^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19

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

Parent: ^{160}Eu: E=93.0 *12*; J^π=(1$^-$); $T_{1/2}$=30.8 s *5*; Q(β^-)=4448.6 *14*; %β^- decay=100.0

^{160}Eu-E: From 2018Ha19.

^{160}Eu-J^π: From 2018Ha19 based on K^π=(0$^-$), π5/2[413],ν5/2[523] configuration.

^{160}Eu-$T_{1/2}$: From 2018Ha19 from summed β-γ(t) spectra.

^{160}Eu-Q(β^-): From 2021Wa16.

2020Ha13 compiled for XUNDL by N. Nica (TAMU).

2018Ha19 compiled for XUNDL by F.G. Kondev (ANL).

2020Ha13: isotopically separated ^{160}Eu nuclei from ^{252}Cf spontaneous fission source at CARIBU facility (ANL) implanted in SATURN moving tape system surrounded by four Ge clover detectors and four plastic scintillators. Measured γ and β singles, β-gated γ time coin, β-gated $\gamma\gamma$ coin and proposed level schemes for the 42.6 s g.s. and 30.8 s isomer β decays of ^{160}Eu. Assigned high-spin K^π two-quasiparticle configurations to experimentally identified states.

2018Ha19: ^{160}Eu nuclide produced in spontaneous fission of 1.7−Ci ^{252}Cf source from the CAlifornium Rare Ion Breeder Upgrade (CARIBU) facility at Argonne National Laboratory. The fission fragments were thermalized in a He gas catcher, separated with an isobar separator and implanted on a moving tape system. Measured Eγ, Iγ, Eβ, $\gamma\gamma$(t), $\beta\gamma$(t), and $\beta\gamma\gamma$(t) coincidences using the SATURN (Scintillator and Tape Using Radioactive Nuclei) system composed of four plastic scintillator paddles and the X-Array composed of four HPGe Clover detectors and one LEPS. A tape cycle of 180 s growth and 180 s decay time was used in the data collection. The masses were determined from the measured cyclotron frequency ratios (relative to $^{84}Kr^+$) using the Canadian Penning Trap spectrometer. Deformed shell model calculations using the Woods-Saxon mean-field potential and Lipkin-Nogami treatment of pairing.

1973Da05, 1973Mo18: used ^{160}Gd(n,p) with fast neutrons, enriched targets, Ge(Li) and scintillation detectors; measured $T_{1/2}$, Eγ, Iγ, Eβ, Iβ, $\gamma\gamma$-coin, $\beta\gamma$-coin. γ rays from nuclides produced in competing reactions were identified from measured $T_{1/2}$. Level schemes are incomplete, discrepant relative to one another, and discrepant relative to the most complete one from 2020Ha13.

2020Ha13 and 2018Ha19 (see also 2019KoZX) are related (done by the same experimental setup and main authors′ group). 2018Ha19 discovered two β^- activities of ^{160}Eu: $T_{1/2}$=42.6 *5* s associated with the (5$^-$) g.s. decay, and $T_{1/2}$=30.8 *5* s associated with the (1$^-$), 93-keV isomer decay. 2020Ha13 proposed the most extended level schemes for both β^- decays. Previously 2005Re18 evaluation adopted a single β^- activity of 38 *4* s for a J=1 state considered as ^{160}Eu g.s. decay, which is now associated by 2018Ha19 with the (1$^-$) isomer decay.

According to 2020Ha13, since the decay of the (1$^-$), 93-keV isomer is spread across many states in ^{160}Gd, there is insufficient information to determine the structures of the daughter levels. Seemingly, since the β-decay branch from this isomer to the 0$^+$ g.s. in ^{160}Gd could not be determined, no β-decay feeding intensities or log *ft* values are reported, and no normalization of the level scheme is attempted.

All data from 2020Ha13 unless otherwise mentioned. Level scheme is incomplete.

^{160}Gd Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0.0	0$^+$	stable	
75.34 *21*	2$^+$	2.72 ns *1*	
248.6 *3*	4$^+$		
988.5 *4*	2$^+$	1.40 ps *6*	
1057.6 *4*	3$^+$	>1525 fs	
1069.9? *3*	4$^+$		E(level): level proposed by 1973Da05 not confirmed by 2020Ha13.
1224.3 *3*	1$^{(-)}$	14.2 fs *14*	
1289.9 *5*	3$^-$	23.6 fs *21*	
1351.2 *4*	1$^-$	125 fs *14*	
1376.9 *3*	2$^-$	>381 fs	J^π: 2020Ha13 adopted 2$^+$ based on 1128γ to 4$^+$ (making this γ an E2 instead of M2 othewise). However 2$^-$ is based on firm arguments and 1128γ was not observed in any other studies.
1436.5 *4*	2$^+$	>236 fs	

