^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02

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Full Evaluation	M. S. Basunia	NDS 110, 999 (2009)	1-Nov-2008

Other references: 1975De21, 1987ViZY, 1997Pe26, 1992Ko10.

1989Bo10: 92.5% enriched ^{172}Yb; Projectile: ^{19}F, E=95 MeV; Detector: 'Chateau de Cristal' consists of 12 Compton-suppressed HPGe and 38 BaF_2 counters; Measured: Eγ, $\gamma\gamma$ coin, γ-fold, and γ-sum-energy, linear polarization and DCO ratios of the γ-rays. The DCO ratios are deduced for γ-rays measured at 33° and 90° and gated on the stretched E2 transitions.

1989Jo02: Target: 98% enriched ^{172}Yb; Projectile: ^{19}F, E=95 MeV; Detector: 6 NaI and an array of 5 HPGe at 90°, 60°, 45°, 30°, −10° with respect to the beam direction, and an additional planer Ge detector at −90° for low energy γ-ray measurement and time resolution; Measured: Eγ, Iγ, $\gamma(\theta)$, and $T_{1/2}$.

1975De21: ^{175}Lu(^{16}O,4nγ) E=95 MeV.

1987ViZY: ^{175}Lu(^{16}O,4nγ) E=90 MeV.

1997Pe26 (Same group of 1989Bo10): ^{172}Yb(^{19}F,4nγ), E=88 MeV; Measured g-factor for the 2670-keV isomer (J^π=31/2$^-$ or 35/2$^-$).

1992Ko10: Target: 95% enriched ^{172}Yb; Projectile: ^{19}F, E=90-,95-, and 100-MeV; Detector: 'Chateau de Cristal' consists of 12 Compton-suppressed HPGe and 26 BaF_2 counters; Measured: Eγ, $\gamma\gamma$ coin, γ-fold, and γ-sum-energy.

In general, the level scheme is mostly similar between 1989Bo10 and 1989Jo02. Differences are noted. 1989Bo10 presents more band structures in the level scheme than those in the 1989Jo02.

^{187}Au Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[@]	Comments
0.0[h]	1/2$^+$		
19.47[h] *13*	3/2$^+$		Additional information 1.
121[&]	9/2$^-$		Additional information 2.
173[d]	5/2$^-$		Additional information 3.
224.9[e] *5*	11/2$^-$	50 ns *5*	
239.7[h] *4*	5/2$^+$		
354.2[&] *4*	13/2$^-$		
444.0[d] *4*	(7/2$^-$,9/2$^-$)		
497.1[a] *4*	11/2$^-$		
674.0[e] *6*	15/2$^-$		
688.8[&] *5*	17/2$^-$		
709.7[h] *7*	9/2$^+$		
742.1[d] *5*	(11/2$^-$,13/2$^-$)		
816.1[a] *5*	15/2$^-$		
1102.7[&] *6*	21/2$^-$		
1122.0[c] *5*	13/2$^+$		
1147.7[h] *8*	13/2$^+$		
1167.1[d] *7*	(15/2$^-$,17/2$^-$)		
1199.3 *8*	17/2$^-$		J^π: (11/2$^-$) in the Adopted Levels. Placement of 525.5γ is from (13/2$^-$) state at 749.9 keV in 1989Jo02 and from 17/2$^-$ state in 1989Bo10.
1233.0[a] *5*	19/2$^-$		
1316.8 *7*	19/2$^-$		J^π: (17/2$^-$) in the Adopted Levels.
1381.1[c] *5*	17/2$^+$		
1405.5[e] *7*	19/2$^-$		
1415.8 *6*	(17/2$^-$,19/2,21/2$^+$)		J^π: 727γ to 17/2$^-$ and 699γ from 21/2$^+$ states.
1594.0[&] *7*	25/2$^-$		

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^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02 (continued)

^{187}Au Levels (continued)

