^{139}La(n,γ) E=th: two γ cascade 2000Va30

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018

This dataset contains (n,γ) data for E=th from 2000Va30 measured at IBR-30 reactor at JINR Laboratory of Neutron Physics, by $\gamma\gamma$ coin with HPGe (15% efficiency) and Ge(Li) (10% efficiency). The amplitudes of coin events were summed and eight high-intensity resolved peaks from the highest-intensity cascades were found in the resulting intensity vs. Eγ1+Eγ2 distribution. The distribution also presented a continuous component from low-intensity cascades, and a zero-average component (noise) from background subtraction. 2000Va30 give energy resolution 3.7 keV "at the edges" and 5 keV "in centers of the spectra".

Each of the eight peaks contains $\gamma\gamma$ cascades depopulating the capture state, through tens of different intermediate levels, to eight low-lying final levels "or their close multiplets", which points out a degree of ambiguity in resolving the final levels.

A total of 266-coin cascades were identified and reported as eight separate groups from the analysis of the eight Eγ1+Eγ2 peaks in Table 1 of 2000Va30. The Eγ1+Eγ2 groups are (keV): 5161.2, 5126.6, 5112.3, 5098.0, 5057.4, 4999.5, 4888.9, and 4841.1. The evaluator checked that these values are the averages of all experimental Eγ1+Eγ2 values listed for each group. Listed are Eγ1 (energy of primary γ, deexciting the capture state), Eγ2 (energy of secondary γ, deexciting the intermediate level), i$\gamma\gamma$ (intensity of coin cascade, in percent of total coin intensity of the group), and E(i.l.) (energy of intermediate level). Uncertainties are listed for all quantities, except Eγ1.

Of the 266 cascades, 206 were placed by 2000Va30 in the level scheme, while 60 remained unplaced. Based on evaluator's analysis, there are 65 distinct values for E(i.l.) in Table 1 each of which is fed by a primary γ and deexcited by at least two secondary γ's, which defines the placed cascades. For unplaced cascades there is only one secondary γ and consequently the order of transitions is unknown. They could be placed on the assumption that the primary γ had higher energy.

One of the major ambiguities of this dataset comes from primary γ's. For a same E(i.l.) value 2000Va30 report different Eγ1 measured values, which correspond to one physical primary γ. For about half of the cases, the measured values differ by more than 2 keV, up to about 8 keV. This can be justified by the values of energy resolution listed above, however it becomes unclear if the intermediate levels deduced by 2000Va30 are or not unambiguously resolved. The evaluator adopted the mean value of measured Eγ1 values as primary γ energy, and the experimental variance of the mean value as uncertainty of primary γ energy (used in the energy fit on levels).

2000Va30 list I$\gamma\gamma$ intensities of the Eγ1+Eγ2 groups normalized to the compound state decay deduced from 1981Lo16, which are (group 1 to 8): 6.3(2)%, 10.1(4)%, 7.4(3)%, 12.0(5)(%), 5.0(2)%, 2.2(2)%, 1.6(2)%, and 7.8(4)%. The intensities of secondary γ's in per 100 neutron radiative captures were calculated by evaluator as I$\gamma\gamma\times$ i$\gamma\gamma$. By summing the intensities of all secondary γ's from each intermediate level, lower limits for the intensities of primary γ's can be obtained. However these intensities are not comparable with the ones from the (n,γ) E=th dataset essentially because the i$\gamma\gamma$'s for each group were normalized by 2000Va30 to 100% for the coincidence detection level set at 520 keV in order to reject coincidences with annihilation quanta. In this way only the cascades through all intermediate levels lying 520 keV below capture state and 520 keV above the final level were detected. However the branching ratio of secondary γ intensities from each intermediary level are comparable, and were listed in the γ table for this dataset.

2000Va30 do not give any information about the source they irradiated and possible contaminant coin cascades. This together with the ambiguities described above in connection with the intermediary and final levels determined the evaluator to consider the data from this dataset in comparison with the ones from the (n,γ) E=th dataset in the attempt to resolve its multiplet levels in the Adopted Levels, Gammas dataset.

2000Va30 theory: concept of substantial effect of vibrational excitations on the nuclear structure and their conversion to excitations of quasiparticle type.

For references about theory, method and similar measurements see references of 2000Va30 and newer references published by same authors: 2002Va28, 2002Va29, 2001Va11, 2001Va36, 2000Bo49, 2000Bo50, 2000Gr34, 2000Va13, 2000Va30.

^{140}La Levels

Based on our general comments, fit on levels (GTOL), and number of γ's that differ significantly from their calculated values (see respective footnotes), one can deduce that many of the levels of 2000Va30 are unresolved multiplets. In order to give the user interested in 2000Va30 physical approach some insight into their data, the original data were reproduced here with minimum changes. The attempt to resolving some of 2000Va30 multiplets based on comparison and integrated with the other datasets is presented in the Adopted Levels, Gammas dataset.

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^{139}La(n,γ) E=th: two γ cascade 2000Va30 (continued)

^{140}La Levels (continued)

