

$^{170}\text{Yb}(p,4n\gamma)$  1977Ba40

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen		NDS 191,1 (2023)	22-Aug-2023

1977Ba40 (also 1974Fo19):  $^{170}\text{Yb}(p,4n\gamma)$ , E=40 MeV, using targets enriched to 67% in  $^{170}\text{Yb}$  at Grenoble. Measured  $E\gamma$ ,  $I\gamma$ ,  $\gamma\gamma$ -coin using Ge(Li) detectors.  
See also  $^{169}\text{Tm}(^3\text{He},5n\gamma)$  dataset from 1977Ba40.

 $^{167}\text{Lu}$  Levels

Band assignments from 1977Ba40 (also 1974Fo19).

E(level) <sup>†</sup>	$J^{\pi\ddagger}$	Comments
0.0 <sup>#</sup>	7/2 <sup>+</sup>	
0.0+x <sup>&amp;</sup>	1/2 <sup>+</sup>	Additional information 1. E(level): x=33.7 keV, as in the Adopted Levels, taken from 2015Ro27.
0.0+y <sup>b</sup>	5/2 <sup>+</sup>	Additional information 2. E(level): y=67.1 keV, as in the Adopted Levels, taken from 2015Ro27.
14.9+x <sup>&amp;</sup> 5	3/2 <sup>+</sup>	E(level): 1977Ba40 propose E=19.6+X from the difference between 107.3 $\gamma$ and 87.7 $\gamma$ placed by 1977Ba40 from the 1/2 <sup>-</sup> level, while it is adopted from 2015Ro27 that it is 102.6 $\gamma$ and 87.7 $\gamma$ that deexcite the 1/2 <sup>-</sup> level and the 107.3 $\gamma$ deexcites the 5/2 <sup>-</sup> level instead.
102.6+x <sup>a</sup> 5	1/2 <sup>-</sup>	E(level): 1977Ba40 propose E=107.3+x based on the placement of 107.3 $\gamma$ from this level; however, it has been adopted from the level scheme in 2015Ro27 that it is 102.6 $\gamma$ that deexcites this level.
116.69+y <sup>b</sup> 10	7/2 <sup>+</sup>	
122.2+x <sup>a</sup> 7	5/2 <sup>-</sup>	
140.02 <sup>#</sup> 7	9/2 <sup>+</sup>	
234.1+x <sup>a</sup> 8	9/2 <sup>-</sup>	
243.9+x <sup>a</sup> 7	3/2 <sup>-</sup>	Additional information 3.
261.85+y <sup>b</sup> 16	9/2 <sup>+</sup>	
305.27 <sup>#</sup> 8	11/2 <sup>+</sup>	
331.82 <sup>@</sup> 8	9/2 <sup>-</sup>	
400.7+x <sup>a</sup> 7	7/2 <sup>-</sup>	
431.57+y <sup>b</sup> 14	11/2 <sup>+</sup>	
433.6 <sup>@</sup> 3	11/2 <sup>-</sup>	
446.6+x <sup>a</sup> 9	13/2 <sup>-</sup>	
494.20 <sup>#</sup> 11	13/2 <sup>+</sup>	
577.0 <sup>@</sup> 4	13/2 <sup>-</sup>	
624.5+y <sup>b</sup> 4	13/2 <sup>+</sup>	
659.0+x <sup>a</sup> 8	11/2 <sup>-</sup>	
704.38 <sup>#</sup> 11	15/2 <sup>+</sup>	
744.2 <sup>@</sup> 4	15/2 <sup>-</sup>	
761.5+x <sup>a</sup> 9	17/2 <sup>-</sup>	
846.88+y <sup>b</sup> 17	15/2 <sup>+</sup>	
934.29 <sup>#</sup> 13	17/2 <sup>+</sup>	
948.0 <sup>@</sup> 4	17/2 <sup>-</sup>	
1000.6+x <sup>a</sup> 8	15/2 <sup>-</sup>	
1159.5 <sup>@</sup> 4	19/2 <sup>-</sup>	
1172.7+x <sup>a</sup> 10	21/2 <sup>-</sup>	
1181.30 <sup>#</sup> 13	19/2 <sup>+</sup>	

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<sup>170</sup>Yb(p,4nγ) **1977Ba40** (continued)

<sup>167</sup>Lu Levels (continued)

