $^{157}\text{Tb}_{92}$

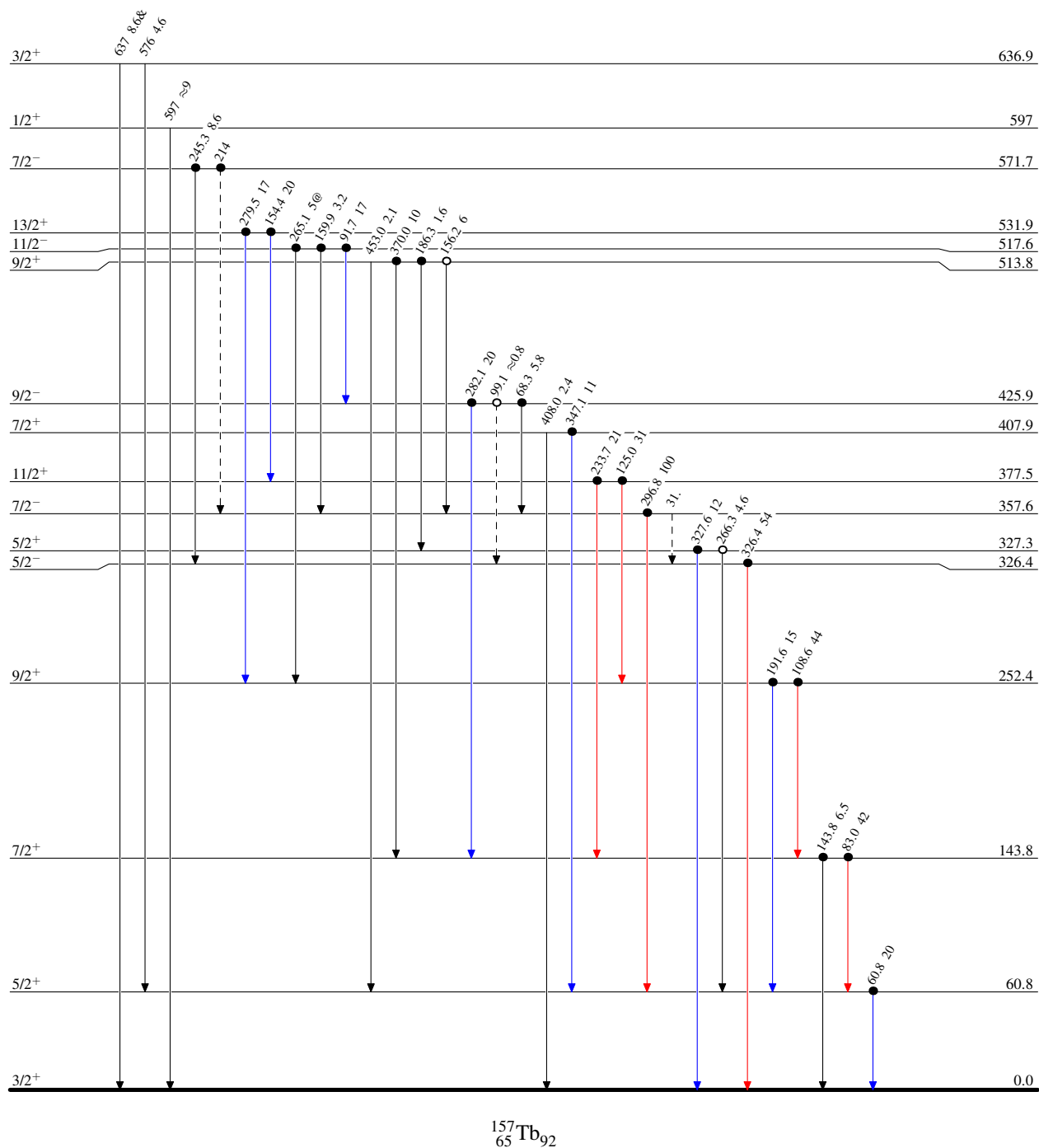
$^{157}\text{Gd}(d,2n\gamma), ^{157}\text{Gd}(p,n\gamma)$ 1971Wi24

