^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21

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

Additional information 1.

1982EmZZ: progress report, see 1984Em02 for results.

1984Em02: ^{25}Mg(^{136}Xe,4nγ) reaction with E(^{136}Xe)=557 MeV. γ measured with Ge and NaI detectors. Level lifetimes deduced by recoil-distance method.

1993Ri05: ^{124}Sn(^{36}S,3nγ) at ≈ 158 MeV. Eγ measured with Ge detector array and given for 14 γ's.

2002Ha55: ^{150}Nd(^{12}C,5nγ) at 65 MeV. Measured Eγ, $\gamma\gamma$ using the GEMINI detector array comprised of 12 BGO Compton-suppressed HPGe detectors which were at 32°, 58°, 90°, 122°, and 148° with respect to the beam direction.

2005Pi21: ^{124}Sn(^{36}S,3nγ) at 165 MeV. Measured Eγ, Iγ, $\gamma\gamma$ using Gammasphere array of 93 large-volume Compton-suppressed Ge detectors. Also ^{130}Te(^{34}S,α3nγ) at 170 MeV. Measured Eγ, Iγ, $\gamma\gamma$ using Euroball III array of 14 seven-element 'Clusters', 26 four-element 'Clovers' and 30 single-crystal Ge detectors, all detectors were Compton-suppressed. An inner BGO ball was also used. Cranked Nilsson-Strutinsky calculations without pairing done for very high-spin states.

The band structure, backbending, signature splitting, rotational alignments, deformation differences, and shape transitions are discussed in 2005Pi21, 2002Ha55, 2000Ha59, 1994Mu10, 1993Ri05, and 1977Hj01.

^{157}Dy Levels

Before 2005Pi21 scheme was primarily from 2002Ha55 with levels added above J = 53/2 from 1993Ri05 and level $T_{1/2}$ from 1984Em02. The actual most extensive level scheme is that of 2005Pi21 with eight bands that extended the six bands of 2002Ha55 and added two new bands. All γ-ray and level energies of 2005Pi21 are rounded off to integer values with no uncertainties and no intensities for γ transitions. The level scheme of 2002Ha55 was constructed from coincidence relations, intensity balances, and DCO ratios, however no γ-ray energy uncertainties, intensities or DCO ratios were reported. Because the more precisely reported values, the Eγ data of 2002Ha55 were preferred for the common portion of the level scheme.

E(level)[†‡]	J$^\pi$[#]	$T_{1/2}$[@]	E(level)[†‡]	J$^\pi$[#]	$T_{1/2}$[@]	E(level)[†‡]	J$^\pi$[#]	$T_{1/2}$[@]
0.0[b]	3/2$^-$		1173.5[b]	19/2$^-$		2978.2[&c]	33/2$^-$	
61.0[c]	5/2$^-$		1262.4[g]	21/2$^-$		3078.7[e]	35/2$^+$	
147.3[b]	7/2$^-$		1280.1[e]	23/2$^+$		3157[i]	(35/2$^-$)	
161.5[d]	9/2$^+$	1.3[a] μs *2*	1358.3[c]	21/2$^-$		3247.9[f]	35/2$^-$	
198.9[f]	11/2$^-$	21.6 ms *16*	1522.0[f]	23/2$^-$		3317.7[b]	35/2$^-$	
211.1[e]	7/2$^+$		1651.8[d]	29/2$^+$	1.28 ps *21*	3440[h]	(37/2$^-$)	
238.0[d]	13/2$^+$		1654.9[b]	23/2$^-$		3519.6[d]	41/2$^+$	0.32 ps *21*
257.1[c]	9/2$^-$		1792.5[g]	25/2$^-$		3551.5[g]	37/2$^-$	
297.5[e]	11/2$^+$		1806.7[e]	27/2$^+$		3561.2[&c]	37/2$^-$	
374.4[g]	13/2$^-$		1849.1[c]	25/2$^-$		3713[i]	(39/2$^-$)	
400.7[b]	11/2$^-$		2072.5[f]	27/2$^-$		3801.2[e]	39/2$^+$	
434.8[d]	17/2$^+$		2177.2[b]	27/2$^-$		3862.1[f]	39/2$^-$	
511.0[e]	15/2$^+$		2217.9[d]	33/2$^+$	0.69 ps *14*	3935.8[b]	39/2$^-$	
547.9[c]	13/2$^-$		2359.4[g]	29/2$^-$		4031[h]	(41/2$^-$)	
570.3[f]	15/2$^-$		2381.4[c]	29/2$^-$		4181.5[g]	41/2$^-$	
746.0[d]	21/2$^+$	10.3 ps *18*	2410.2[e]	31/2$^+$		4201.7[c]	41/2$^-$	
749.2[b]	15/2$^-$		2651.8[f]	31/2$^-$		4239.9[d]	45/2$^+$	0.54 ps *24*
784.9[g]	17/2$^-$		2686[i]	(31/2$^-$)		4348[i]	(43/2$^-$)	
843.4[e]	19/2$^+$		2734.9[b]	31/2$^-$		4512.9[f]	43/2$^-$	
920.0[c]	17/2$^-$		2843.6[d]	37/2$^+$	0.42 ps *8*	4568.2[e]	43/2$^+$	
1016.2[f]	19/2$^-$		2896[h]	(33/2$^-$)		4596.8?[b]	(43/2$^-$)	
1156.6[d]	25/2$^+$	4.2 ps *7*	2948.3[g]	33/2$^-$		4698[h]	(45/2$^-$)	

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^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21 (continued)

^{157}Dy Levels (continued)

