^{197}Au(^{13}C,5nγ) 1984Da19

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 166, 1 (2020)	20-Apr-2020

1984Da19: Reaction: ^{197}Au(^{13}C,5nγ); Beam: ^{13}C, E=85 MeV; Target: ^{197}Au, 5 mg/cm^2 thick; Experiments: $\gamma\gamma$(t) and nγ(t) using two large volume Ge(Li) detectors positioned at ±90°, LEPS detector and NE213 detector positioned at forward angles. A 8 μs time range was used; $\gamma\gamma$(t) using two Compton-suppressed Ge(Li) detectors positioned at ±90°. The time range for $\gamma\gamma$ coin was 2 μs; γ(t) measurements using a single Compton-suppressed Ge(Li) detector (beam on 1 μs/ beam off 40 μs); $\gamma(\theta)$ using Ge(Li) and LEPS detectors over an angular range of 90° to 150° with both millisecond-chopped and continuous beams; conversion electron measurements using a cooled Si(Li) detector at 125° in conjunction with a mini-orange magnetic filter and a Compton-suppressed Ge(Li) detector at 55°. Pulsed beam with 1 μs on and 40 μs off. Measured: Eγ, Iγ, $\gamma(\theta)$, α(K)exp, α(L)exp, α(M)exp, α(exp) and $T_{1/2}$. Deduced: levels, J^π, transition multipolarities and strengths, and configurations.

^{205}At Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0[#]	9/2$^-$	26.9 min *8*	J^π,$T_{1/2}$: From Adopted Levels.
638.20[@] *8*	11/2$^-$		
664.25[@] *9*	13/2$^-$		
969.81[&] *11*	13/2$^+$		
1132.28[a] *10*	15/2$^-$		
1230.58[a] *11*	17/2$^-$		
1441.36[g] *13*	15/2$^+$		
1563.53[j] *22*	21/2$^-$		
1756.10[g] *16*	17/2$^+$		
1862.29 *11*	19/2$^-$		
1877.74 *13*	17/2$^+$		
1935.94[b] *23*	23/2$^-$		
2054.32 *13*	21/2$^+$		
2062.57[c] *25*	25/2$^+$	67.9 ns *14*	$T_{1/2}$: From nγ(t). Note, that the absence of prompt peak in the time spectrum gated on 126.7γ implies that this γ ray directly depopulates the isomer.
2339.60[d] *25*	29/2$^+$	7.76 μs *14*	$T_{1/2}$: From γ(t) (beam on 1 μs, beam off 40 μs). No direct verification of the isomeric nature of this level was possible in 1984Da19, owing to the contamination of 227.1γ with the strong 279γ, ^{197}Au Coulomb excitation line, and of 403.6γ with 402.6γ and 404.8γ.
2499.24[e] *25*	27/2$^-$		
2499.24+x			Additional information 1. E(level): Tentatively suggested in 1984Da19 to decay via γ rays with unknown energies to the 2499.2-keV, 2339.6-keV, 1563.5-keV and 1132.3-keV levels.
2696.24+x *10*			
2721.6[h] *3*	29/2$^+$		
3040.44+x *23*			
3221.7[f] *3*	29/2$^-$		
3274.6[i] *3*	33/2$^+$		
3335.24+x *25*			
3382.8+x *3*			
3480.9 *3*			
3505.1+x *4*			
3524.7[h] *3*	31/2$^{(+)}$		
3700.7 *4*	(33/2$^+$)		
3795.2+x *4*			
3814.9[i] *3*	35/2$^+$		
3894.9 *3*	35/2		
3897.3+x *5*			

Continued on next page (footnotes at end of table)

^{197}Au(^{13}C,5nγ) 1984Da19 (continued)

^{205}At Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
3954.4 *4*	(37/2$^+$)	4150.1 *4*	37/2	4341.5 *4*	37/2$^{(+)}$	4405.7 *5*	(39/2$^+$)
4017.7+x *6*		4150.4+x *6*		4387.4+x *9*		4546.0 *4*	39/2

† From least-squares fit to Eγ.

‡ From 1984Da19, based on deduced γ-ray transition multipololarities, unless otherwise stated.

configuration=$\pi(h^{+1}_{9/2})$.

@ configuration=$\pi(h^{+1}_{9/2})\otimes\nu(f^{-2}_{5/2})_{2^+}$.

& configuration=$\pi(i^{+1}_{13/2})$.

a configuration=$\pi(h^{+1}_{9/2})\otimes\nu(f^{-2}_{5/2})_{4^+}$.

b configuration=$\pi((h^{+2}_{9/2})_{8^+},f^{+1}_{7/2})$.

c configuration=$\pi(h^{+1}_{9/2})\otimes\nu(i^{-1}_{13/2},f^{-1}_{5/2})_{9^-}$.

d configuration=$\pi((h^{+2}_{9/2})_{8^+},i^{+1}_{13/2})$.

e configuration=$\pi((h^{+2}_{9/2})_{8^+},f^{+1}_{7/2})\otimes\nu(f^{-2}_{5/2})\ _{2^+}$.

f configuration=$\pi((h^{+2}_{9/2})_{8^+},f^{+1}_{7/2})\otimes\nu(f^{-2}_{5/2})\ _{4^+}$.

g configuration=$\pi(i^{+1}_{13/2})\otimes\nu(f^{-2}_{5/2})_{2^+}$.

h configuration=$\pi(h^{+3}_{9/2})_{13/2^-}\otimes\nu(i^{-1}_{13/2},f^{-1}_{5/2})\ _{9^-}$.

i configuration=$\pi(h^{+3}_{9/2})_{17/2^-}\otimes\nu(i^{-1}_{13/2},f^{-1}_{5/2})\ _{9^-}$.

j configuration=$\pi(h^{+3}_{9/2})$.