E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>
1411.8 <sup>@</sup> 4	21/2 <sup>-</sup>	1671.1+x <sup>a</sup> 11	25/2 <sup>-</sup>	2216.4 <sup>@</sup> 7	27/2 <sup>-</sup>	2581.5 <sup>#</sup> 6	29/2 <sup>+</sup>
1425.4+x <sup>a</sup> 8	19/2 <sup>-</sup>	1720.72 <sup>#</sup> 16	23/2 <sup>+</sup>	2243.9+x <sup>a</sup> 12	29/2 <sup>-</sup>	2884.9+x <sup>a</sup> 13	33/2 <sup>-</sup>
1444.75 <sup>#</sup> 18	21/2 <sup>+</sup>	1947.7 <sup>@</sup> 6	25/2 <sup>-</sup>	2300.1 <sup>#</sup> 5	27/2 <sup>+</sup>		
1656.4 <sup>@</sup> 5	23/2 <sup>-</sup>	2008.75 <sup>#</sup> 20	25/2 <sup>+</sup>	2532.0 <sup>@</sup> 7	29/2 <sup>-</sup>		

<sup>†</sup> From a least-squares fit to E<sub>γ</sub> data. From a comparison to level structure in [2015Ro27](#) and in the Adopted Levels, x=33.7 keV, and y=67.1 keV.

<sup>‡</sup> From [1977Ba40](#), based on energy and intensity fits of coincident transitions into rotational bands based on expected Nilsson states.

<sup>#</sup> Band(A): π7/2[404] band.

<sup>@</sup> Band(B): π9/2[514] band.

<sup>&</sup> Band(C): π1/2[411] band.

<sup>a</sup> Band(D): π1/2[541] band.

<sup>b</sup> Band(E): π5/2[402] band (?). Tentative assignment.

γ(<sup>167</sup>Lu)

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>	Comments
(14.9 <sup>@</sup> )		14.9+x	3/2 <sup>+</sup>	0.0+x	1/2 <sup>+</sup>	
(19.6 <sup>@</sup> )		122.2+x	5/2 <sup>-</sup>	102.6+x	1/2 <sup>-</sup>	
<sup>x</sup> 68.3 1	33.5 34					
<sup>x</sup> 71.0 5	2.8 14					
<sup>x</sup> 72.7 5	8.4 42					
<sup>x</sup> 75.2 1	15.4 16					
<sup>x</sup> 78.7 1	25.2 25					
<sup>x</sup> 80.7 5	6.5 <sup>#</sup> 33					
<sup>x</sup> 85.9 1	11.6 12					
87.7 1	149 <sup>#</sup> 15	102.6+x	1/2 <sup>-</sup>	14.9+x	3/2 <sup>+</sup>	
<sup>x</sup> 90.2 5	8.5 43					
<sup>x</sup> 91.5 5	17.6 18					
<sup>x</sup> 92.5 5	18.2 18					
<sup>x</sup> 95.5 5	8.5 43					
<sup>x</sup> 97.6 1	17.1 17					
<sup>x</sup> 99.8 5	<sup>a</sup>					
101.7 5	37.8 38	433.6	11/2 <sup>-</sup>	331.82	9/2 <sup>-</sup>	
102.6 5	39.9 <sup>#</sup> 40	102.6+x	1/2 <sup>-</sup>	0.0+x	1/2 <sup>+</sup>	E <sub>γ</sub> : placement from Adopted Gammas; <a href="#">1977Ba40</a> place this γ from the 5/2 <sup>-</sup> level to feed the 3/2 <sup>+</sup> level.
107.3 5	55.7 56	122.2+x	5/2 <sup>-</sup>	14.9+x	3/2 <sup>+</sup>	E <sub>γ</sub> : placement from Adopted Gammas; <a href="#">1977Ba40</a> place this γ from the 1/2 <sup>-</sup> level to feed the 1/2 <sup>+</sup> level.
111.7 5	103 10	234.1+x	9/2 <sup>-</sup>	122.2+x	5/2 <sup>-</sup>	
116.7 1	41.9 <sup>#</sup> 42	116.69+y	7/2 <sup>+</sup>	0.0+y	5/2 <sup>+</sup>	
<sup>x</sup> 119.9 5	9.5 48					
122.1 <sup>d</sup> 5	17.1 17	243.9+x?	3/2 <sup>-</sup>	122.2+x	5/2 <sup>-</sup>	
<sup>x</sup> 125.9 5	8.2 41					
<sup>x</sup> 129.2 5	13.0 13					
<sup>x</sup> 130.5 5	8.7 44					
<sup>x</sup> 137.0 1	11.8 12					
139.9 1	100 10	140.02	9/2 <sup>+</sup>	0.0	7/2 <sup>+</sup>	
143.4 5	50.3 <sup>#</sup> 50	577.0	13/2 <sup>-</sup>	433.6	11/2 <sup>-</sup>	

