^{160}Lu ε decay (36.1 s+40 s) 1984Au13,1983Ge08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 176, 1 (2021)	1-May-2021

Parent: ^{160}Lu: E≥0.0; $T_{1/2}$=36.1 s *3*; Q(ε)=7890 *60*; %ε+%$β^+$ decay=100.0

Parent: ^{160}Lu: E=0.0+x; $T_{1/2}$=40 s *1*; Q(ε)=7890 *60*; %ε+%$β^+$ decay=100.0

Additional information 1.

1984Au13: sources produced via the ^{144}Sm(^{19}F,3n) reaction, E(^{19}F)=85 MeV. Self-supporting Sm targets (89% ^{144}Sm) of thickness 1 mg/cm^2. Recoils stopped in a second foil prior to counting. Measured Eγ, Iγ, γ(t), γγ, E(ce),Ice using Ge(Li) detectors (efficiency≈24%) and a mini-orange spectrometer.

1983Ge08: sources produced via the ^{155}Gd(^{14}N,9n) and ^{151}Eu(^{16}O,7n) reactions. Recoils collected and transported in He-jet system for study. Measured Eγ, Iγ, γ(t), γγ, γγ(θ), K x ray-γ coincidences using Ge(Li) and LEPS detectors.

Other references: 1983ViZV, 1982Ga27, 1981Ga36, 1981RaZH, 1980Be39, 1979Al16.

^{160}Yb Levels

1984Au13 report two activities in ^{160}Lu, with half-lives of 36.2 s *3* and 40 s *1*. In many cases it is not clear which level is populated in the decay of a given activity. Consequently, the level scheme (which is based largely on that of 1984Au13) represents in some sense an average of that of these two activities.

E(level)[†]	Jπ[‡]	$T_{1/2}$	Comments
0.0[#]	0^+	4.8 min *2*	$T_{1/2}$: from Adopted Levels.
243.2[#] *1*	2^+		
638.5[#] *1*	4^+		
820.5[@] *1*	2^+		
1086.2 *1*	$(0)^+$		Jπ: preferred assignment, although 1984Au13 state that J^π=2^+,3^+,and 4^+ are also possible.
1112.8[@] *1*	3^+		
1221.7?			
1254.6 *2*	(4^+)		
1292.9 *1*	(2^+)		
1358.4 *1*	2^+		
1496.4 *2*	$(1,2^+)$		
1525.4 *1*	3^-		
1529.3 *1*	$(2^+,3,4^+)$		
1567.6 *2*	$(4)^-$		
1676.5 *1*	$(2^+,3,4^+)$		
1811.4 *3*	$(1,2^+)$		

[†] Level energies computed from a least-squares fit involving the listed γ-ray energy values.
[‡] From adopted values.
[#] Band(A): g.s. band.
[@] Band(B): γ-vibrational band.

γ(^{160}Yb)

1984Au13 report two activities in ^{160}Lu, with half-lives of 36.2 s *3* and 40 s *1*. In many cases it is not clear which activity gives rise to a given γ ray. Consequently, the decay scheme (which is largely that of 1984Au13) represents in some sense an average of those of these two activities.

γ rays with energies of 375.65 *20* and 738.22 observed by 1980Be39 are not reported by 1983Ge08 and 1984Au13.

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^{160}Lu ε decay (36.1 s+40 s) 1984Au13,1983Ge08 (continued)