E(level)[†‡]	Jπ[#]	E(level)[†‡]	Jπ[#]	E(level)[†‡]	Jπ[#]	E(level)[†‡]	Jπ[#]
4857.2[g]	45/2$^-$	6655[d]	57/2$^+$	9037?[c]	(65/2$^-$)	12719[d]	81/2$^+$
4887[c]	45/2$^-$	6799[f]	55/2$^-$	9084[g]	65/2$^-$	13070[h]	(81/2$^-$)
5002.7[d]	49/2$^+$	7045[e]	55/2$^+$	9391[i]	(67/2$^-$)	13811?[i]	(83/2$^-$)
5053[i]	(47/2$^-$)	7046[h]	(57/2$^-$)	9473[d]	69/2$^+$	13905[d]	85/2$^+$
5217[f]	47/2$^-$	7226[g]	57/2$^-$	9580[f]	67/2$^-$	14055?	(85/2$^+$)
5361[e]	47/2$^+$	7235[c]	57/2$^-$	9824[h]	(69/2$^-$)	14257[h]	(85/2$^-$)
5430[h]	(49/2$^-$)	7493[i]	(59/2$^-$)	10015?[c]	(69/2$^-$)	14880?[i]	(87/2$^-$)
5590[g]	49/2$^-$	7549[d]	61/2$^+$	10086[g]	69/2$^-$	15147[d]	89/2$^+$
5621[c]	49/2$^-$	7675[f]	59/2$^-$	10428[i]	(71/2$^-$)	15487[h]	(89/2$^-$)
5805.5[d]	53/2$^+$	7922[h]	(61/2$^-$)	10505[d]	73/2$^+$	16005?[i]	(91/2$^-$)
5815[i]	(51/2$^-$)	7955?[e]	59/2$^+$	10614[f]	71/2$^-$	16448[d]	93/2$^+$
5979[f]	51/2$^-$	8109?[c]	(61/2$^-$)	10856[h]	(73/2$^-$)	16769?[h]	(93/2$^-$)
6180[e]	51/2$^+$	8132[g]	61/2$^-$	11523[i]	(75/2$^-$)	17194?[i]	(95/2$^-$)
6215[h]	(53/2$^-$)	8413[i]	(63/2$^-$)	11587[d]	77/2$^+$	17822[d]	97/2$^+$
6380[g]	53/2$^-$	8488[d]	65/2$^+$	11698?[f]	(75/2$^-$)	18106?[h]	(97/2$^-$)
6404[c]	53/2$^-$	8602[f]	63/2$^-$	11941[h]	(77/2$^-$)	19251[d]	101/2$^+$
6628[i]	(55/2$^-$)	8847[h]	(65/2$^-$)	12669[i]	(79/2$^-$)	20737?[d]	(105/2$^+$)

[†] For Eγ's from 2002Ha55 from least-squares fit to Eγ's by compilers where they assigned uncertainties to the γ-ray energies of 0.3 and 1 keV (the level energy uncertainties of the compilers have not been adopted here). The rounded off Eγ's from 2005Pi21 were added on top of the highest levels calculated by the least-squares fit giving also rounded off values for the level energies coming exclusively from 2005Pi21 measured Eγ's.

[‡] The energies of the bandheads for the 9/2$^+$ and 11/2$^-$ bands were determined (2002Ha55) from the energies of the depopulating γ's taken from ^{157}Dy adopted γ radiations.

[#] Assignments are primarily from 2002Ha55. No measurements to determine J^π values were done by 2005Pi21 which adopted those of 2002Ha55 (also 1993Ri05 and 1973Kl03) for the common part of the level scheme, while for the new part they assigned J^π values based on band affiliation and theoretical calculations. Altogether all J^π assignments agree with those of the Adopted Levels.

[@] From 1984Em02, unless otherwise noted. 1984Em02 show the 13/2$^+$ level at 2388 rather than the 238 keV given here. However, since the γ-ray sequences, here and in 1984Em02, agree, the $T_{1/2}$ values from 1984Em02 are included.

[&] 583γ from 37/2$^-$ and 596γ from 33/2$^-$ from 2005Pi21 are adopted here, the order of which is reversed in 2002Ha55.

[a] from 1974An11.

[b] Band(A): νh$_{9/2}$,3/2[521] α=−1/2 band.

[c] Band(a): νh$_{9/2}$,3/2[521] α=+1/2 band.

[d] Band(B): νi$_{13/2}$,3/2[651] α=+1/2 band.

[e] Band(b): νi$_{13/2}$,3/2[651] α=−1/2 band.

[f] Band(C): νh$_{11/2}$,11/2[505] α=−1/2 band.

[g] Band(c): νh$_{11/2}$,11/2[505] α=+1/2 band.

[h] Band(D): Possible 3-quasiparticle band, α=+1/2.

[i] Band(d): Possible 3-quasiparticle band, α=−1/2.

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21 (continued)