Continued on next page (footnotes at end of table)

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19 (continued)

^{160}Gd Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[‡]	Comments
1463.9 *5*	3^-	5.0 fs *35*	
1584.7? *4*			E(level): level proposed by 1973Da05 not confirmed by 2020Ha13.
1608.4 *8*			
1657.3 *6*	$(1^-,2)^{\#}$		
1886.9 *7*	$(1,2)^{\#}$		
1932.1 *5*	2^+	0.5 ps *+12−2*	
1965.8 *5*	(1^-)		Jπ: 2020Ha13 assigned 2^+.
1996.7? *4*	(1^-)		E(level),Jπ: proposed by 1973Da05 but not confirmed by 2020Ha13.
2242.2 *7*	$(1,2)^{\#}$		
2277.5 *5*	1		
2283.6 *7*	$(1^+,2^+)$		
2315.7 *11*	$(1,2)^{\#}$		
2327.5 *6*	$(1^+,2)^{\#}$		
2333.5 *5*	$(1,2^+)^{\#}$		
2362.4 *4*	$(2^+,3^-)$		
2385.6 *8*	$(1,2)^{\#}$		
2432.8 *4*	$(1^-,2^+)^{\#}$		
2464.42 *10*	$(1^-)^{\#}$		
2470.0 *8*	1^-		
2510.7 *5*	$(1,2^-)^{\#}$		
2516.6 *5*	$(2)^{\#}$		
2530.0 *6*	$(1^-,2)^{\#}$		

[†] From a least-squares fit to Eγ.
[‡] From Adopted Levels.
[#] Tentatively assigned by 2020Ha13 based on γ decay pattern and possible β feeding pattern.

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19 (continued)

$\gamma(^{160}Gd)$

Unplaced γ are from 2018Ha19 with intensities relative to $I_{173.34\gamma}$=100.

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	δ [#&]	α [@]	Comments
75.4 *3*		75.34	2^+	0.0	0^+				
173.3 *3*		248.6	4^+	75.34	2^+	E2		0.360	α(K)=0.239 *4*; α(L)=0.0941 *14*; α(M)=0.0218 *3* α(N)=0.00490 *7*; α(O)=0.000665 *10*; α(P)=1.325×10^{-5} *19*
235.8 *10*	181 *22*	1224.3	$1^{(-)}$	988.5	2^+				
319.3 *10*	119 *15*	1376.9	2^-	1057.6	3^+	E1		0.01363	α(K)=0.01160 *17*; α(L)=0.001601 *23*; α(M)=0.000345 *5* α(N)=7.89×10^{-5} *11*; α(O)=1.201×10^{-5} *17*; α(P)=7.42×10^{-7} *11*
367.4 *10*	867 *37*	1657.3	$(1^-,2)$	1289.9	3^-				
384.1 *10*	919 *37*	1608.4		1224.3	$1^{(-)}$				
412.0[a] *2*		1996.7?	(1^-)	1584.7?					E_γ,I_γ: observed by 1973Da05 but not confirmed by 2020Ha13. $I_{412.0\gamma}$=56 *8* relative to $I_{173.34\gamma}$=100.
433.2 *10*	912 *59*	1657.3	$(1^-,2)$	1224.3	$1^{(-)}$				
514.8[a] *3*		1584.7?		1069.9?	4^+				E_γ: observed by 1973Da05 but not confirmed by 2020Ha13 $I_{514.8\gamma}$=60 *9* relative to $I_{173.34\gamma}$=100.
705.1 *10*	81 *11*	2362.4	$(2^+,3^-)$	1657.3	$(1^-,2)$				
[x]737.0 *5*	11 *2*								
807.2 *10*	185 *15*	2464.42	(1^-)	1657.3	$(1^-,2)$				
809.0 *10*	804 *37*	1057.6	3^+	248.6	4^+	M1+E2	−11.7 *+16−23*	0.00437	α(K)=0.00366 *6*; α(L)=0.000556 *8*; α(M)=0.0001214 *17* α(N)=2.78×10^{-5} *4*; α(O)=4.22×10^{-6} *6*; α(P)=2.53×10^{-7} *4*
821.6[a] *3*		1069.9?	4^+	248.6	4^+	M1+E2	−0.71 *3*	0.00629 *11*	α(K)=0.00534 *10*; α(L)=0.000747 *13*; α(M)=0.000162 *3* α(N)=3.72×10^{-5} *6*; α(O)=5.76×10^{-6} *10*; α(P)=3.83×10^{-7} *7* E_γ: observed by 1973Da05 but not confirmed by 2020Ha13 $I_{821.6\gamma}$=49 *7* relative to $I_{173.34\gamma}$=100.
841.1 *10*	141 *15*	2277.5	1	1436.5	2^+				
856.1 *10*	448 *30*	2464.42	(1^-)	1608.4					
865.4 *10*	41 *7*	2242.2	(1,2)	1376.9	2^-				
874.5 *10*	585 *37*	1932.1	2^+	1057.6	3^+	M1+E2		0.0050 *14*	α(K)=0.0042 *12*; α(L)=0.00060 *14*; α(M)=0.00013 *3* α(N)=3.0×10^{-5} *7*; α(O)=4.6×10^{-6} *11*; α(P)=3.01×10^{-7} *89*
891.0 *10*	104 *11*	2242.2	(1,2)	1351.2	1^-				
897.1 *10*	74 *7*	2333.5	$(1,2^+)$	1436.5	2^+				
898.2 *10*	167 *15*	1886.9	(1,2)	988.5	2^+				
898.4 *10*	174 *15*	2362.4	$(2^+,3^-)$	1463.9	3^-				
908.2 *10*	385 *37*	1965.8	(1^-)	1057.6	3^+				
913.1 *8*	2607 *48*	988.5	2^+	75.34	2^+	M1+E2	−0.45 *+4−5*	0.00529 *11*	α(K)=0.00451 *9*; α(L)=0.000618 *12*; α(M)=0.0001336 *25* α(N)=3.07×10^{-5} *6*; α(O)=4.78×10^{-6} *10*; α(P)=3.24×10^{-7} *7*
924.7[a] *3*		1996.7?	(1^-)	1069.9?	4^+				E_γ,I_γ: observed by 1973Da05 but not confirmed by 2020Ha13. $I_{924.7\gamma}$=19 *3* relative to $I_{173.34\gamma}$=100.
943.7 *10*	293 *26*	1932.1	2^+	988.5	2^+				