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[@]	Comments
1602.7[h] *10*	17/2$^+$		
1685.1[d] *9*	(19/2$^-$,21/2$^-$)		
1697.5[c] *6*	21/2$^+$		
1739.9[a] *6*	23/2$^-$		
1766.3			
2007.6 *7*	23/2$^-$		
2052.8 *8*	21/2		
2097.8[c] *7*	25/2$^+$		
2114.9[f] *7*	21/2$^+$		
2160.9[&] *9*	29/2$^-$		
2196.5[e] *8*	23/2$^-$		
2247.1[d] *10*	(23/2$^-$,25/2$^-$)		
2281.6[f] *7*	23/2$^+$	<10 ns	
2292.9[b] *7*	27/2$^-$		
2354.9[a] *8*	27/2$^-$		
2431.2[f] *8*	25/2$^+$	24 ns *3*	T$_{1/2}$: Weighted average of 21 ns *6* (1997Pe26) and 25 ns *3* (1989Jo02).
2551.6 *9*			
2564.5?[f] *10*	27/2$^+$		
2568.8[c] *8*	29/2$^+$		
2581.0[e] *8*	(25/2$^-$)[#]		J$^\pi$: (25/2) in 1989Bo10 and 27/2$^-$ in 1989Jo02.
2669.8[g] *10*	31/2$^-$	100 ns *5*	μ=−3.9 *5* T$_{1/2}$: Weighted average of 102 ns *5* (1997Pe26) and 90 ns *10* (1989Jo02); Other: 100 ns (1989Bo10). μ: deduced by the evaluator from g=0.25 *3* (1997Pe26). The g-factor is measured using time differential perturbed angular distribution. 1997Pe26 speculates that the g-factor might be for a (35/2$^-$) state at 2669.8+ΔE keV level feeding the 2669.8-keV level by a <40−keV γ-ray based on the hindrence factor calculation.
2670.5 *9*	(25/2)		
2672.1?[d] *11*			
2792.9 *9*	29/2$^-$,31/2$^-$[#]		J$^\pi$: 29/2$^-$ in 1989Jo02, 31/2$^-$ in 1989Bo10.
2798.9[&] *10*	33/2$^-$		
2966.5[g] *11*	33/2$^-$		
3013.9[a] *9*	(31/2$^-$)		
3040.2[c] *10*	33/2$^+$		
3055.9?[f] *11*	31/2$^+$		
3129.3[g] *11*	35/2$^-$		
3190.1?[d] *12*			
3346.1[b] *10*	35/2$^-$[#]		J$^\pi$: 33/2$^-$ in 1989Jo02, 35/2$^-$ in 1989Bo10.
3353.4 *12*	35/2$^-$		
3482.4[g] *11*	37/2$^-$		
3484.1[c] *11*	37/2$^+$		
3503.7[&] *11*	37/2$^-$		
3761.9[g] *11*	39/2$^-$		
3809.9[f] *12*	35/2$^+$		
3977.3[b] *11*	39/2$^-$		
3994.4[c] *12*	41/2$^+$		
4015.3 *11*	39/2$^-$		
4225.5[g] *11*	41/2$^-$		
4263.8[&] *12*	41/2$^-$		

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^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02 (continued)

^{187}Au Levels (continued)

E(level)[†]	J$^\pi$[‡]	Comments
4316.9 *13*		
4506.6[g] *12*	43/2$^-$	
4550.2 *12*	43/2$^-$	
4576.0[f] *13*	39/2$^+$	
4593.6[c] *13*	45/2$^+$	
4650.1 *13*	39/2$^+$	
4657.0 *12*	43/2$^-$	
4690.3[b] *12*	(43/2$^-$)	
4787.2[f] *13*	43/2$^+$	
4850.9 *12*	47/2$^-$	
5041.3[&] *13*	(45/2$^-$)	
5127.5 *12*	47/2$^-$	
5253.0 *14*		
5281.7[c] *14*	49/2$^+$	
5351.6[g] *13*	(47/2)	
5374.3[f] *14*	47/2$^+$	
5519.1 *13*	51/2$^-$	
5745.9 *13*		
5781.3[f] *15*	(49/2$^+$)	
5814.3 *15*		
5868.5 *13*		
5979.3 *15*		
6054.7[c] *15*	(53/2$^+$)	
6128.3 *14*	53/2,55/2$^-$[#]	J$^\pi$: (55/2$^-$) in 1989Jo02, 53/2 in 1989Bo10.
6249.1 *14*		
6399.1[f] *16*	(51/2$^+$)[#]	J$^\pi$: from 1989Jo02. (53/2) in 1989Bo10. 617.6γ to 49/2$^+$ state is consistent with the A$_2$=−0.15 *9* (1989Jo02).
6504.5 *14*		
6593.3 *15*		
6914.7[c] *16*	(57/2$^+$)	
7218.9[f] *17*	(57/2)[#]	J$^\pi$: (53/2$^+$) in 1989Jo02.

