^{129}Pr ε decay (30 s) 1996Gi08

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Janos Timar and Zoltan Elekes, Balraj Singh	NDS 121, 143 (2014)	31-May-2014

Parent: ^{129}Pr: E=0.0; J$^{\pi}$=(3/2^{+}); $T_{1/2}$=30 s *4*; Q(ε)=6510 *40*; %ε+%β^{+} decay≈100.0
^{129}Pr-Q(ε): From 2012Wa38.
^{129}Pr-J$^{\pi}$,$T_{1/2}$: From ^{129}Pr Adopted Levels.
^{129}Pr-E: Assumed contribution from only one activity.
1996Gi08: ^{94,96}Mo(^{40}Ca,X), E=255 MeV; Ge detectors, He-jet; measured $\gamma\gamma$(t)-, (x ray)γ(t)-coin.
Other: 1977Bo02.
Additional information 1.
From assignment of 9/2^{-} to the 60-ns isomer at 108 keV, 1998Io01 assigned 7/2^{+} to g.s. and increased spin by one unit all the positive- parity levels. For the negative-parity band, a new level was proposed at 119.4 keV with J^{π}=11/2^{-} and energies of higher levels were adjusted accordingly, and the spins increased by 2 units. The placements of 619γ, 701γ, 1028γ, 1040γ, and 1217γ were revised also. These modifications of the decay scheme proposed in 1998Io01 have not been adopted by the evaluators, since the spin of 9/2 for the 60-ns isomer at 107.6 is not considered by the evaluators as definitely determined. The experimental quadrupole interaction pattern (figure 1 in 1998Io01) fits 9/2 better than 7/2, but the fit for 9/2 still suffers from somewhat large χ^2 of 2.7. Assignment of 9/2^{-} for the isomer also leads to serious discrepancies with band structures and theoretical predictions.
No meaningful ε and β^{+} feedings can be deduced since feeding to ground state of ^{129}Ce is unknown and multipolarities of several low-energy transitions, with expected large conversion coefficients, are unknown. For these reasons, the decay scheme cannot be normalized to obtain γ-ray intensities per 100 ^{129}Pr nuclei.

^{129}Ce Levels

E(level)[†]	J$^{\pi}$[‡]	$T_{1/2}$[‡]	Comments
0.0	(5/2^{+})	3.5 min *3*	J$^{\pi}$: see discussion in Adopted Levels for (5/2^{+}) assignment rather than 7/2^{+} as proposed by 1998Io01.
0.0+x	(1/2^{+})		E(level): x<0.5 keV from parallel decay paths from the 918.8 level to g.s. and the 0.0+x level; expected to be an isomer.
39.50+x *9*	(3/2^{+})		
107.58 *10*	(7/2^{-})	60 ns *2*	J$^{\pi}$: see discussion in Adopted Levels for (7/2^{-}) assignment rather than 9/2^{-} as proposed by 1998Io01.
144.41 *15*	(7/2^{+})		
189.55 *13*	(9/2^{-})		
243.30+x *9*	(5/2^{+})		
279.02 *9*	(9/2^{+},7/2^{+})		
331.30+x *20*	(7/2^{+})		
334.89 *14*	(11/2^{-})		
347.72 *25*	(9/2^{+})		
589.10 *25*	(11/2^{+})		
613.60 *16*			
616.9+x *5*			
671.40+x *22*	(9/2^{+})		
748.06 *20*			
781.1 *4*			
789.8+x *5*			
806+x *3*	(11/2^{+})		
808.6 *3*			
820.3 *3*			
830.02 *24*			
831.41+x *22*			
835.0+x *4*			
866.7 *11*	(13/2^{+})		
918.8+x *4*			
979.92 *24*			

Continued on next page (footnotes at end of table)

^{129}Pr ε decay (30 s) 1996Gi08 (continued)

^{129}Ce Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	E(level)†	Jπ‡
1134.0+x *5*	(3/2,5/2)	1324.6 *10*		1347.5+x *10*	1678.5+x *4*	(3/2,5/2)
1135.5 *4*		1337.6 *4*		1445.4 *11*	1825.9+x *4*	
1229.6 *5*		1340+x *3*	(3/2,5/2)	1549.9 *5*	2008.9 *4*	

† From least-squares fit to Eγ data, 305.3γ not used in the fitting procedure.
‡ From Adopted Levels.