^{197}Au(^{13}C,5nγ) 1984Da19 (continued)

$\gamma(^{205}At)$

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Iγ (delayed)[†]	Comments
(8.30 *13*)		2062.57	$25/2^+$	2054.32	$21/2^+$	[E2]	3.8×10^5 *4*	7.2×10^{-4} *16*	ce(M)/(γ+ce)=0.76 *11* ce(N)/(γ+ce)=0.20 *5*; ce(O)/(γ+ce)=0.038 *11*; ce(P)/(γ+ce)=0.0037 *11* α(M)=2.9×10^5 *6* α(N)=7.4×10^4 *15*; α(O)=1.4×10^4 *3*; α(P)=1.4×10^3 *3* E_γ: From adopted gammas. Not observed directly, but required by the coincidence relationships. Iγ (delayed) from intensity balance (by the evaluator).
(43.8 *4*)		3524.7	$31/2^{(+)}$	3480.9					E_γ: From adopted gammas. Not observed directly, but required by the coincidence relationships.
98.4 *4*	24 *1*	1230.58	$17/2^-$	1132.28	$15/2^-$	M1+E2	12.58 *22*	28 *3*	ce(K)/(γ+ce)=0.747 *8*; ce(L)/(γ+ce)=0.137 *3*; ce(M)/(γ+ce)=0.0324 *8* ce(N)/(γ+ce)=0.00839 *21*; ce(O)/(γ+ce)=0.00180 *5*; ce(P)/(γ+ce)=0.000248 *6* α(K)=10.14 *18*; α(L)=1.86 *4*; α(M)=0.440 *8* α(N)=0.1139 *21*; α(O)=0.0244 *5*; α(P)=0.00337 *7* Mult.: α(exp)=17.0 *30*; A_2=−0.10 *13*, A_4=−0.15 *20*.
102.1 *3*	29 *1*	3897.3+x		3795.2+x		D			Iγ (delayed) inferred from the in-beam intensity. Mult.: A_2=−0.23 *12*, A_4=−0.03 *17*.
118.1 *5*	8 *1*	2054.32	$21/2^+$	1935.94	$23/2^-$	(E1)	0.306 *6*	6 *1*	ce(K)/(γ+ce)=0.185 *3*; ce(L)/(γ+ce)=0.0376 *7*; ce(M)/(γ+ce)=0.00897 *17* ce(N)/(γ+ce)=0.00229 *5*; ce(O)/(γ+ce)=0.000468 *9*; ce(P)/(γ+ce)=5.68×10^{-5} *11* α(K)=0.241 *5*; α(L)=0.0491 *9*; α(M)=0.01171 *21* α(N)=0.00299 *6*; α(O)=0.000611 *11*; α(P)=7.41×10^{-5} *13* Mult.: A_2=0.06 *18*, A_4=0.16 *31*.
120.4 *2*	15 *1*	4017.7+x		3897.3+x		D			Iγ (delayed) inferred from the in-beam intensity. Mult.: A_2=−0.35 *14*, A_4=0.00 *23*.
121.7 *3*		1877.74	$17/2^+$	1756.10	$17/2^+$	[M1,E2]	6.91 *11*	13.1 *25*	ce(K)/(γ+ce)=0.707 *7*; ce(L)/(γ+ce)=0.1271 *25*; ce(M)/(γ+ce)=0.0301 *7* ce(N)/(γ+ce)=0.00780 *17*; ce(O)/(γ+ce)=0.00167 *4*; ce(P)/(γ+ce)=0.000231 *5* α(K)=5.59 *9*; α(L)=1.005 *16*; α(M)=0.238 *4* α(N)=0.0617 *10*; α(O)=0.01321 *21*; α(P)=0.00182 *3* Iγ (delayed) from intensity balance (by the evaluator). Iγ (delayed)<47 in 1984Da19. I_γ: Iγ (delayed)<75 (deduced from the decay of the 67.9 ns isomer).
122.3 *2*	39 *1*	3505.1+x		3382.8+x		D			Mult.: Unresolved from 121.7γ of unknown origin. Mult.: A_2=−0.36 *6*, A_4=0.01 *9*.
126.7 *1*	168 *2*	2062.57	$25/2^+$	1935.94	$23/2^-$	E1	0.257	142 *7*	ce(K)/(γ+ce)=0.1620 *20*; ce(L)/(γ+ce)=0.0325 *5*;

