^{165}Ho(^{40}Ar,4nγ) 2014Au03,2015Au01

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 187,355 (2023)	20-Sep-2022

2014Au03,2015Au01: $^{40}Ar^{8+}$, E=205−MeV, I=11 pnA beam from the K-130 cyclotron at the University of Jyvaskyla Accelerator Lab. Target: self-supporting 350−μg/cm^2 thick ^{165}Ho. Detectors: The JUROGAM2 array consisting of Compton-suppressed 24 Clover and 15 Phase-1 and GASP type HPGe detectors. The fusion-evaporation residues (recoils) were separated from the primary beam and other unwanted particles using the gas-filled recoil separator RITU and studied at the focal plane using the GREAT spectrometer. The recoils were implanted onto 300 μm DSSD surrounded by 28 Si PIN diodes to measure the α particle and ce energies. γ rays at the focal plane were measured using three Clover and one planar type HPGe detector. Measured: Eγ, Iγ, ce, γγ coin, γ-recoil e$^-$coin, recoil e$^-$ tagged prompt γ, recoil e$^-$ tagged prompt γ-delayed γ coin, recoil e$^-$ tagged prompt γ-prompt γ coin, γ(θ), and isomer half-life. Deduced levels, isomer, J, π, multipolarity, configuration, bands.

^{201}At Levels

E(level)[†]	J^π[‡]	T$_{1/2}$	Comments
0.0	9/2$^-$	87.6 s *13*	J^π,T$_{1/2}$: From Adopted Levels.
190.10 *10*	7/2$^-$		Possible configuration=π $f^{+1}_{7/2}$.
459.20 *14*	1/2$^+$	45 ms *3*	%IT=100 Proposed configuration=π $s^{-1}_{1/2}$. T$_{1/2}$: From recoil-ce(Δt) in 2014Au03, where recoils were correlated with the 173γ and 433γ above the isomer, and ce were in coincidence with 190γ and 269γ below the isomer. The value was deduced using the logarithmic time-scale method.
631.8[#] *4*	3/2$^+$		Proposed configuration=π $d^{-1}_{3/2}$.
635.17 *16*	13/2$^-$		Configuration=π ($h^{+1}_{9/2}$)⊗2$^+$.
690.98 *16*	11/2$^-$		Configuration=π ($h^{+1}_{9/2}$)⊗2$^+$.
749.36 *14*	13/2$^+$	≈20 ns	T$_{1/2}$: from γ(t) in 2015Au01. Configuration=π $i^{+1}_{13/2}$.
804.2[@] *6*	5/2$^+$		Proposed configuration=π $d^{-1}_{5/2}$.
1065.2[#] *6*	7/2$^+$		
1228.96 *22*	17/2$^-$		Configuration=π ($h^{+1}_{9/2}$)⊗4$^+$.
1261.29 *20*	15/2$^+$		
1288.6[@] *6*	9/2$^+$		
1494.85 *19*	17/2$^+$		Dominant configuration=π ($i^{+1}_{13/2}$)⊗2$^+$.
1613.3[#] *7*	11/2$^+$		
1625.34 *19*	17/2$^+$		Dominant configuration=π ($h^{+1}_{9/2}$) ν ($f^{-1}_{5/2}$,$i^{-1}_{13/2}$)$_{5-}$.
1705.03 *24*	21/2$^-$		Dominant configuration=π ($h^{+1}_{9/2}$)⊗6$^+$.
1856.0[@] *7*	13/2$^+$		
1921.30 *21*	21/2$^+$		Dominant configuration=π ($h^{+1}_{9/2}$) ν ($f^{-1}_{5/2}$,$i^{-1}_{13/2}$)$_{7-}$.
1980.6 *3*	23/2$^-$		Dominant configuration=π [$f^{+1}_{7/2}$,($h^{+2}_{9/2}$)$_{8+}$].
2004.3 *3*	23/2$^+$		Dominant configuration=π ($h^{+1}_{9/2}$) ν ($f^{-1}_{5/2}$,$i^{-1}_{13/2}$)$_{8-}$.
2050.8 *3*	25/2$^+$	<20 ns	T$_{1/2}$: prompt-like time distribution suggests that the half-life is much shorter than 20 ns. Dominant configuration=π ($h^{+1}_{9/2}$) ν ($f^{-1}_{5/2}$,$i^{-1}_{13/2}$)$_{9-}$.
2147.2 *4*	21/2$^-$		Dominant configuration=π ($f^{+1}_{7/2}$)⊗ν ($i^{-2}_{13/2}$)$_{8+}$.
2232.1[#] *9*	15/2$^+$		
2319.8 *3*	29/2$^+$	3.39 μs *9*	%IT=100 T$_{1/2}$: From recoil-269γ(t) using the planar detector data and the logarithmic time scale method (2015Au01). A prompt coincidence with a 296γ, 427γ, 594γ, 635γ, 746γ or 749γ in any of the focal plane clover detectors was also required. Dominant configuration=π [$i^{+1}_{13/2}$,($h^{+2}_{9/2}$)$_{8+}$].
2518.9 *5*	25/2$^-$		Configuration=π ($h^{+1}_{9/2}$)⊗8$^+$.
2637.6 *5*	(25/2$^+$)		
2990.2[&] *5*	(23/2$^-$)		E(level): The total transition intensity of 145γ that feeds this level is much higher than