E(level)[†]	Comments
0.0	E(level): Final level for group 1.
34.5	Additional information 1. E(level): Final level for group 2, from difference of Eγ1+Eγ2 of groups 1 and 2. Compare with 34.4 keV from (n,γ) E=th dataset (rounded-off value).
48.9	Additional information 2. E(level): Final level for group 3, from difference of Eγ1+Eγ2 of groups 1 and 3. Compare with 48.9 keV from (n,γ) E=th dataset (rounded-off value).
63.2	Additional information 3. E(level): Final level for group 4, from difference of Eγ1+Eγ2 of groups 1 and 4. Compare with 63.2 keV from (n,γ) E=th dataset (rounded-off value).
103.8	Additional information 4. E(level): Final level for group 5, from difference of Eγ1+Eγ2 of groups 1 and 5. Compare with 103.8 keV from (n,γ) E=th dataset (rounded-off value).
161.7	Additional information 5. E(level): Final level for group 6, from difference of Eγ1+Eγ2 of groups 1 and 6. Compare with 162.7 keV from (n,γ) E=th dataset (rounded-off value).
271.5 *4*	Additional information 6. E(level): Final level for group 7, intermediate level energy in other groups (2000Va30). Compare with 272.3 keV from difference of Eγ1+Eγ2 of groups 1 and 7, and 272.3 keV from (n,γ) E=th dataset (rounded-off value).
320.1	Additional information 7. E(level): Final level for group 8, from difference of Eγ1+Eγ2 of groups 1 and 8, most likely the unresolved multiplet of 318.2 keV and 322.1 keV from (n,γ) E=th dataset (see Adopted dataset).
602.2 *4*	
659.03 *19*	
670.5 *5*	
743.64 *8*	
771.68 *6*	
776.2 *6*	
1030.9 *5*	
1037.6 *5*	
1056.15 *19*	
1100.9 *5*	
1116.58 *25*	
1137.5 *7*	
1161.4 *5*	
1188.17 *19*	
1201.3 *4*	
1259.98 *13*	
1264.7 *5*	
1288.2 *5*	
1340.0 *4*	
1389.1 *7*	
1423.94 *16*	
1427.7 *6*	
1433.84 *9*	
1445.2 *5*	
1478.4 *4*	
1482.02 *9*	
1487.5 *4*	
1495.59 *9*	
1499.3? *9*	
1551.50 *16*	
1555.46 *13*	
1563.1 *6*	
1581.4 *3*	
1657.9 *5*	
1685.22 *21*	

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^{139}La(n,γ) E=th: two γ cascade 2000Va30 (continued)

^{140}La Levels (continued)

E(level)[†]	Comments
1701.1 *4*	
1720.82 *24*	
1735.94 *9*	
1743.3 *6*	
1816.1 *5*	
1822.4 *8*	
1842.2 *3*	
1849.9 *5*	
1879.79 *17*	
1953.3 *5*	
1965.1 *5*	
1972.02 *17*	
1997.9 *4*	
2017.57 *24*	
2046.04 *25*	
2078.40 *10*	
2120.57 *20*	
2122.7 *7*	
2126.9 *4*	
2147.7 *5*	
2172.9 *3*	
2196.9 *4*	
2203.2 *8*	
2245.3 *4*	
2297.62 *21*	
2323.3 *5*	
2394.2 *5*	
2402.7 *4*	
2939.2 *6*	
3009.4 *5*	
(5161.2[‡])	Additional information 8.

[†] From fit on levels (GTOL). The 34.5, 48.9, 63.2, 103.8, 161.7, 271.5 *4*, 320.1, and 5161.2 levels were held fixed (the uncertainty of 271.5 was incorporated into the calculated results of the other levels, GTOL option G). This gives the reduced χ^2=4.6, which is much greater than the critical χ^2=1.2. To check the dependence of the fit on the fixed levels, their corresponding values (with uncertainties, and option G) from Adopted Levels were used, except for 320.1, which being an unresolved multiplet in 2000Va30, was kept as above. This gives the reduced χ^2=5.0. A third attempt was done by replacing 271.5 *4* by 272.3 with no uncertainty (see Comments) in the first set, which gives the reduced χ^2=4.9. Based on these results, the E(level)′s from the first fit were listed in the table.

[‡] Adopted value: 5160.98 *4*. This value was not used here because it would imply using the adopted values for the final levels of the energy groups, and moreover would ask for resolving the 320.1 multiplet (and others) in this dataset, which can be done properly only in Adopted dataset. All these changes would obscure the contribution of the 2000Va30 original data to Adopted dataset.

γ(^{140}La)

Unplaced γ's: many tentative placements for unplaced γ's of 2000Va30 are signaled in the Comments, based on levels fed by primary γ's observed in (n,γ) E=th dataset, which match one of the γ's from unplaced coincidence pairs in 2000Va30. Each of these levels makes possible the determination of the order of transitions, which is undetermined in 2000Va30. Except for very few cases, the placements are tentative both because the missing $\Delta E\gamma$ for the primary γ's of 2000Va30 (which makes the matches rather tentative), and the fact that the reversed order of coincident transitions can not be excluded based only on the energy match of one of its γ's. Signaled in Comments are very few exceptions, when both unplaced coincident γ's from 2000Va30 can be

$^{139}La(n,\gamma)$ E=th: two γ cascade 2000Va30 (continued)

$\gamma(^{140}La)$ (continued)

matched with two corresponding placed γ's in (n,γ) E=th dataset. See also general comment on unplaced γ's.
The assignment of γ's to levels can be affected by many unresolved multiplets in 2000Va30 (see comment on level table).
ΔE: 0.0 in 2000Va30. This transition is relatively intense and probably ΔE<0.1 value was truncated, or misprint; the value listed here set by evaluator.

E_i(level)	E_γ	I_γ[†]	E_f	Comments
271.5	236.5 *4*	34 *7*	34.5	
	271.9[e] *1*	100 *8*	0.0	
602.2	553.8 *14*	17 *9*	48.9	
	567.3 *28*	100 *40*	34.5	$\Delta I\gamma$: i$\gamma\gamma$=3.59 *1430* by 2000Va30, uncertainty probably misprinted; this value was divided by 10 by evaluator for relative branching.
659.03	554.9 *7*	10 *3*	103.8	
	611.3 *12*	13 *6*	48.9	
	625.4 *3*	63 *8*	34.5	
	658.1[e] *3*	100 *5*	0.0	ΔE: 0.0 by 2000Va30, probably misprint; replaced by evaluator with typical value.
670.5	565.0 *8*	55 *19*	103.8	
	608.3 *6*	100 *28*	63.2	
743.64	423.2[e] *1*	100 *8*	320.1	
	640.5[e] *2*	7.6 *8*	103.8	
	678.5 *8*	3.5 *11*	63.2	
	710.0[e] *2*	17.0 *22*	34.5	
771.68	608.4 *6*	7.2 *19*	161.7	
	668.2[e] *1*	25.1 *19*	103.8	
	708.3 *1*	70 *5*	63.2	
	722.7 *1*	100 *6*	48.9	
776.2	613.9 *8*	100 *33*	161.7	
	673.5 *11*	51 *21*	103.8	
1030.9	869.6 *7*	100 *27*	161.7	
	924.8 *12*	42 *21*	103.8	
	983.1 *10*	88 *31*	48.9	
1037.6	1004.9 *8*	82 *24*	34.5	
	1036.5 *6*	100 *25*	0.0	
1056.15	993.2 *7*	78 *21*	63.2	
	1021.6 *6*	100 *23*	34.5	
1100.9	937.6 *9*	62 *22*	161.7	
	1038.8 *10*	63 *25*	63.2	
	1101.3 *7*	100 *27*	0.0	
1116.58	1054.0 *7*	41 *12*	63.2	
	1116.4 *3*	100 *13*	0.0	
1137.5	1101.8 *10*	100 *38*	34.5	
	1139.2 *13*	84 *39*	0.0	
1161.4	1000.9 *9*	56 *21*	161.7	
	1097.6 *6*	100 *25*	63.2	
1188.17	1125.2 *5*	100 *20*	63.2	
	1187.9 *10*	56 *21*	0.0	
1201.3	883.7[e] *8*	100 *31*	320.1	
	1096.1 *5*	62 *13*	103.8	
	1137.5 *8*	84 *25*	63.2	
	1203.9 *11*	65 *26*	0.0	
1259.98	939.7 *2*	100 *11*	320.1	
	986.0[e] *8*	9 *3*	271.5	