$^{205}_{85}At_{120}$-3

$^{197}Au(^{13}C,5n\gamma)$ 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α [#]	$I\gamma$ (delayed) [†]	Comments
									ce(M)/(γ+ce)=0.00773 *11* ce(N)/(γ+ce)=0.00197 *3*; ce(O)/(γ+ce)=0.000404 *6*; ce(P)/(γ+ce)=4.94×10^{-5} *8* α(K)=0.204 *3*; α(L)=0.0408 *6*; α(M)=0.00971 *14* α(N)=0.00248 *4*; α(O)=0.000508 *8*; α(P)=6.21×10^{-5} *9* I_γ: Iγ (delayed)=542 *11* (deduced from the decay of the 67.9 ns isomer). Mult.: α(exp)=0.87 *31*; A_2=−0.06 *2*, A_4=−0.03 *1*.
132.7 *2*	20 *1*	4150.4+x		4017.7+x		D			Mult.: A_2=−0.14 *8*, A_4=0.10 *11*.
x142.8 *2*	9 *3*								
x149.2 *2*	6 *1*					D			Mult.: A_2=−0.06 *26*, A_4=0.10 *40*.
x167.3 *1*	23 *1*					D			Mult.: A_2=−0.26 *9*, A_4=−0.19 *13*.
176.0 *2*	31 *1*	3700.7	(33/2$^+$)	3524.7	31/2$^{(+)}$	(M1+E2)	2.43		α(K)=1.97 *3*; α(L)=0.351 *5*; α(M)=0.0831 *12* α(N)=0.0215 *3*; α(O)=0.00461 *7*; α(P)=0.000636 *10* Mult.: α(exp)=2.0 *10*; A_2=−0.16 *8*, A_4=0.00 *12*.
176.5 *1*	63 *1*	2054.32	21/2$^+$	1877.74	17/2$^+$	E2	0.781	42 *6*	ce(K)/(γ+ce)=0.1205 *17*; ce(L)/(γ+ce)=0.235 *3*; ce(M)/(γ+ce)=0.0628 *10* ce(N)/(γ+ce)=0.01622 *25*; ce(O)/(γ+ce)=0.00320 *5*; ce(P)/(γ+ce)=0.000333 *6* α(K)=0.215 *3*; α(L)=0.419 *6*; α(M)=0.1118 *16* α(N)=0.0289 *5*; α(O)=0.00571 *9*; α(P)=0.000594 *9* I_γ: Iγ (delayed)=226 *10* (deduced from the decay of the 67.9 ns isomer). Mult.: A_2=0.14 *4*, A_4=−0.01 *6*.
x181.8 *1*	21 *1*					D			Mult.: A_2=−0.29 *10*, A_4=−0.05 *15*.
192.1 *1*	171 *2*	2054.32	21/2$^+$	1862.29	19/2$^-$	E1	0.0927	143 *11*	ce(K)/(γ+ce)=0.0682 *9*; ce(L)/(γ+ce)=0.01268 *18*; ce(M)/(γ+ce)=0.00300 *5* ce(N)/(γ+ce)=0.000770 *11*; ce(O)/(γ+ce)=0.0001596 *23*; ce(P)/(γ+ce)=2.01×10^{-5} *3* α(K)=0.0745 *11*; α(L)=0.01385 *20*; α(M)=0.00328 *5* α(N)=0.000841 *12*; α(O)=0.0001744 *25*; α(P)=2.20×10^{-5} *3* I_γ: Iγ (delayed)=597 *14* (deduced from the decay of the 67.9 ns isomer). Mult.: α(exp)<0.18; A_2=−0.04 *2*, A_4=0.01 *4*.
x193.1 *3*	17 *5*								
197.0 *1*	37 *1*	2696.24+x		2499.24+x		D			Mult.: A_2=−0.38 *10*, A_4=−0.21 *16*.
x215.6 *2*	15 *10*								
x220.6 *2*	35 *5*								
237.0 *6*	20 *10*	4387.4+x		4150.4+x					
253.7 *2*	67 *2*	3954.4	(37/2$^+$)	3700.7	(33/2$^+$)	(E2)	0.222		α(K)=0.0986 *14*; α(L)=0.0917 *14*; α(M)=0.0241 *4* α(N)=0.00624 *9*; α(O)=0.001244 *18*; α(P)=0.0001344 *20* Mult.: A_2=0.10 *11*, A_4=0.23 *12*.

$^{205}_{85}At_{120}$-4

$^{197}Au(^{13}C,5n\gamma)$ 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α #	Iγ (delayed) †	Comments
x255.0 *10*	<30								
259.2 *1*	48 *2*	3480.9		3221.7	29/2−	(E1)	0.0453		α(K)=0.0367 *6*; α(L)=0.00656 *10*; α(M)=0.001549 *22* α(N)=0.000398 *6*; α(O)=8.30×10^{-5} *12*; α(P)=1.069×10^{-5} *15* Mult.: α(exp)=0.00 *20*; A_2=−0.24 *13*, A_4=−0.13 *20*.
277.1 *1*	62 *2*	2339.60	29/2+	2062.57	25/2+	E2	0.1679	416 *17*	ce(K)/(γ+ce)=0.0694 *10*; ce(L)/(γ+ce)=0.0553 *8*; ce(M)/(γ+ce)=0.01451 *21* ce(N)/(γ+ce)=0.00375 *6*; ce(O)/(γ+ce)=0.000750 *11*; ce(P)/(γ+ce)=8.20×10^{-5} *12* α(K)=0.0810 *12*; α(L)=0.0646 *9*; α(M)=0.01695 *24* α(N)=0.00438 *7*; α(O)=0.000876 *13*; α(P)=9.57×10^{-5} *14* Mult.: α(L)exp=0.064 *8*; A_2=0.10 *7*, A_4=0.01 *10*.
290.1 *1*	41 *2*	3795.2+x		3505.1+x		D			Mult.: A_2=−0.22 *11*, A_4=0.20 *14*.
294.8 *1*	68 *2*	3335.24+x		3040.44+x		D			Mult.: A_2=−0.26 *10*, A_4=0.14 *12*.
298.3 *3*		2054.32	21/2+	1756.10	17/2+	[E2]	0.1341	30 *7*	ce(K)/(γ+ce)=0.0607 *9*; ce(L)/(γ+ce)=0.0428 *6*; ce(M)/(γ+ce)=0.01119 *17* ce(N)/(γ+ce)=0.00289 *5*; ce(O)/(γ+ce)=0.000580 *9*; ce(P)/(γ+ce)=6.40×10^{-5} *10* α(K)=0.0688 *10*; α(L)=0.0486 *7*; α(M)=0.01269 *19* α(N)=0.00328 *5*; α(O)=0.000658 *10*; α(P)=7.26×10^{-5} *11* I_γ,Mult.: Unresolved from 299γ in ^{204}At. I_γ: Iγ (delayed)=111 *19* (deduced from the decay of the 67.9 ns isomer).
303.0 *1*	61 *2*	3524.7	31/2(+)	3221.7	29/2−	(E1)	0.0316		α(K)=0.0257 *4*; α(L)=0.00450 *7*; α(M)=0.001061 *15* α(N)=0.000273 *4*; α(O)=5.71×10^{-5} *8*; α(P)=7.42×10^{-6} *11* Mult.: α(exp)=0.00 *20*; A_2=−0.22 *10*, A_4=0.09 *15*.
314.9 *2*	119 *2*	1756.10	17/2+	1441.36	15/2+	M1+E2	0.482	77 *12*	ce(K)/(γ+ce)=0.264 *3*; ce(L)/(γ+ce)=0.0466 *7*; ce(M)/(γ+ce)=0.01103 *17* ce(N)/(γ+ce)=0.00286 *5*; ce(O)/(γ+ce)=0.000612 *9*; ce(P)/(γ+ce)=8.45×10^{-5} *13* α(K)=0.391 *6*; α(L)=0.0691 *10*; α(M)=0.01634 *23* α(N)=0.00423 *6*; α(O)=0.000906 *13*; α(P)=0.0001252 *18* I_γ: Iγ (delayed)=198 *21* (deduced from the decay of the 67.9 ns isomer). Mult.: α(L)exp=0.057 *11*, A_2=−0.16 *4*, A_4=0.04 *7*.
331.6 *1*	239 *8*	969.81	13/2+	638.20	11/2−	E1	0.0257	100 *23*	ce(K)/(γ+ce)=0.0204 *3*; ce(L)/(γ+ce)=0.00355 *5*; ce(M)/(γ+ce)=0.000836 *12* ce(N)/(γ+ce)=0.000215 *3*; ce(O)/(γ+ce)=4.51×10^{-5} *7*; ce(P)/(γ+ce)=5.88×10^{-6} *9* α(K)=0.0210 *3*; α(L)=0.00364 *5*; α(M)=0.000857 *12* α(N)=0.000220 *3*; α(O)=4.62×10^{-5} *7*; α(P)=6.03×10^{-6} *9* I_γ: Iγ (delayed)=427 *36* (deduced from the decay of the

