^{142}Ce(α,2nγ) 1976Be56,1976De11

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	A. A. Sonzogni	NDS 93, 599 (2001)	1-Dec-2000

1976Be56: E=27 MeV. Measured: γ(semi); $\gamma\gamma$(semi-semi); $\gamma(\theta)$ θ=30°, 60°, 90°; Ce(semi); excitation functions E(α)=22, 24, 27 MeV.

1976De11: measured: γ(semi) (E(α)=28.5 MeV); $\gamma\gamma$ (semi-semi) (E(α)= 30.5 MeV); $\gamma(\theta)$ θ=90°, 112°, 125°, 135°, 145°, 156° (E(α)=30.5 MeV); excitation functions E(α)=28.5, 33.5, 37.0, 40.0 MeV.

No isomeric level with $T_{1/2}$>1 ns observed (1976De11).

Level schemes of 1976Be56 and 1976De11 are in agreement for levels below 3 MeV. However, above 3 MeV there is little agreement. Except for levels at 3056.7 and 3178.3, other energy levels given here are due to 1976Be56. 1976De11 have proposed the following levels above 3178, with depopulating transitions given in parenthesis: 3486.8(514.6), 3594.8(416.5), 3641.1(668.9), 3827.8(341.1,925.2), 3910.5(82.7,315.5,423.7,1007.9), 4224.2(396.4), 4283.1(372.6,455.2), 4468.7(185.6,558.2), 4630.9(162.2), 4986.5(355.6,703.5) $\gamma\gamma$-coincidences shown are also due to 1976Be56. Some of the levels proposed by 1976Be56 do not seem to be in disagreement with $\gamma\gamma$ results of 1976De11.

^{144}Nd Levels

E(level)	J$^\pi$†	E(level)	J$^\pi$†	E(level)	J$^\pi$†	E(level)	J$^\pi$†
0.0	0^+	2218.0	$(6)^+$	3178.3		3874.6?	(9,10)
696.5	2^+	2419.9	$^+$	3232.9?	(7^-)	3946.1	(9,11)
1314.5	4^+	2612.4	(7^-)	3297.2?	(8^-)	3993.1?	
1510.6	3^-	2709.7	$(8)^+$	3344.6	(9^+)	4065.0	(11^-)
1560.9	2^+	2875.9	(6^+)	3395.7?	(9^-)	4155.0	$(9^-,11^-)$
1791.3	6^+	2902.9	(8^-)	3530.4	$(8^+,10^+)$	4460.4	
2093.1	5^-	2972.0	(8^+)	3802.3?	(10,11)	4622.7	
2109.3?	(2^+)	3056.7?		3829.2?	(11^-)	4937.2	

† From Adopted Levels.

γ(^{144}Nd)

Unless stated otherwise, Eγ, Iγ, $\gamma(\theta)$, α(K)exp values of 1976Be56 are given. For many levels branching ratios of 1976Be56 differ from 1976De11. These are given in comments.

E$_\gamma$	I$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
68.8 *1*	0.2	2972.0	(8^+)	2902.9	(8^-)	
^{x}82.7‡	<0.2					E$_\gamma$: seen in coincidence spectrum.
95.9 *1*	0.3	2972.0	(8^+)	2875.9	(6^+)	
97.3 *1*	0.4	2709.7	$(8)^+$	2612.4	(7^-)	
121.8 *3*	0.3 *1*	3178.3		3056.7?		I$_\gamma$: from 1976De11.
162.3 *1*	1.6	4622.7		4460.4		α(K)exp≈0.35; $\gamma(\theta)$: A$_2$=−0.06 *7*.
185.8 *1*	3.2	3530.4	$(8^+,10^+)$	3344.6	(9^+)	I$_\gamma$: Iγ(186γ)/Iγ(558γ)=100/31 (1976Be56), 100/102 (1976De11). α(K)exp≈0.25.
193.2 *1*	25.5	2902.9	(8^-)	2709.7	$(8)^+$	α(K)exp≈0.035; $\gamma(\theta)$: A$_2$=−0.12 *4*.
201.9 *1*	0.9	2419.9	$^+$	2218.0	$(6)^+$	$\gamma(\theta)$: A$_2$=0.46 *60*.
206.0‡	1.0 *3*	3178.3		2972.0	(8^+)	
^{x}234.8‡	2.5 *5*					
^{x}246.2‡	1.6 *4*					
^{x}257.8‡	1.1 *4*					
275.7‡	4.1 *4*	3178.3		2902.9	(8^-)	$\gamma(\theta)$: A$_2$=−0.08 *4*, A$_4$=−0.06 *6* (1976De11).