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^{139}La(n,γ) E=th: two γ cascade 2000Va30 (continued)

γ(^{140}La) (continued)

E_i(level)	E_γ	I_γ[†]	E_f
1259.98	1213.3 8	22 7	48.9
	1225.2 5	55 43	34.5
	1260.2 2	95 10	0.0
1264.7	1202.1 12	73 31	63.2
	1229.7 10	100 36	34.5
1288.2	1224.0 7	100 27	63.2
	1255.0 8	72 22	34.5
1340.0	1291.8 7	100 25	48.9
	1304.7 7	89 24	34.5
1389.1	1228.6 15	87 48	161.7
	1388.3 10	100 36	0.0
1423.94	1103.5 3	100 14	320.1
	1152.1 11	9 4	271.5
	1320.3 7	24 6	103.8
	1360.5 8	30 9	63.2
	1375.6 7	29 8	48.9
1427.7	1267.4 12	71 32	161.7
	1392.5 7	100 25	34.5
1433.84	1164.3[e] 4	16 3	271.5
	1330.0 1	86 6	103.8
	1367.3[e] 11	19 7	63.2
	1385.0 2	100 9	48.9
	1398.7 3	59 7	34.5
1445.2	1124.1 6	100 23	320.1
	1381.7 12	42 20	63.2
	1400.1[e] 12	51 19	48.9
1478.4	1207.1 4	34 7	271.5
	1414.6 6	100 23	63.2
1482.02	1163.2[e] 3	32 4	320.1
	1213.4[e] 5	6.5 15	271.5
	1324.1[e] 10	8 3	161.7
	1379.8 9	5.7 19	103.8
	1419.2 3	60 7	63.2
	1437.8[e] 8	8.8 24	48.9
	1447.0[e] 1	100 6	34.5
	1483.0 6	10.6 23	0.0
1487.5	1168.1 6	100 23	320.1
	1452.4 6	80 17	34.5
1495.59	1222.8 5	5.2 14	271.5
	1332.3 8	10 3	161.7
	1395.0 14	3.7 18	103.8
	1432.5 2	51 5	63.2
	1444.8[e] 5	16 3	48.9
	1495.6 1	100 5	0.0
1499.3?	1464.9[h] 7	8.1 22	34.5
1551.50	1232.5[e] 3	100 13	320.1
	1276.7[e] 8	9 3	271.5
	1388.6 9	18 6	161.7
	1446.1 8	17 5	103.8
	1489.0 3	82 10	63.2
	1499.0[e] 10	16 6	48.9
	1516.6 3	42 6	34.5
1555.46	1283.6 5	21 5	271.5
	1452.1 4	56 7	103.8
	1506.3 2	100 16	48.9
1563.1	1291.4 11	38 16	271.5
	1502.6 14	97 45	63.2
	1527.2 9	100 32	34.5
1581.4	1420.1 4	100 17	161.7
	1580.4 8	47 14	0.0
1657.9	1384.7 16	21 12	271.5
	1496.8 7	100 27	161.7
1685.22	1361.3 15	47 25	320.1
	1413.3 8	20 6	271.5
	1620.4[e] 4	91 14	63.2
	1652.1[e] 3	100 13	34.5
	1684.7 5	62 12	0.0
1701.1	1538.2 11	46 18	161.7
	1598.5 13	33 16	103.8
	1701.1 5	100 18	0.0
1720.82	1405.5[e] 8	75 24	320.1
	1451.1 6	24 6	271.5
	1562.5[e] 11	30 12	161.7
	1615.1[e] 3	100 11	103.8
	1691.5[e] 11	30 11	34.5
1735.94	1418.1[e] 6	37 9	320.1
	1464.6 15	4.1 21	271.5
	1573.1 7	16 5	161.7
	1632.0 1	100 7	103.8
	1673.2 5	29 5	63.2
	1702.3 4	27 4	34.5
	1735.5 12	14 5	0.0
1743.3	1471.3 12	30 13	271.5
	1681.4 8	100 29	63.2
	1740.7 13	76 31	0.0
1816.1	1495.3 8	100 29	320.1
	1753.7 10	48 16	63.2
1822.4	1501.9 13	100 42	320.1
	1714.9 16	33 18	103.8
	1826.3 15	42 21	0.0
1842.2	1570.1 8	33 10	271.5
	1680.9 11	55 21	161.7
	1738.7 4	100 17	103.8
	1840.8 14	40 19	0.0
1849.9	1787.3 12	87 35	63.2
	1849.5 9	100 33	0.0
1879.79	1777.4 9	27 8	103.8
	1817.0 8	37 11	63.2
	1845.0 9	32 10	34.5
	1879.6 2	100 10	0.0
1953.3	1632.7 6	100 24	320.1
	1919.6 10	44 16	34.5
1965.1	1803.1 14	67 33	161.7
	1965.5 15	100 45	0.0
1972.02	1650.6 5	69 14	320.1
	1700.4 10	10 4	271.5
	1868.4 2	100 8	103.8
	1909.4 9	30 9	63.2
1997.9	1949.8 5	100 18	48.9
	1962.3 6	93 20	34.5