$\gamma(^{157}Dy)$

E_γ †	E_i(level)	J_i^π	E_f	J_f^π	E_γ †	E_i(level)	J_i^π	E_f	J_f^π
14.23‡ *5*	161.5	9/2+	147.3	7/2−	438.3	1358.3	21/2−	920.0	17/2−
37.36‡ *8*	198.9	11/2−	161.5	9/2+	445.9	1016.2	19/2−	570.3	15/2−
60.8	61.0	5/2−	0.0	3/2−	471	3157	(35/2−)	2686	(31/2−)
76.2	511.0	15/2+	434.8	17/2+	477.6	1262.4	21/2−	784.9	17/2−
76.4	238.0	13/2+	161.5	9/2+	481.5	1654.9	23/2−	1173.5	19/2−
86.2	147.3	7/2−	61.0	5/2−	490.8	1849.1	25/2−	1358.3	21/2−
86.3	297.5	11/2+	211.1	7/2+	495.2	1651.8	29/2+	1156.6	25/2+
97.2	843.4	19/2+	746.0	21/2+	505.8	1522.0	23/2−	1016.2	19/2−
109.7	257.1	9/2−	147.3	7/2−	515	2896	(33/2−)	2381.4	29/2−
136.1	297.5	11/2+	161.5	9/2+	522.3	2177.2	27/2−	1654.9	23/2−
143.6	400.7	11/2−	257.1	9/2−	526.6	1806.7	27/2+	1280.1	23/2+
147.2	547.9	13/2−	400.7	11/2−	530.2	1792.5	25/2−	1262.4	21/2−
147.5	147.3	7/2−	0.0	3/2−	532.3	2381.4	29/2−	1849.1	25/2−
150.05‡ *2*	211.1	7/2+	61.0	5/2−	534.3	1280.1	23/2+	746.0	21/2+
170.5	920.0	17/2−	749.2	15/2−	544	3440	(37/2−)	2896	(33/2−)
175.5	374.4	13/2−	198.9	11/2−	550.5	2072.5	27/2−	1522.0	23/2−
184.8	1358.3	21/2−	1173.5	19/2−	556	3713	(39/2−)	3157	(35/2−)
195.8	570.3	15/2−	374.4	13/2−	557.7	2734.9	31/2−	2177.2	27/2−
196	257.1	9/2−	61.0	5/2−	566.1	2217.9	33/2+	1651.8	29/2+
196.7	434.8	17/2+	238.0	13/2+	567.0	2359.4	29/2−	1792.5	25/2−
201.1	749.2	15/2−	547.9	13/2−	579.3	2651.8	31/2−	2072.5	27/2−
213.6	511.0	15/2+	297.5	11/2+	582.8	3317.7	35/2−	2734.9	31/2−
214.4	784.9	17/2−	570.3	15/2−	583.0	3561.2	37/2−	2978.2	33/2−
231.2	1016.2	19/2−	784.9	17/2−	588.8	2948.3	33/2−	2359.4	29/2−
246.2	1262.4	21/2−	1016.2	19/2−	591	4031	(41/2−)	3440	(37/2−)
253.5	400.7	11/2−	147.3	7/2−	596.2	3247.9	35/2−	2651.8	31/2−
253.5	1173.5	19/2−	920.0	17/2−	596.8	2978.2	33/2−	2381.4	29/2−
259.4	1522.0	23/2−	1262.4	21/2−	603.2	3551.5	37/2−	2948.3	33/2−
270.5	1792.5	25/2−	1522.0	23/2−	603.5	2410.2	31/2+	1806.7	27/2+
273.0	511.0	15/2+	238.0	13/2+	614.2	3862.1	39/2−	3247.9	35/2−
279.8	2072.5	27/2−	1792.5	25/2−	618.1	3935.8	39/2−	3317.7	35/2−
286.9	2359.4	29/2−	2072.5	27/2−	625.7	2843.6	37/2+	2217.9	33/2+
291	547.9	13/2−	257.1	9/2−	630.1	4181.5	41/2−	3551.5	37/2−
292.4	2651.8	31/2−	2359.4	29/2−	635	4348	(43/2−)	3713	(39/2−)
296.4	2948.3	33/2−	2651.8	31/2−	640.5	4201.7	41/2−	3561.2	37/2−
296.5	1654.9	23/2−	1358.3	21/2−	650.0	1806.7	27/2+	1156.6	25/2+
299.6	3247.9	35/2−	2948.3	33/2−	650.7	4512.9	43/2−	3862.1	39/2−
303.5	3551.5	37/2−	3247.9	35/2−	661#	4596.8?	(43/2−)	3935.8	39/2−
310.5	3862.1	39/2−	3551.5	37/2−	667	4698	(45/2−)	4031	(41/2−)
311.1	746.0	21/2+	434.8	17/2+	668.5	3078.7	35/2+	2410.2	31/2+
319.5	4181.5	41/2−	3862.1	39/2−	675.4	4857.2	45/2−	4181.5	41/2−
331.7	4512.9	43/2−	4181.5	41/2−	676.0	3519.6	41/2+	2843.6	37/2+
332.5	843.4	19/2+	511.0	15/2+	685	4887	45/2−	4201.7	41/2−
344.6	4857.2	45/2−	4512.9	43/2−	704	5217	47/2−	4512.9	43/2−
348.4	749.2	15/2−	400.7	11/2−	705	5053	(47/2−)	4348	(43/2−)
359	5217	47/2−	4857.2	45/2−	720.3	4239.9	45/2+	3519.6	41/2+
371.5	570.3	15/2−	198.9	11/2−	722.5	3801.2	39/2+	3078.7	35/2+
372.2	920.0	17/2−	547.9	13/2−	732	5430	(49/2−)	4698	(45/2−)
374	5590	49/2−	5217	47/2−	733	5590	49/2−	4857.2	45/2−
408.8	843.4	19/2+	434.8	17/2+	734	5621	49/2−	4887	45/2−
410.5	784.9	17/2−	374.4	13/2−	762	5815	(51/2−)	5053	(47/2−)
410.5	1156.6	25/2+	746.0	21/2+	762	5979	51/2−	5217	47/2−
424.5	1173.5	19/2−	749.2	15/2−	762.8	5002.7	49/2+	4239.9	45/2+
436.6	1280.1	23/2+	843.4	19/2+	767.0	4568.2	43/2+	3801.2	39/2+

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^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21 (continued)

γ(^{157}Dy) (continued)