Continued on next page (footnotes at end of table)

^{165}Ho(^{40}Ar,4nγ) 2014Au03,2015Au01 (continued)

^{201}At Levels (continued)

E(level)†	Jπ‡	Comments
		the 1069γ one that depopulates it, thus suggesting the existence of at least one additional, unobserved decay branch. Configuration=π $(i^{+1}_{13/2})\otimes\nu$ $(f^{-1}_{5/2},i^{-1}_{13/2})_{5-}$.
3135.2& 6	(25/2⁻)	
3219.2 6		
3240.9 5	(33/2⁺)	Possible configuration=π $[i^{+1}_{13/2},(h^{+2}_{9/2})_{8+}]\otimes 2^+$.
3245.4 6	(29/2⁺)	
3369.6 5		
3379.6& 7	(27/2⁻)	
3504.4 4		
3621.8 7		
3666.5?& 8	(29/2⁻)	
3693.9 7		
3699.7 6		
3779.1 6		
3785.9 8		
3853.3 7		
3952.8 6		
3983.8& 9	(31/2⁻)	
4111.4 6		
4159.0 7		
4256.1& 10	(33/2⁻)	
4454.0& 11	(35/2⁻)	
4789.0& 12	(37/2⁻)	

† From a least-squares fit to Eγ.

‡ From 2014Au03 and 2015Au01, based on the deduced γ-ray transition multipolarities using the $\gamma(\theta)$ analysis, observed decay pattern, systematics in the region and shell-model assignments.

Seq.(B): Based on π $(d^{-1}_{3/2})\otimes^{202}$Rn core states ($J^\pi=2^+,4^+,6^+$).

@ Seq.(C): Based on π $(d^{-1}_{5/2})\otimes^{202}$Rn core states ($J^\pi=2^+,4^+$).

& Band(A): Magnetic-dipole, shears band. Configuration=π $(i^{+1}_{13/2})\otimes\nu$ $(f^{-1}_{5/2},i^{-1}_{13/2})_{9-}$ for the lower cascade and Configuration= π $(h^{+2}_{9/2},i^{+1}_{13/2})\otimes\nu$ $(f^{-1}_{5/2},i^{-1}_{13/2})_{5-}$ above the band crossing.

γ(^{201}At)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	α[g]	$I_{(\gamma+ce)}$[b]	Comments
46.5 *2*		2050.8	25/2$^+$	2004.3	23/2$^+$			90 *30*	E_γ,$I_{(\gamma+ce)}$: from recoil-gated planar singles spectrum.
58.5 *2*		749.36	13/2$^+$	690.98	11/2$^-$	[E1]	0.424 *7*	6 *2*	ce(L)/(γ+ce)=0.2262 *30*; ce(M)/(γ+ce)=0.0545 *9* ce(N)/(γ+ce)=0.01379 *24*; ce(O)/(γ+ce)=0.00274 *5*; ce(P)/(γ+ce)=0.000306 *5* α(L)=0.322 *5*; α(M)=0.0775 *13* α(N)=0.01963 *33*; α(O)=0.00389 *7*; α(P)=0.000436 *7* E_γ: from recoil-gated planar singles spectrum.
83.0 *4*		2004.3	23/2$^+$	1921.30	21/2$^+$	[M1]	3.99 *8*	120 *40*	ce(L)/(γ+ce)=0.609 *8*; ce(M)/(γ+ce)=0.1443 *33* ce(N)/(γ+ce)=0.0374 *9*; ce(O)/(γ+ce)=0.00800 *20*; ce(P)/(γ+ce)=0.001105 *28* α(L)=3.04 *6*; α(M)=0.720 *14* α(N)=0.187 *4*; α(O)=0.0400 *8*; α(P)=0.00552 *11* E_γ: calculated value using the assumption that in a closed loop of transitions, the energy shift is zero. Two loops were used, weighted average of those results given here; partially overlaps with the Kα x-ray peak.
114.1[a] *2*		749.36	13/2$^+$	635.17	13/2$^-$	[E1]	0.332 *5*	12 *1*	ce(K)/(γ+ce)=0.1965 *23*; ce(L)/(γ+ce)=0.0404 *6*; ce(M)/(γ+ce)=0.00963 *15* ce(N)/(γ+ce)=0.00246 *4*; ce(O)/(γ+ce)=0.000502 *8*; ce(P)/(γ+ce)=6.07×10^{-5} *9* α(K)=0.262 *4*; α(L)=0.0538 *8*; α(M)=0.01283 *19* α(N)=0.00327 *5*; α(O)=0.000668 *10*; α(P)=8.08×10^{-5} *12*
130.3[a] *2*	3.9 *4*	1625.34	17/2$^+$	1494.85	17/2$^+$	(M1)	5.69 *8*	20 *3*	ce(K)/(γ+ce)=0.688 *6*; ce(L)/(γ+ce)=0.1235 *22*; ce(M)/(γ+ce)=0.0293 *6* ce(N)/(γ+ce)=0.00758 *15*; ce(O)/(γ+ce)=0.001623 *31*; ce(P)/(γ+ce)=0.000224 *4* α(K)=4.61 *7*; α(L)=0.826 *12*; α(M)=0.1957 *29* α(N)=0.0507 *7*; α(O)=0.01086 *16*; α(P)=0.001499 *22* Mult.: A2=−0.36 *7* (2015Au01).
135.0[h] *4*	0.50[@] *4*	3504.4		3369.6					
145.0 *4*	3.7 *3*	3135.2	(25/2$^-$)	2990.2	(23/2$^-$)	(M1)[&]	4.20 *7*		α(K)=3.40 *5*; α(L)=0.609 *10*; α(M)=0.1441 *23* α(N)=0.0373 *6*; α(O)=0.00799 *13*; α(P)=0.001104 *18* Mult.: A2=−0.5 *2* (2015Au01).
153.6[h] *4*	0.47[@] *4*	3853.3		3699.7					
172.5[dc] *4*	18[dc] *1*	804.2	5/2$^+$	631.8	3/2$^+$				
172.6[dc] *4*	113[dc] *5*	631.8	3/2$^+$	459.20	1/2$^+$	(M1+E2)	1.7 *9*		α(K)=1.2 *9*; α(L)=0.42 *5*; α(M)=0.106 *18* α(N)=0.027 *5*; α(O)=0.0056 *7*; α(P)=0.000663 *14* Mult.: R=0.83 *5* (2014Au03). The x-ray intensity in a spectrum produced by gating on 533γ is consistent with Mult=M1+E2, but not with a pure Mult=E2.