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^{139}La(n,γ) E=th: two γ cascade 2000Va30 (continued)

γ(^{140}La) (continued)

E_i(level)	E_γ	I_γ[†]	E_f
2017.57	1697.1 12	63 25	320.1
	1855.7 13	34 15	161.7
	1912.8 10	33 12	103.8
	1954.9 5	100 17	63.2
	1983.6 13	36 16	34.5
2046.04	1727.2[e] 3	100 14	320.1
	1941.4[e] 10	20 7	103.8
	1993.0[e] 6	40 8	48.9
	2044.4 15	19 10	0.0
2078.40	1758.7 4	39 5	320.1
	1804.8[e] 6	5.5 14	271.5
	1974.6 1	100 5	103.8
	2030.4 8	9.3 25	48.9
2120.57	1800.7 13	100 42	320.1
	1958.7 12	69 27	161.7
2122.7	1848.9 11	42 16	271.5
	2075.4 9	100 31	48.9
2126.9	1806.6 6	100 20	320.1
	1856.0 10	13 5	271.5
	1963.9 20	19 12	161.7
	2090.9 7	45 10	34.5
	2129.9 10	39 12	0.0
2147.7	1878.7 12	20 8	271.5
	2100.2 16	30 16	48.9
	2112.1 6	100 18	34.5
2172.9	1898.8[e] 8	19 6	271.5
	2140.7[e] 7	45 11	34.5
	2172.7 4	100 14	0.0
2196.9	1877.9 5	100 19	320.1
	1926.6 10	13 5	271.5
	2148.2 13	23 10	48.9
	2160.0 9	41 12	34.5
	2194.8 9	41 12	0.0
2203.2	2156.7 15	73 37	48.9
	2165.5 18	79 42	34.5
	2203.3 13	100 45	0.0
2245.3	1924.2 8	100 29	320.1
	1974.1 5	33 8	271.5
2297.62	1976.0[e] 4	100 17	320.1
	2027.2 6	19 5	271.5
	2249.4 3	100 14	48.9
	2262.0 9	32 10	34.5
2323.3	2274.9 11	100 38	48.9
	2288.2 15	82 39	34.5
2394.2	2122.5 10	47 18	271.5
	2344.9 13	100 43	48.9
2402.7	2131.1 11	22 8	271.5

E_i(level)	E_γ	E_f
(5161.2)	2766.9[f] 5	2394.2
	2837.9[f] 5	2323.3
	2863.6[f] 8	2297.62
	2915.8[f] 11	2245.3
	2958.2[f] 16	2203.2
	2964.5[f] 9	2196.9
	2988.1[f] 12	2172.9
	3012.3[f] 12	2147.7
	3034.0[f] 8	2126.9
	3038.5[f] 15	2122.7
	3040.6[f] 2	2120.57
	3082.8[f] 4	2078.40
	3116.5[f] 11	2046.04
	3143.7[f] 3	2017.57
	3163.4[f] 9	1997.9
	3189.2[f] 5	1972.02
	3196.1[f] 5	1965.1
	3207.7[f] 7	1953.3
	3281.0[f] 4	1879.79
	3311.2[f] 5	1849.9
	3319.1[f] 4	1842.2
	3338.8[f] 22	1822.4
	3345.0[f] 7	1816.1
	3418.2[f] 12	1743.3
	3424.9[f] 4	1735.94
	3437.5[f] 13	1720.82
	3460.1[f] 7	1701.1
	3476.8[f] 9	1685.22
	3503.5[f] 8	1657.9
	3580.1[f] 6	1581.4
	3597.4[f] 12	1563.1
	3605.5[f] 2	1555.46
	3610.7[f] 6	1551.50
	3665.1[f] 9	1495.59
	3673.7[f] 7	1487.5
	3677.2[f e] 6	1482.02
	3682.6[f] 9	1478.4
	3715.1[f] 15	1445.2
	3727.6[f] 10	1433.84
	3733.1[f] 10	1427.7
	3737.1[f] 2	1423.94
	3771.9[f] 9	1389.1
	3821.2[f] 7	1340.0
	3872.9[f] 12	1288.2
	3896.4[f] 5	1264.7
	3901.1[f] 6	1259.98
	3959.1[f] 10	1201.3

^{139}La(n,γ) E=th: two γ cascade 2000Va30 (continued)

γ(^{140}La) (continued)

E_i(level)	E_γ	I_γ[†]	E_f	E_i(level)	E_γ	E_f
	2240.8 *5*	100 *22*	161.7		3973.0[f] *2*	1188.17
2939.2	2905.2 *7*	100 *26*	34.5		3999.5[f] *9*	1161.4
	2937.8 *13*	72 *32*	0.0		4023.4[f] *15*	1137.5
3009.4	2688.7 *9*	100 *32*	320.1		4044.4[f] *5*	1116.58
	2738.2 *8*	30 *9*	271.5		4060.3[f] *8*	1100.9
(5161.2)	2151.6[f] *9*		3009.4		4105.0[f] *2*	1056.15
	2222.4[f] *10*		2939.2		4123.2[f] *15*	1037.6
	2758.3[f] *5*		2402.7		4130.6[f] *10*	1030.9

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^{139}La(n,γ) E=th: two γ cascade 2000Va30 (continued)

γ(^{140}La) (continued)