$^{205}_{85}At_{120}$-5

$^{197}Au(^{13}C,5n\gamma)$ 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	δ †	α #	Iγ (delayed) †	Comments
										67.9 ns isomer). Mult.: A_2=−0.05 *4*, A_4=−0.08 *6*. Contaminated by the 332.9γ.
332.9 *2*	708 *5*	1563.53	21/2$^-$	1230.58	17/2$^-$	E2		0.0972	1073 *33*	ce(K)/(γ+ce)=0.0493 *7*; ce(L)/(γ+ce)=0.0293 *4*; ce(M)/(γ+ce)=0.00761 *11* ce(N)/(γ+ce)=0.00197 *3*; ce(O)/(γ+ce)=0.000396 *6*; ce(P)/(γ+ce)=4.44×10^{-5} *7* α(K)=0.0540 *8*; α(L)=0.0322 *5*; α(M)=0.00835 *12* α(N)=0.00216 *3*; α(O)=0.000435 *7*; α(P)=4.87×10^{-5} *7* I_γ: Iγ (delayed)=600 *36* (deduced from the decay of the 67.9 ns isomer). Mult.: α(K)exp=0.052 *5*, α(L)exp=0.025 *5* (deduced by assuming that 331.6γ is E1), A_2=0.19 *2*, A_4=−0.04 *3*.
335.2 *1*	53 *4*	4150.1	37/2	3814.9	35/2$^+$	D				Mult.: A_2=−0.45 *20*, A_4=−0.10 *28*.
x340.4 *2*	32 *2*					D				Mult.: A_2=−0.43 *25*, A_4=−0.04 *18*.
342.4 *2*	54 *2*	3382.8+x		3040.44+x		D				Mult.: A_2=−0.64 *9*, A_4=0.02 *13*.
344.2 *2*	82 *2*	3040.44+x		2696.24+x		D				Mult.: A_2=−0.37 *6*, A_4=0.07 *8*.
372.4 *1*	478 *3*	1935.94	23/2$^-$	1563.53	21/2$^-$	M1+E2	−0.05 *2*	0.305	942 *22*	ce(K)/(γ+ce)=0.1898 *22*; ce(L)/(γ+ce)=0.0334 *5*; ce(M)/(γ+ce)=0.00790 *12* ce(N)/(γ+ce)=0.00205 *3*; ce(O)/(γ+ce)=0.000438 *7*; ce(P)/(γ+ce)=6.05×10^{-5} *9* α(K)=0.248 *4*; α(L)=0.0436 *7*; α(M)=0.01031 *15* α(N)=0.00267 *4*; α(O)=0.000572 *8*; α(P)=7.90×10^{-5} *12* I_γ: Iγ (delayed)=610 *14* (deduced from the decay of the 67.9 ns isomer). Mult.: α(K)exp=0.24 *4*, α(L)exp=0.043 *4*, A_2=−0.19 *2*, A_4=0.05 *2*.
x390.6 *3*	40 *6*					D				Mult.: A_2=−0.14 *23*, A_4=−0.05 *32*.
395.9 *2*	54 *3*	4546.0	39/2	4150.1	37/2	D				Mult.: A_2=−0.37 *12*, A_4=−0.27 *21*.
403.6 *1*	158 *4*	2339.60	29/2$^+$	1935.94	23/2$^-$	E3		0.240	756 *29*	ce(K)/(γ+ce)=0.0744 *10*; ce(L)/(γ+ce)=0.0881 *12*; ce(M)/(γ+ce)=0.0237 *4* ce(N)/(γ+ce)=0.00616 *9*; ce(O)/(γ+ce)=0.001238 *18*; ce(P)/(γ+ce)=0.0001375 *20* α(K)=0.0923 *13*; α(L)=0.1093 *16*; α(M)=0.0294 *5* α(N)=0.00764 *11*; α(O)=0.001536 *22*; α(P)=0.0001705 *24* Mult.: α(K)exp=0.092 *5*, α(L)exp=0.12 *1*, α(M)exp=0.044 *11* (assuming that 494.1γ is E2); A_2=0.03 *6*, A_4=0.01 *8*. The isotropic angular distributions are attributed to relaxation of the alignment during the long lifetime of the isomer.