γ(^{201}At) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	δ	α[g]	$I_{(\gamma+ce)}$[b]	Comments
190.1 *1*		190.10	7/2−	0.0	9/2−	M1+E2	0.65 *8*	1.55 *7*		α(K)=1.17 *7*; α(L)=0.289 *4*; α(M)=0.0710 *12* α(N)=0.01838 *32*; α(O)=0.00383 *6*; α(P)=0.000488 *8* E_γ: From 2014Au03. Mult.,δ: From K/(L+M+...)exp=3.1 *2* (2014Au03). δ was determined by the evaluator using the briccmixing program.
197.9 *4*	1.6 *2*	4454.0	(35/2−)	4256.1	(33/2−)	(M1)[&]		1.745 *26*		α(K)=1.414 *21*; α(L)=0.252 *4*; α(M)=0.0596 *9* α(N)=0.01545 *23*; α(O)=0.00331 *5*; α(P)=0.000457 *7* Mult.: A2=−0.80 *12* (2015Au01).
206.2 *4*	0.31[@] *5*	4159.0		3952.8						
216.3[a] *3*		1921.30	21/2+	1705.03	21/2−	[E1]		0.0696 *10*	1.3 *3*	ce(K)/(γ+ce)=0.0525 *7*; ce(L)/(γ+ce)=0.00960 *14*; ce(M)/(γ+ce)=0.002271 *33* ce(N)/(γ+ce)=0.000582 *8*; ce(O)/(γ+ce)=0.0001211 *17*; ce(P)/(γ+ce)=1.541×10^{-5} *22* α(K)=0.0561 *8*; α(L)=0.01026 *15*; α(M)=0.002429 *35* α(N)=0.000623 *9*; α(O)=0.0001295 *19*; α(P)=1.648×10^{-5} *24*
223.3[c] *4*	17[c] *1*	1288.6	9/2+	1065.2	7/2+	(M1)				Mult.: A2=−0.29 *7* and R=0.74 *12* (2014Au03).
233.4[a] *2*	14.5 *4*	1494.85	17/2+	1261.29	15/2+	(M1)		1.101 *16*	24 *3*	ce(K)/(γ+ce)=0.425 *4*; ce(L)/(γ+ce)=0.0755 *11*; ce(M)/(γ+ce)=0.01786 *28* ce(N)/(γ+ce)=0.00463 *7*; ce(O)/(γ+ce)=0.000991 *16*; ce(P)/(γ+ce)=0.0001368 *22* α(K)=0.892 *13*; α(L)=0.1586 *23*; α(M)=0.0375 *5* α(N)=0.00972 *14*; α(O)=0.002081 *30*; α(P)=0.000287 *4* Mult.: A2=−0.05 *2* (2015Au01).
242.8[c] *7*	5.7[ec] *5*	1856.0	13/2+	1613.3	11/2+					
244.4 *4*	8.3 *5*	3379.6	(27/2−)	3135.2	(25/2−)	(M1)[&]		0.968 *14*		α(K)=0.785 *12*; α(L)=0.1395 *21*; α(M)=0.0330 *5* α(N)=0.00855 *13*; α(O)=0.001830 *27*; α(P)=0.000253 *4* Mult.: A2=−0.59 *9* (2015Au01).
263.6 *4*	1.2[@] *2*	3504.4		3240.9	(33/2+)	D				Mult.: A2=−0.26 *9* (2015Au01).
269.0 *2*		2319.8	29/2+	2050.8	25/2+	E2		0.1842 *26*	118 *11*	ce(K)/(γ+ce)=0.0731 *10*; ce(L)/(γ+ce)=0.0613 *8*; ce(M)/(γ+ce)=0.01610 *23* ce(N)/(γ+ce)=0.00416 *6*; ce(O)/(γ+ce)=0.000832 *12*; ce(P)/(γ+ce)=9.05×10^{-5} *13* α(K)=0.0865 *12*; α(L)=0.0726 *10*; α(M)=0.01907 *27* α(N)=0.00493 *7*; α(O)=0.000985 *14*; α(P)=0.0001072 *15* Mult.: From K/(L+M+...)exp=0.93 *5* (2015Au01).
269.1 *1*		459.20	1/2+	190.10	7/2−	E3		1.231 *17*		α(K)=0.2270 *32*; α(L)=0.737 *10*; α(M)=0.2028 *29*

