

<sup>151</sup>Eu(α,2nγ), <sup>153</sup>Eu(α,4nγ) 1978Wi02,1978De27

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 170, 1 (2020)	16-Aug-2020

1978Wi02: <sup>151</sup>Eu(α,2nγ) E=23-27 MeV and <sup>153</sup>Eu(α,4nγ) E=39-51 MeV. Measured I<sub>γ</sub>(θ), γγ coincidence, γ(θ) at E(α)=27 MeV in (α,2nγ).

1978De27: <sup>153</sup>Eu(α,4nγ) E=45-55 MeV, Measured γ(θ), γγ coincidences.

<sup>153</sup>Tb Levels

E(level) <sup>†‡</sup>	J <sup>π</sup> #	Comments
0.0 <sup>c</sup>	5/2 <sup>+</sup>	
80.7 <sup>d</sup>	7/2 <sup>+</sup>	
147.6 <sup>b</sup>	3/2 <sup>+</sup>	
163.3 <sup>@</sup>	11/2 <sup>-</sup>	
213.8 <sup>a</sup>	7/2 <sup>-</sup>	
218.6		
240.6 <sup>b</sup>	5/2 <sup>+</sup>	
254.1 <sup>c</sup>	7/2 <sup>+</sup>	
262.9 <sup>&amp;</sup>	9/2 <sup>-</sup>	
325.17 <sup>d</sup>	9/2 <sup>+</sup>	
389.6 <sup>b</sup>	7/2 <sup>+</sup>	
444.8 <sup>c</sup>	9/2 <sup>+</sup>	
511.4 <sup>@</sup>	15/2 <sup>-</sup>	
529.6 <sup>d</sup>	11/2 <sup>+</sup>	
535.6 <sup>&amp;</sup>	13/2 <sup>-</sup>	
572.0 <sup>b</sup>	9/2 <sup>+</sup>	
597.5 <sup>a</sup>	(7/2 <sup>-</sup> ,9/2 <sup>-</sup> )	
630.8 <sup>c</sup>	11/2 <sup>+</sup>	
755.5 <sup>d</sup>	13/2 <sup>+</sup>	
791.7 <sup>b</sup>		J <sup>π</sup> : Band assignment assumes J <sup>π</sup> =11/2 <sup>+</sup> .
848.6 <sup>c</sup>	13/2 <sup>+</sup>	
876.9 <sup>?</sup>		
967.0 <sup>&amp;</sup>	17/2 <sup>-</sup>	
968.2 <sup>d</sup>	15/2 <sup>+</sup>	
979.0 <sup>@</sup>	19/2 <sup>-</sup>	
1010.4 <sup>a</sup>	(11/2 <sup>-</sup> ,13/2 <sup>-</sup> )	
1067.2 <sup>c</sup>	(15/2 <sup>+</sup> )	
1199.5 <sup>d</sup>	17/2 <sup>+</sup>	
1422.7 <sup>d</sup>	19/2 <sup>+</sup>	
1495.0 <sup>&amp;</sup>	21/2 <sup>-</sup>	
1532.9 <sup>@</sup>	23/2 <sup>-</sup>	
1627.4		
1681.6 <sup>d</sup>	21/2 <sup>+</sup>	
1923.8 <sup>d</sup>	23/2 <sup>+</sup>	
2086.7		
2095.2 <sup>&amp;</sup>	25/2 <sup>-</sup>	
2155.6 <sup>@</sup>	27/2 <sup>-</sup>	
2211.3 <sup>d</sup>	25/2 <sup>+</sup>	
2467.4 <sup>d</sup>	27/2 <sup>+</sup>	

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<sup>151</sup>Eu(α,2nγ), <sup>153</sup>Eu(α,4nγ) **1978Wi02,1978De27 (continued)**

<sup>153</sup>Tb Levels (continued)

E(level) <sup>†‡</sup>	J <sup>π</sup> #	Comments
2740.4	(29/2) <sup>-</sup>	E(level): From <b>1978De27</b> .
2827.0 <sup>@</sup>	31/2 <sup>-</sup>	
3493.6? <sup>@</sup>	(35/2) <sup>-</sup>	

<sup>†</sup> Additional information 1.

<sup>‡</sup> From least-squares fit to E<sub>γ</sub> data, assuming 0.3 keV uncertainty for each γ ray.