E_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	E_γ[†]	E_i(level)	J_i^π	E_f	J_f^π
783	6404	53/2$^-$	5621	49/2$^-$	978[#]	10015?	(69/2$^-$)	9037?	(65/2$^-$)
785	6215	(53/2$^-$)	5430	(49/2$^-$)	985	9473	69/2$^+$	8488	65/2$^+$
791	6380	53/2$^-$	5590	49/2$^-$	1002	10086	69/2$^-$	9084	65/2$^-$
793	5361	47/2$^+$	4568.2	43/2$^+$	1032	10505	73/2$^+$	9473	69/2$^+$
802.8	5805.5	53/2$^+$	5002.7	49/2$^+$	1032	10856	(73/2$^-$)	9824	(69/2$^-$)
813	6628	(55/2$^-$)	5815	(51/2$^-$)	1034	2686	(31/2$^-$)	1651.8	29/2$^+$
820	6180	51/2$^+$	5361	47/2$^+$	1034	10614	71/2$^-$	9580	67/2$^-$
820	6799	55/2$^-$	5979	51/2$^-$	1038	10428	(71/2$^-$)	9391	(67/2$^-$)
831	7046	(57/2$^-$)	6215	(53/2$^-$)	1069[#]	14880?	(87/2$^-$)	13811?	(83/2$^-$)
831	7235	57/2$^-$	6404	53/2$^-$	1082	11587	77/2$^+$	10505	73/2$^+$
846	7226	57/2$^-$	6380	53/2$^-$	1084[#]	11698?	(75/2$^-$)	10614	71/2$^-$
849	6655	57/2$^+$	5805.5	53/2$^+$	1085	11941	(77/2$^-$)	10856	(73/2$^-$)
865	7045	55/2$^+$	6180	51/2$^+$	1095	11523	(75/2$^-$)	10428	(71/2$^-$)
865	7493	(59/2$^-$)	6628	(55/2$^-$)	1124[#]	16005?	(91/2$^-$)	14880?	(87/2$^-$)
869	3713	(39/2$^-$)	2843.6	37/2$^+$	1129	13070	(81/2$^-$)	11941	(77/2$^-$)
874[#]	8109?	(61/2$^-$)	7235	57/2$^-$	1132	12719	81/2$^+$	11587	77/2$^+$
876	7675	59/2$^-$	6799	55/2$^-$	1142[#]	13811?	(83/2$^-$)	12669	(79/2$^-$)
876	7922	(61/2$^-$)	7046	(57/2$^-$)	1146	12669	(79/2$^-$)	11523	(75/2$^-$)
894	7549	61/2$^+$	6655	57/2$^+$	1185	13905	85/2$^+$	12719	81/2$^+$
906	8132	61/2$^-$	7226	57/2$^-$	1187	14257	(85/2$^-$)	13070	(81/2$^-$)
910	7955?	59/2$^+$	7045	55/2$^+$	1189[#]	17194?	(95/2$^-$)	16005?	(91/2$^-$)
920	8413	(63/2$^-$)	7493	(59/2$^-$)	1230	15487	(89/2$^-$)	14257	(85/2$^-$)
925	8847	(65/2$^-$)	7922	(61/2$^-$)	1242	15147	89/2$^+$	13905	85/2$^+$
927	8602	63/2$^-$	7675	59/2$^-$	1282[#]	16769?	(93/2$^-$)	15487	(89/2$^-$)
928[#]	9037?	(65/2$^-$)	8109?	(61/2$^-$)	1301	16448	93/2$^+$	15147	89/2$^+$
939	3157	(35/2$^-$)	2217.9	33/2$^+$	1336[#]	14055?	(85/2$^+$)	12719	81/2$^+$
939	8488	65/2$^+$	7549	61/2$^+$	1337[#]	18106?	(97/2$^-$)	16769?	(93/2$^-$)
952	9084	65/2$^-$	8132	61/2$^-$	1373	17822	97/2$^+$	16448	93/2$^+$
977	9824	(69/2$^-$)	8847	(65/2$^-$)	1429	19251	101/2$^+$	17822	97/2$^+$
978	9391	(67/2$^-$)	8413	(63/2$^-$)	1486	20737?	(105/2$^+$)	19251	101/2$^+$
978	9580	67/2$^-$	8602	63/2$^-$					

[†] Values with decimal point are from 2002Ha55 and those shown as rounded-off integer numbers are from 2005Pi21. Some exceptions are noted separately.

[‡] From ^{157}Dy Adopted Levels, Gammas dataset.