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<b><sup>170</sup>Yb(p,4n<math>\gamma</math>) <sup>1977</sup>Ba40 (continued)</b>						
<u><math>\gamma(^{167}\text{Lu})</math> (continued)</u>						
$E_\gamma$ †	$I_\gamma$ ‡	$E_i(\text{level})$	$J_i^\pi$	$E_f$	$J_f^\pi$	Comments
144.7 5	61.8 <sup>#</sup> 62	261.85+y	9/2 <sup>+</sup>	116.69+y	7/2 <sup>+</sup>	
<sup>x</sup> 147.0 1	59.5 60					
<sup>x</sup> 148.5 5	3.9 20					
<sup>x</sup> 154.3 1	19.6 20					
156.5 <sup>d</sup> 1	29.8 <sup>#</sup> 30	400.7+x	7/2 <sup>-</sup>	243.9+x?	3/2 <sup>-</sup>	Shown in Fig 3 of <sup>1977</sup> Ba40, but attributed to <sup>168</sup> Lu $\epsilon$ decay in authors' Table 1.
<sup>x</sup> 159.0 5	9.1 46					
<sup>x</sup> 160.6 5	14.1 14					
<sup>x</sup> 161.5 5	13.1 13					
165.2 1	62.2 62	305.27	11/2 <sup>+</sup>	140.02	9/2 <sup>+</sup>	
167.2 <sup>cd</sup> 1	26.6 <sup>c</sup> 27	400.7+x	7/2 <sup>-</sup>	234.1+x	9/2 <sup>-</sup>	
167.2 <sup>c</sup> 1	26.6 <sup>c</sup> 27	744.2	15/2 <sup>-</sup>	577.0	13/2 <sup>-</sup>	
169.7 1	73.2 73	431.57+y	11/2 <sup>+</sup>	261.85+y	9/2 <sup>+</sup>	
<sup>x</sup> 174.8 5	7.4 37					
<sup>x</sup> 179.0 5	25.1 <sup>#</sup> 25					
<sup>x</sup> 186.6 5	10.4 11					
188.8 5	83.2 <sup>#</sup> 83	494.20	13/2 <sup>+</sup>	305.27	11/2 <sup>+</sup>	
191.7 1	78.2 <sup>#</sup> 78	331.82	9/2 <sup>-</sup>	140.02	9/2 <sup>+</sup>	
193.1 5	107 11	624.5+y	13/2 <sup>+</sup>	431.57+y	11/2 <sup>+</sup>	
<sup>x</sup> 197.3 5	35.0 35					
203.5 5	29.3 29	948.0	17/2 <sup>-</sup>	744.2	15/2 <sup>-</sup>	
210.1 5	17.2 17	704.38	15/2 <sup>+</sup>	494.20	13/2 <sup>+</sup>	
211.6 5	105 11	1159.5	19/2 <sup>-</sup>	948.0	17/2 <sup>-</sup>	$I_\gamma$ : for 211.6+212.3.
212.3 <sup>c</sup> 5	105 <sup>c#</sup> 11	446.6+x	13/2 <sup>-</sup>	234.1+x	9/2 <sup>-</sup>	$E_\gamma$ : 212.8 in Table 1 of <sup>1977</sup> Ba40, but 212.3 in authors' Fig. 3 and text; also in Table 1 and Fig. 1 of <sup>1974</sup> Fo19. $I_\gamma$ : for 211.6+212.3.
212.3 <sup>c</sup> 5	105 <sup>c#</sup> 11	659.0+x	11/2 <sup>-</sup>	446.6+x	13/2 <sup>-</sup>	
<sup>x</sup> 217.9 1	27.6 28					
222.6 5	28.7 <sup>#</sup> 29	846.88+y	15/2 <sup>+</sup>	624.5+y	13/2 <sup>+</sup>	
224.2 <sup>d</sup> 5	23.3 23	243.9+x?	3/2 <sup>-</sup>	14.9+x	3/2 <sup>+</sup>	
<sup>x</sup> 228.6 1	43.1 43					
230.1 5		934.29	17/2 <sup>+</sup>	704.38	15/2 <sup>+</sup>	
243.3 <sup>d</sup> 5	28.7 29	243.9+x?	3/2 <sup>-</sup>	0.0+x	1/2 <sup>+</sup>	
244.8 <sup>c</sup> 5	19.5 <sup>c</sup> 20	577.0	13/2 <sup>-</sup>	331.82	9/2 <sup>-</sup>	
244.8 <sup>c</sup> 5	19.5 <sup>c</sup> 20	1656.4	23/2 <sup>-</sup>	1411.8	21/2 <sup>-</sup>	
247.0 1	43.3 <sup>#</sup> 43	1181.30	19/2 <sup>+</sup>	934.29	17/2 <sup>+</sup>	
252.3 1		1411.8	21/2 <sup>-</sup>	1159.5	19/2 <sup>-</sup>	
<sup>x</sup> 254.5 1	20.3 20					
<sup>x</sup> 256.7 5	29.3 29					
258.5 5	30.3 30	659.0+x	11/2 <sup>-</sup>	400.7+x	7/2 <sup>-</sup>	$I_\gamma$ : see comment with 256.7 $\gamma$ .
<sup>x</sup> 258.5 5	30.0 30					
261.7 5	17.6 18	261.85+y	9/2 <sup>+</sup>	0.0+y	5/2 <sup>+</sup>	
263.5 5		1444.75	21/2 <sup>+</sup>	1181.30	19/2 <sup>+</sup>	
267.9 <sup>d</sup> 5		2216.4	27/2 <sup>-</sup>	1947.7	25/2 <sup>-</sup>	
<sup>x</sup> 270.5 5	33.7 34					
<sup>x</sup> 271.6 5	3.0 15					
276.0 1		1720.72	23/2 <sup>+</sup>	1444.75	21/2 <sup>+</sup>	
278.5 1	36.6 <sup>#</sup> 37	400.7+x	7/2 <sup>-</sup>	122.2+x	5/2 <sup>-</sup>	
<sup>x</sup> 280.6 1	65.0 65					
<sup>x</sup> 284.3 1	10.5 11					
288.1 5	16.3 16	2008.75	25/2 <sup>+</sup>	1720.72	23/2 <sup>+</sup>	