$^{205}_{85}At_{120}$-6

^{197}Au(^{13}C,5nγ) 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	δ †	α #	Iγ (delayed) †	Comments
436.3 *1*	53 *2*	1877.74	17/2$^+$	1441.36	15/2$^+$	M1+E2		0.199	30 *14*	ce(K)/(γ+ce)=0.1351 *17*; ce(L)/(γ+ce)=0.0237 *4*; ce(M)/(γ+ce)=0.00559 *8* ce(N)/(γ+ce)=0.001449 *21*; ce(O)/(γ+ce)=0.000310 *5*; ce(P)/(γ+ce)=4.29×10^{-5} *6* α(K)=0.1621 *23*; α(L)=0.0284 *4*; α(M)=0.00671 *10* α(N)=0.001738 *25*; α(O)=0.000372 *6*; α(P)=5.14×10^{-5} *8* I_γ: Iγ (delayed)=129 *10* (deduced from the decay of the 67.9 ns isomer). Mult.: A_2=−0.22 *8*, A_4=−0.10 *12*.
451.3 *3*	72 *2*	4405.7	(39/2$^+$)	3954.4	(37/2$^+$)	M1+E2		0.182		α(K)=0.1481 *21*; α(L)=0.0259 *4*; α(M)=0.00612 *9* α(N)=0.001586 *23*; α(O)=0.000340 *5*; α(P)=4.69×10^{-5} *7* Mult.: α(K)exp=0.10 *6*, A_2=−0.46 *7*, A_4=0.14 *11*.
468.0 *1*	339 *2*	1132.28	15/2$^-$	664.25	13/2$^-$	M1+E2	−0.30 *3*	0.155 *3*	345 *23*	ce(K)/(γ+ce)=0.1086 *19*; ce(L)/(γ+ce)=0.0194 *4*; ce(M)/(γ+ce)=0.00459 *8* ce(N)/(γ+ce)=0.001189 *20*; ce(O)/(γ+ce)=0.000254 *5*; ce(P)/(γ+ce)=3.49×10^{-5} *7* α(K)=0.1254 *25*; α(L)=0.0224 *4*; α(M)=0.00530 *9* α(N)=0.001373 *23*; α(O)=0.000293 *5*; α(P)=4.03×10^{-5} *7* I_γ: Iγ (delayed)=457 *12* (deduced from the decay of the 67.9 ns isomer). Mult.: α(K)exp=0.12, α(L)exp=0.027; A_2=−0.42 *1*, A_4=0.05 *2*. Partially overlap with 471.5γ (A_2=−0.35 *3*, A_4=−0.02 *4*) (1984Da19).
[x]468.3 *2*	33 *11*									
471.5 *1*	143 *3*	1441.36	15/2$^+$	969.81	13/2$^+$	M1+E2	−0.21 *5*	0.157 *4*	98 *15*	ce(K)/(γ+ce)=0.1100 *22*; ce(L)/(γ+ce)=0.0194 *4*; ce(M)/(γ+ce)=0.00459 *9* ce(N)/(γ+ce)=0.001190 *22*; ce(O)/(γ+ce)=0.000255 *5*; ce(P)/(γ+ce)=3.51×10^{-5} *7* α(K)=0.127 *3*; α(L)=0.0225 *5*; α(M)=0.00531 *10* α(N)=0.00138 *3*; α(O)=0.000295 *6*; α(P)=4.06×10^{-5} *8* I_γ: Iγ (delayed)=309 *11* (deduced from the decay of the 67.9 ns isomer). Mult.: α(exp) values unresolved from that for 468.0γ, A_2=−0.35 *3*, A_4=−0.02 *4*.

$^{205}_{85}At_{120}$-7

$^{197}Au(^{13}C,5n\gamma)$ 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[†]	α[#]	Iγ (delayed)[†]	Comments
494.1 *1*	169 *2*	1132.28	15/2$^-$	638.20	11/2$^-$	E2		0.0346	192 *19*	ce(K)/(γ+ce)=0.0227 *4*; ce(L)/(γ+ce)=0.00807 *12*; ce(M)/(γ+ce)=0.00204 *3* ce(N)/(γ+ce)=0.000528 *8*; ce(O)/(γ+ce)=0.0001080 *16*; ce(P)/(γ+ce)=1.289×10^{-5} *18* α(K)=0.0234 *4*; α(L)=0.00835 *12*; α(M)=0.00211 *3* α(N)=0.000546 *8*; α(O)=0.0001117 *16*; α(P)=1.334×10^{-5} *19* I$_\gamma$: Iγ (delayed)=227 *10* (deduced from the decay of the 67.9 ns isomer). Mult.: A$_2$=0.25 *3*, A$_4$=0.03 *4*. Conversion coefficient values are contaminated by these for the 403.6γ.
[x]516.5 *3*	26 *9*									
526.6 *1*	47 *2*	4341.5	37/2$^{(+)}$	3814.9	35/2$^+$	M1+E2	−0.23 *8*	0.116 *4*		α(K)=0.094 *4*; α(L)=0.0166 *5*; α(M)=0.00393 *11* α(N)=0.00102 *3*; α(O)=0.000218 *6*; α(P)=3.00×10^{-5} *9* Mult.: α(K)exp<0.20; A$_2$=−0.65 *11*, A$_4$=0.45 *15*.
540.3 *1*	116 *4*	3814.9	35/2$^+$	3274.6	33/2$^+$	M1+E2	−0.07 *5*	0.1123 *18*		α(K)=0.0914 *15*; α(L)=0.01594 *24*; α(M)=0.00376 *6* α(N)=0.000974 *15*; α(O)=0.000209 *4*; α(P)=2.89×10^{-5} *5* Mult.: α(K)exp=0.12 *2*; A$_2$=−0.38 *9*, A$_4$=−0.04 *14*.
[x]550.7 *5*	46 *5*									
553.0 *1*	272 *3*	3274.6	33/2$^+$	2721.6	29/2$^+$	E2		0.0266		α(K)=0.0187 *3*; α(L)=0.00591 *9*; α(M)=0.001484 *21* α(N)=0.000384 *6*; α(O)=7.89×10^{-5} *11*; α(P)=9.59×10^{-6} *14* Mult.: α(K)exp=0.03 *1*; A$_2$=0.38 *3*, A$_4$=−0.04 *4*.
563.3 *1*	202 *3*	2499.24	27/2$^-$	1935.94	23/2$^-$	E2		0.0255		α(K)=0.0180 *3*; α(L)=0.00560 *8*; α(M)=0.001403 *20* α(N)=0.000363 *5*; α(O)=7.47×10^{-5} *11*; α(P)=9.10×10^{-6} *13* Mult.: α(K)exp=0.028 *4*; A$_2$=0.30 *4*, A$_4$=−0.08 *6*.
566.4 *1*	605 *4*	1230.58	17/2$^-$	664.25	13/2$^-$	E2		0.0251	707 *36*	ce(K)/(γ+ce)=0.01738 *24*; ce(L)/(γ+ce)=0.00537 *8*; ce(M)/(γ+ce)=0.001346 *19* ce(N)/(γ+ce)=0.000348 *5*; ce(O)/(γ+ce)=7.17×10^{-5} *10*; ce(P)/(γ+ce)=8.74×10^{-6} *13* α(K)=0.01782 *25*; α(L)=0.00551 *8*; α(M)=0.001380 *20* α(N)=0.000357 *5*; α(O)=7.35×10^{-5} *11*;