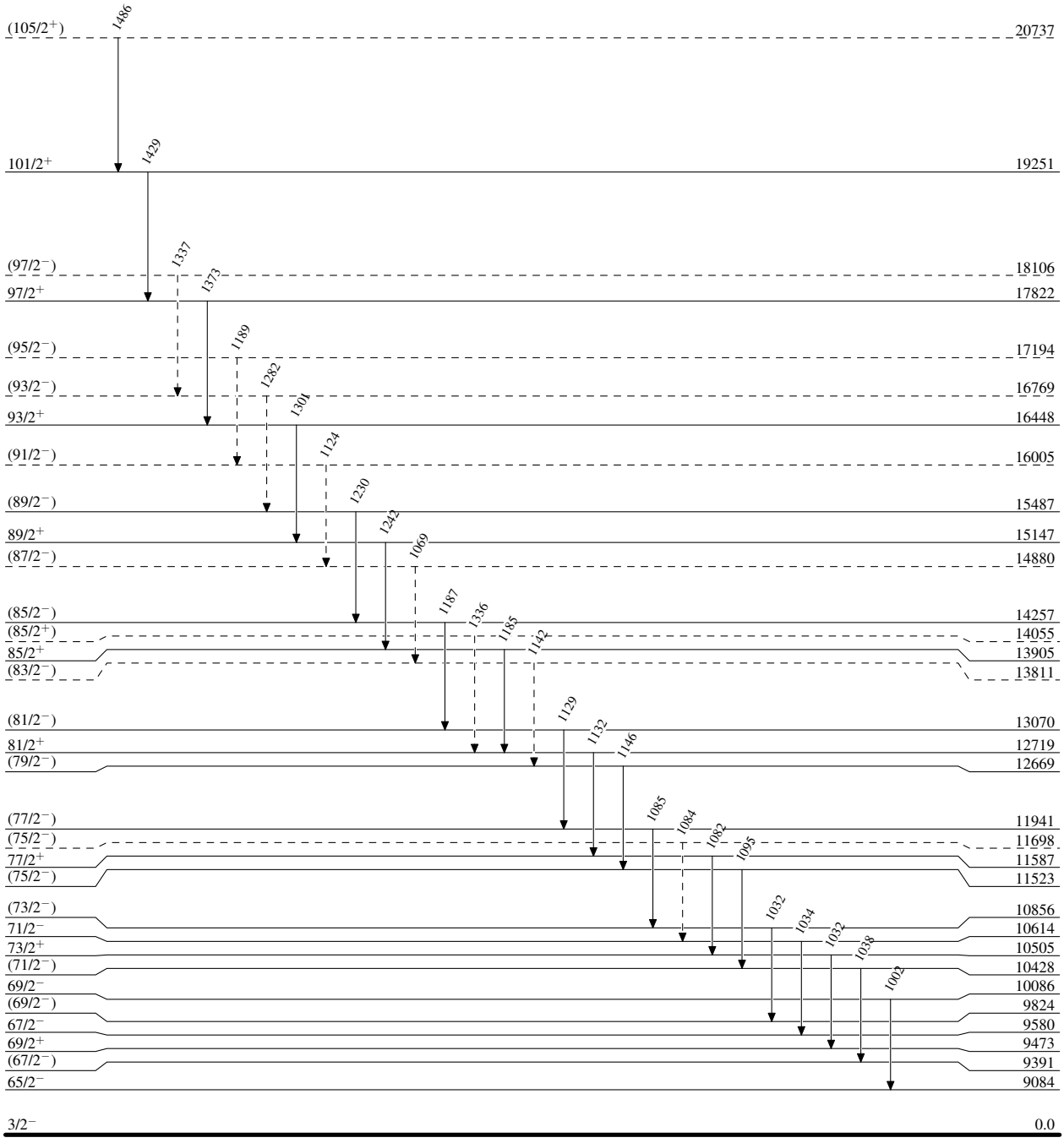
[#] Placement of transition in the level scheme is uncertain.

Legend

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21

Level Scheme

γ Decay (Uncertain)