$^{201}_{85}At_{116}$-4

γ(^{201}At) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	α[g]	$I_{(\gamma+ce)}$[b]	Comments
									α(N)=0.0528 *7*; α(O)=0.01050 *15*; α(P)=0.001115 *16* E_γ: From 2014Au03. Mult.: From K/(L+M+...)exp=0.24 *1* (2014Au03).
272.3 *4*	3.5 *3*	4256.1	(33/2$^-$)	3983.8	(31/2$^-$)	(M1)[&]	0.718 *10*		α(K)=0.583 *8*; α(L)=0.1033 *15*; α(M)=0.0244 *4* α(N)=0.00633 *9*; α(O)=0.001355 *20*; α(P)=0.0001871 *27* Mult.: A2=−0.45 *11* (2015Au01).
275.5[a] *2*	6.6 *2*	1980.6	23/2$^-$	1705.03	21/2$^-$	(M1)		12 *2*	Mult.: A2=−0.47 *2* (2015Au01).
286.9 *4*	6.6 *4*	3666.5?	(29/2$^-$)	3379.6	(27/2$^-$)	(M1)[&]	0.622 *9*		α(K)=0.505 *7*; α(L)=0.0894 *13*; α(M)=0.02113 *31* α(N)=0.00547 *8*; α(O)=0.001172 *17*; α(P)=0.0001619 *24* Mult.: A2=−0.47 *3* (2015Au01).
295.9[a] *2*	40 *2*	1921.30	21/2$^+$	1625.34	17/2$^+$	(E2)	0.1374 *19*	60 *6*	ce(K)/(γ+ce)=0.0616 *8*; ce(L)/(γ+ce)=0.0440 *6*; ce(M)/(γ+ce)=0.01151 *16* ce(N)/(γ+ce)=0.00298 *4*; ce(O)/(γ+ce)=0.000597 *9*; ce(P)/(γ+ce)=6.58×10^{-5} *9* α(K)=0.0700 *10*; α(L)=0.0501 *7*; α(M)=0.01310 *19* α(N)=0.00339 *5*; α(O)=0.000679 *10*; α(P)=7.48×10^{-5} *11* Mult.: A2=+0.11 *4* (2015Au01).
[x]297.5[‡] *4*	3.0[@] *2*								
299.3[a] *2*		2004.3	23/2$^+$	1705.03	21/2$^-$	[E1]	0.0325 *5*	5.0 *7*	ce(K)/(γ+ce)=0.02556 *35*; ce(L)/(γ+ce)=0.00449 *6*; ce(M)/(γ+ce)=0.001059 *15* ce(N)/(γ+ce)=0.000272 *4*; ce(O)/(γ+ce)=5.69×10^{-5} *8*; ce(P)/(γ+ce)=7.39×10^{-6} *10* α(K)=0.0264 *4*; α(L)=0.00463 *7*; α(M)=0.001093 *15* α(N)=0.000281 *4*; α(O)=5.88×10^{-5} *8*; α(P)=7.63×10^{-6} *11*
317.3 *4*	6.7 *4*	3983.8	(31/2$^-$)	3666.5?	(29/2$^-$)	(M1)[&]	0.472 *7*		α(K)=0.383 *6*; α(L)=0.0677 *10*; α(M)=0.01601 *23* α(N)=0.00415 *6*; α(O)=0.000888 *13*; α(P)=0.0001226 *18* Mult.: A2=−0.81 *9* (2015Au01).
335.0 *4*	1.5 *2*	4789.0	(37/2$^-$)	4454.0	(35/2$^-$)	(M1)[&]	0.407 *6*		α(K)=0.331 *5*; α(L)=0.0583 *8*; α(M)=0.01379 *20* α(N)=0.00357 *5*; α(O)=0.000765 *11*; α(P)=0.0001056 *15* Mult.: A2=−0.66 *4* (2015Au01).
339.2 *2*		2319.8	29/2$^+$	1980.6	23/2$^-$	E3	0.464 *7*	14 *5*	ce(K)/(γ+ce)=0.0931 *13*; ce(L)/(γ+ce)=0.1648 *21*; ce(M)/(γ+ce)=0.0448 *6* ce(N)/(γ+ce)=0.01166 *17*; ce(O)/(γ+ce)=0.002331 *35*; ce(P)/(γ+ce)=0.000253 *4* α(K)=0.1364 *19*; α(L)=0.2413 *34*; α(M)=0.0656 *9* α(N)=0.01707 *24*; α(O)=0.00341 *5*; α(P)=0.000371 *5* Mult.: From K/(L+M+...)exp=0.45 *4* (2015Au01). The 339γ K−conversion peak overlaps with the L+M+... conversion peaks from the 269- and 276-keV transitions. The number of 269- and 276−keV L+M+... conversion events were estimated using