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<sup>170</sup>Yb(p,4nγ) **1977Ba40** (continued)

γ(<sup>167</sup>Lu) (continued)

<u>E<sub>γ</sub><sup>†</sup></u>	<u>I<sub>γ</sub><sup>‡</sup></u>	<u>E<sub>i</sub>(level)</u>	<u>J<sub>i</sub><sup>π</sup></u>	<u>E<sub>f</sub></u>	<u>J<sub>f</sub><sup>π</sup></u>	<u>Comments</u>
291.3 <sup>bd</sup> 5		1947.7	25/2 <sup>-</sup>	1656.4	23/2 <sup>-</sup>	
291.3 <sup>bd</sup> 5		2300.1	27/2 <sup>+</sup>	2008.75	25/2 <sup>+</sup>	
294.0 5	20.1 20	433.6	11/2 <sup>-</sup>	140.02	9/2 <sup>+</sup>	
305.3 1	54.2 54	305.27	11/2 <sup>+</sup>	0.0	7/2 <sup>+</sup>	
<sup>x</sup> 309.9 5	37.8 38					
310.9 5	18.8 19	744.2	15/2 <sup>-</sup>	433.6	11/2 <sup>-</sup>	
314.9 <sup>c</sup> 1	172 <sup>c&amp;</sup> 17	431.57+y	11/2 <sup>+</sup>	116.69+y	7/2 <sup>+</sup>	
314.9 <sup>c</sup> 1	172 <sup>c&amp;</sup> 17	761.5+x	17/2 <sup>-</sup>	446.6+x	13/2 <sup>-</sup>	
314.9 <sup>d</sup> 5	&	2532.0	29/2 <sup>-</sup>	2216.4	27/2 <sup>-</sup>	E <sub>γ</sub> : for triply-placed γ. Negligible intensity is expected from its possible placement from 2532 level.
<sup>x</sup> 321.5 1	11.8 12					
<sup>x</sup> 324.4 1	25.1 25					
331.9 1	79.1 79	331.82	9/2 <sup>-</sup>	0.0	7/2 <sup>+</sup>	
<sup>x</sup> 336.1 5	15.2 15					
341.7 1	16.0 16	1000.6+x	15/2 <sup>-</sup>	659.0+x	11/2 <sup>-</sup>	
<sup>x</sup> 348.4 1	43.3 43					
<sup>x</sup> 351.6 1	14.6 15					
354.2 1	38.5 39	494.20	13/2 <sup>+</sup>	140.02	9/2 <sup>+</sup>	
<sup>x</sup> 357.9 1	14.3 14					
≈363		624.5+y	13/2 <sup>+</sup>	261.85+y	9/2 <sup>+</sup>	E <sub>γ</sub> : from Fig. 3 of <b>1977Ba40</b> ; presumably different from the unplaced 364.5γ.
<sup>x</sup> 364.5 1	22.6 23					
<sup>x</sup> 367.3 1	13.7 14					
371.0 1	13.9 14	948.0	17/2 <sup>-</sup>	577.0	13/2 <sup>-</sup>	
<sup>x</sup> 377.9 5	6.5 33					
<sup>x</sup> 379.8 5	10.7 11					
<sup>x</sup> 388.3 5	11.3 11					
<sup>x</sup> 397.0 5	23.4 24					
399.1 1	40.7 41	704.38	15/2 <sup>+</sup>	305.27	11/2 <sup>+</sup>	
<sup>x</sup> 401.1 1	29.9 30					
<sup>x</sup> 409.7 5	9.7 49					
411.2 5	10.8 11	1172.7+x	21/2 <sup>-</sup>	761.5+x	17/2 <sup>-</sup>	
415.3 <sup>c</sup> 1	15.6 <sup>c</sup> 16	846.88+y	15/2 <sup>+</sup>	431.57+y	11/2 <sup>+</sup>	
415.3 <sup>c</sup> 1	15.6 <sup>c</sup> 16	1159.5	19/2 <sup>-</sup>	744.2	15/2 <sup>-</sup>	
<sup>x</sup> 417.6 1	42.4 43					
424.8 <sup>c</sup> 1	9.2 <sup>c</sup> 46	659.0+x	11/2 <sup>-</sup>	234.1+x	9/2 <sup>-</sup>	
424.8 <sup>c</sup> 1	9.2 <sup>c</sup> 46	1425.4+x	19/2 <sup>-</sup>	1000.6+x	15/2 <sup>-</sup>	
<sup>x</sup> 432.6 5	14.7 15					
<sup>x</sup> 436.5 5	19.6 20					
440.1 1	82.3 82	934.29	17/2 <sup>+</sup>	494.20	13/2 <sup>+</sup>	
<sup>x</sup> 449.9 5	6.5 33					
<sup>x</sup> 459.5 1	7.3 37					
<sup>x</sup> 462.1 5	6.8 34					
463.8 5		1411.8	21/2 <sup>-</sup>	948.0	17/2 <sup>-</sup>	
<sup>x</sup> 467.9 5	9.1 46					
476.9 1	15.6 16	1181.30	19/2 <sup>+</sup>	704.38	15/2 <sup>+</sup>	
496.7 5		1656.4	23/2 <sup>-</sup>	1159.5	19/2 <sup>-</sup>	
498.4 5		1671.1+x	25/2 <sup>-</sup>	1172.7+x	21/2 <sup>-</sup>	
<sup>x</sup> 500.8 5	<i>a</i>					
511.0 5	<i>#a</i>	1444.75	21/2 <sup>+</sup>	934.29	17/2 <sup>+</sup>	
535.9 5	4.9 25	1947.7	25/2 <sup>-</sup>	1411.8	21/2 <sup>-</sup>	
539.4 1	34.4 <sup>#</sup> 35	1720.72	23/2 <sup>+</sup>	1181.30	19/2 <sup>+</sup>	
553.8 5	5.9 30	1000.6+x	15/2 <sup>-</sup>	446.6+x	13/2 <sup>-</sup>	

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<sup>170</sup>Yb(p,4nγ) **1977Ba40** (continued)

γ(<sup>167</sup>Lu) (continued)