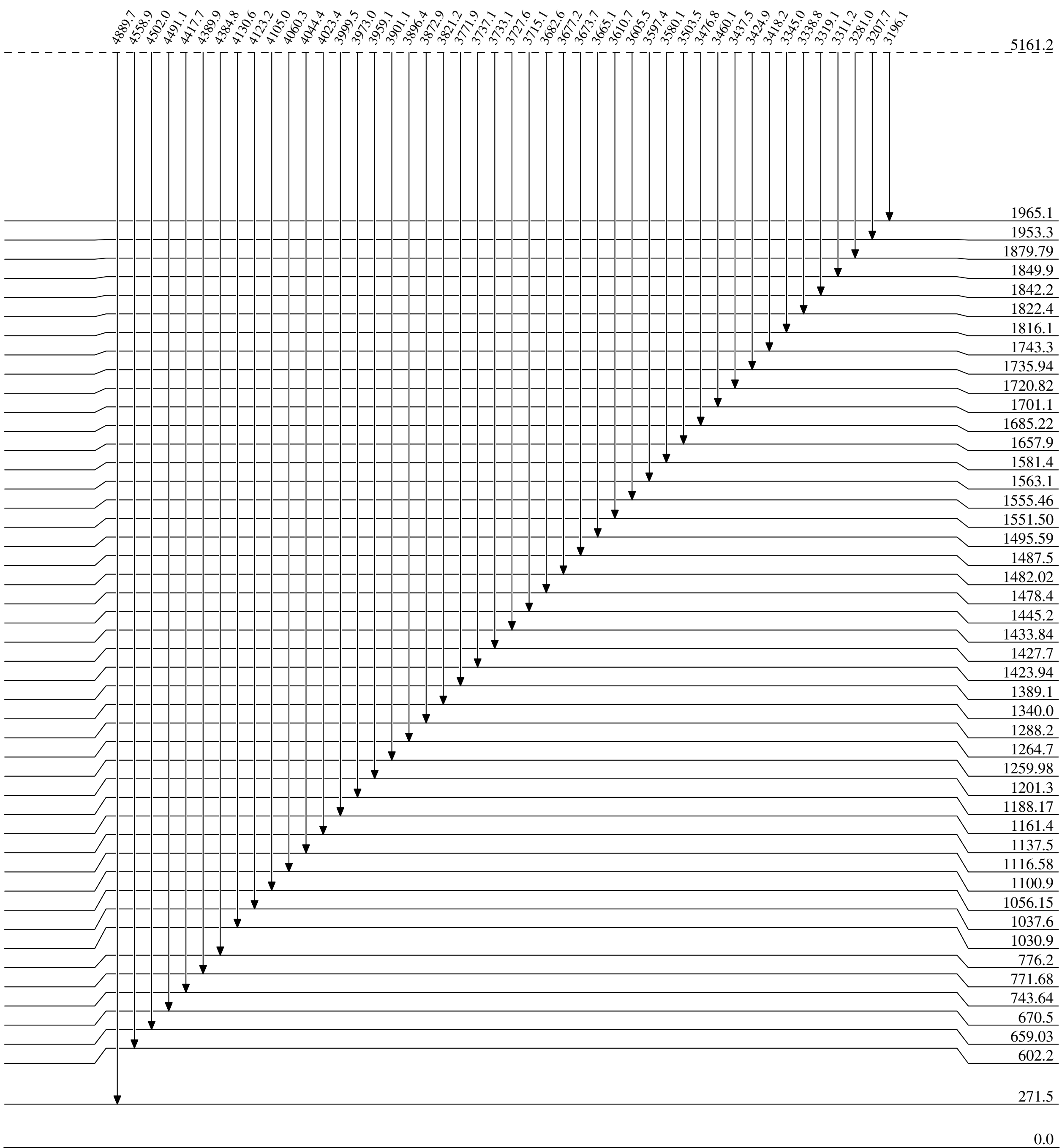
E_i(level)	E_γ	E_f	E_i(level)	E_γ	E_f
(5161.2)	4384.8[f] 9	776.2	(5161.2)	4491.1[f] 13	670.5
	4389.9[f] 4	771.68		4502.0[f] 5	659.03
	4417.7[f] 7	743.64		4558.9[f] 4	602.2
				4889.7[f] 4	271.5

[†] Relative photon branching ratio from each level.
[‡] From group 2 (Eγ1+Eγ2=5126.6 keV).
[#] From group 6 (Eγ1+Eγ2=4999.5 keV).
[@] From group 4 (Eγ1+Eγ2=5098.0 keV).
[&] From group 3 (Eγ1+Eγ2=5112.3 keV).
[a] From group 8 (Eγ1+Eγ2=4841.1 keV).
[b] From group 5 (Eγ1+Eγ2=5057.4 keV).
[c] From group 7 (Eγ1+Eγ2=4888.9 keV).
[d] From group 1 (Eγ1+Eγ2=5161.2 keV).
[e] Differ by 3σ or more from calculated value (35 occurrences).
[f] Unweighted mean value of measured primary γ′s from coin cascades populating the intermediate level. Uncertainties listed here were calculated for level fit purpose as standard deviation of the unweighted mean.
[g] 0.0 in 2000Va30. This transition is relatively intense and probably ΔE<0.1 value was truncated, or misprint; the value listed here set by evaluator.
[h] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{139}La(n,γ) E=th: two γ cascade 2000Va30