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^{142}Ce(α,2nγ) 1976Be56,1976De11 (continued)

$\gamma(^{144}Nd)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[@]	Comments
290.5 *1*	1.6	2902.9	(8^-)	2612.4	(7^-)			α(K)exp≈0.03; $\gamma(\theta)$: A_2=0.44 *10*.
302.0 *1*	0.8	2093.1	5^-	1791.3	6^+	(E1)	0.01336	α(K)=0.01143; α(L)=0.00152; α(M)=0.00032 I_γ: see 778γ. α(K)exp≈0.025; $\gamma(\theta)$: A_2=−0.2 *3*.
309.5[#] *2*	1.4	2419.9	$^+$	2109.3?	(2^+)			$\gamma(\theta)$: A_2=−0.1 *1*; α(K)exp≈0.06.
314.5 *1*	1.5	4937.2		4622.7				$\gamma(\theta)$: A_2=−0.27 *17*.
[x]341.1[‡]	2.0 *5*							
357.0 *1*	2.3	3232.9?	(7^-)	2875.9	(6^+)			α(K)exp≈0.02; $\gamma(\theta)$: A_2=−0.26 *7*.
372.6 *1*	4.8	3344.6	(9^+)	2972.0	(8^+)	M1	0.0393	α(K)= 0.0336; α(L)=0.00452; α(M)=0.00095; α(N+..)=0.00026 α(K)exp≈0.045; $\gamma(\theta)$: A_2=−0.10 *8*.
393.2[#] *2*	0.9	3297.2?	(8^-)	2902.9	(8^-)			
395.9 *2*	1.9	4460.4		4065.0	(11^-)			I_γ: Iγ(514γ)/Iγ(396γ)=100/63 (1976Be56), 100/13 (1976De11).
[x]404.2[‡]	0.8 *4*							
415.7 *2*	1.6	3946.1	(9,11)	3530.4	$(8^+,10^+)$	(M1)	0.0296	α(K)= 0.0253; α(L)=0.00340; α(M)=0.00072; α(N+..)=0.00020 α(K)exp≈0.045; $\gamma(\theta)$: A_2=−0.36 *15*. I_γ: Iγ(416γ)/Iγ(551γ)=100/44 (1976Be56), 100/15 (1976De11).
423.7 *1*	6.4	3395.7?	(9^-)	2972.0	(8^+)			α(K)exp≈0.01; $\gamma(\theta)$: A_2=−0.19 *7*?
426.7 *1*	17.6	2218.0	$(6)^+$	1791.3	6^+	M1	0.0277	α(K)=0.02366; α(L)=0.00318; α(M)=0.00067; α(N+..)=0.00018 α(K)exp≈0.03; $\gamma(\theta)$:A_2=0.44 *4*.
[x]453.8 *2*	0.8							
[x]455.4 *5*	0.6							
476.8 *1*	80.5	1791.3	6^+	1314.5	4^+	E2	0.01344	α(K)=0.01109; α(L)=0.00184; α(M)=0.00040; α(N+..)=0.00011 α(K)exp≈0.01; $\gamma(\theta)$: A_2=0.42 *4*.
492.9[#] *2*	1.3	3395.7?	(9^-)	2902.9	(8^-)			α(K)exp≈0.045; $\gamma(\theta)$: A_2=0.4 *2*.
514.3 *2*	3.0	4460.4		3946.1	(9,11)			$\gamma(\theta)$: A_2=0.4 *2*. I_γ: see 396γ.
[x]541.6[‡]	1.0 *4*							
550.8 *3*	0.7	3946.1	(9,11)	3395.7?	(9^-)			I_γ: see 416γ.
558.2	1.0	3530.4	$(8^+,10^+)$	2972.0	(8^+)	(M1)	0.01420	α(K)=0.01207; α(L)=0.00160 α(K)exp≈0.02; $\gamma(\theta)$: A_2=0.4 *2*. I_γ: see 186γ.
[x]578.0 *2*	1.7							
582.0 *2*	1.1	2093.1	5^-	1510.6	3^-			I_γ: see 778γ. α(K)exp≈0.025; $\gamma(\theta)$: A_2=0.4 *3*.
618.0 *1*	91.3	1314.5	4^+	696.5	2^+	E2	0.00685	α(K)=0.00569; α(L)=0.00087 α(K)exp≈0.007; $\gamma(\theta)$: A_2=+0.45 *4*.
657.7 *2*	6.6	2875.9	(6^+)	2218.0	$(6)^+$	M1	0.00947	α(K)=0.00806; α(L)=0.00106 α(K)exp≈0.009; $\gamma(\theta)$: A_2=0.53 *3*. I_γ: Iγ(1085γ)/Iγ(658γ)=3/100 (1976Be56), 17/100 (1976De11).
669.3 *2*	4.8	4065.0	(11^-)	3395.7?	(9^-)	E2	0.00562	α(K)=0.00469; α(L)=0.00070 α(K)exp≈0.006; $\gamma(\theta)$: A_2=0.36 *5*.
[x]681.5[#] *3*	1.4							$\gamma(\theta)$: A_2=−0.35 *25*.
684.8[#] *2*	2.0	3297.2?	(8^-)	2612.4	(7^-)			$\gamma(\theta)$: A_2=−0.16 *12*.
[x]693.3[#] *5*								$\gamma(\theta)$: A_2=−0.15 *20*.
696.5 *1*	100	696.5	2^+	0.0	0^+	E2	0.00511	α(K)=0.00427; α(L)=0.00063 $\gamma(\theta)$: A_2=+0.40 *3*.