<u>E<sub>γ</sub><sup>†</sup></u>	<u>I<sub>γ</sub><sup>‡</sup></u>	<u>E<sub>i</sub>(level)</u>	<u>J<sub>i</sub><sup>π</sup></u>	<u>E<sub>f</sub></u>	<u>J<sub>f</sub><sup>π</sup></u>	<u>Comments</u>
560.0 5		2216.4	27/2 <sup>-</sup>	1656.4	23/2 <sup>-</sup>	
564.0 1	10.4 11	2008.75	25/2 <sup>+</sup>	1444.75	21/2 <sup>+</sup>	
572.7 5		2243.9+x	29/2 <sup>-</sup>	1671.1+x	25/2 <sup>-</sup>	E <sub>γ</sub> : from Fig. 3 of <b>1977Ba40</b> , absent in authors' Table 1, but present in γγ-coin.
572.7 5		2581.5	29/2 <sup>+</sup>	2008.75	25/2 <sup>+</sup>	
579.4 5		2300.1	27/2 <sup>+</sup>	1720.72	23/2 <sup>+</sup>	
584.3 1	34.1 <sup>#</sup> 34	2532.0	29/2 <sup>-</sup>	1947.7	25/2 <sup>-</sup>	E <sub>γ</sub> : attributed to <sup>168</sup> Yb in Table 1 of <b>1977Ba40</b> , but included in authors' level scheme Fig. 3.
<sup>x</sup> 634.4 1	6.7 34					
641.0 5		2884.9+x	33/2 <sup>-</sup>	2243.9+x	29/2 <sup>-</sup>	E <sub>γ</sub> : from Figs. 1 and 3 of <b>1977Ba40</b> ; misprinted as 614.0 in authors' Table 1.
<sup>x</sup> 661.6 1	15.4 16					
<sup>x</sup> 718.8 1	71.8 72					
<sup>x</sup> 729.3 5	7.9 40					
<sup>x</sup> 780.8 1	25.0 25					
<sup>x</sup> 803.1 1	20.4 21					
<sup>x</sup> 806.8 5	6.8 34					
<sup>x</sup> 829.1 5	7.5 38					
<sup>x</sup> 837.3 5	8.4 42					
<sup>x</sup> 841.5 1	12.5 13					
<sup>x</sup> 844.5 1	22.2 22					
<sup>x</sup> 846.6 1	11.5 12					
<sup>x</sup> 853.3 1	24.3 24					
<sup>x</sup> 860.0 1	9.2 46					

<sup>†</sup> From <sup>169</sup>Tm(<sup>3</sup>He,5nγ) at 45 MeV and/or <sup>170</sup>Yb(p,4nγ),E=40 MeV, except where noted. ΔE<sub>γ</sub>=0.1 keV and ΔI<sub>γ</sub>=10% for strong, well-resolved peaks; ΔE<sub>γ</sub>=0.5 keV for weak or barely-resolved peaks.

<sup>‡</sup> From (p,4nγ),E=40 MeV. ΔI<sub>γ</sub>=50% for weak peaks (when I<sub>γ</sub>≤10).

<sup>#</sup> Includes component from contaminant line.

<sup>@</sup> From energy difference between initial and final levels. Note that **1977Ba40** place 87.7γ and 107.3γ from the same level, while place 87.7γ and 102.6γ from the same level, with the latter placement adopted in the Adopted Levels, Gammas.

<sup>&</sup> Triplet γ with I<sub>γ</sub>=172 17. Based on no intensities given for 267.9γ and 291.3γ immediately below the possible 314.9γ in the ΔJ=1 cascade of 9/2[514] band, I<sub>γ</sub>(315γ) from 2532 level is expected to be negligible, leaving essentially all the triplet intensity to be assigned from the 761+x level and the 431+y level.

<sup>a</sup> Weak γ.

<sup>b</sup> Multiply placed.

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

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

<sup>x</sup> γ ray not placed in level scheme.