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19 (continued)

$\gamma(^{160}Gd)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#&]	α[@]	Comments
968.9 *10*	333 *22*	2432.8	$(1^-,2^+)$	1463.9	3^-				
976.3 *10*	115 *11*	2327.5	$(1^+,2)$	1351.2	1^-				
977.3 *10*	215 *19*	1965.8	(1^-)	988.5	2^+				
982.3 *7*	3796 *56*	1057.6	3^+	75.34	2^+	M1+E2	+47 *+18−10*	0.00286	α(K)=0.00241 *4*; α(L)=0.000350 *5*; α(M)=7.62×10^{-5} *11* α(N)=1.746×10^{-5} *25*; α(O)=2.67×10^{-6} *4*; α(P)=1.670×10^{-7} *24*
982.5 *10*	33 *7*	2333.5	$(1,2^+)$	1351.2	1^-				
985.3 *10*	81 *11*	2362.4	$(2^+,3^-)$	1376.9	2^-				
988.4 *8*	2681 *52*	988.5	2^+	0.0	0^+	E2		0.00282	α(K)=0.00238 *4*; α(L)=0.000345 *5*; α(M)=7.51×10^{-5} *11* α(N)=1.721×10^{-5} *24*; α(O)=2.64×10^{-6} *4*; α(P)=1.648×10^{-7} *23*
995.0[a] *5*		1069.9?	4^+	75.34	2^+	E2		0.00299 *22*	α(K)=0.00252 *18*; α(L)=0.00037 *3*; α(M)=8.0×10^{-5} *7* α(N)=1.84×10^{-5} *15*; α(O)=2.82×10^{-6} *23*; α(P)=1.77×10^{-7} *15* E_γ: observed by 1973Da05 but not confirmed by 2020Ha13 $I_{995.0\gamma}$=36 *5* relative to $I_{173.34\gamma}$=100.
1017.9 *10*	278 *26*	2242.2	(1,2)	1224.3	$1^{(-)}$				
1027.8 *10*	96 *7*	2464.42	(1^-)	1436.5	2^+				
1034.5 *10*	263 *19*	2385.6	(1,2)	1351.2	1^-				
1041.2 *9*	1904 *44*	1289.9	3^-	248.6	4^+	E1		1.05×10^{-3}	α(K)=0.000904 *13*; α(L)=0.0001178 *17*; α(M)=2.53×10^{-5} *4* α(N)=5.81×10^{-6} *9*; α(O)=9.00×10^{-7} *13*; α(P)=6.08×10^{-8} *9*
1046.7 *10*	770 *44*	2510.7	$(1,2^-)$	1463.9	3^-				
1052.6 *9*	1111 *41*	2516.6	(2)	1463.9	3^-				
1055.8 *10*	460 *45*	2432.8	$(1^-,2^+)$	1376.9	2^-				
1059.3 *10*	104 *11*	2283.6	$(1^+,2^+)$	1224.3	$1^{(-)}$				
1081.6 *10*	180 *19*	2432.8	$(1^-,2^+)$	1351.2	1^-				
1087.5 *9*	1889 *44*	2464.42	(1^-)	1376.9	2^-				
1109.3 *10*	367 *37*	2333.5	$(1,2^+)$	1224.3	$1^{(-)}$				
1113.1 *9*	1459 *44*	2464.42	(1^-)	1351.2	1^-				
1128.3[a] *10*	89 *11*	1376.9	2^-	248.6	4^+				
1138.1 *9*	1133 *37*	2362.4	$(2^+,3^-)$	1224.3	$1^{(-)}$				
1142.8 *8*	2081 *44*	2432.8	$(1^-,2^+)$	1289.9	3^-				
1149.1 *3*	7722 *56*	1224.3	$1^{(-)}$	75.34	2^+	(E1)		8.88×10^{-4}	α(K)=0.000755 *11*; α(L)=9.81×10^{-5} *14*; α(M)=2.10×10^{-5} *3* α(N)=4.83×10^{-6} *7*; α(O)=7.50×10^{-7} *11*; α(P)=5.09×10^{-8} *8*; α(IPF)=8.47×10^{-6} *12*
1153.2 *10*	85 *11*	2530.0	$(1^-,2)$	1376.9	2^-				
1159.6 *10*	263 *19*	2510.7	$(1,2^-)$	1351.2	1^-				