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^{142}Ce(α,2nγ) 1976Be56,1976De11 (continued)

$\gamma(^{144}Nd)$ (continued)

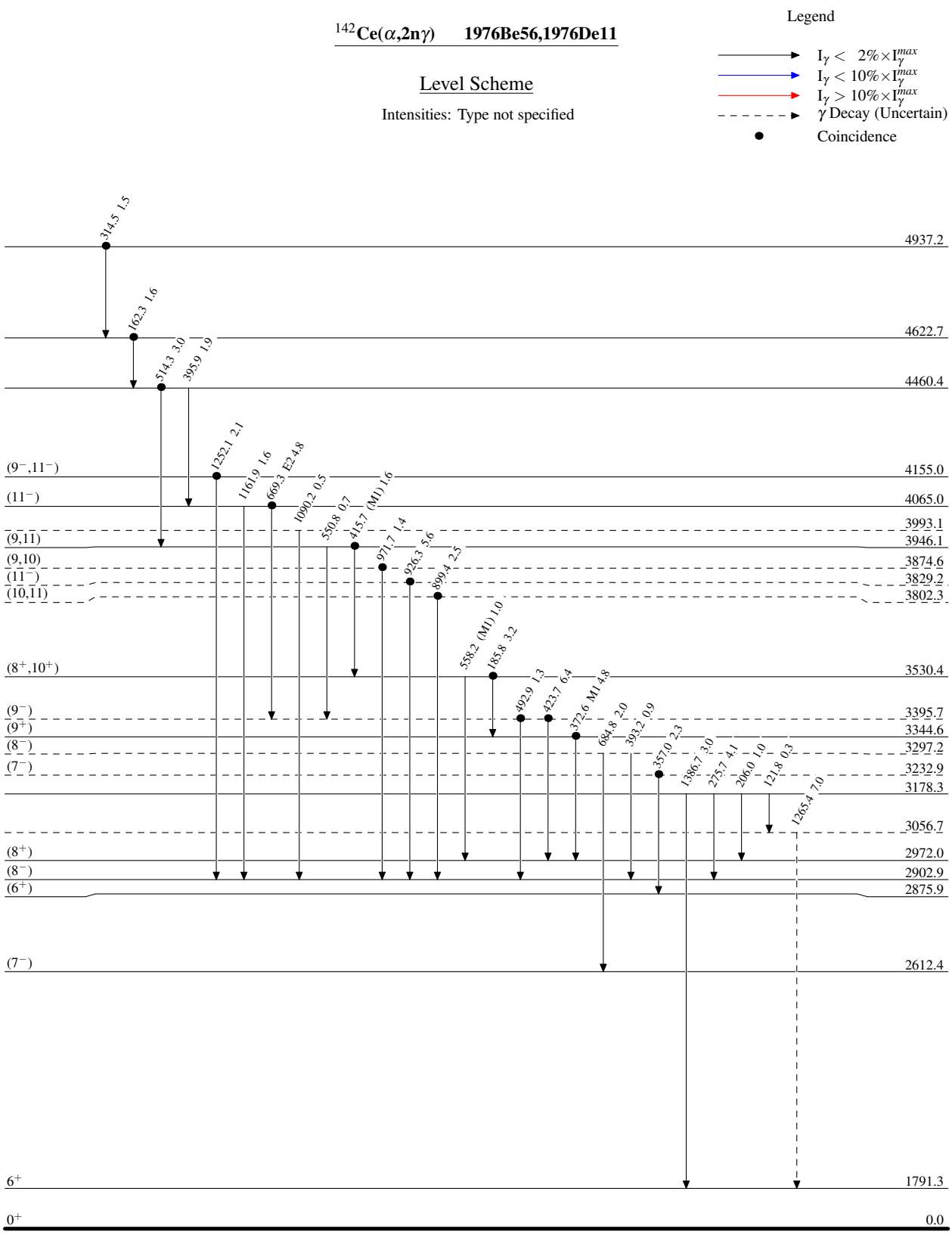
E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[@]	Comments
[x]700.0 *5*	1.6							$\gamma(\theta)$: A_2=0.57 *54*.
754.0 *1*	10.2	2972.0	(8^+)	2218.0	$(6)^+$	E2	0.00423	α(K)=0.00355; α(L)=0.00052 α(K)exp≈0.004; $\gamma(\theta)$: A_2=0.43 *4*.
778.5 *2*	3.7	2093.1	5^-	1314.5	4^+			I_γ: Iγ(302γ):Iγ(582γ):I(778γ)=22:30:100 (1976Be56), 11:11:100 (1976De11). $\gamma(\theta)$: A_2=−0.18 *5*.
814.1 *2*	3.0	1510.6	3^-	696.5	2^+			$\gamma(\theta)$: A_2=−0.13 *7*.
821.1 *1*	9.0	2612.4	(7^-)	1791.3	6^+			$\gamma(\theta)$: A_2=−0.19 *3*.
[x]860.9 *6*	0.3							
864.4 *3*	1.4	1560.9	2^+	696.5	2^+			I_γ: see 1560γ. $\gamma(\theta)$: A_2=−0.17 *18*.
[x]889.4[#] *4*	0.5							
899.4 *2*	2.5	3802.3?	(10,11)	2902.9	(8^-)			$\gamma(\theta)$: A_2=−0.05 *24*.
[x]905.8 *2*	1.2							
918.4 *1*	30.2	2709.7	$(8)^+$	1791.3	6^+	E2	0.00271	α(K)=0.00228; α(L)=0.00032 α(K)exp≈0.0025; $\gamma(\theta)$: A_2=0.47 *4*.