[†] From a least-squares adjustment to the γ energies assuming ΔE=0.5 keV for all γ-ray energies. Bands 1, 2, 3, 4, and 5 represent collective behavior and Bands 6, 7, 8, and 9 are the part of the systems of levels with non-collective behavior.
[‡] From the $\gamma(\theta)$ measurements and rotational band structure.
[#] Assignment differs between 1989Bo10 and 1989Jo02.
[@] From $\gamma\gamma$(t) (1989Jo02).
[&] Band 1: configuration=π h$_{9/2}$ α=+1/2 *1*/2$^-$[541].
[a] Band 2: configuration=π h$_{9/2}$ α=−1/2 *1*/2$^-$[541].
[b] Band 3: configuration=π f$_{7/2}$.
[c] Band 4: configuration=π i$_{13/2}$ 1/2$^+$[660].
[d] Band 5.
[e] Band 6: configuration=π h$_{11/2}$.
[f] Band 7.
[g] Band 8: Isomeric band.
[h] Band 9.

^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02 (continued)

$\gamma(^{187}Au)$

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	Comments
89.0[‡]	2[‡]	1405.5	19/2$^-$	1316.8	19/2$^-$		E_γ: expected but not observed by 1989Jo02 and uncertainly placed from 2669.8-keV level (J^π=31/2$^-$).
103.9	2	224.9	11/2$^-$	121	9/2$^-$		E_γ: reported only in 1989Jo02.
133.7[‡]	9[‡]	2564.5?	27/2$^+$	2431.2	25/2$^+$	D+Q	A_2=−0.12 *4*, A_4=+0.01 *5* (1989Jo02); R_{DCO}=0.5 *2* (1989Bo10). Placement is shown from 35/2$^+$ state at 3810.9 keV in 1989Jo02.
137.6[‡]	[‡]	4787.2	43/2$^+$	4650.1	39/2$^+$		
143		497.1	11/2$^-$	354.2	13/2$^-$		
148		1381.1	17/2$^+$	1233.0	19/2$^-$		
149.6[b‡]	17[b‡]	2431.2	25/2$^+$	2281.6	23/2$^+$	(M1+E2)[&]	A_2=−0.14(2), A_4=−0.03 *2* for doublet (1989Jo02); R_{DCO}=0.6 *2* (1989Bo10).
150[b]	17[b]	2581.0	(25/2$^-$)	2431.2	25/2$^+$		A_2=−0.14(2), A_4=−0.03 *2* for doublet (1989Jo02). E_γ: Placement only in 1989Jo02.
162.7[‡]	14[‡]	3129.3	35/2$^-$	2966.5	33/2$^-$	D+Q	A_2=−0.33 *3*, A_4=+0.09 *4* (1989Jo02); R_{DCO}=0.5 *1* (1989Bo10).