$^{205}_{85}At_{120}$-8

^{197}Au(^{13}C,5nγ) 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	δ †	α #	Iγ (delayed) †	Comments
										α(P)=8.96×10^{-6} *13* I_γ: Iγ (delayed)=546 *13* (deduced from the decay of the 67.9 ns isomer). Mult.: α(K)exp=0.020 *2*, α(L)exp=0.0060 *15*, A_2=0.21 *2*, A_4=0.02 *2*.
x605.5 *2*	70 *20*									
x612.7 *5*	70 *50*									
620.3 *1*	43 *3*	3894.9	35/2	3274.6	33/2$^+$	D				Mult.: A_2=−0.42 *20*, A_4=0.30 *35*.
x625.9 *1*	28 *4*					D				Mult.: A_2=−0.81 *37*, A_4=−0.09 *57*.
631.8 *1*	39 *4*	1862.29	19/2$^-$	1230.58	17/2$^-$	M1+E2		0.0746	19 *4*	ce(K)/(γ+ce)=0.0565 *8*; ce(L)/(γ+ce)=0.00981 *14*; ce(M)/(γ+ce)=0.00231 *4* ce(N)/(γ+ce)=0.000599 *9*; ce(O)/(γ+ce)=0.0001283 *18*; ce(P)/(γ+ce)=1.775×10^{-5} *25* α(K)=0.0607 *9*; α(L)=0.01054 *15*; α(M)=0.00249 *4* α(N)=0.000644 *9*; α(O)=0.0001379 *20*; α(P)=1.91×10^{-5} *3* I_γ: Iγ (delayed)=69 *11* (deduced from the decay of the 67.9 ns isomer). Mult.: A_2=0.04 *26*, A_4=−0.06 *42*. Iγ (delayed): Value inferred from the ns isomer decay intensity.
x637.2 *3*	129 *5*					M1+E2		0.0729		α(K)=0.0594 *9*; α(L)=0.01030 *15*; α(M)=0.00243 *4* α(N)=0.000629 *9*; α(O)=0.0001348 *19*; α(P)=1.86×10^{-5} *3* Mult.: α(K)exp=0.02 *2*; A_2=−0.26 *9*, A_4=−0.03 *14*.
638.2 *1*	475 *5*	638.20	11/2$^-$	0.0	9/2$^-$	M1+E2	+0.20 *5*	0.0706 *15*	291 *23*	ce(K)/(γ+ce)=0.0536 *11*; ce(L)/(γ+ce)=0.00936 *18*; ce(M)/(γ+ce)=0.00221 *5* ce(N)/(γ+ce)=0.000572 *11*; ce(O)/(γ+ce)=0.0001224 *24*; ce(P)/(γ+ce)=1.69×10^{-5} *4* α(K)=0.0574 *13*; α(L)=0.01002 *19*; α(M)=0.00236 *5* α(N)=0.000612 *12*; α(O)=0.0001310 *25*; α(P)=1.81×10^{-5} *4* I_γ: Iγ (delayed)=644 *14* (deduced from the decay of the 67.9 ns isomer). Mult.: α(K)exp=0.023 *4*, A_2=−0.35 *3*, A_4=−0.06 *4*.
659.0 *1*	354 *4*	2721.6	29/2$^+$	2062.57	25/2$^+$	E2		0.0180		α(K)=0.01326 *19*; α(L)=0.00358 *5*; α(M)=0.000887 *13* α(N)=0.000229 *4*; α(O)=4.75×10^{-5} *7*;

$^{205}_{85}At_{120}$-9

$^{197}Au(^{13}C,5n\gamma)$ 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[†]	α[#]	Iγ (delayed)[†]	Comments
664.3 *1*	1000 *6*	664.25	13/2$^-$	0.0	9/2$^-$	E2		0.01770	1000 *25*	α(P)=5.93×10^{-6} *9* Mult.: α(K)exp=0.017 *3*; A_2=0.41 *3*, A_4=−0.12 *5*. ce(K)/(γ+ce)=0.01283 *18*; ce(L)/(γ+ce)=0.00344 *5*; ce(M)/(γ+ce)=0.000852 *12* ce(N)/(γ+ce)=0.000220 *3*; ce(O)/(γ+ce)=4.57×10^{-5} *7*; ce(P)/(γ+ce)=5.71×10^{-6} *8* α(K)=0.01305 *19*; α(L)=0.00350 *5*; α(M)=0.000868 *13* α(N)=0.000224 *4*; α(O)=4.65×10^{-5} *7*; α(P)=5.81×10^{-6} *9* Mult.: α(K)exp=0.013 *2*, A_2=0.21 *2*, A_4=0.04 *2*. I_γ: Iγ (delayed)=1000 *17* (deduced from the decay of the 67.9 ns isomer).
722.5 *1*	119 *4*	3221.7	29/2$^-$	2499.24	27/2$^-$	M1+E2	−0.10 *5*	0.0521 *9*		α(K)=0.0424 *7*; α(L)=0.00734 *12*; α(M)=0.00173 *3* α(N)=0.000448 *7*; α(O)=9.60×10^{-5} *16*; α(P)=1.328×10^{-5} *22* Mult.: α(K)exp=0.025 *6*; A_2=−0.43 *8*, A_4=−0.02 *12*.
730.0 *1*	181 *3*	1862.29	19/2$^-$	1132.28	15/2$^-$	E2		0.01451	116 *25*	ce(K)/(γ+ce)=0.01075 *15*; ce(L)/(γ+ce)=0.00268 *4*; ce(M)/(γ+ce)=0.000660 *10* ce(N)/(γ+ce)=0.0001707 *24*; ce(O)/(γ+ce)=3.55×10^{-5} *5*; ce(P)/(γ+ce)=4.49×10^{-6} *7* α(K)=0.01090 *16*; α(L)=0.00272 *4*; α(M)=0.000670 *10* α(N)=0.0001732 *25*; α(O)=3.60×10^{-5} *5*; α(P)=4.56×10^{-6} *7* I_γ: Iγ (delayed)=380 *13* (deduced from the decay of the 67.9 ns isomer).
786.2 *2*	37 *3*	1756.10	17/2$^+$	969.81	13/2$^+$	E2		0.01246	23 *4*	Mult.: α(K)exp=0.013 *2*, A_2=0.19 *5*, A_4=0.01 *7*. ce(K)/(γ+ce)=0.00936 *13*; ce(L)/(γ+ce)=0.00222 *4*; ce(M)/(γ+ce)=0.000544 *8* ce(N)/(γ+ce)=0.0001406 *20*; ce(O)/(γ+ce)=2.93×10^{-5} *5*; ce(P)/(γ+ce)=3.74×10^{-6} *6* α(K)=0.00948 *14*; α(L)=0.00225 *4*; α(M)=0.000550 *8* α(N)=0.0001423 *20*; α(O)=2.97×10^{-5} *5*; α(P)=3.79×10^{-6} *6* I_γ: Iγ (delayed)=83 *10* (deduced from the decay of the 67.9 ns isomer). Mult.: A_2=0.47 *21*, A_4=−0.60 *40*. Iγ (delayed): Value inferred from the ns isomer decay intensity.