926.3 *1*	5.6	3829.2?	(11^-)	2902.9	(8^-)			α(K)exp≈0.004; $\gamma(\theta)$: A_2=0.42 *12*.
[x]963.6[‡]	1.2 *4*							
971.7 *2*	1.4	3874.6?	(9,10)	2902.9	(8^-)			α(K)exp≈0.007; $\gamma(\theta)$: A_2=+0.06 *20*.
[x]980.4[#] *2*	0.8							
[x]1006.7 *4*	0.3							
1085.3 *7*	0.2	2875.9	(6^+)	1791.3	6^+			I_γ: see 658γ.
1090.2 *4*	0.5	3993.1?		2902.9	(8^-)			
1161.9[#]	1.6	4065.0	(11^-)	2902.9	(8^-)			$\gamma(\theta)$: A_2=0.28 *23*.
1180.7 *1*	8.4	2972.0	(8^+)	1791.3	6^+			$\gamma(\theta)$: A_2=0.43 *4*.
1252.1 *2*	2.1	4155.0	$(9^-,11^-)$	2902.9	(8^-)			$\gamma(\theta)$: A_2=0.4 *2*.
1265.4[‡&]	7.0 *11*	3056.7?		1791.3	6^+			$\gamma(\theta)$: A_2=−0.59 *7*, A_4=+0.25 *8* (1976De11).
[x]1384.4[‡]	1.4 *5*							
1386.7 *2*	3.0 *5*	3178.3		1791.3	6^+			$\gamma(\theta)$: A_2=+0.31 *10*, A_4=−0.23 *18* (1976De11). I_γ: from 1976De11.
1412.8 *4*	2.2	2109.3?	(2^+)	696.5	2^+			
1560.5 *2*	1.6	1560.9	2^+	0.0	0^+			I_γ: Iγ(1560γ)/Iγ(864γ)=100/88 (1976Be56), 100/533 (1976De11).