166.7[‡]	19[‡]	2281.6	23/2$^+$	2114.9	21/2$^+$	(M1+E2)[&]	A_2=−0.14 *2*, A_4=+0.02 *2* (1989Jo02); R_{DCO}=0.6 *2* (1989Bo10).
194.1[‡]	7[‡]	4850.9	47/2$^-$	4657.0	43/2$^-$		
211.6[‡]	15[‡]	4787.2	43/2$^+$	4576.0	39/2$^+$	Q	A_2=+0.38 *4*, A_4=−0.08 *5* (1989Jo02).
220		239.7	5/2$^+$	19.47	3/2$^+$		
229		2281.6	23/2$^+$	2052.8	21/2		
233.4[‡]	100[‡]	354.2	13/2$^-$	121	9/2$^-$	Q[&]	A_2=+0.27 *1*, A_4=−0.09 *1* (1989Jo02).
240		239.7	5/2$^+$	0.0	1/2$^+$		
259.4[‡]	4[‡]	1381.1	17/2$^+$	1122.0	13/2$^+$		A_2=+0.07 *4*, A_4=−0.08 *5* (1989Jo02).
270		2551.6		2281.6	23/2$^+$		
271		444.0	(7/2$^-$,9/2$^-$)	173	5/2$^-$		
279.7[‡]	23[‡]	3761.9	39/2$^-$	3482.4	37/2$^-$	(M1+E2)	A_2=−0.14 *2*, A_4=+0.07 *2* (1989Jo02); R_{DCO}=0.7 *1* and linear polarization=−0.19 *7* (1989Bo10).
281.0[‡]	3[‡]	4506.6	43/2$^-$	4225.5	41/2$^-$	D+Q	A_2=−0.12 *2*, A_4=+0.09 *2* (1989Jo02).
297.1[‡]	43[‡]	2966.5	33/2$^-$	2669.8	31/2$^-$	(M1+E2)	A_2=−0.03 *1*, A_4=+0.09 *1* (1989Jo02); R_{DCO}=0.5 *1* and Linear polarization=−0.35 *10* (1989Bo10).
298		742.1	(11/2$^-$,13/2$^-$)	444.0	(7/2$^-$,9/2$^-$)		
316.4[‡]	29[‡]	1697.5	21/2$^+$	1381.1	17/2$^+$	Q	A_2=+0.28 *1*, A_4=−0.10 *2* (1989Jo02).
319.2[‡]	7[‡]	816.1	15/2$^-$	497.1	11/2$^-$	Q[&]	A_2=+0.39 *3*, A_4=−0.12 *3* (1989Jo02).
323		444.0	(7/2$^-$,9/2$^-$)	121	9/2$^-$		
325		4550.2	43/2$^-$	4225.5	41/2$^-$		R_{DCO}=0.5 *2* (1989Bo10).
334.7[‡]	93[‡]	688.8	17/2$^-$	354.2	13/2$^-$	Q[&]	A_2=+0.28 *1*, A_4=−0.09 *1* (1989Jo02).
344.5[‡]	8[‡]	4850.9	47/2$^-$	4506.6	43/2$^-$	Q	A_2=+0.19 *6*, A_4=−0.06 *8* (1989Jo02).
353.4[‡]	33[‡]	3482.4	37/2$^-$	3129.3	35/2$^-$	(M1+E2)	A_2=−0.15 *2*, A_4=+0.08 *2* (1989Jo02); R_{DCO}=0.3 *1* and linear polarization=−0.07 *2* (1989Bo10).
358		2097.8	25/2$^+$	1739.9	23/2$^-$		
376.4[‡]	11[‡]	497.1	11/2$^-$	121	9/2$^-$	(M1+E2)[&]	A_2=−0.81 *2*, A_4=+0.19 *2* (1989Jo02); R_{DCO}=0.3 *1* and linear polarization=−0.10 *5* (1989Bo10).