$^{160}_{64}Gd_{96}$-4

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19 (continued)

$\gamma(^{160}Gd)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#&]	α[@]	Comments
1161.2 *10*	526 *37*	2385.6	(1,2)	1224.3	$1^{(-)}$				
1165.3 *10*	511 *52*	2516.6	(2)	1351.2	1^-				
1178.7 *10*	281 *19*	2530.0	$(1^-,2)$	1351.2	1^-				
[x]1185 *1*	6 *1*								
1187.9 *6*	4504 *59*	1436.5	2^+	248.6	4^+	E2		0.00194	α(K)=0.001641 *23*; α(L)=0.000230 *4*; α(M)=4.99×10^{-5} *7* α(N)=1.146×10^{-5} *16*; α(O)=1.764×10^{-6} *25*; α(P)=1.138×10^{-7} *16*; α(IPF)=4.31×10^{-6} *6*
1208.5 *10*	807 *33*	2432.8	$(1^-,2^+)$	1224.3	$1^{(-)}$				
1214.5 *7*	328×10[1] *15*	1289.9	3^-	75.34	2^+	(E1)		8.28×10^{-4}	α(K)=0.000684 *10*; α(L)=8.86×10^{-5} *13*; α(M)=1.90×10^{-5} *3* α(N)=4.37×10^{-6} *7*; α(O)=6.78×10^{-7} *10*; α(P)=4.61×10^{-8} *7*; α(IPF)=3.09×10^{-5} *5*
1215.3 *8*	261×10[1] *12*	1463.9	3^-	248.6	4^+				
1224.2 *6*	4944 *63*	1224.3	$1^{(-)}$	0.0	0^+	(E1)		8.21×10^{-4}	α(K)=0.000674 *10*; α(L)=8.74×10^{-5} *13*; α(M)=1.87×10^{-5} *3* α(N)=4.30×10^{-6} *6*; α(O)=6.68×10^{-7} *10*; α(P)=4.54×10^{-8} *7*; α(IPF)=3.53×10^{-5} *5*
1226.1 *10*	81 *11*	2283.6	$(1^+,2^+)$	1057.6	3^+				
1226.7 *10*	456 *48*	2516.6	(2)	1289.9	3^-				
[x]1234.0 *3*	12 *2*								
1240.0 *9*	1259 *74*	2530.0	$(1^-,2)$	1289.9	3^-				
1240.1 *8*	226×10[1] *16*	2464.42	(1^-)	1224.3	$1^{(-)}$				
1269.9 *10*	919 *33*	2327.5	$(1^+,2)$	1057.6	3^+				
1275.7 *7*	352×10[1] *16*	1351.2	1^-	75.34	2^+	E1		7.90×10^{-4}	α(K)=0.000627 *9*; α(L)=8.11×10^{-5} *12*; α(M)=1.740×10^{-5} *25* α(N)=4.00×10^{-6} *6*; α(O)=6.21×10^{-7} *9*; α(P)=4.23×10^{-8} *6*; α(IPF)=5.98×10^{-5} *9*
1286.5 *9*	1533 *37*	2510.7	$(1,2^-)$	1224.3	$1^{(-)}$				
1288.9 *10*	96 *11*	2277.5	1	988.5	2^+				
1292.4 *10*	933 *74*	2516.6	(2)	1224.3	$1^{(-)}$				
1295.0 *10*	170 *19*	2283.6	$(1^+,2^+)$	988.5	2^+				
1301.6 *2*	833×10[1] *11*	1376.9	2^-	75.34	2^+	E1(+M2)	−0.08 *+5−4*	0.00081 *4*	α(K)=0.00063 *4*; α(L)=8.2×10^{-5} *5*; α(M)=1.76×10^{-5} *11* α(N)=4.05×10^{-6} *25*; α(O)=6.3×10^{-7} *4*; α(P)=4.3×10^{-8} *3*; α(IPF)=7.26×10^{-5} *12*
1304.9 *10*	567 *37*	2362.4	$(2^+,3^-)$	1057.6	3^+				
1305.7 *10*	189 *15*	2530.0	$(1^-,2)$	1224.3	$1^{(-)}$				
1327.2 *10*	156 *19*	2315.7	(1,2)	988.5	2^+				
1339.0 *9*	1374 *37*	2327.5	$(1^+,2)$	988.5	2^+				
1344.9 *10*	111 *15*	2333.5	$(1,2^+)$	988.5	2^+				