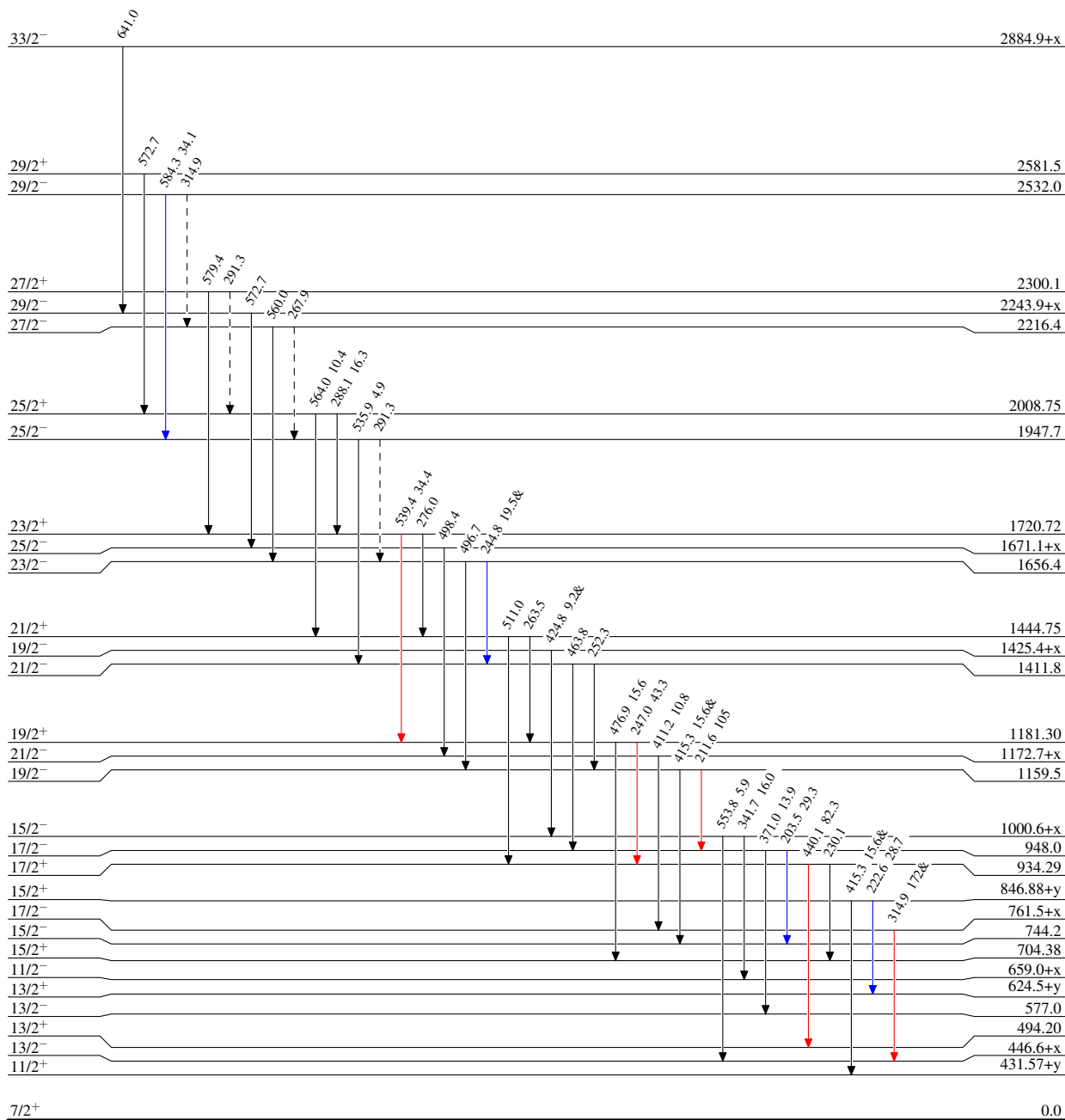
$^{170}\text{Yb}(p,4n\gamma)$   $^{1977}\text{Ba40}$

Level Scheme

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