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^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02 (continued)

$\gamma(^{187}Au)$ (continued)

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ	Comments
384.7[‡]	5[‡]	2581.0	(25/2$^-$)	2196.5	23/2$^-$			R_{DCO}=0.7 *3* (1989Bo10).
387		3353.4	35/2$^-$	2966.5	33/2$^-$			
388		742.1	(11/2$^-$,13/2$^-$)	354.2	13/2$^-$			
400.4[‡]	27[‡]	2097.8	25/2$^+$	1697.5	21/2$^+$	Q		A_2=+0.30 *1*, A_4=−0.10 *2* (1989Jo02).
407.0[‡]	6[‡]	5781.3	(49/2$^+$)	5374.3	47/2$^+$			A_2=−0.00 *14*, A_4=−0.43 *7* (1989Jo02); R_{DCO}=0.6 *2* (1989Bo10).
413.8[‡]	81[‡]	1102.7	21/2$^-$	688.8	17/2$^-$	Q[&]		A_2=+0.26 *1*, A_4=−0.07 *1* (1989Jo02).
416.8[‡]	10[‡]	1233.0	19/2$^-$	816.1	15/2$^-$			A_2=+0.12 *3*, A_4=−0.04 *3* (1989Jo02).
425[a]		1167.1	(15/2$^-$,17/2$^-$)	742.1	(11/2$^-$,13/2$^-$)			
425[a]		2672.1?		2247.1	(23/2$^-$,25/2$^-$)			
431.6[‡]	2[‡]	4657.0	43/2$^-$	4225.5	41/2$^-$			A_2=−0.05 *12*, A_4=+0.45 *15* (1989Jo02).
438		1147.7	13/2$^+$	709.7	9/2$^+$			
440		5814.3		5374.3	47/2$^+$			
443.8[‡]	19[‡]	3484.1	37/2$^+$	3040.2	33/2$^+$	Q		A_2=+0.38 *3*, A_4=−0.16 *4* (1989Jo02).
449.5[‡]	64[‡]	674.0	15/2$^-$	224.9	11/2$^-$	Q[&]		A_2=+0.25 *1*, A_4=−0.11 *1* (1989Jo02).
455		1602.7	17/2$^+$	1147.7	13/2$^+$			
459.4[‡]	20[‡]	3129.3	35/2$^-$	2669.8	31/2$^-$	Q		A_2=+0.31 *3*, A_4=−0.16 *3* (1989Jo02).
462.1[‡]	[‡]	816.1	15/2$^-$	354.2	13/2$^-$			R_{DCO}=0.20 *5* (1989Bo10).
463.6[‡]	7[‡]	4225.5	41/2$^-$	3761.9	39/2$^-$	(M1+E2)		R_{DCO}=0.3 *1* and linear polarization=−0.25 *10* (1989Bo10).
464.5[‡]	14[‡]	1697.5	21/2$^+$	1233.0	19/2$^-$			R_{DCO}=0.6 *2* (1989Bo10).
465[a]		6593.3		6128.3	53/2,55/2$^-$			
466		5253.0		4787.2	43/2$^+$			
470		709.7	9/2$^+$	239.7	5/2$^+$			
470.9[b‡]	48[b‡]	2568.8	29/2$^+$	2097.8	25/2$^+$	(Q)		A_2=+0.32 *2*, A_4=−0.10 *2* for doublet (1989Jo02).
470.9[b‡]	48[b‡]	3040.2	33/2$^+$	2568.8	29/2$^+$	(Q)		
474		2670.5	(25/2)	2196.5	23/2$^-$			R_{DCO}=0.6 *4* (1989Bo10).
491.6[‡]	71[‡]	1594.0	25/2$^-$	1102.7	21/2$^-$	(E2)[&]		A_2=+0.31 *1*, A_4=−0.15 *1* (1989Jo02).
491.8[‡]	55[‡]	3055.9?	31/2$^+$	2564.5?	27/2$^+$			E_γ: Placement is from (29/2$^+$) state at 2923 keV in 1989Jo02 but the state is not reported in 1989Bo10.
500.0[‡]	7[‡]	2792.9	29/2$^-$,31/2$^-$	2292.9	27/2$^-$			A_2=−0.23 *4*, A_4=−0.05 *5* (1989Jo02).
507.0[‡]	8[‡]	1739.9	23/2$^-$	1233.0	19/2$^-$			
507		4316.9		3809.9	35/2$^+$			
508.8[‡]	48[‡]	2669.8	31/2$^-$	2160.9	29/2$^-$	(M1+E2)[&]	1.1	A_2=−0.15 *1*, A_4=+0.04 *2* (1989Jo02); R_{DCO}=0.4 *1* (1989Bo10). δ: From 55% E2 as mentioned in 1989Bo10 referring 1987ViZY.
510.6[‡]	16[‡]	3994.4	41/2$^+$	3484.1	37/2$^+$			
516.0[‡]	5[‡]	3482.4	37/2$^-$	2966.5	33/2$^-$			
518[a]		1685.1	(19/2$^-$,21/2$^-$)	1167.1	(15/2$^-$,17/2$^-$)			
518[a]		3190.1?		2672.1?				
525.5[‡]	[‡]	1199.3	17/2$^-$	674.0	15/2$^-$			A_2=+0.22 *6*, A_4=+0.05 *7* (1989Jo02). Placement is from (13/2$^-$) state at 749.9 keV in 1989Jo02, but the level is not reported in 1989Bo10. 525.5.
533		4015.3	39/2$^-$	3482.4	37/2$^-$			
544.5[‡]	5[‡]	1233.0	19/2$^-$	688.8	17/2$^-$	(M1+E2)		A_2=−1.10 *7*, A_4=+0.19 *8* (1989Jo02);

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^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02 (continued)

$\gamma(^{187}Au)$ (continued)