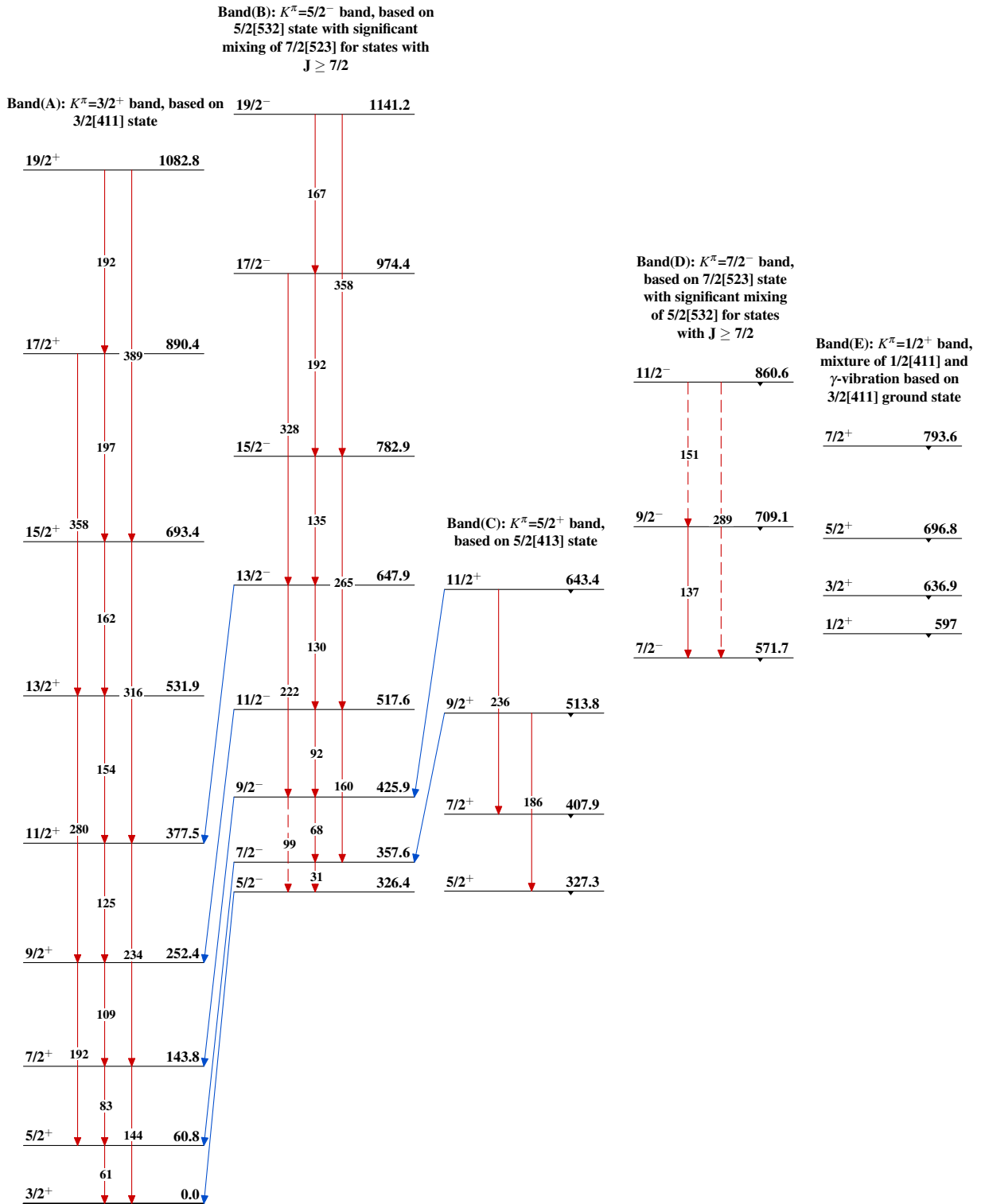
Level Scheme (continued)

Intensities: Relative I_γ
 & Multiply placed: undivided intensity given
 @ Multiply placed: intensity suitably divided

Legend

- $I_\gamma < 2\% \times I_\gamma^{\max}$
- $I_\gamma < 10\% \times I_\gamma^{\max}$
- $I_\gamma > 10\% \times I_\gamma^{\max}$
- - - - -→ γ Decay (Uncertain)
- Coincidence
- Coincidence (Uncertain)



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$^{157}\text{Gd}(\text{d},2\text{n}\gamma), ^{157}\text{Gd}(\text{p},\text{n}\gamma)$ **1971Wi24 (continued)**

**Band(F): $K^\pi=7/2^+$ band,
based on 7/2[404] state**

<u>7/2⁺</u>	<u>658.5</u>
	▼

$^{157}_{65}\text{Tb}_{92}$