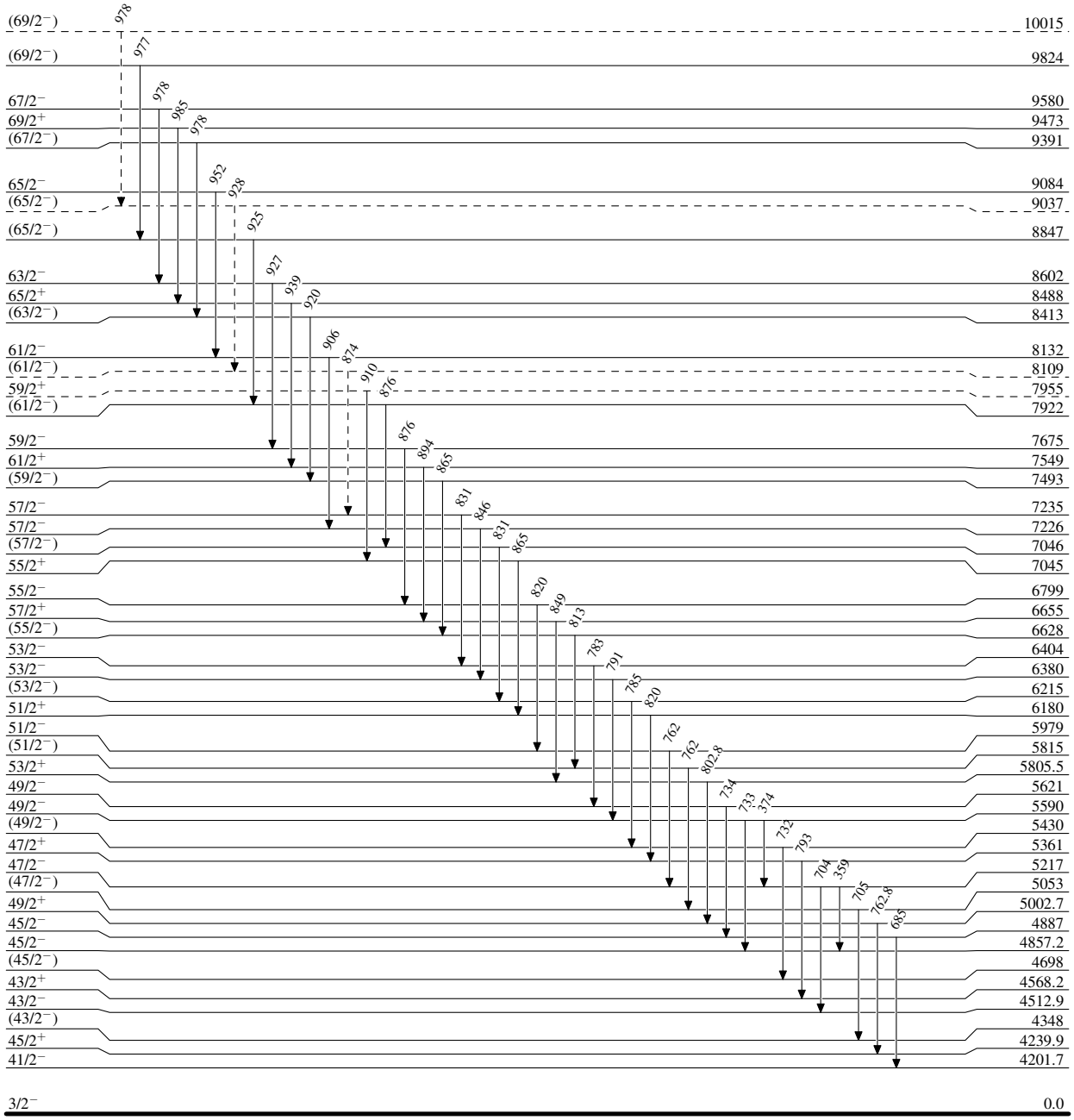
$^{157}_{66}Dy_{91}$

Legend

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21

Level Scheme (continued)

γ Decay (Uncertain)



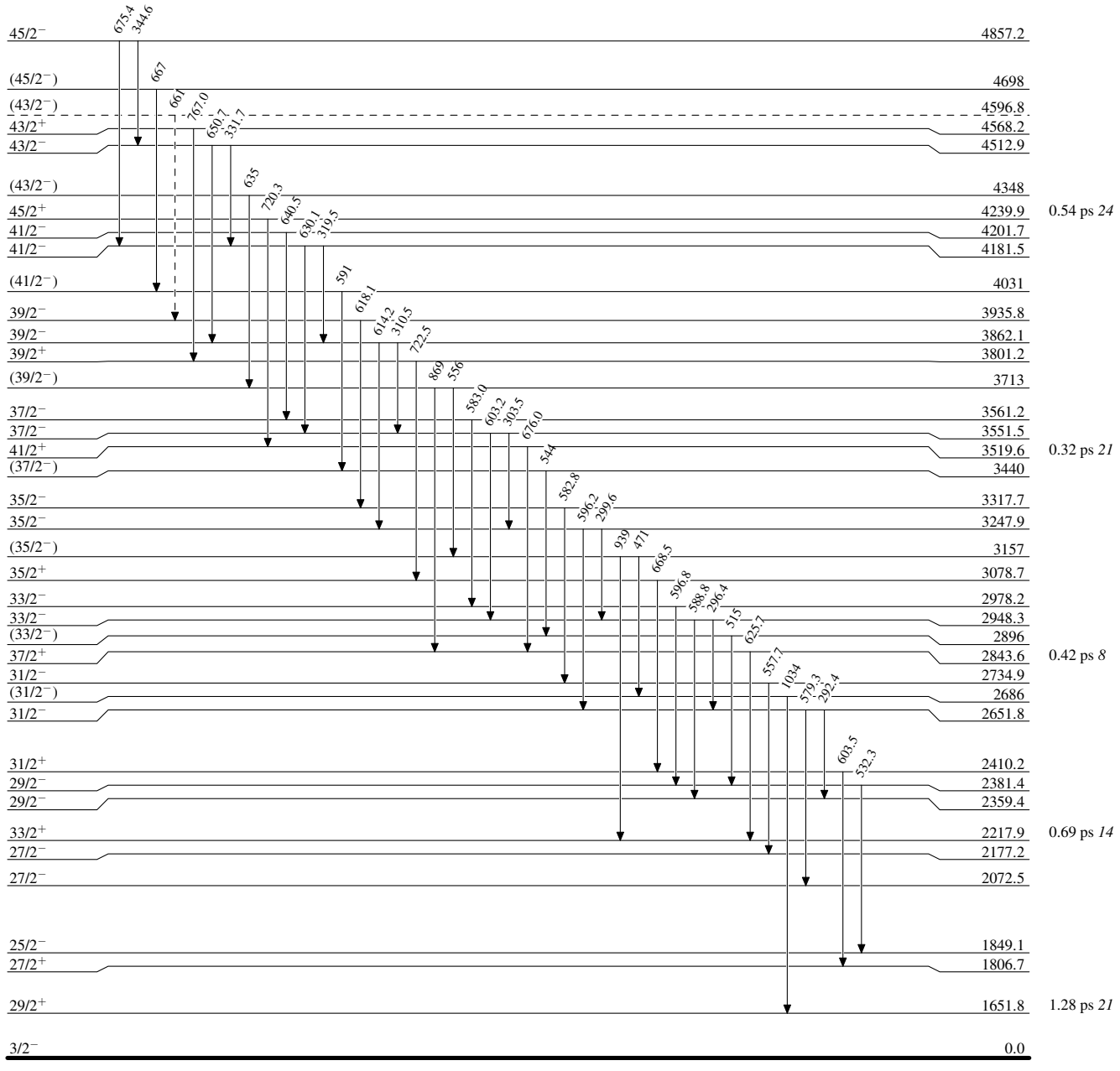
$^{157}_{66}Dy_{91}$

Legend

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) **2002Ha55,2005Pi21**

Level Scheme (continued)