Legend

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



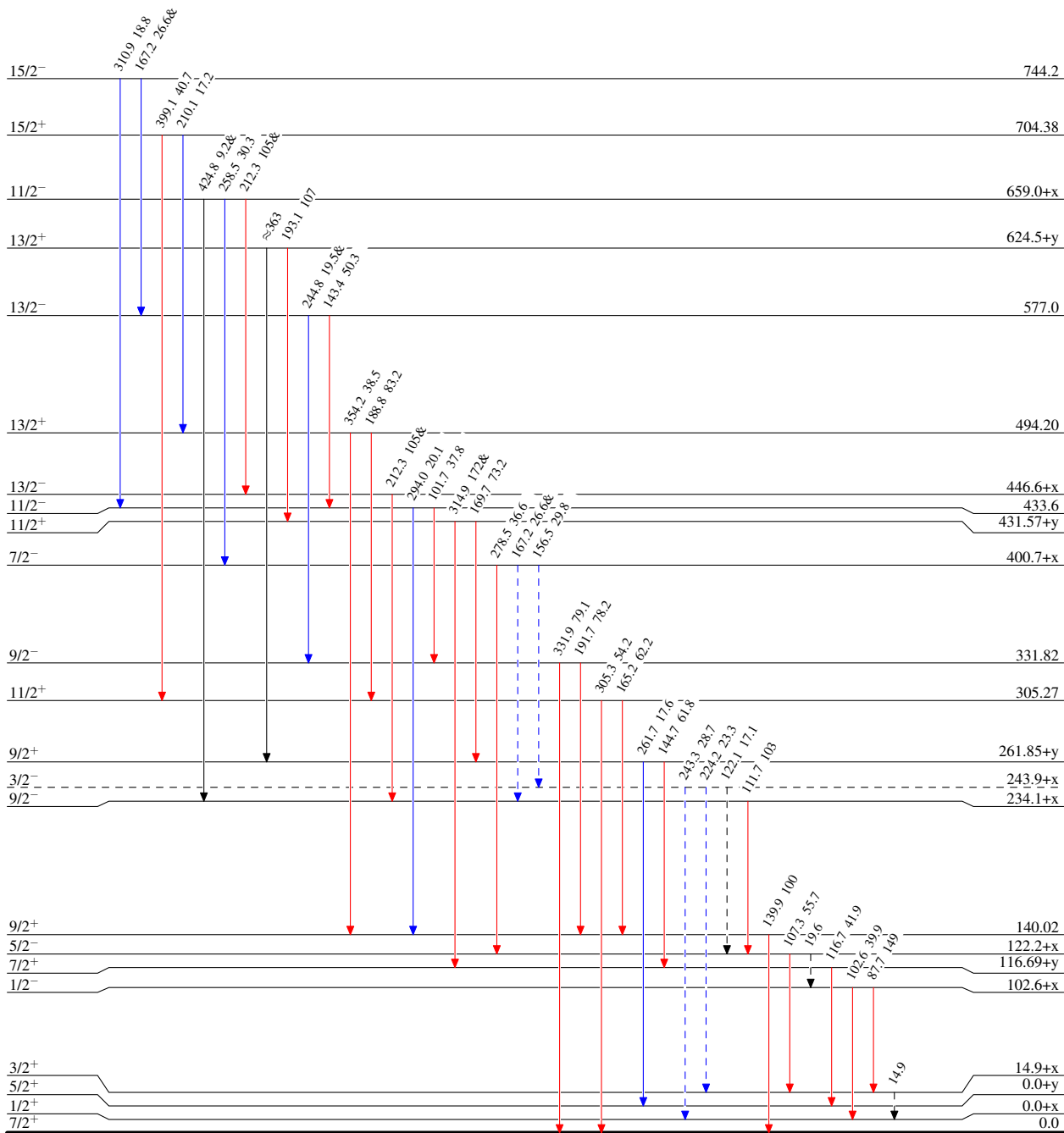
$^{170}\text{Yb}(p,4n\gamma)$   $^{1977}\text{Ba40}$