$^{201}_{85}$At$_{116}$-5

γ(^{201}At) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	α[g]	$I_{(\gamma+ce)}$[b]	Comments
									Iγ(269γ)/Iγ(276γ), the number of observed 269- and 276-keV K conversion events, and the theoretical K/(L+M+...) ratios for the 269−keV E2 and 276−keV M1 transitions.
364.1[a] 3	6.5 3	1625.34	17/2$^+$	1261.29	15/2$^+$	(M1)	0.325 5	8 2	ce(K)/(γ+ce)=0.1991 23; ce(L)/(γ+ce)=0.0351 5; ce(M)/(γ+ce)=0.00829 12 ce(N)/(γ+ce)=0.002146 31; ce(O)/(γ+ce)=0.000459 7; ce(P)/(γ+ce)=6.35×10^{-5} 9 α(K)=0.264 4; α(L)=0.0464 7; α(M)=0.01098 16 α(N)=0.00284 4; α(O)=0.000609 9; α(P)=8.41×10^{-5} 12 Mult.: A2=−0.11 3 (2015Au01).
371.7 4	10.9 4	2518.9	25/2$^-$	2147.2	21/2$^-$	(E2)			Mult.: A2=+0.16 6 (2015Au01).
402.6 4	2.6[#] 3	3621.8		3219.2		D			Mult.: A2=−0.7 2 (2015Au01).
426.5[a] 2	39 2	1921.30	21/2$^+$	1494.85	17/2$^+$	(E2)	0.0497 7	69 9	ce(K)/(γ+ce)=0.0303 4; ce(L)/(γ+ce)=0.01281 18; ce(M)/(γ+ce)=0.00327 5 ce(N)/(γ+ce)=0.000847 12; ce(O)/(γ+ce)=0.0001721 24; ce(P)/(γ+ce)=2.007×10^{-5} 28 α(K)=0.0318 4; α(L)=0.01345 19; α(M)=0.00344 5 α(N)=0.000889 13; α(O)=0.0001807 25; α(P)=2.107×10^{-5} 30 Mult.: A2=+0.14 7 (2015Au01).
433.3[c] 4	100[c] 4	1065.2	7/2$^+$	631.8	3/2$^+$	(E2)			Mult.: R=1.21 5 (2014Au03).
442.6 4	6.0 2	2147.2	21/2$^-$	1705.03	21/2$^-$	(E2)			Mult.: A2=+0.35 8 (2015Au01); consistent with ΔJ=0 transition.
448.4 4	2.9[@] 2	3952.8		3504.4		D			Mult.: A2=−0.3 2 (2015Au01).
448.5 4	2.8[#] 2	3693.9		3245.4	(29/2$^+$)	D			Mult.: A2=−0.4 2 (2015Au01).
476.2[a] 2	33 1	1705.03	21/2$^-$	1228.96	17/2$^-$	(E2)		21 4	Mult.: A2=+0.13 4 (2015Au01).
484.5[c] 4	41[c] 3	1288.6	9/2$^+$	804.2	5/2$^+$	(E2)			Mult.: A2=+0.70 6 and R=1.4 2 (2014Au03).
511.8[a] 2		1261.29	15/2$^+$	749.36	13/2$^+$	D		38 7	Mult.: A2=−0.14 3 (2015Au01).
538.2 4	2.9[@] 2	3779.1		3240.9	(33/2$^+$)				
540.5 5	3.1[#] 3	3785.9		3245.4	(29/2$^+$)				
548.1[c] 4	48[c] 2	1613.3	11/2$^+$	1065.2	7/2$^+$	(E2)			Mult.: A2=+0.5 2 and R=1.26 12 (2014Au03).
567.3[c] 4	37[c] 2	1856.0	13/2$^+$	1288.6	9/2$^+$	(E2)			Mult.: A2=+0.5 3 and R=1.2 3 (2014Au03).
581.6 4	2.1[#] 2	3219.2		2637.6	(25/2$^+$)	D			Mult.: A2=−0.44 7 (2015Au01).
593.8[a] 2	77 3	1228.96	17/2$^-$	635.17	13/2$^-$			25 4	A2=+0.08 2 (2015Au01).
607.8 4	8.4[#] 8	3245.4	(29/2$^+$)	2637.6	(25/2$^+$)	(E2)	0.02148 30		α(K)=0.01551 22; α(L)=0.00449 6; α(M)=0.001119 16 α(N)=0.000289 4; α(O)=5.98×10^{-5} 8; α(P)=7.37×10^{-6} 10 Mult.: A2=+0.35 8 (2015Au01).
618.8[c] 6	7[ec] 3	2232.1	15/2$^+$	1613.3	11/2$^+$	(E2)			Mult.: A2=+0.6 4 and R=1.1 4 (2014Au03).
635.1[a] 2	100 3	635.17	13/2$^-$	0.0	9/2$^-$			42 6	A2=+0.09 4 (2015Au01).