# From **1978Wi02**.

<sup>@</sup> Band(A): Favored Coriolis decoupled h<sub>11/2</sub>-related band.

& Band(B): Unfavored Coriolis decoupled h<sub>11/2</sub>-related band.

<sup>a</sup> Band(C): Negative-parity band.

<sup>b</sup> Band(D): 3/2[411] band member.

<sup>c</sup> Band(E): 5/2[402] band.

<sup>d</sup> Band(F): 7/2[404] band member.

γ(<sup>153</sup>Tb)

E <sub>γ</sub> <sup>†</sup>	I <sub>γ</sub> <sup>‡</sup>	E <sub>i</sub> (level)	J <sub>i</sub> <sup>π</sup>	E <sub>f</sub>	J <sub>f</sub> <sup>π</sup>
71.7	1.4 4	325.17	9/2 <sup>+</sup>	254.1	7/2 <sup>+</sup>
80.7	85 4	80.7	7/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>
82.6	4.6 <sup>@</sup> 14	163.3	11/2 <sup>-</sup>	80.7	7/2 <sup>+</sup>
93.0	2.7 8	240.6	5/2 <sup>+</sup>	147.6	3/2 <sup>+</sup>
99.6	14 2	262.9	9/2 <sup>-</sup>	163.3	11/2 <sup>-</sup>
147.6	8.9 27	147.6	3/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>
149.0	2.5 8	389.6	7/2 <sup>+</sup>	240.6	5/2 <sup>+</sup>
173.5	1.2 4	254.1	7/2 <sup>+</sup>	80.7	7/2 <sup>+</sup>
182.4	2.6 8	572.0	9/2 <sup>+</sup>	389.6	7/2 <sup>+</sup>
186.0	6.4 20	630.8	11/2 <sup>+</sup>	444.8	9/2 <sup>+</sup>
190.5	9.6 29	444.8	9/2 <sup>+</sup>	254.1	7/2 <sup>+</sup>
204.5	7.7 23	529.6	11/2 <sup>+</sup>	325.17	9/2 <sup>+</sup>
212.7	6.1 18	968.2	15/2 <sup>+</sup>	755.5	13/2 <sup>+</sup>
213.8	14 2	213.8	7/2 <sup>-</sup>	0.0	5/2 <sup>+</sup>
217.9	2.9 9	848.6	13/2 <sup>+</sup>	630.8	11/2 <sup>+</sup>
218.6 <sup>a</sup>	<4.4 <sup>a</sup>	218.6		0.0	5/2 <sup>+</sup>
218.6 <sup>ab</sup>	<4.4 <sup>a</sup>	791?		572.0	9/2 <sup>+</sup>
218.6 <sup>a</sup>	4.4 <sup>a</sup> 13	1067.2	(15/2 <sup>+</sup> )	848.6	13/2 <sup>+</sup>
223.3	3.1 9	1422.7	19/2 <sup>+</sup>	1199.5	17/2 <sup>+</sup>
225.9	6.8 20	755.5	13/2 <sup>+</sup>	529.6	11/2 <sup>+</sup>
231.3	4.1 12	1199.5	17/2 <sup>+</sup>	968.2	15/2 <sup>+</sup>
240.5	0.6 2	240.6	5/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>
242.2	1.7 5	1923.8	23/2 <sup>+</sup>	1681.6	21/2 <sup>+</sup>
244.3	27 3	325.17	9/2 <sup>+</sup>	80.7	7/2 <sup>+</sup>
254.3	27 3	254.1	7/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>
256.2	0.4 2	2467.4	27/2 <sup>+</sup>	2211.3	25/2 <sup>+</sup>
259.0	1.2 4	1681.6	21/2 <sup>+</sup>	1422.7	19/2 <sup>+</sup>
272.6	13 1	535.6	13/2 <sup>-</sup>	262.9	9/2 <sup>-</sup>
287.5	0.5 2	2211.3	25/2 <sup>+</sup>	1923.8	23/2 <sup>+</sup>
305.8	2.8 8	630.8	11/2 <sup>+</sup>	325.17	9/2 <sup>+</sup>
310.7	1.1 3	755.5	13/2 <sup>+</sup>	444.8	9/2 <sup>+</sup>
325.0	4.0 12	325.17	9/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>