$^{160}_{64}Gd_{96}$-5

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19 (continued)

$\gamma(^{160}Gd)$ (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	δ [#&]	α [@]	Comments
1351.1 *10*	630 *30*	1351.2	1^-	0.0	0^+	E1		7.62×10^{-4}	α(K)=0.000567 *8*; α(L)=7.32×10^{-5} *11*; α(M)=1.570×10^{-5} *22* α(N)=3.61×10^{-6} *5*; α(O)=5.60×10^{-7} *8*; α(P)=3.83×10^{-8} *6*; α(IPF)=0.0001018 *15*
1361.2 *9*	1774 *41*	1436.5	2^+	75.34	2^+	M1+E2		0.0019 *4*	α(K)=0.0016 *4*; α(L)=0.00021 *4*; α(M)=4.6×10^{-5} *9* α(N)=1.06×10^{-5} *20*; α(O)=1.6×10^{-6} *4*; α(P)=1.11×10^{-7} *25*; α(IPF)=3.51×10^{-5} *20*
1373.9 *10*	67 *7*	2362.4	$(2^+,3^-)$	988.5	2^+				
1388.5 *9*	1674 *37*	1463.9	3^-	75.34	2^+	E1		7.56×10^{-4}	α(K)=0.000541 *8*; α(L)=6.98×10^{-5} *10*; α(M)=1.497×10^{-5} *21* α(N)=3.44×10^{-6} *5*; α(O)=5.34×10^{-7} *8*; α(P)=3.65×10^{-8} *6*; α(IPF)=0.0001262 *18*
1436.4 *10*	285 *15*	1436.5	2^+	0.0	0^+				
1459.0 *10*	422 *37*	2516.6	(2)	1057.6	3^+				
1475.9 *10*	122 *7*	2464.42	(1^-)	988.5	2^+				
1522.3 *10*	144 *15*	2510.7	$(1,2^-)$	988.5	2^+				
1683.5 *10*	767 *30*	1932.1	2^+	248.6	4^+	E2		1.13×10^{-3}	α(K)=0.000842 *12*; α(L)=0.0001133 *16*; α(M)=2.44×10^{-5} *4* α(N)=5.61×10^{-6} *8*; α(O)=8.70×10^{-7} *13*; α(P)=5.84×10^{-8} *9*; α(IPF)=0.0001439 *21*
1717.0 *10*	200 *19*	1965.8	(1^-)	248.6	4^+				
1811.6 *8*	2426 *44*	1886.9	(1,2)	75.34	2^+				
1856.6 *10*	1178 *33*	1932.1	2^+	75.34	2^+	M1+E2	+0.92 *+41−64*	0.00120 *12*	α(K)=0.00082 *9*; α(L)=0.000110 *12*; α(M)=2.36×10^{-5} *25* α(N)=5.4×10^{-6} *6*; α(O)=8.5×10^{-7} *9*; α(P)=5.8×10^{-8} *7*; α(IPF)=0.000237 *13*
1890.4 *10*	219 *19*	1965.8	(1^-)	75.34	2^+	(E1(+M2))	−0.03 *+25−31*		
1932.1 *10*	426 *26*	1932.1	2^+	0.0	0^+				
1965.8 *10*	626 *30*	1965.8	(1^-)	0.0	0^+	E1		9.04×10^{-4}	α(K)=0.000304 *5*; α(L)=3.88×10^{-5} *6*; α(M)=8.32×10^{-6} *12* α(N)=1.91×10^{-6} *3*; α(O)=2.98×10^{-7} *5*; α(P)=2.06×10^{-8} *3*; α(IPF)=0.000550 *8*
2202.1 *9*	1526 *41*	2277.5	1	75.34	2^+				
2277.5 *8*	2070 *44*	2277.5	1	0.0	0^+	D			
2287.0 *6*	4478 *63*	2362.4	$(2^+,3^-)$	75.34	2^+				
2333.3 *10*	15 *4*	2333.5	$(1,2^+)$	0.0	0^+				
2357.5 *9*	1178 *33*	2432.8	$(1^-,2^+)$	75.34	2^+				
2389.2 *10*	663 *26*	2464.42	(1^-)	75.34	2^+				
2394.6 *10*	141 *11*	2470.0	1^-	75.34	2^+				
2432.9 *10*	111 *19*	2432.8	$(1^-,2^+)$	0.0	0^+				
2435.2 *9*	1037 *33*	2510.7	$(1,2^-)$	75.34	2^+				
2464.4 *1*	10000 *11*	2464.42	(1^-)	0.0	0^+				