$^{201}_{85}$At$_{116}$-6

γ(^{201}At) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[f]	α[g]	$I_{(\gamma+ce)}$[b]	Comments
691.1[a] *2*		690.98	11/2$^-$	0.0	9/2$^-$			11 *2*	
716.3 *4*	11.9[#] *7*	2637.6	(25/2$^+$)	1921.30	21/2$^+$	(E2)	0.01509 *21*		α(K)=0.01130 *16*; α(L)=0.00286 *4*; α(M)=0.000705 *10* α(N)=0.0001822 *26*; α(O)=3.79×10^{-5} *5*; α(P)=4.78×10^{-6} *7* Mult.: A2=+0.46 *4* (2015Au01).
745.5[a] *2*	74 *2*	1494.85	17/2$^+$	749.36	13/2$^+$	(E2)	0.01389 *19*	72 *8*	ce(K)/(γ+ce)=0.01033 *14*; ce(L)/(γ+ce)=0.00254 *4*; ce(M)/(γ+ce)=0.000624 *9* ce(N)/(γ+ce)=0.0001614 *23*; ce(O)/(γ+ce)=3.36×10^{-5} *5*; ce(P)/(γ+ce)=4.26×10^{-6} *6* α(K)=0.01048 *15*; α(L)=0.00258 *4*; α(M)=0.000633 *9* α(N)=0.0001637 *23*; α(O)=3.41×10^{-5} *5*; α(P)=4.32×10^{-6} *6* Mult.: A2=+0.4 *2* (2015Au01).
749.3[a] *2*		749.36	13/2$^+$	0.0	9/2$^-$	[M2]	0.1204 *17*	105 *12*	ce(K)/(γ+ce)=0.0847 *11*; ce(L)/(γ+ce)=0.01727 *24*; ce(M)/(γ+ce)=0.00417 *6* ce(N)/(γ+ce)=0.001085 *15*; ce(O)/(γ+ce)=0.0002317 *33*; ce(P)/(γ+ce)=3.17×10^{-5} *4* α(K)=0.0949 *13*; α(L)=0.01935 *27*; α(M)=0.00467 *7* α(N)=0.001215 *17*; α(O)=0.000260 *4*; α(P)=3.55×10^{-5} *5*
^{x}774.9[‡] *4*	1.7[@] *2*								A2=+0.29 4 (2015Au01).
870.5[h] *4*	0.93[@] *8*	4111.4		3240.9	(33/2$^+$)				
876.1[a] *2*	19.4 *6*	1625.34	17/2$^+$	749.36	13/2$^+$	(E2)	0.01002 *14*	24 *3*	ce(K)/(γ+ce)=0.00767 *11*; ce(L)/(γ+ce)=0.001703 *24*; ce(M)/(γ+ce)=0.000414 *6* ce(N)/(γ+ce)=0.0001070 *15*; ce(O)/(γ+ce)=2.242×10^{-5} *31*; ce(P)/(γ+ce)=2.90×10^{-6} *4* α(K)=0.00775 *11*; α(L)=0.001720 *24*; α(M)=0.000418 *6* α(N)=0.0001081 *15*; α(O)=2.264×10^{-5} *32*; α(P)=2.93×10^{-6} *4* Mult.: A2=+0.16 *3* (2015Au01).
917.8 *4*	7.0 *4*	2147.2	21/2$^-$	1228.96	17/2$^-$	(E2)			Mult.: A2=+0.37 *6* (2015Au01).
921.1 *4*	10.1[@] *6*	3240.9	(33/2$^+$)	2319.8	29/2$^+$	(E2)	0.00908 *13*		α(K)=0.00706 *10*; α(L)=0.001525 *21*; α(M)=0.000370 *5* α(N)=9.56×10^{-5} *13*; α(O)=2.005×10^{-5} *28*; α(P)=2.61×10^{-6} *4* Mult.: A2=+0.20 *3* (2015Au01).
1049.9[h] *4*	2.2[@] *2*	3369.6		2319.8	29/2$^+$	D			Mult.: A2=−0.7 *3* (2015Au01).
1068.9[h] *4*	4.5 *3*	2990.2	(23/2$^-$)	1921.30	21/2$^+$	D			A2=−0.47 *5* (2015Au01).
1184.5 *4*	1.7[@] *2*	3504.4		2319.8	29/2$^+$	D,Q			Mult.: A2=+0.40 *8* (2015Au01).
1379.9[h] *5*	1.4[@] *2*	3699.7		2319.8	29/2$^+$				

γ(^{201}At) (continued)

† From 2015Au01 using the JUROGAM2 data, unless otherwise stated. Iγ normalized to Iγ(635γ)=100.

‡ Transition probably feeds the 2319-keV, 29/2$^+$ level (2015Au01).

From summed spectra gated on 296γ and 427γ (2015Au01).

@ From 269γ, 427γ, 635γ, 746γ, or 749γ delayed γ-ray tagged singles spectrum (2015Au01).

& In addition to stretched dipole angular distributions, M1 character supported by high x-ray yield in coincidence with transition (2015Au01).

[a] From 2015Au01 using the focal-plane Clover data.

[b] From 2015Au01. The focal plane values deduced from the focal-plane Clover data, unless otherwise stated. Normalized to Iγ(269γ)=100. Internal conversion coefficients that were used to calculate I(γ+ce) were taken from 2008Ki07.

[c] From 2014Au03. Iγ above the J^π=1/2$^+$ isomer are from recoil-ce-tagged singles γ-ray data.