γ(^{160}Yb) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[@&]	Comments
243.4 *1*	100	243.2	2^+	0.0	0^+	E2[‡]	0.1415	α(K)=0.0945 *14*; α(L)=0.0361 *5*; α(M)=0.00865 *13* α(N)=0.00199 *3*; α(O)=0.000244 *4*; α(P)=4.62×10^{-6} *7*
292.5 *3*	1.0 *1*	1112.8	3^+	820.5	2^+	M1+E2	0.124 *45*	α(K)=0.099 *43*; α(L)=0.0195 *17*; α(M)=0.0045 *3* α(N)=0.00105 *7*; α(O)=0.000141 *19*; α(P)=5.7×10^{-6} *29*
395.4 *1*	21.0 *9*	638.5	4^+	243.2	2^+	E2[#]	0.0333	α(K)=0.0252 *4*; α(L)=0.00620 *9*; α(M)=0.001451 *21* α(N)=0.000336 *5*; α(O)=4.35×10^{-5} *6*; α(P)=1.348×10^{-6} *19*
434.1 *2*	1.0 *2*	1254.6	(4^+)	820.5	2^+	(E2)	0.0258	α(K)=0.0199 *3*; α(L)=0.00457 *7*; α(M)=0.001065 *15* α(N)=0.000247 *4*; α(O)=3.23×10^{-5} *5*; α(P)=1.075×10^{-6} *15* Mult.: from adopted gammas (E1 from 1984Au13 is not adopted).
474.4 *1*	1.1 *1*	1112.8	3^+	638.5	4^+	D+Q		Mult.: from adopted gammas (E2 from 1984Au13 is not adopted).
577.2 *1*	10.7 *8*	820.5	2^+	243.2	2^+	M1+E2	0.0204 *80*	α(K)=0.0169 *70*; α(L)=0.00272 *79*; α(M)=6.1×10^{-4} *17* α(N)=1.43×10^{-4} *40*; α(O)=2.01×10^{-5} *62*; α(P)=9.9×10^{-7} *44*
616.2 *3*	1.7 *3*	1254.6	(4^+)	638.5	4^+	(M1+E2)	0.0173 *67*	α(K)=0.0144 *58*; α(L)=0.00229 *68*; α(M)=5.1×10^{-4} *15* α(N)=1.20×10^{-4} *35*; α(O)=1.69×10^{-5} *53*; α(P)=8.4×10^{-7} *37* Mult.: from adopted gammas (E1 from 1984Au13 is not adopted).
653.8	0.3	1292.9	(2^+)	638.5	4^+			E_γ: from 1983Ge08. γ not reported by 1984Au13. I_γ: normalized to Iγ(1292.7) using the relative Iγ values reported by 1983Ge08.
704.7 *1*	2.7 *2*	1525.4	3^-	820.5	2^+	E1[#]	0.00294	α(K)=0.00250 *4*; α(L)=0.000349 *5*; α(M)=7.72×10^{-5} *11* α(N)=1.80×10^{-5} *3*; α(O)=2.56×10^{-6} *4*; α(P)=1.333×10^{-7} *19*
719.9 *1*	0.8 *1*	1358.4	2^+	638.5	4^+	E2[#]	0.00747	α(K)=0.00610 *9*; α(L)=0.001070 *15*; α(M)=0.000243 *4* α(N)=5.67×10^{-5} *8*; α(O)=7.77×10^{-6} *11*; α(P)=3.41×10^{-7} *5*
820.4 *1*	6.1 *5*	820.5	2^+	0.0	0^+	E2[#]	0.00561	α(K)=0.00462 *7*; α(L)=0.000772 *11*; α(M)=0.0001748 *25* α(N)=4.08×10^{-5} *6*; α(O)=5.64×10^{-6} *8*; α(P)=2.59×10^{-7} *4*
843.0 *1*	2.1 *4*	1086.2	$(0)^+$	243.2	2^+	E2[#]	0.00529	α(K)=0.00436 *7*; α(L)=0.000723 *11*; α(M)=0.0001635 *23* α(N)=3.82×10^{-5} *6*; α(O)=5.29×10^{-6} *8*; α(P)=2.45×10^{-7} *4*
869.6 *1*	6.2 *5*	1112.8	3^+	243.2	2^+	(M1+E2)	0.0075 *26*	α(K)=0.0063 *23*; α(L)=9.5×10^{-4} *29*; α(M)=2.13×10^{-4} *62* α(N)=5.0×10^{-5} *15*; α(O)=7.1×10^{-6} *22*; α(P)=3.7×10^{-7} *14* Mult.: from adopted gammas (E2 from 1984Au13 is not adopted).