γ(^{129}Ce)

Eγ	Iγ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α@	Comments
39.5 *1*	50 *6*	39.50+x	(3/2$^+$)	0.0+x	(1/2$^+$)			
81.9 *1*	18.3 *15*	189.55	(9/2$^-$)	107.58	(7/2$^-$)			
88.0 *5*	5.3 *7*	331.30+x	(7/2$^+$)	243.30+x	(5/2$^+$)			
107.6 *1*	100	107.58	(7/2$^-$)	0.0	(5/2$^+$)	[E1]	0.199	α(K)=0.1692 *24*; α(L)=0.0234 *4*; α(M)=0.00487 *7* α(N)=0.001065 *16*; α(O)=0.0001660 *24*; α(P)=1.030×10^{-5} *15*
134.6 *2*	6.4 *9*	279.02	(9/2$^+$,7/2$^+$)	144.41	(7/2$^+$)			
144.4 *2*	90 *4*	144.41	(7/2$^+$)	0.0	(5/2$^+$)			
145.4 *2*	21 *1*	334.89	(11/2$^-$)	189.55	(9/2$^-$)			
203.3 *2*	16 *2*	347.72	(9/2$^+$)	144.41	(7/2$^+$)			
203.8 *2*	117 *6*	243.30+x	(5/2$^+$)	39.50+x	(3/2$^+$)			
227.3 *1*	2.3 *2*	334.89	(11/2$^-$)	107.58	(7/2$^-$)			
241† *1*	17† *3*	589.10	(11/2$^+$)	347.72	(9/2$^+$)			
243.3 *1*	93 *5*	243.30+x	(5/2$^+$)	0.0+x	(1/2$^+$)			
279.0 *1*	39 *2*	279.02	(9/2$^+$,7/2$^+$)	0.0	(5/2$^+$)			
291.8 *2*	60 *3*	331.30+x	(7/2$^+$)	39.50+x	(3/2$^+$)			
305.3 *2*	12.4 *8*	918.8+x		613.60				
334.5 *2*	4.0 *5*	613.60		279.02	(9/2$^+$,7/2$^+$)			
340 *1*	2.5 *5*	671.40+x	(9/2$^+$)	331.30+x	(7/2$^+$)			
≈348†	3.6† *3*	347.72	(9/2$^+$)	0.0	(5/2$^+$)			
373 *1*	5‡ *1*	616.9+x		243.30+x	(5/2$^+$)			
428.1 *2*	27 *1*	671.40+x	(9/2$^+$)	243.30+x	(5/2$^+$)			
x441.2# *3*	60.9‡							
444.7 *2*	17.5 *5*	589.10	(11/2$^+$)	144.41	(7/2$^+$)			
≈446	<1	781.1		334.89	(11/2$^-$)			
≈475	<1	806+x	(11/2$^+$)	331.30+x	(7/2$^+$)			
≈501	3 *1*	831.41+x		331.30+x	(7/2$^+$)			
506.1 *2*	24 *2*	613.60		107.58	(7/2$^-$)			
519 *1*	<2	866.7	(13/2$^+$)	347.72	(9/2$^+$)			
546.5 *5*	50‡ *5*	789.8+x		243.30+x	(5/2$^+$)			
558.5 *2*	13.8 *8*	748.06		189.55	(9/2$^-$)			
577.5 *5*	120‡ *9*	616.9+x		39.50+x	(3/2$^+$)			
588.1 *2*	66 *2*	831.41+x		243.30+x	(5/2$^+$)			
591.5 *3*	9.4 *6*	781.1		189.55	(9/2$^-$)			
591.7 *3*	10 *1*	835.0+x		243.30+x	(5/2$^+$)			Additional information 2.
619b *1*	13.4 *8*	808.6		189.55	(9/2$^-$)			
630 *1*	5.2 *4*	820.3		189.55	(9/2$^-$)			