[d] Doublet in 2014Au03. Intensities of the two components from 173-gated, recoil-corrected $\gamma\gamma$-coin data.

[e] Weak transition in 2014Au03, intensity from 173-keV gated, recoil-correlated $\gamma\gamma$-coin data.

[f] From $\gamma(\theta)$ in 2014Au03 and 2015Au01, unless otherwise stated. The reported in 2014Au03 correlation ratios, R, are defined as R=[Iγ(133.6°)+Iγ(157.6°)]/Iγ(104.5° or 75.5°). Expected values are 1.30 *7* for ΔJ=2, quadrupole, and 0.70 *6* for ΔJ=1, dipole transitions.

[g] Additional information 1.

[h] Placement of transition in the level scheme is uncertain.

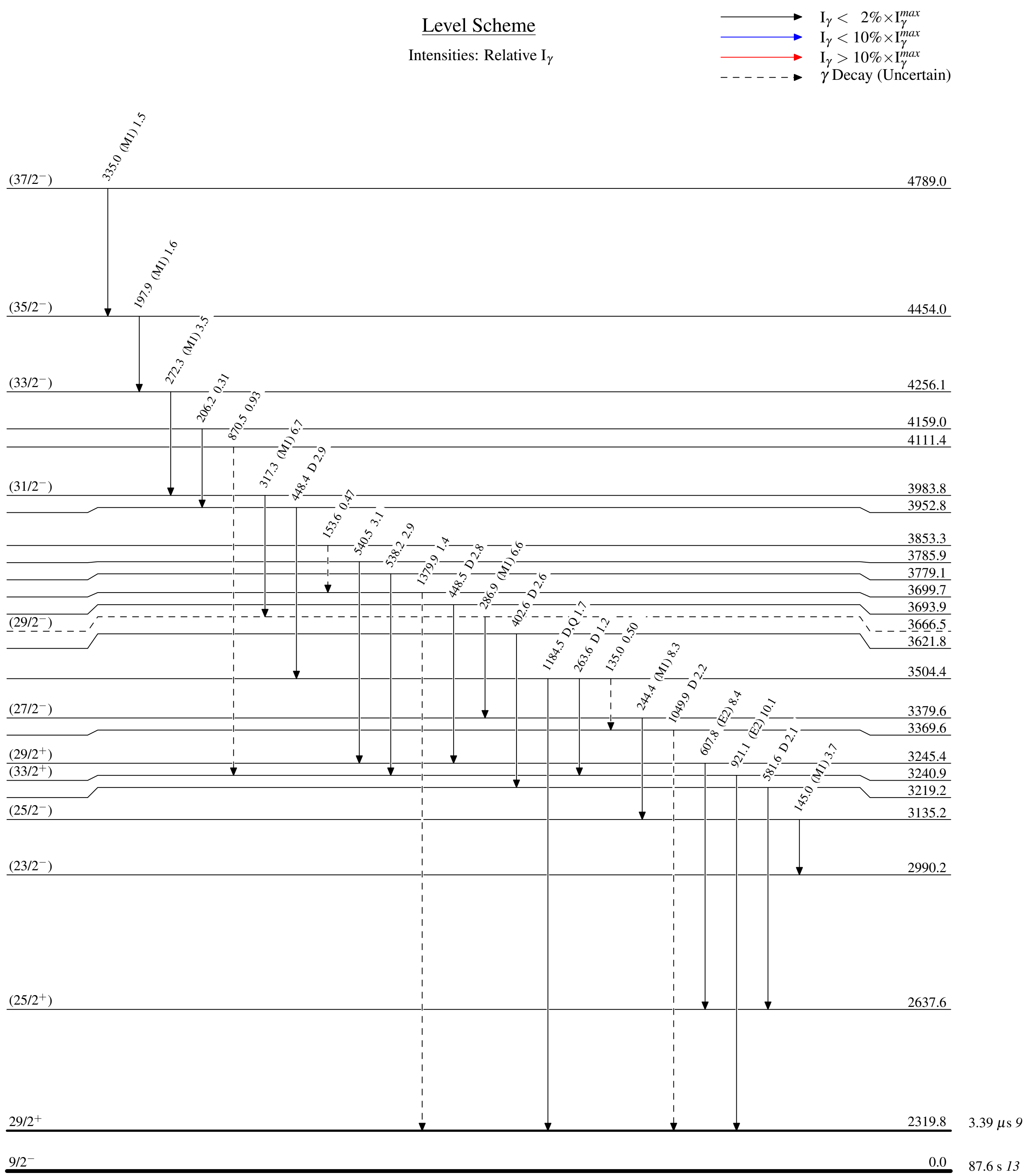
[x] γ ray not placed in level scheme.