Level Scheme (continued)

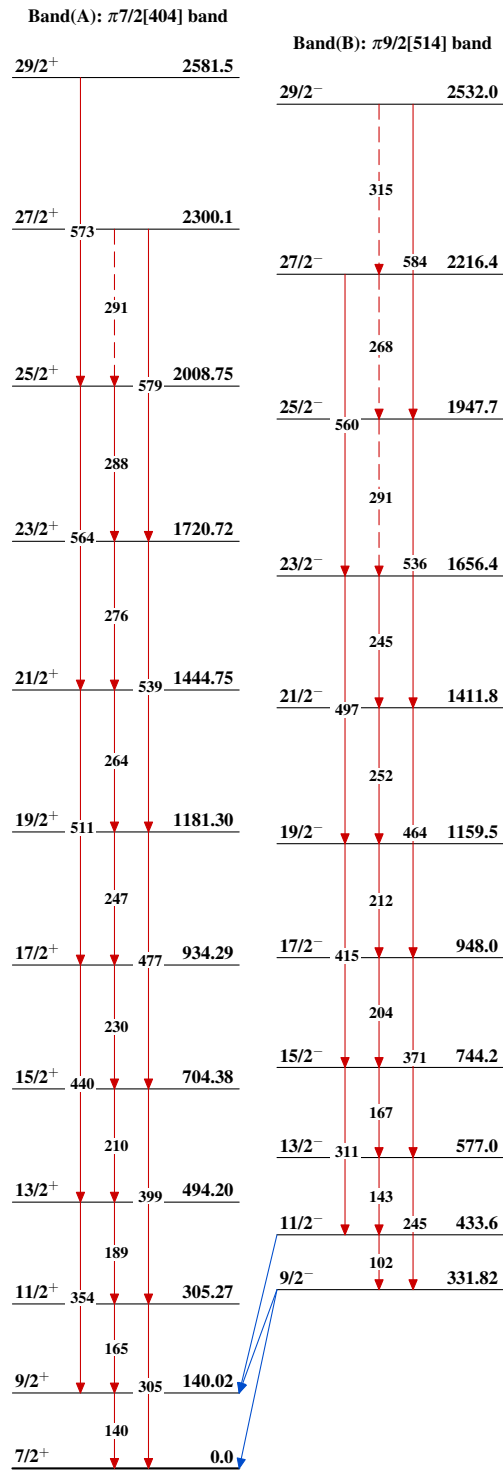
Intensities: Relative  $I_\gamma$   
& Multiply placed: undivided intensity given

Legend

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



$^{167}_{71}\text{Lu}_{96}$

$^{170}\text{Yb}(p,4n\gamma)$  **1977Ba40** $^{167}_{71}\text{Lu}_{96}$



$^{170}\text{Yb}(p,4n\gamma)$  1977Ba40 (continued)