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<sup>151</sup>Eu( $\alpha,2n\gamma$ ), <sup>153</sup>Eu( $\alpha,4n\gamma$ ) **1978Wi02,1978De27** (continued)

$\gamma(^{153}\text{Tb})$  (continued)

$E_\gamma^\dagger$	$I_\gamma^\ddagger$	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$
334.6	1.2 4	597.5	(7/2 <sup>-</sup> ,9/2 <sup>-</sup> )	262.9	9/2 <sup>-</sup>
337.4	4.5 14	968.2	15/2 <sup>+</sup>	630.8	11/2 <sup>+</sup>
348.1	100 5	511.4	15/2 <sup>-</sup>	163.3	11/2 <sup>-</sup>
350.8	0.8 3	1199.5	17/2 <sup>+</sup>	848.6	13/2 <sup>+</sup>
364.1	3.1 9	444.8	9/2 <sup>+</sup>	80.7	7/2 <sup>+</sup>
367.8	1.3 4	630.8	11/2 <sup>+</sup>	262.9	9/2 <sup>-</sup>
372.2	28 3	535.6	13/2 <sup>-</sup>	163.3	11/2 <sup>-</sup>
376.5	5.7 17	630.8	11/2 <sup>+</sup>	254.1	7/2 <sup>+</sup>
383.6	1.1 3	597.5	(7/2 <sup>-</sup> ,9/2 <sup>-</sup> )	213.8	7/2 <sup>-</sup>
389.6	3.2 9	389.6	7/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>
403.8	3.4 10	848.6	13/2 <sup>+</sup>	444.8	9/2 <sup>+</sup>
413.0	3.2 10	1010.4	(11/2 <sup>-</sup> ,13/2 <sup>-</sup> )	597.5	(7/2 <sup>-</sup> ,9/2 <sup>-</sup> )
430.3	16 2	755.5	13/2 <sup>+</sup>	325.17	9/2 <sup>+</sup>
431.4	18 5	967.0	17/2 <sup>-</sup>	535.6	13/2 <sup>-</sup>
434.2	6.0 18	597.5	(7/2 <sup>-</sup> ,9/2 <sup>-</sup> )	163.3	11/2 <sup>-</sup>
436.5	5.2 16	1067.2	(15/2 <sup>+</sup> )	630.8	11/2 <sup>+</sup>
438.6	14 2	968.2	15/2 <sup>+</sup>	529.6	11/2 <sup>+</sup>
444.0	11 3	1199.5	17/2 <sup>+</sup>	755.5	13/2 <sup>+</sup>
444.8	4.1 12	444.8	9/2 <sup>+</sup>	0.0	5/2 <sup>+</sup>
448.8	19 6	529.6	11/2 <sup>+</sup>	80.7	7/2 <sup>+</sup>
454.5	11 3	1422.7	19/2 <sup>+</sup>	968.2	15/2 <sup>+</sup>
455.5	12 4	967.0	17/2 <sup>-</sup>	511.4	15/2 <sup>-</sup>
467.6	48 5	979.0	19/2 <sup>-</sup>	511.4	15/2 <sup>-</sup>
474.7	3.9 12	1010.4	(11/2 <sup>-</sup> ,13/2 <sup>-</sup> )	535.6	13/2 <sup>-</sup>
482.1	6.8 20	1681.6	21/2 <sup>+</sup>	1199.5	17/2 <sup>+</sup>
498.9	3.4 10	1010.4	(11/2 <sup>-</sup> ,13/2 <sup>-</sup> )	511.4	15/2 <sup>-</sup>
501.2	6.1 18	1923.8	23/2 <sup>+</sup>	1422.7	19/2 <sup>+</sup>
516.1	6.3 19	1495.0	21/2 <sup>-</sup>	979.0	19/2 <sup>-</sup>
528.0	10 1	1495.0	21/2 <sup>-</sup>	967.0	17/2 <sup>-</sup>
529.6	2.0 6	2211.3	25/2 <sup>+</sup>	1681.6	21/2 <sup>+</sup>
543.5	2.9 9	2467.4	27/2 <sup>+</sup>	1923.8	23/2 <sup>+</sup>
553.9	19 2	1532.9	23/2 <sup>-</sup>	979.0	19/2 <sup>-</sup>
562.3		2095.2	25/2 <sup>-</sup>	1532.9	23/2 <sup>-</sup>
584.8 <sup>#&amp;</sup>		2740.4	(29/2) <sup>-</sup>	2155.6	27/2 <sup>-</sup>
591.7	5.9 18	2086.7		1495.0	21/2 <sup>-</sup>
600.1	4.8 14	2095.2	25/2 <sup>-</sup>	1495.0	21/2 <sup>-</sup>
614	1.0 3	876.9?		262.9	9/2 <sup>-</sup>
622.7	6.1 18	2155.6	27/2 <sup>-</sup>	1532.9	23/2 <sup>-</sup>
645.1 <sup>&amp;b</sup>		2740.4	(29/2) <sup>-</sup>	2095.2	25/2 <sup>-</sup>
<sup>x</sup> 658.5 <sup>#</sup>					
660.4		1627.4		967.0	17/2 <sup>-</sup>
666.6		3493.6?	(35/2) <sup>-</sup>	2827.0	31/2 <sup>-</sup>
671.4		2827.0	31/2 <sup>-</sup>	2155.6	27/2 <sup>-</sup>
<sup>x</sup> 779.0 <sup>#</sup>					