[†] From α(K)exp, normalized to 696γ (E2). The α(K)exp values given have been estimated by the evaluator from the plot given by 1976Be56.
[‡] γ reported by 1976De11 but not seen by 1976Be56. Iγ given with respect to Iγ(696γ)=100.
[#] γ reported by 1976Be56 but not seen by 1976De11.
[@] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{142}Ce(α,2nγ) 1976Be56,1976De11

Level Scheme

Intensities: Type not specified



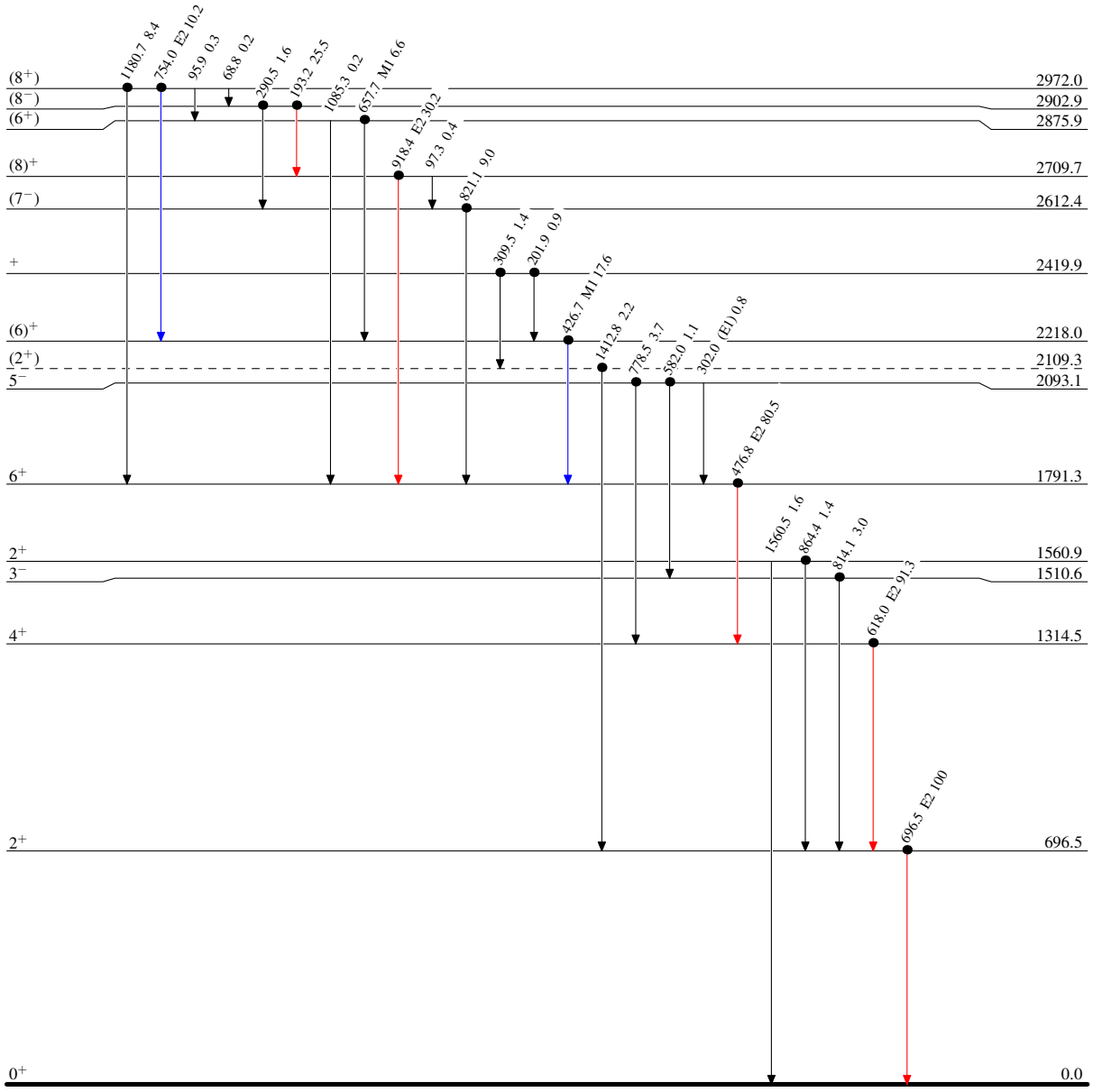
$^{144}_{60}Nd_{84}$

^{142}Ce(α,2nγ) **1976Be56,1976De11**

Level Scheme (continued)

Intensities: Type not specified

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
Coincidence



$^{144}_{60}Nd_{84}$