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	Comments
							R_{DCO}=0.2 *1* and linear polarization=−0.2 *1* (1989Bo10).
553.1[b‡]	14[b‡]	2292.9	27/2$^-$	1739.9	23/2$^-$		A_2=+0.05 *4*, A_4=−0.02 *5* for doublet (1989Jo02).
553.1[b‡]	14[b‡]	3346.1	35/2$^-$	2792.9	29/2$^-$,31/2$^-$		A_2=+0.05 *4*, A_4=−0.02 *5* for doublet (1989Jo02).
562		2247.1	(23/2$^-$,25/2$^-$)	1685.1	(19/2$^-$,21/2$^-$)		
565.2‡	13‡	1381.1	17/2$^+$	816.1	15/2$^-$	(E1)[&]	A_2=−0.40 *2*, A_4=+0.18 *3* (1989Jo02); R_{DCO}=0.6 *2* and linear polarization=0.4 *2* (1989Bo10).
566.8‡	64‡	2160.9	29/2$^-$	1594.0	25/2$^-$	(E2)[&]	A_2=+0.30 *1*, A_4=−0.10 *1* (1989Jo02).
567		1766.3		1199.3	17/2$^-$		
577.4‡	5‡	5127.5	47/2$^-$	4550.2	43/2$^-$		A_2=+0.08 *12*, A_4=+0.03 *15* (1989Jo02). E_γ: Placement is from (49/2$^-$) state at 5428.5 keV in 1989Jo02 but the state is not reported in 1989Bo10.
587.2‡	16‡	5374.3	47/2$^+$	4787.2	43/2$^+$	Q	A_2=+0.36 *6*, A_4=−0.22 *7* (1989Jo02).
599.5‡	10‡	4593.6	45/2$^+$	3994.4	41/2$^+$		
602		2007.6	23/2$^-$	1405.5	19/2$^-$		
605		5979.3		5374.3	47/2$^+$		
609.4‡	5‡	6128.3	53/2,55/2$^-$	5519.1	51/2$^-$		A_2=+0.13 *9*, A_4=+0.49 *12* (1989Jo02); R_{DCO}=0.4 *2* (1989Bo10).
615		2354.9	27/2$^-$	1739.9	23/2$^-$		
617.6‡	5‡	6399.1	(51/2$^+$)	5781.3	(49/2$^+$)		A_2=−0.15 *9*, A_4=−0.33 *11* (1989Jo02).
621		5127.5	47/2$^-$	4506.6	43/2$^-$		
624.9‡	5‡	1122.0	13/2$^+$	497.1	11/2$^-$	[&]	A_2=−0.25 *6*, A_4=−0.04 *7* (1989Jo02).
631.5‡	‡	3977.3	39/2$^-$	3346.1	35/2$^-$		E_γ: Uncertain placement from (31/2$^-$) state at 2924.6 keV in 1989Jo02, and the state is not reported in 1989Bo10.
632.9‡	10‡	3761.9	39/2$^-$	3129.3	35/2$^-$		A_2=+0.56 *12*, A_4=−0.09 *14* (1989Jo02).
636		6504.5		5868.5			
637‡	‡	1739.9	23/2$^-$	1102.7	21/2$^-$		
638.1‡	18‡	2798.9	33/2$^-$	2160.9	29/2$^-$	Q	A_2=+0.27 *4*, A_4=−0.07 *5* (1989Jo02).
642		4657.0	43/2$^-$	4015.3	39/2$^-$		
642.9‡	8‡	1316.8	19/2$^-$	674.0	15/2$^-$	[&]	A_2=+0.26 *3*, A_4=+0.02 *4* (1989Jo02).
659		3013.9	(31/2$^-$)	2354.9	27/2$^-$		
662		4015.3	39/2$^-$	3353.4	35/2$^-$		
668.4‡	16‡	5519.1	51/2$^-$	4850.9	47/2$^-$	Q	A_2=+0.48 *7*, A_4=−0.32 *9* (1989Jo02).
688.3‡	4‡	5281.7	49/2$^+$	4593.6	45/2$^+$		
691		2007.6	23/2$^-$	1316.8	19/2$^-$		
692.2‡	2‡	1381.1	17/2$^+$	688.8	17/2$^-$		R_{DCO}=0.9 *1* (1989Bo10).
[x]696.0	3					D+Q	A_2=−0.18 *30*, A_4=+0.59 *42* (1989Jo02). Placement is shown along with the 788.1γ from (53/2$^-$) state at 6216.3 keV in 1989Jo02, but the γ-ray and the state are not reported in 1989Bo10.
699		2114.9	21/2$^+$	1415.8	(17/2$^-$,19/2,21/2$^+$)		
699.1‡	7‡	2292.9	27/2$^-$	1594.0	25/2$^-$	(M1+E2)	A_2=−0.94 *11*, A_4=+0.50 *13* (1989Jo02); R_{DCO}=0.3 *1* and linear polarization=−0.5 *3* (1989Bo10).
704.7‡	11‡	3503.7	37/2$^-$	2798.9	33/2$^-$	Q	A_2=+0.45 *9*, A_4=−0.48 *11* (1989Jo02).