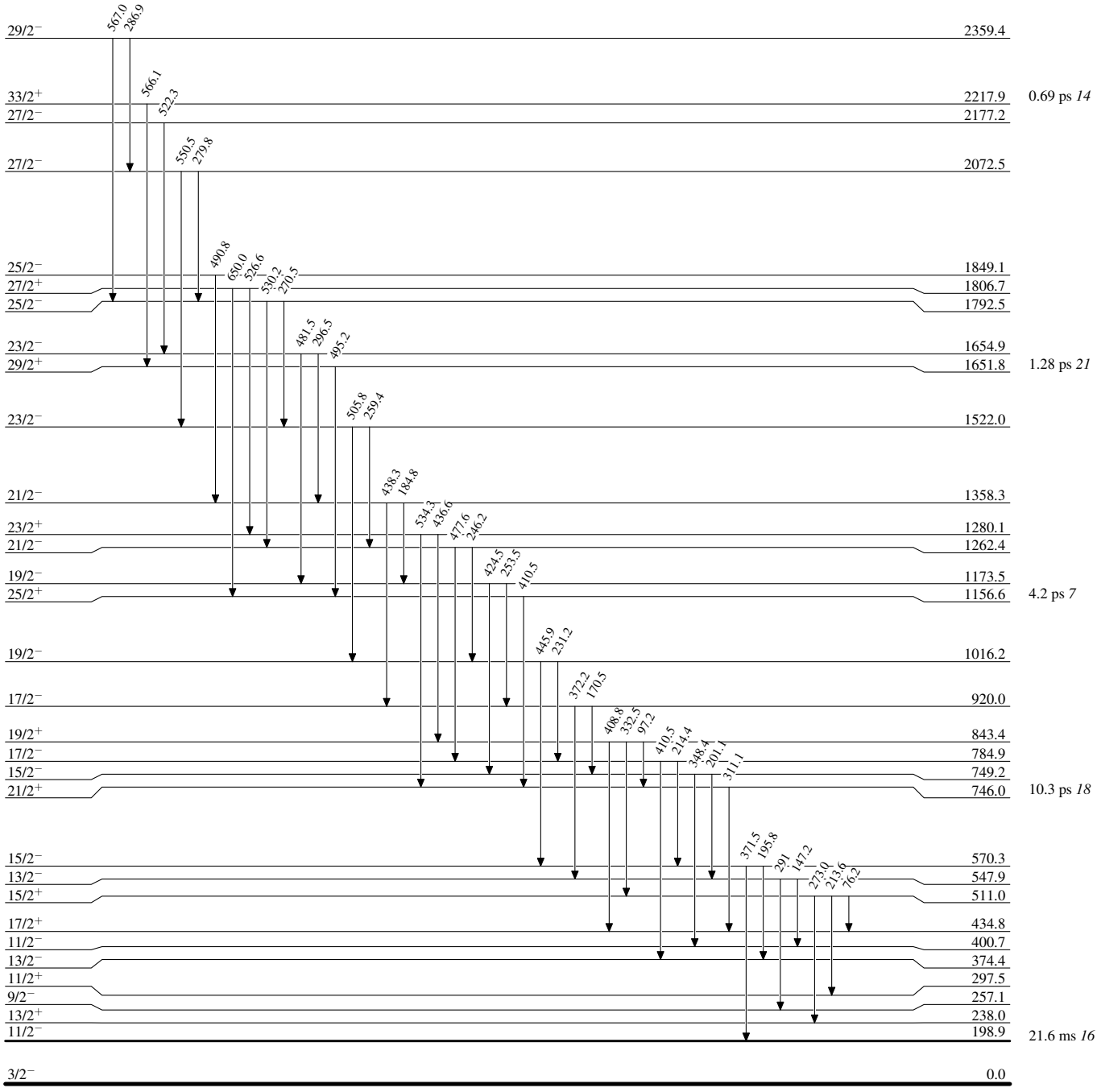
γ Decay (Uncertain)



$^{157}_{66}Dy_{91}$

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21

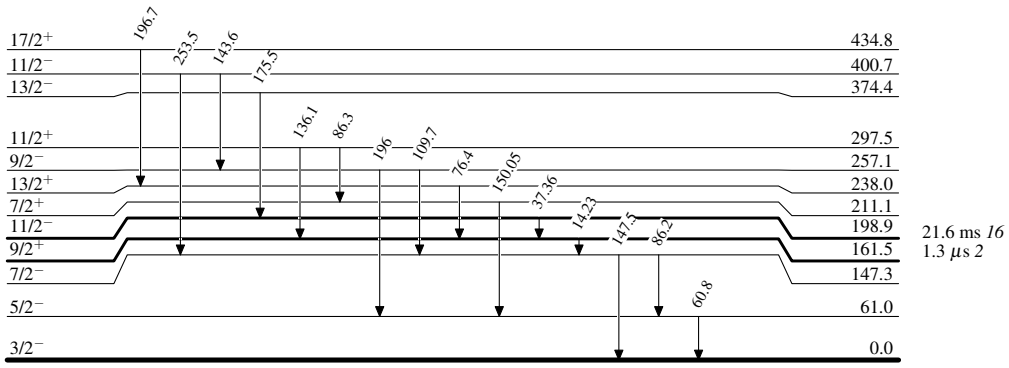
Level Scheme (continued)