<sup>†</sup> 1978Wi02 estimated uncertainties to be 0.1-0.3 keV.

<sup>‡</sup> Values are those measured at 125° in ( $\alpha,2n\gamma$ ) at E( $\alpha$ )=27 MeV. 1978Wi02 state that uncertainties are 5% to 30% depending on  $I_\gamma$ . Based on that the following  $\Delta I_\gamma$  were assigned by the evaluator: 5% for  $I_\gamma > 50$ , 10% for  $I_\gamma = 10-50$ , and 30% for  $I_\gamma < 10$ .

Additional  $I_\gamma$  data from the ( $\alpha,4n\gamma$ ) reaction at E=51 MeV are given by the authors.

<sup>#</sup> Assignment to <sup>153</sup>Tb uncertain.

<sup>@</sup> Corrected for background 82.8-keV line from <sup>153</sup>Gd decay.

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$^{151}\text{Eu}(\alpha,2n\gamma), ^{153}\text{Eu}(\alpha,4n\gamma)$  [1978Wi02,1978De27](#) (continued)

$\gamma(^{153}\text{Tb})$  (continued)

& Placement from [1978De27](#).

<sup>a</sup> Multiply placed with undivided intensity.

<sup>b</sup> Placement of transition in the level scheme is uncertain.

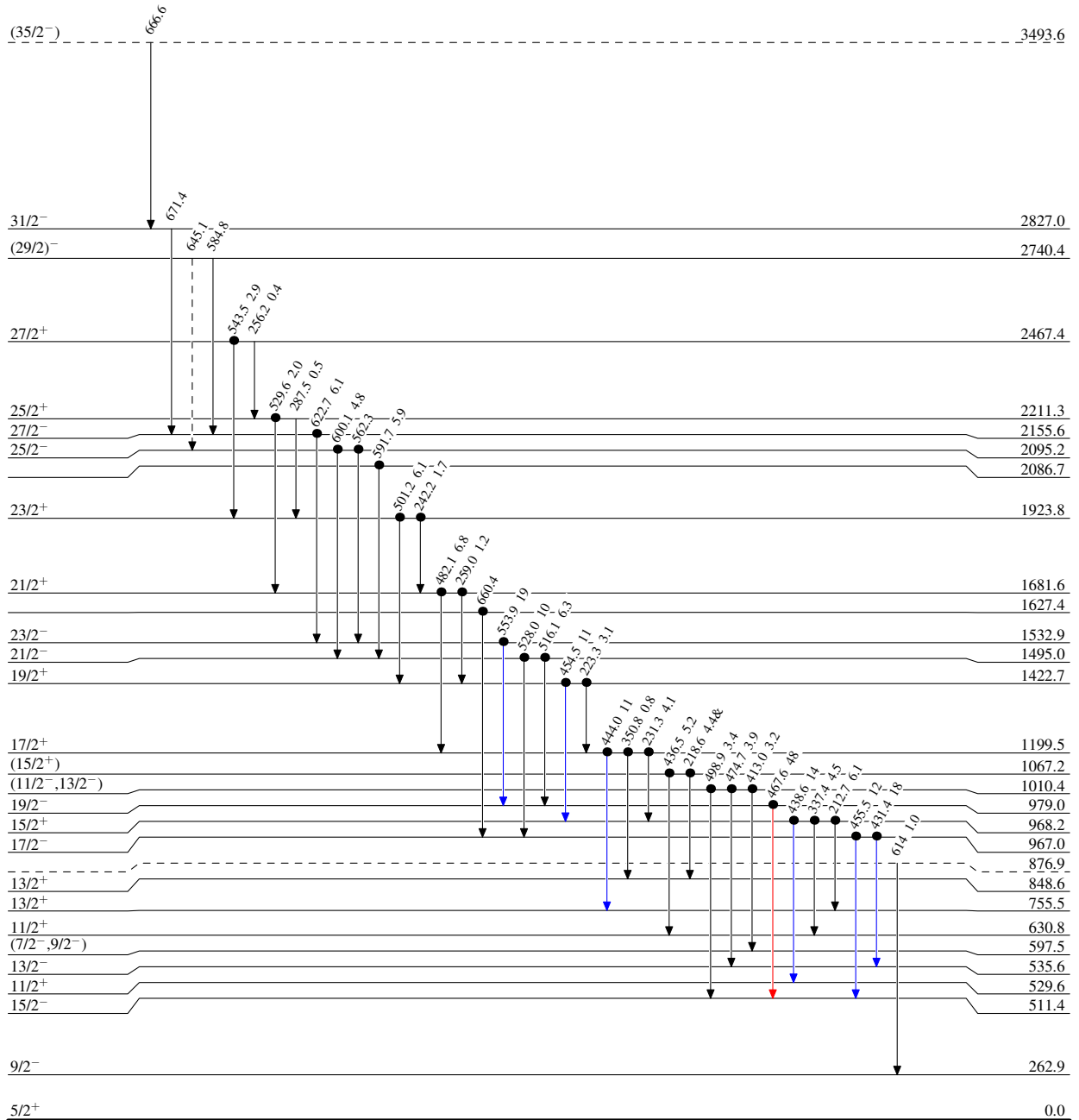
<sup>x</sup>  $\gamma$  ray not placed in level scheme.

<sup>151</sup>Eu( $\alpha,2n\gamma$ ), <sup>153</sup>Eu( $\alpha,4n\gamma$ ) 1978Wi02,1978De27

Legend

**Level Scheme**  
Intensities: Relative I <sub>$\gamma$</sub>   
& Multiply placed: undivided intensity given

- ▶ I <sub>$\gamma$</sub>  < 2% × I <sub>$\gamma$</sub> <sup>max</sup>
- ▶ I <sub>$\gamma$</sub>  < 10% × I <sub>$\gamma$</sub> <sup>max</sup>
- ▶ I <sub>$\gamma$</sub>  > 10% × I <sub>$\gamma$</sub> <sup>max</sup>
- - -▶  $\gamma$  Decay (Uncertain)
- Coincidence