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^{160}Lu ε decay (36.1 s+40 s) 1984Au13,1983Ge08 (continued)

γ(^{160}Yb) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[@&]	Comments
890.7 *1*	0.7 *1*	1529.3	(2$^+$,3,4$^+$)	638.5	4$^+$			
929.1 *2*	0.7 *2*	1567.6	(4)$^-$	638.5	4$^+$	E1[#]	1.72×10^{-3}	α(K)=0.001460 *21*; α(L)=0.000201 *3*; α(M)=4.44×10^{-5} *7* α(N)=1.039×10^{-5} *15*; α(O)=1.480×10^{-6} *21*; α(P)=7.86×10^{-8} *11*
978.5[a]		1221.7?		243.2	2$^+$			E_γ: from 1983Ge08. γ not reported by 1984Au13.
1038.0 *1*	0.8 *2*	1676.5	(2$^+$,3,4$^+$)	638.5	4$^+$			
1049.8 *1*	1.8 *3*	1292.9	(2$^+$)	243.2	2$^+$			
1115.3 *1*	6.8 *5*	1358.4	2$^+$	243.2	2$^+$			
1253.4 *2*	1.0 *3*	1496.4	(1,2$^+$)	243.2	2$^+$			
1283.0 *2*	0.5 *2*	1525.4	3$^-$	243.2	2$^+$			
1286.4 *2*	0.4 *1*	1529.3	(2$^+$,3,4$^+$)	243.2	2$^+$			
1292.7 *2*	1.1 *2*	1292.9	(2$^+$)	0.0	0$^+$			
1358.3 *2*	0.5 *4*	1358.4	2$^+$	0.0	0$^+$			
1433.2 *3*	0.5 *3*	1676.5	(2$^+$,3,4$^+$)	243.2	2$^+$			
1496.3 *2*	1.5 *2*	1496.4	(1,2$^+$)	0.0	0$^+$			
1568.9 *3*	1.3 *4*	1811.4	(1,2$^+$)	243.2	2$^+$			
1810.1 *4*	0.5 *2*	1811.4	(1,2$^+$)	0.0	0$^+$			

[†] Same values as in Adopted Levels, Gammas; values measured in this dataset are commented separately.
[‡] Values based on γγ(θ) (1983Ge08) and α(K)exp (1984Au13) data.
[#] Values based on α(K)exp data (1984Au13, with only graphical values – see Fig. 3 "K-shell conversion coefficient values (...) from the electron measurements"). These data generally do not exclude an admixture of M1 in the dominant E2 component.
[@] Additional information 2.
[&] Additional information 3.
[a] Placement of transition in the level scheme is uncertain.

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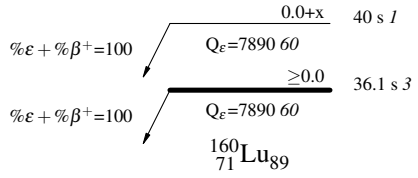
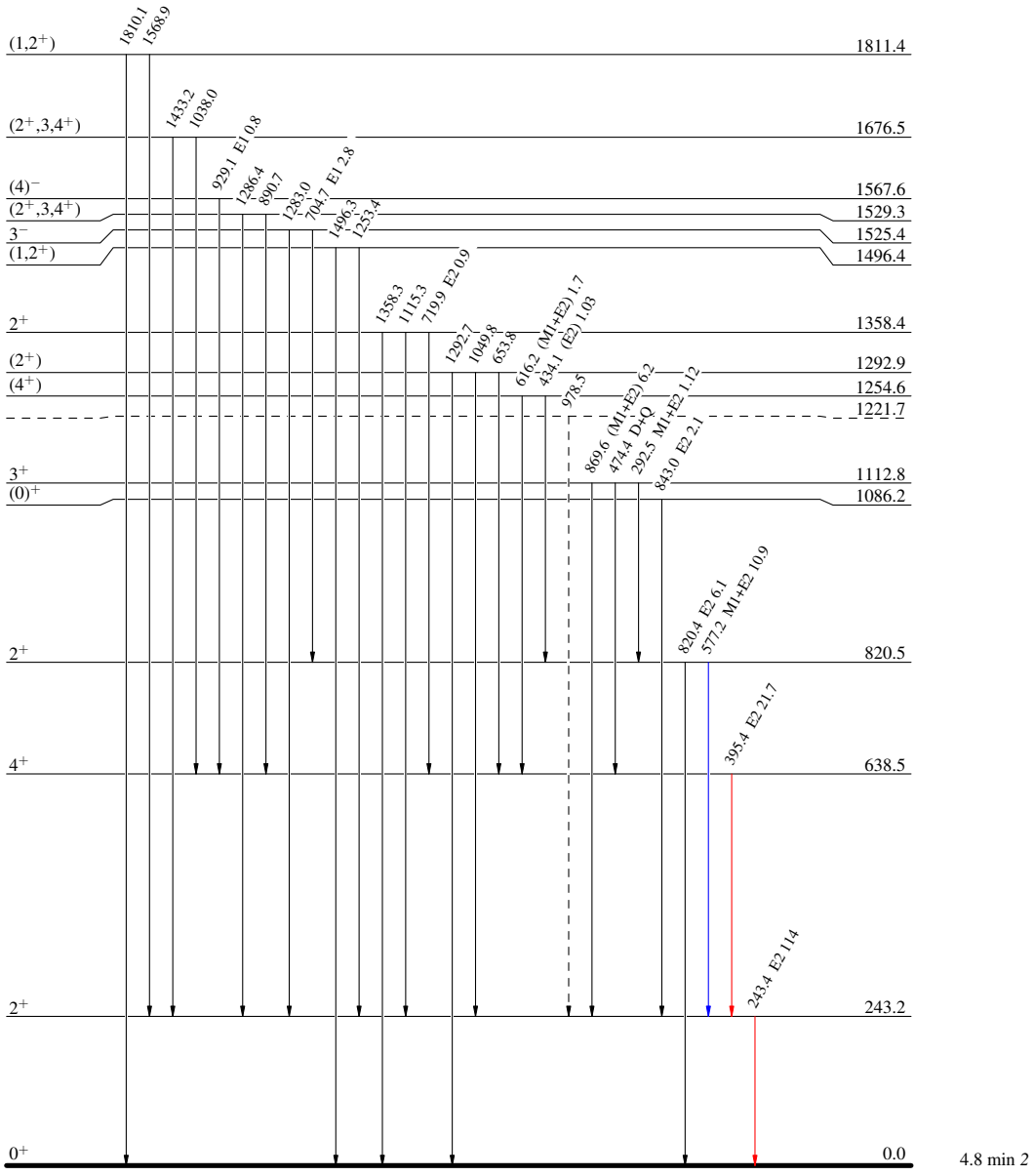
Decay Scheme