Level Scheme

Intensities: Relative photon branching from each level

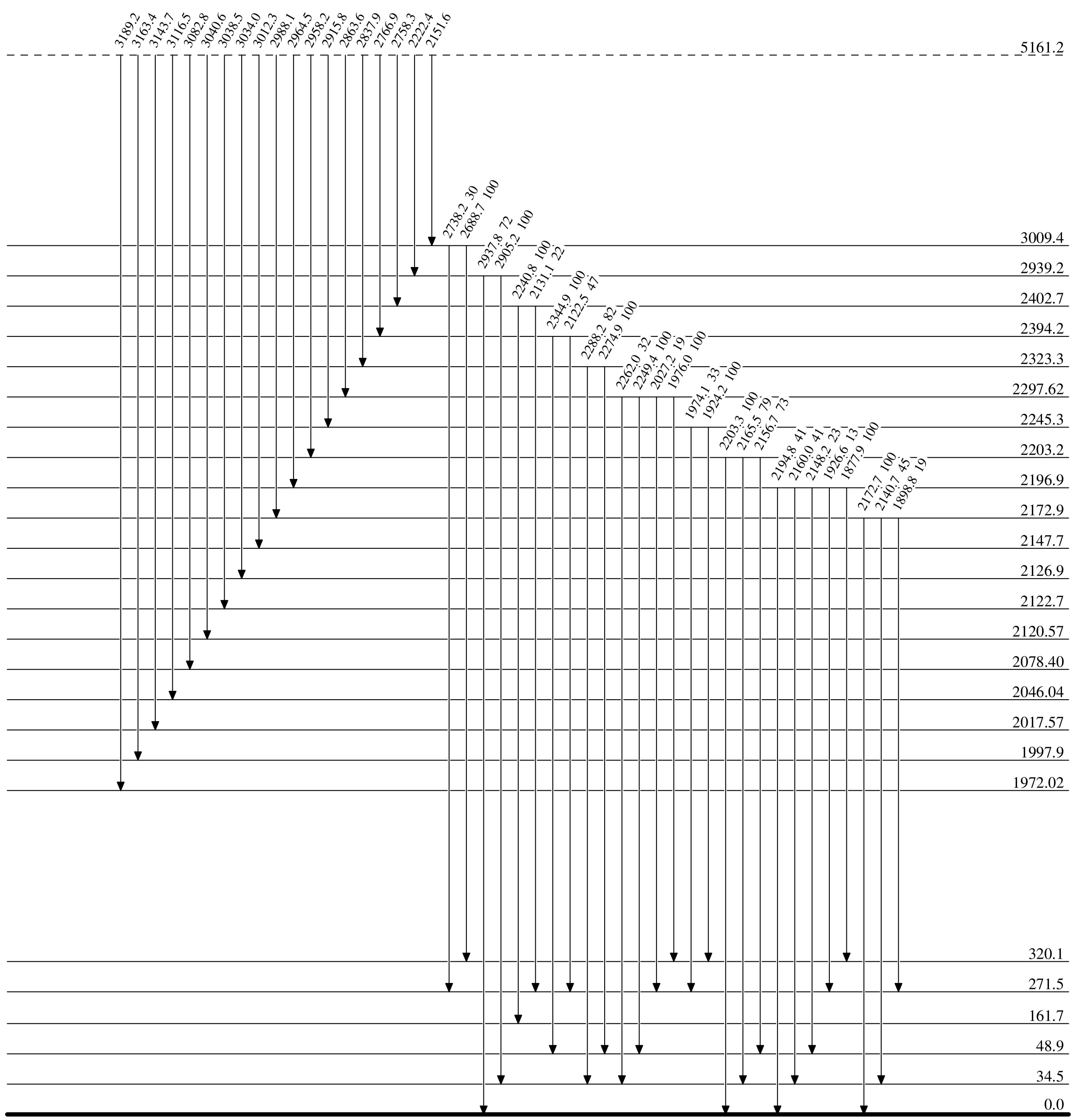


$^{140}_{57}La_{83}$

^{139}La(n,γ) E=th: two γ cascade 2000Va30

Level Scheme (continued)

Intensities: Relative photon branching from each level

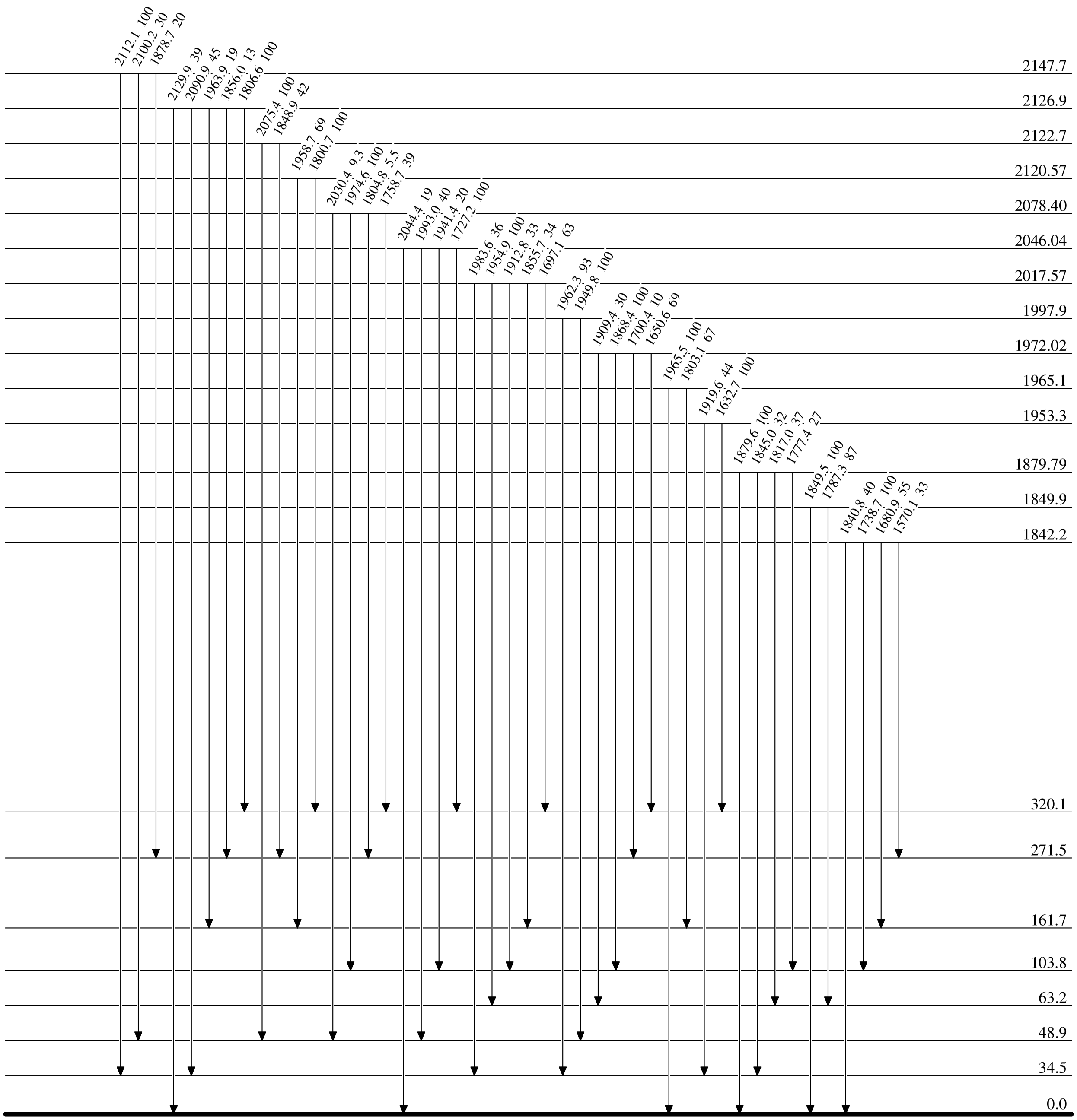


$^{140}_{57}La_{83}$

^{139}La(n,γ) E=th: two γ cascade 2000Va30

Level Scheme (continued)