$^{205}_{85}At_{120}$-10

$^{197}Au(^{13}C,5n\gamma)$ 1984Da19 (continued)

$\gamma(^{205}At)$ (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [#]	Iγ (delayed) [†]	Comments
[x]794.2 *3*	47 *3*					(E3)	0.0317		α(K)=0.0211 *3*; α(L)=0.00793 *12*; α(M)=0.00202 *3* α(N)=0.000525 *8*; α(O)=0.0001083 *16*; α(P)=1.325×10^{-5} *19* Mult.: α(K)exp=0.021 *3*, α(L)exp=0.0072 *2*, α(M)exp=0.004 *2* (unresolved from 797.4γ); A_2=0.50 *17*, A_4=−0.02 *25*.
[x]797.4 *3*	79 *4*					(E3)	0.0314		α(K)=0.0210 *3*; α(L)=0.00782 *11*; α(M)=0.00199 *3* α(N)=0.000518 *8*; α(O)=0.0001068 *15*; α(P)=1.308×10^{-5} *19* Mult.: α(K)exp=0.021 *3*, α(L)exp=0.0072 *2*, α(M)exp=0.004 *2* (unresolved from 794.2γ); A_2=0.28 *10*, A_4=0.03 *20*.
[x]822.0 *10*	50 *3*								Mult.: α(K)exp=0.030 *5*; A_2=0.12 *17*, A_4=0.09 *26*.
969.6 *2*	42 *2*	969.81	13/2$^+$	0.0	9/2$^-$	M2	0.0588	27 *4*	ce(K)/(γ+ce)=0.0442 *6*; ce(L)/(γ+ce)=0.00860 *12*; ce(M)/(γ+ce)=0.00206 *3* ce(N)/(γ+ce)=0.000536 *8*; ce(O)/(γ+ce)=0.0001146 *16*; ce(P)/(γ+ce)=1.574×10^{-5} *22* α(K)=0.0468 *7*; α(L)=0.00911 *13*; α(M)=0.00219 *3* α(N)=0.000568 *8*; α(O)=0.0001214 *17*; α(P)=1.666×10^{-5} *24* I_γ: Iγ (delayed)=98 *6* (deduced from the decay of the 67.9 ns isomer). Mult.: α(K)exp=0.06 *4*, α(L)exp=0.010 *7*, A_2=0.10 *12*, A_4=0.05 *20*. Iγ (delayed): Value inferred from the ns isomer decay intensity.

[†] From 1984Da19. Iγ correspond to in-beam values, while Iγ (delayed) is for transitions following the decay of the 7.76 μs isomer.
[‡] From 1984Da19, based on $\gamma(\theta)$, conversion electron coefficients, and multiple decay branches, unless otherwise stated.
[#] Additional information 2.
[x] γ ray not placed in level scheme.