Intensities: Relative $I_{(\gamma+ce)}$

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





$^{160}_{70}Yb_{90}$

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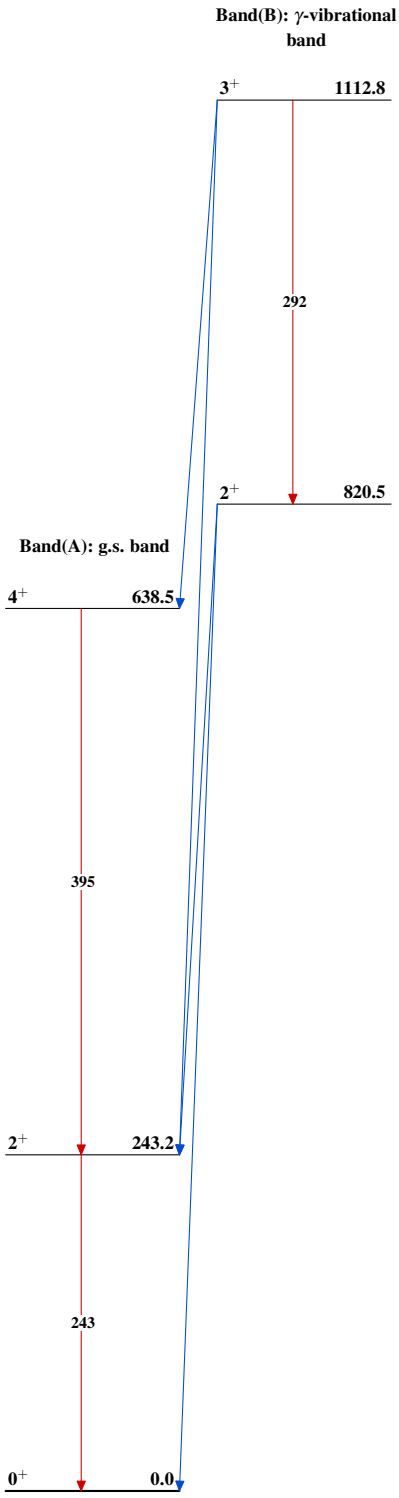

$^{160}_{70}Yb_{90}$