Intensities: Relative photon branching from each level

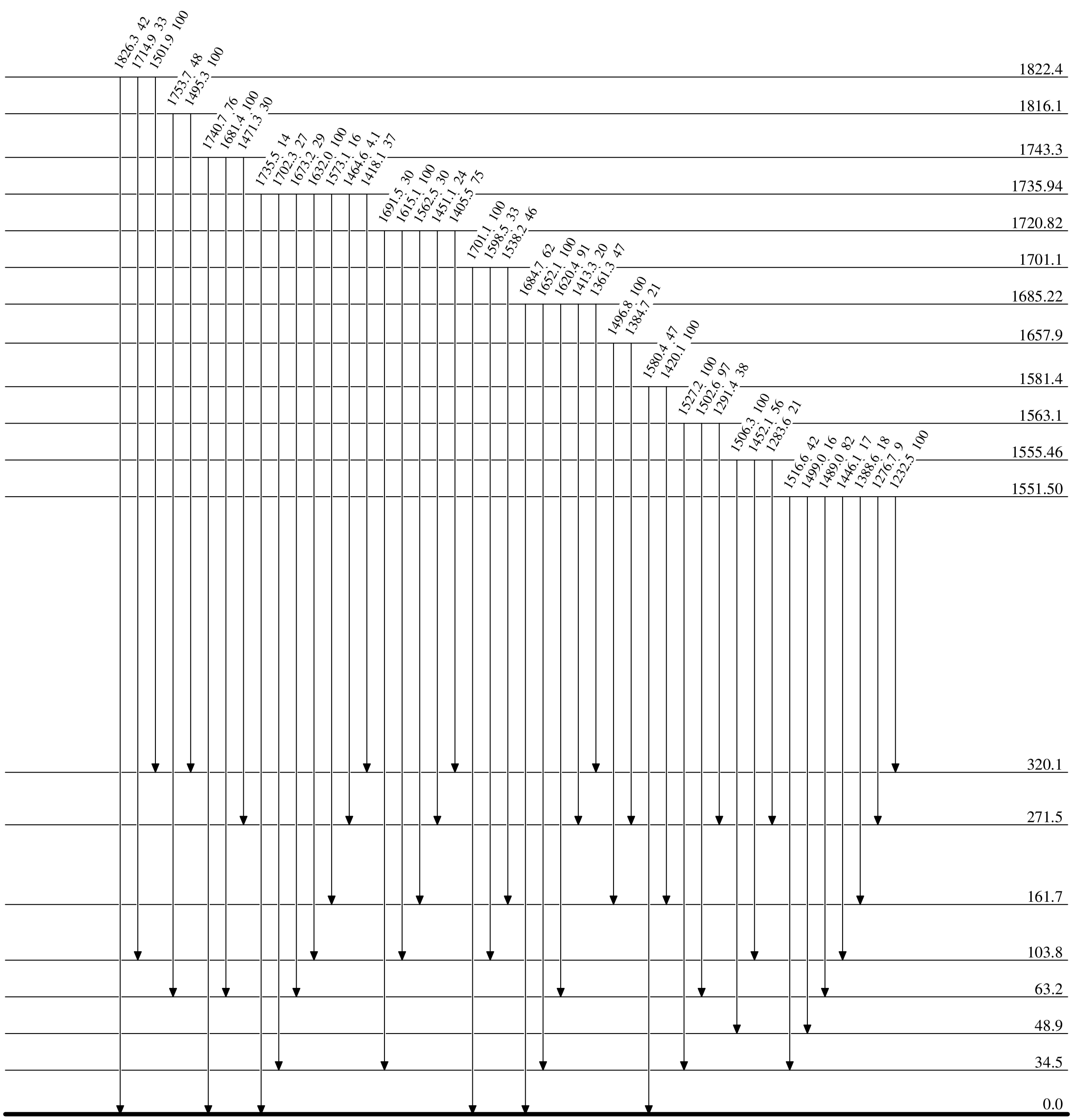


$^{140}_{57}La_{83}$

^{139}La(n,γ) E=th: two γ cascade 2000Va30

Level Scheme (continued)