$^{160}_{64}Gd_{96}$-6

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19 (continued)

$\gamma(^{160}Gd)$ (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [#]	α [@]	Comments
2470.0 *10*	485 *22*	2470.0	1^-	0.0	0^+	E1	1.13×10^{-3}	α(K)=0.000213 *3*; α(L)=2.70×10^{-5} *4*; α(M)=5.78×10^{-6} *8* α(N)=1.329×10^{-6} *19*; α(O)=2.07×10^{-7} *3*; α(P)=1.439×10^{-8} *21*; α(IPF)=0.000886 *13*

† Uncertainties assigned by the evaluator (no assignment given in 2020Ha13) from 0.1 to 1 keV for one thousand interval of relative intensities (from highest to lowest), except for the 75.4γ and 173.3γ reported with no intensity to whom 0.3 keV was assigned.

‡ Intensities relative to $I_{2464.4\gamma}$=10000 (2020Ha13).

From Adopted Gammas.

@ Additional information 1.

& Additional information 2.

a Placement of transition in the level scheme is uncertain.

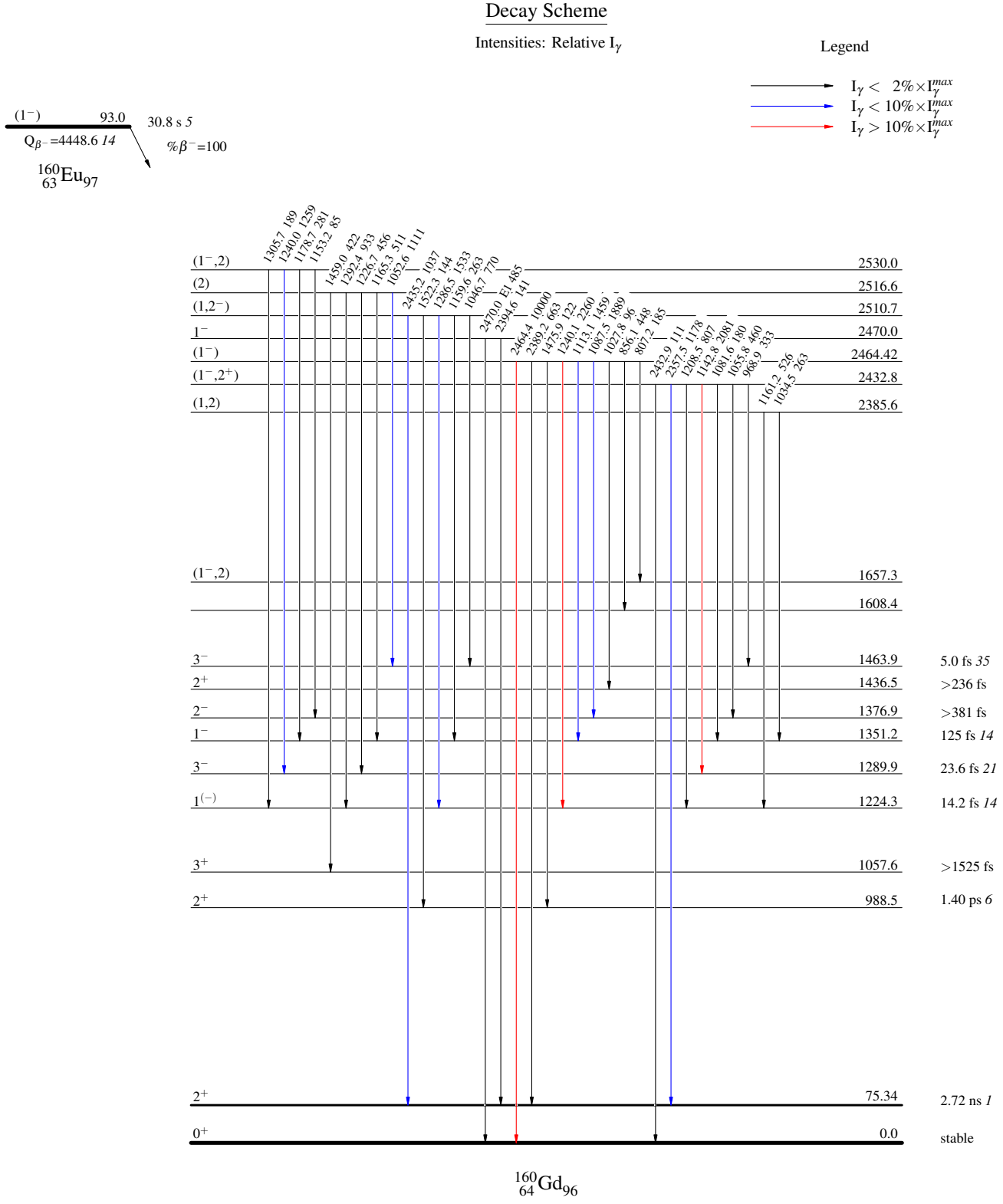
x γ ray not placed in level scheme.