$^{205}_{85}At_{120}$-11

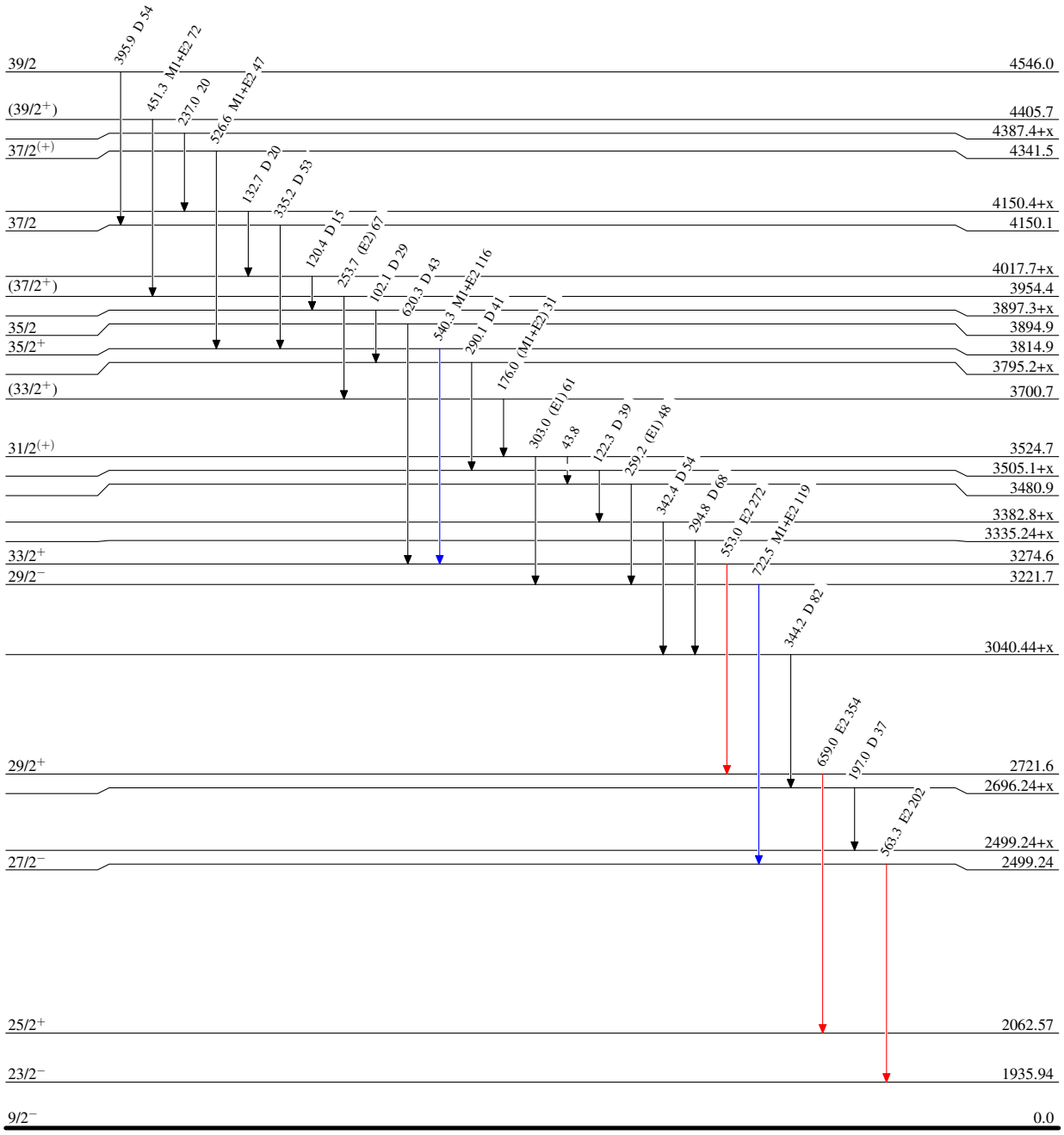
^{197}Au(^{13}C,5nγ) 1984Da19

Level Scheme

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)



$^{205}_{85}At_{120}$

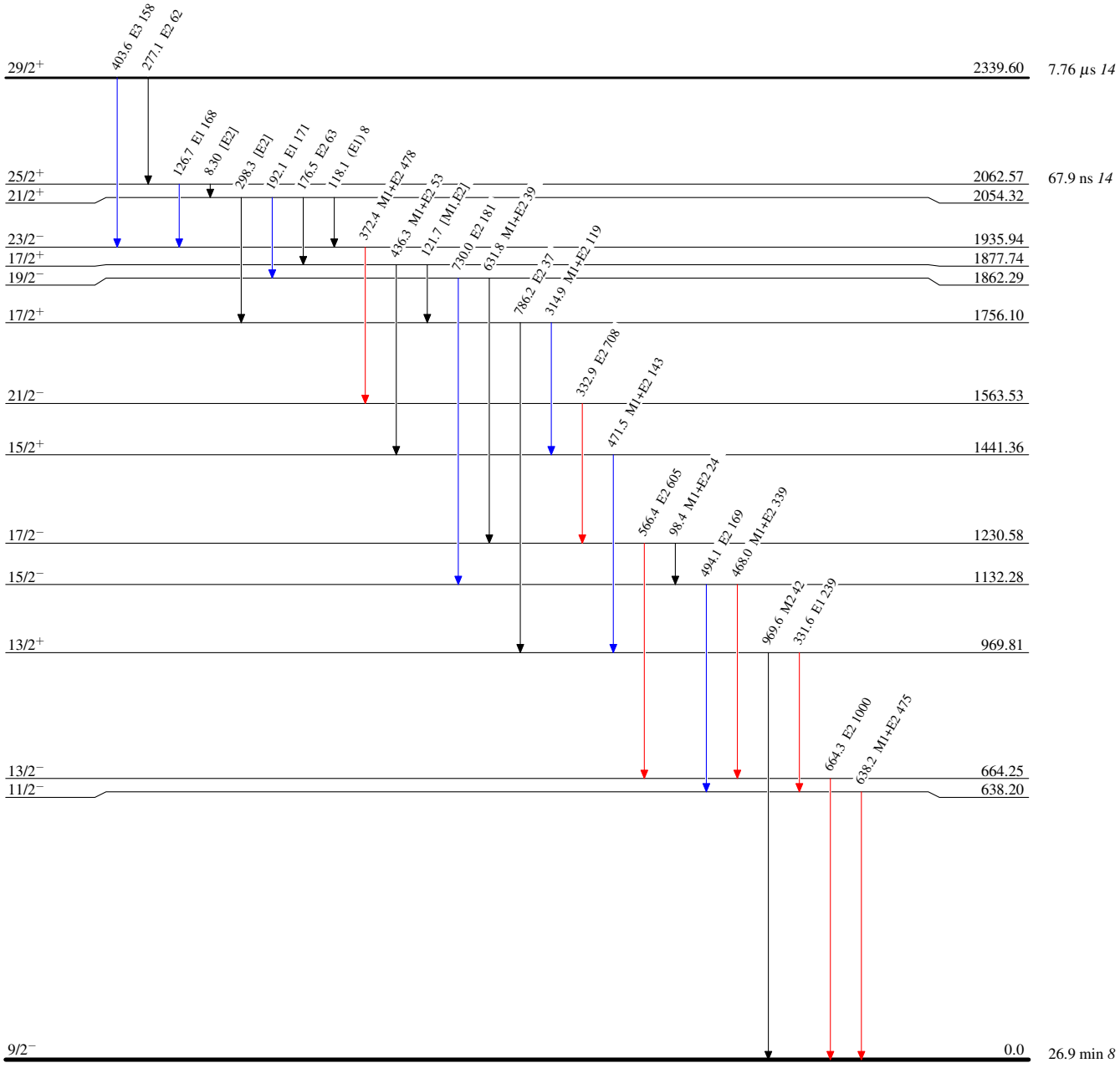
^{197}Au(^{13}C,5nγ) **1984Da19**

Level 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)



$^{205}_{85}At_{120}$