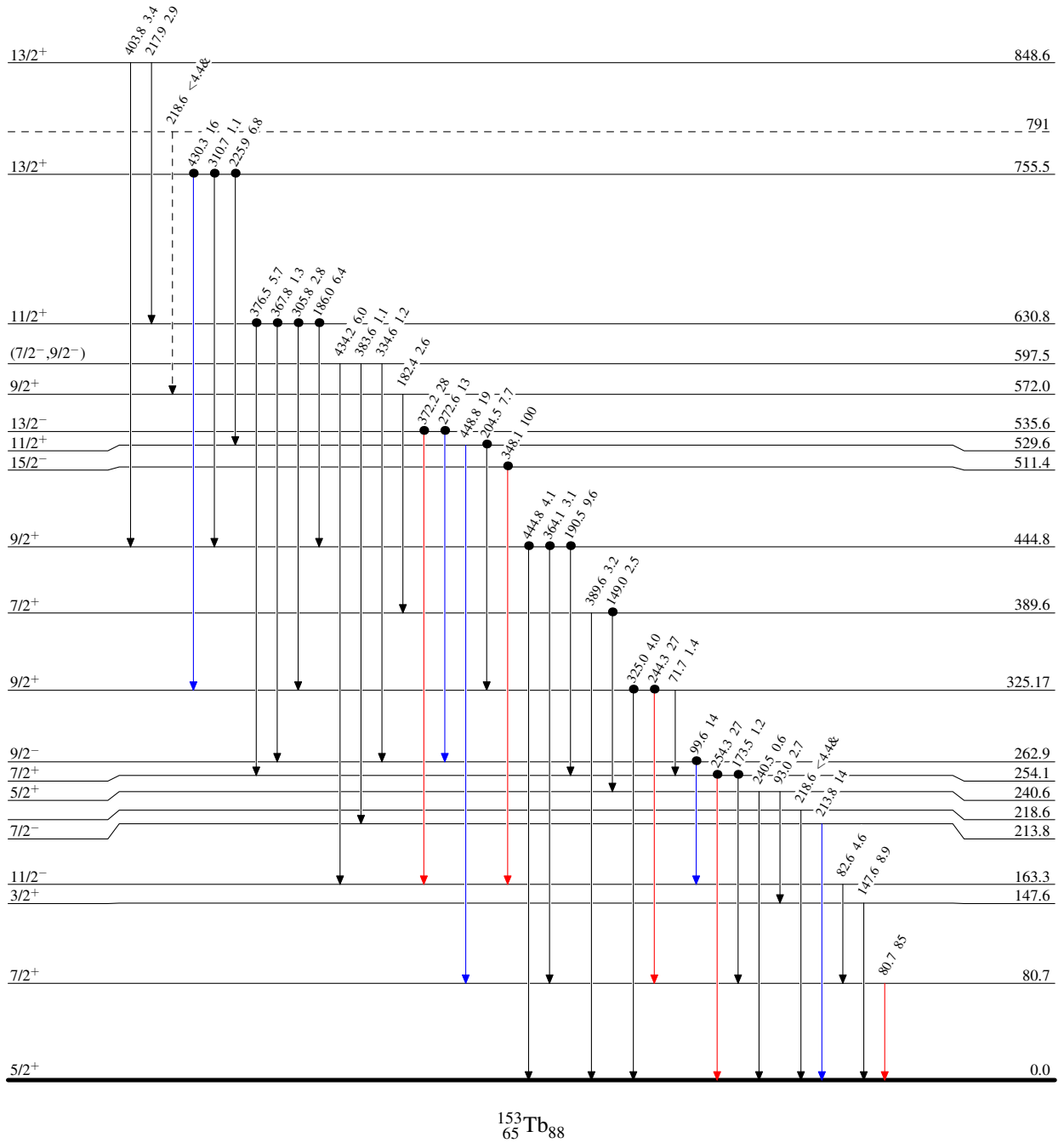
$^{151}\text{Eu}(\alpha,2n\gamma), ^{153}\text{Eu}(\alpha,4n\gamma)$  1978Wi02,1978De27