Continued on next page (footnotes at end of table)

^{129}Pr ε decay (30 s) 1996Gi08 (continued)

γ(^{129}Ce) (continued)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f
640.5 *3*	4.8 *4*	748.06		107.58	(7/2⁻)
640.5 *3*	4.8 *4*	830.02		189.55	(9/2⁻)
≈675	6.2 *5*	781.1		107.58	(7/2⁻)
675.5 *3*	29 *2*	918.8+x		243.30+x	(5/2⁺)
701.0[b] *3*	9.3 *6*	808.6		107.58	(7/2⁻)
712.8 *3*	6.8 *5*	820.3		107.58	(7/2⁻)
722.4 *3*	29 *2*	830.02		107.58	(7/2⁻)
789.7 *3*	6.2 *5*	979.92		189.55	(9/2⁻)
873.0 *3*	7.7 *5*	979.92		107.58	(7/2⁻)
960.8 *4*	8.6 *6*	1549.9		589.10	(11/2⁺)
≈990	<2	1337.6		347.72	(9/2⁺)
1027.9[&] *3*	11.2 *8*	1135.5		107.58	(7/2⁻)
1040.0[&] *5*	4.2 *4*	1229.6		189.55	(9/2⁻)
1094.5 *5*	1.0 *2*	1134.0+x	(3/2,5/2)	39.50+x	(3/2⁺)
1104 *3*	2.0 *3*	1347.5+x		243.30+x	(5/2⁺)
1122 *1*	2.0 *2*	1229.6		107.58	(7/2⁻)
1154.5 *3*	15.4 *8*	1825.9+x		671.40+x	(9/2⁺)
1193.2 *3*	14.6 *7*	1337.6		144.41	(7/2⁺)
1217[a] *1*	6.5 *5*	1324.6		107.58	(7/2⁻)
1230 *1*	3.2 *2*	1337.6		107.58	(7/2⁻)
1300 *3*	31 *2*	1340+x	(3/2,5/2)	39.50+x	(3/2⁺)
1301 *1*	5.0 *5*	1445.4		144.41	(7/2⁺)
1308 *1*	10 *1*	1347.5+x		39.50+x	(3/2⁺)
1639.0 *3*	21 *1*	1678.5+x	(3/2,5/2)	39.50+x	(3/2⁺)
1864.5 *3*	<2	2008.9		144.41	(7/2⁺)

† Complex line.

‡ Intensity estimated from A=129 on-line singles spectra in ^{92}Mo(^{40}Ca,X), E=190 MeV, and normalized to Iγ(203.8γ) and Iγ(243.3γ).

The γ line in coin with Ce x rays only.

@ δ(E2/M1)=0.3 assumed when not given.

& Based on their assignment of 9/2⁻ for the 107.6 isomer, 1998Io01 proposed that 1040.0γ and 1027.9γ deexcite a new level at 1147.6; former transition to 107.6 level and the latter to a newly proposed 11/2⁻ level at 119.4 keV. The evaluators have not adopted this proposal.

a Based on their assignment of 9/2⁻ for the 107.6 isomer, 1998Io01 proposed that 1217γ deexcites level at 1337.6 to a newly proposed 11/2⁻ level at 119.4 keV. The evaluators have not adopted this proposal.