Intensities: Relative photon branching from each level



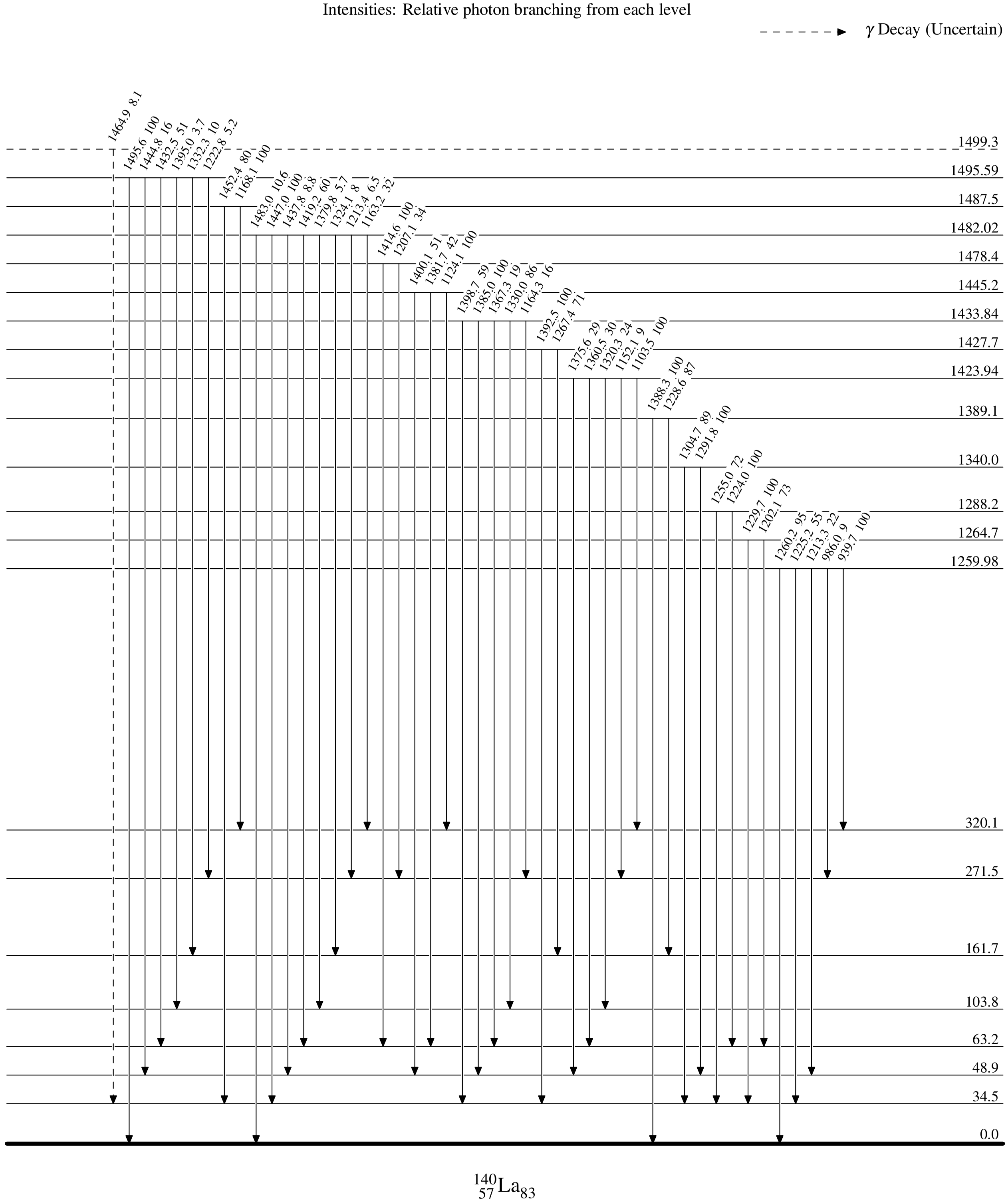
$^{140}_{57}La_{83}$

$^{139}La(n,\gamma)$ E=th: two γ cascade 2000Va30

Level Scheme (continued)

Intensities: Relative photon branching from each level

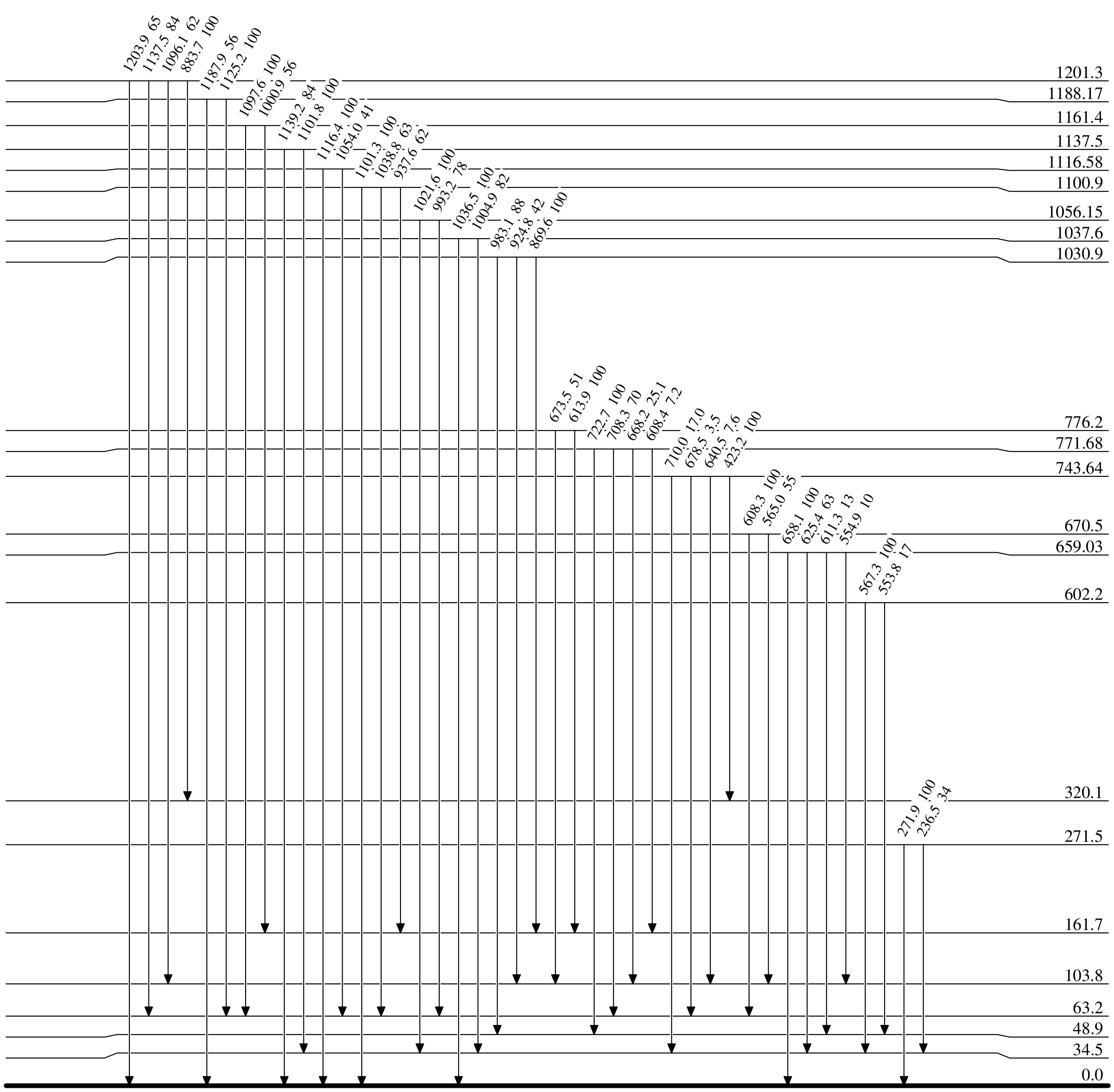
Legend



$^{139}La(n,\gamma)$ E=th: two γ cascade 2000Va30

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{140}_{57}La_{83}$