Legend

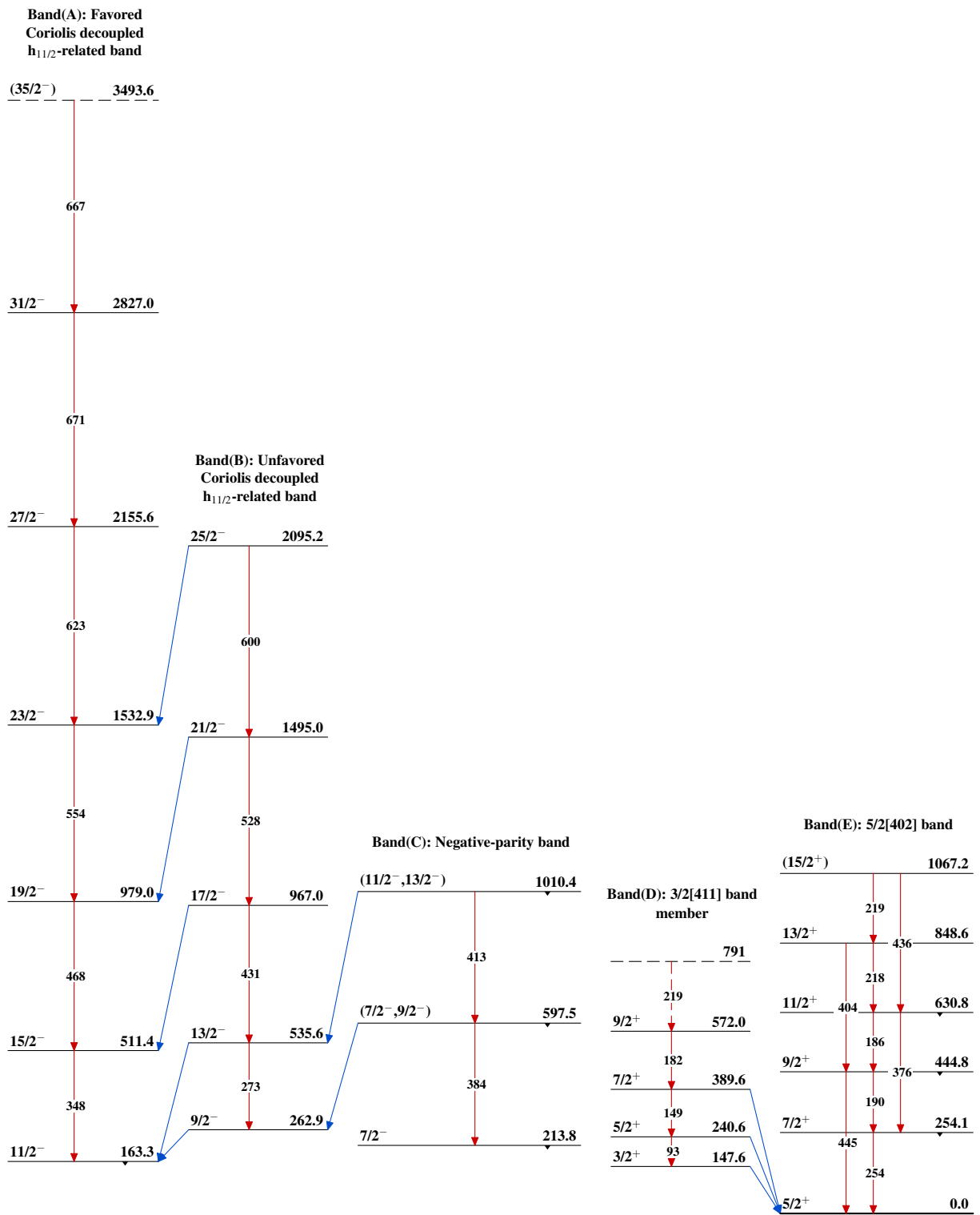
Level Scheme (continued)

Intensities: Relative  $I_\gamma$   
& Multiply placed: undivided intensity given

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

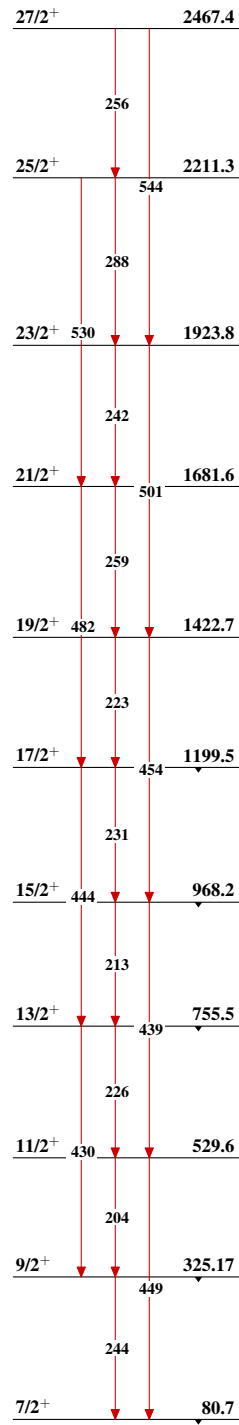


$^{153}\text{Tb}_{88}$

$^{151}\text{Eu}(\alpha,2n\gamma), ^{153}\text{Eu}(\alpha,4n\gamma)$  1978Wi02,1978De27 $^{153}\text{Tb}_{88}$

$^{151}\text{Eu}(\alpha,2n\gamma), ^{153}\text{Eu}(\alpha,4n\gamma)$  1978Wi02,1978De27 (continued)

Band(F): 7/2[404] band member

 $^{153}\text{Tb}_{88}$