$^{201}_{85}$At$_{116}$-8

^{165}Ho(^{40}Ar,4nγ) 2014Au03,2015Au01

Level Scheme

Intensities: Relative I_γ



$^{201}_{85}At_{116}$

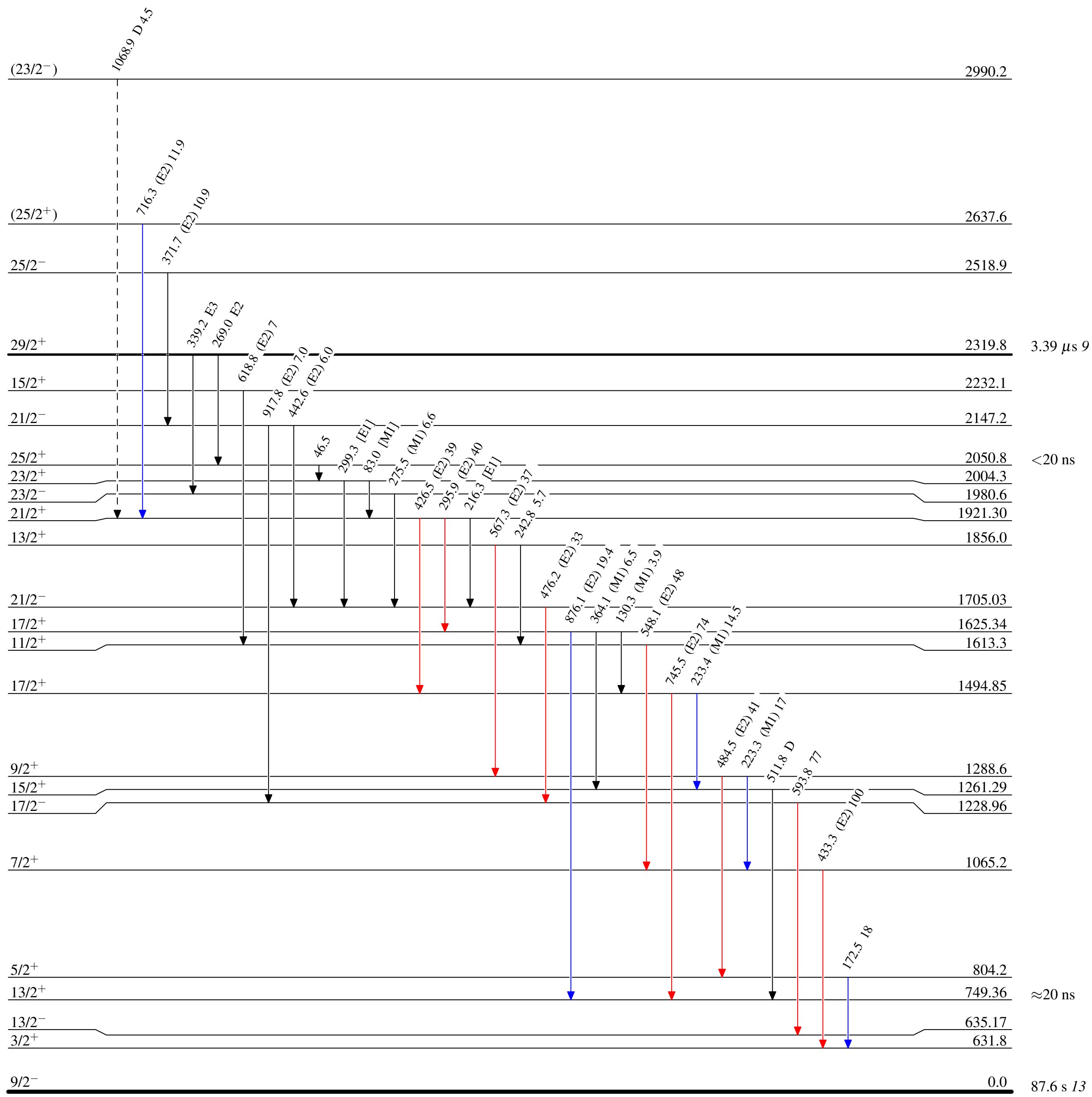
$^{165}Ho(^{40}Ar,4n\gamma)$ 2014Au03,2015Au01

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)

Level Scheme (continued)

Intensities: Relative I_γ

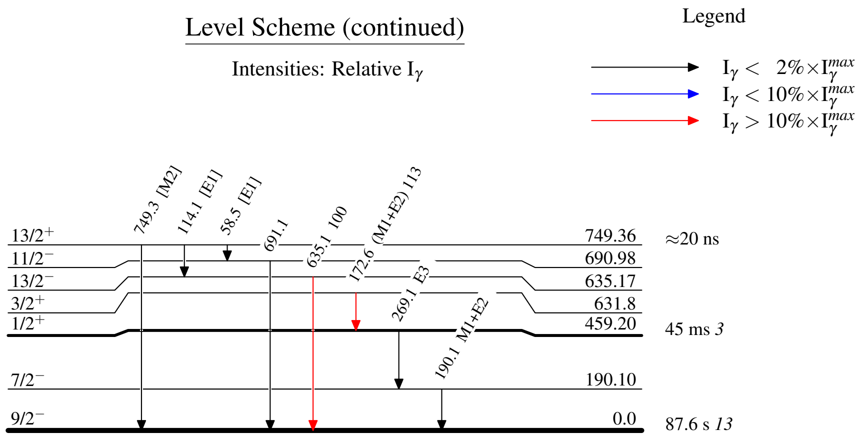


$^{201}_{85}At_{116}$

^{165}Ho(^{40}Ar,4nγ) 2014Au03,2015Au01

Level Scheme (continued)

Intensities: Relative I_γ



$^{201}_{85}At_{116}$

^{165}Ho(^{40}Ar,4nγ) 2014Au03,2015Au01