$^{160}_{64}Gd_{96}$-7

^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19

Decay Scheme

Intensities: Relative I_γ



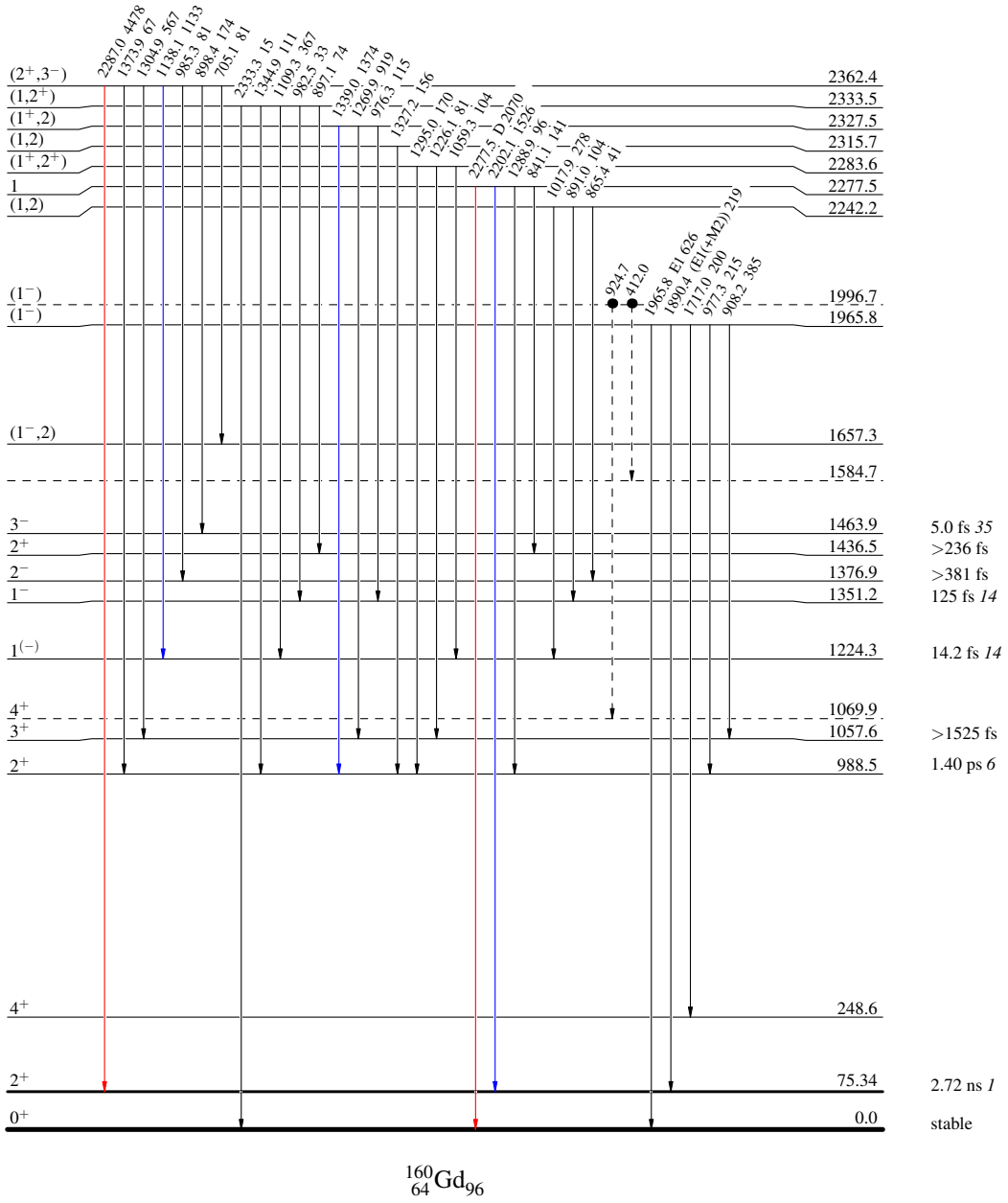
^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19