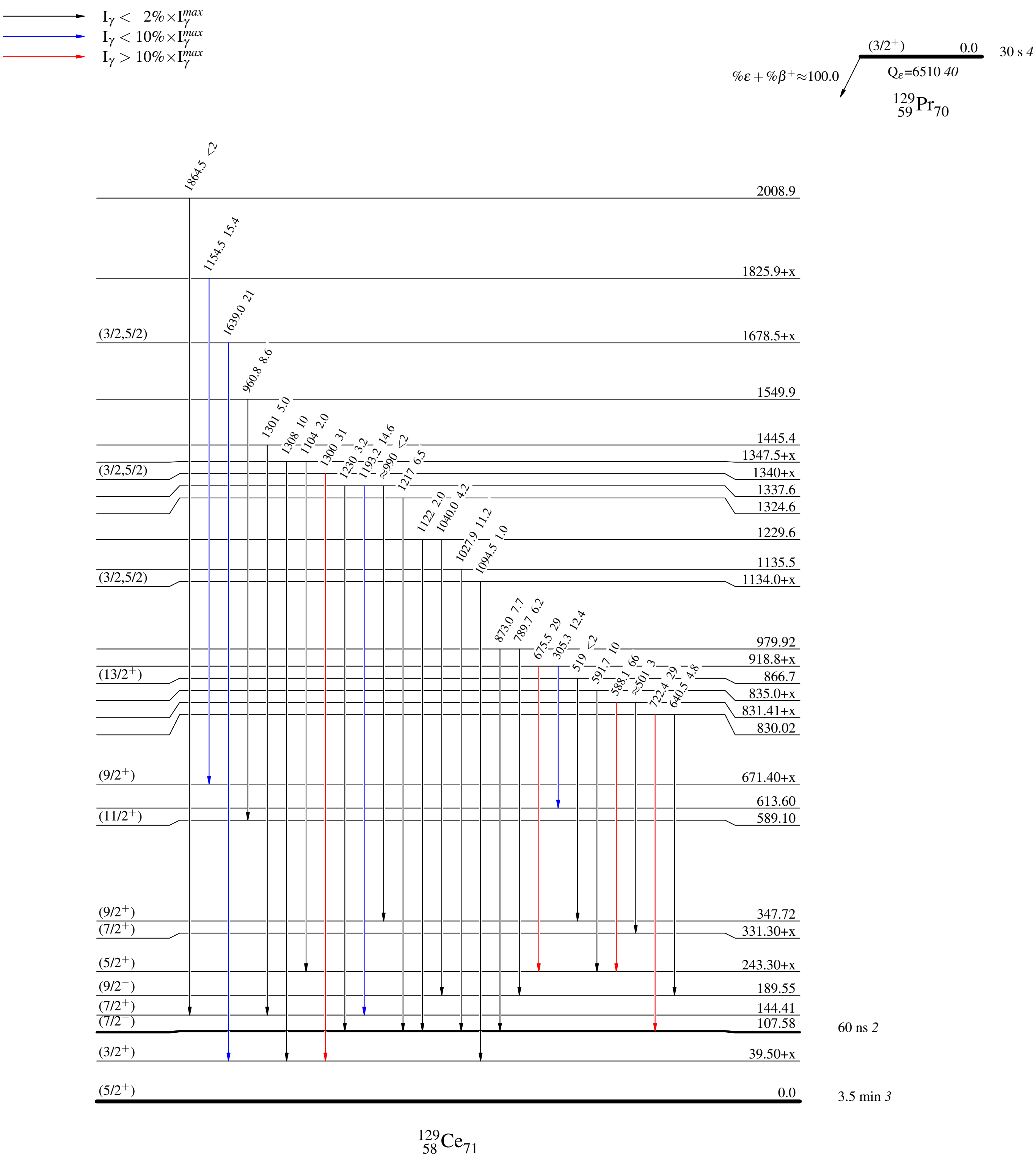
b Based on their assignment of 9/2⁻ for the 107.6 isomer, 1998Io01 proposed that 619γ and 701.0γ deexcite level at 820.4; former transition to a 201.3, 13/2⁻ level and the latter to a newly proposed 11/2⁻ level at 119.4 keV. The evaluators have not adopted this proposal.

x γ ray not placed in level scheme.

^{129}Pr ε decay (30 s) 1996Gi08

Decay Scheme

Intensities: Relative I_γ



^{129}Pr ε decay (30 s) 1996Gi08

Decay Scheme (continued)

Intensities: Relative I_γ