$^{157}_{66}Dy_{91}$

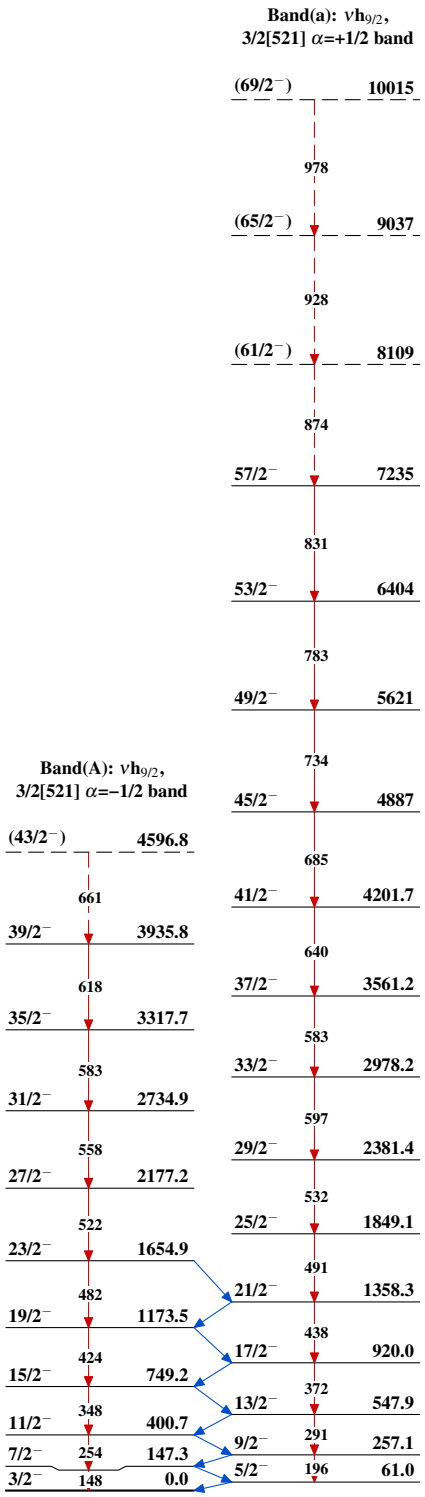
^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21

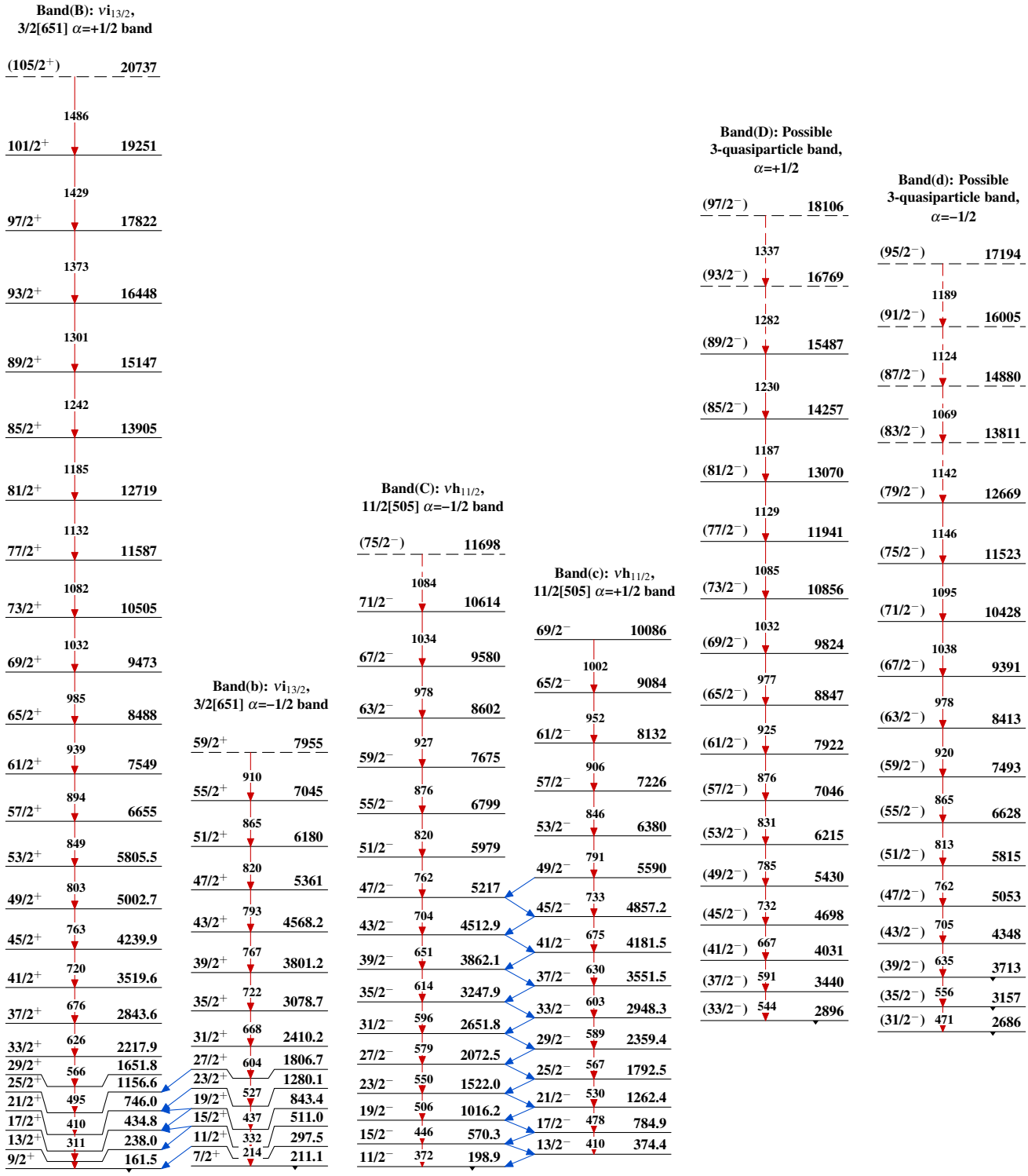
Level Scheme (continued)



$^{157}_{66}Dy_{91}$

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21



$^{157}_{66}Dy_{91}$

^{150}Nd(^{12}C,5nγ),^{124}Sn(^{36}S,3nγ) 2002Ha55,2005Pi21 (continued)