Decay Scheme (continued)

Intensities: Relative I_γ

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)
- Coincidence

(1⁻) 93.0 30.8 s *5*
Q_{β^-}=4448.6 *14* $\%\beta^-$=100
$^{160}_{63}Eu_{97}$



$^{160}_{64}Gd_{96}$

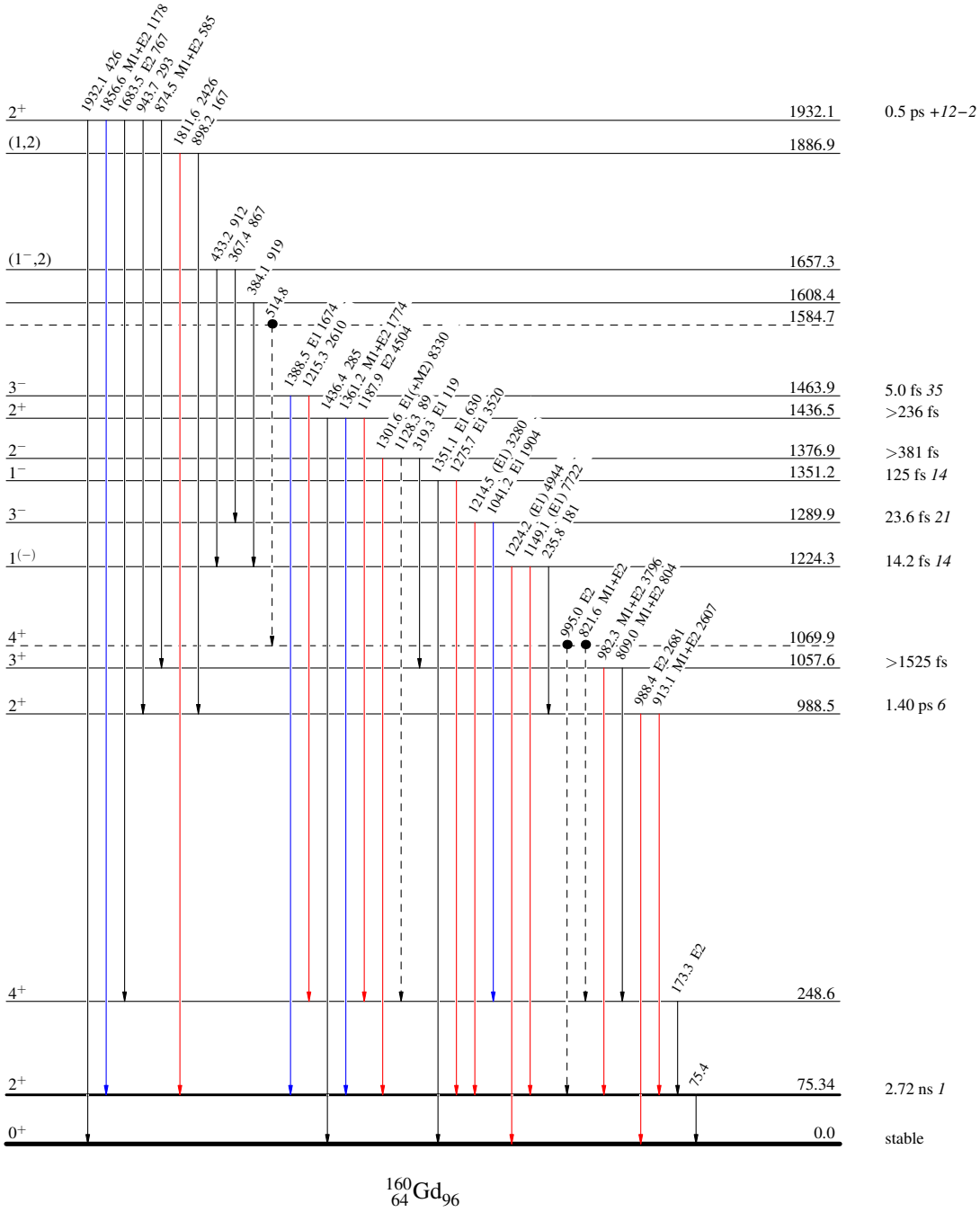
^{160}Eu β^- decay (30.8 s) 2020Ha13,2018Ha19

Decay Scheme (continued)

Intensities: Relative I_γ

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)
- Coincidence

(1^-) 93.0 30.8 s *5*
Q_{β^-}=4448.6 *14* $\%\beta^-$=100
$^{160}_{63}Eu_{97}$



$^{160}_{64}Gd_{96}$