Continued on next page (footnotes at end of table)

^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02 (continued)

$\gamma(^{187}Au)$ (continued)

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	Comments
709.8[‡]	39[‡]	2114.9	21/2$^+$	1405.5	19/2$^-$	(E1)[&]	A_2=−0.20 *1*, A_4=−0.02 *2* (1989Jo02); R_{DCO}=0.7 *2* and linear polarization=0.4 *2* (1989Bo10).
713		4690.3	(43/2$^-$)	3977.3	39/2$^-$		
727		1415.8	(17/2$^-$,19/2,21/2$^+$)	688.8	17/2$^-$		
730		6249.1		5519.1	51/2$^-$		E_γ: Placement from (59/2$^-$) state at 6859.5 keV in 1989Jo02 but the state is not reported in 1989Bo10.
731.5[‡]	19[‡]	1405.5	19/2$^-$	674.0	15/2$^-$	(E2)[&]	A_2=+0.31 *1*, A_4=−0.13 *1* (1989Jo02).
736.4[‡]	5[‡]	2052.8	21/2	1316.8	19/2$^-$		A_2=−0.41 *8*, A_4=−0.05 *10* (1989Jo02); R_{DCO}=0.5 *2* (1989Bo10).
741		5868.5		5127.5	47/2$^-$		
743.2[‡]	[‡]	4225.5	41/2$^-$	3482.4	37/2$^-$		
744.6[‡]	17[‡]	4506.6	43/2$^-$	3761.9	39/2$^-$		
754.1[‡]	51[‡]	3809.9	35/2$^+$	3055.9?	31/2$^+$	Q	A_2=+0.20 *1*, A_4=−0.11 *2* (1989Jo02). E_γ: Placement is from (33/2$^+$) state at 3677.2 keV in 1989Jo02 but the state is not reported in 1989Bo10.
760.3[‡]	5[‡]	4263.8	41/2$^-$	3503.7	37/2$^-$		
766.4[‡]	28[‡]	4576.0	39/2$^+$	3809.9	35/2$^+$		A_2=+0.60 *3*, A_4=−0.24 *4* (1989Jo02).
773		6054.7	(53/2$^+$)	5281.7	49/2$^+$		
777.5	2	5041.3	(45/2$^-$)	4263.8	41/2$^-$		E_γ: Average of 1989Bo10 and 1989Jo02.
788.1[‡]	5[‡]	4550.2	43/2$^-$	3761.9	39/2$^-$		A_2=+0.32 *17*, A_4=−1.40 *25* (1989Jo02). E_γ: This γ-ray is placed from (53/2$^-$) state at 6216.3 keV in 1989Jo02 but the state is not reported in 1989Bo10.
790.6[‡]	5[‡]	2196.5	23/2$^-$	1405.5	19/2$^-$	(E2)[&]	A_2=+0.34 *8*, A_4=−0.09 *11* (1989Jo02).
819.6[‡]	4[‡]	7218.9	(57/2)	6399.1	(51/2$^+$)		
840.3[‡]	14[‡]	4650.1	39/2$^+$	3809.9	35/2$^+$		A_2=+0.06 *7*, A_4=−0.09 *9* (1989Jo02).
845		5351.6	(47/2)	4506.6	43/2$^-$		
860		6914.7	(57/2$^+$)	6054.7	(53/2$^+$)		
[x]881[c]	3						Placement is shown from (57/2$^-$) state at 7097.3 keV in 1989Jo02, but the γ-ray and the state are not reported in 1989Bo10.
886		4015.3	39/2$^-$	3129.3	35/2$^-$		
895		5745.9		4850.9	47/2$^-$		
895.1[‡]	7[‡]	4657.0	43/2$^-$	3761.9	39/2$^-$	Q	A_2=+0.37 *8*, A_4=−0.21 *10* (1989Jo02).

[†] From 1989Bo10, except otherwise noted.
[‡] From 1989Jo02. Eγ and placement also reported in 1989Bo10.
[#] From 1989Jo02, relative uncertainty reported as 5% for intense transitions, normalized to 233.4γ.
[@] From 1989Jo02 on the basis of $\gamma(\theta)$, θ=90°, 60°, 45°, 30°, and −10°.
[&] Multipolarity confirmed by ce measurements of 1987ViZY, ce data are not quoted.
[a] Multiply placed.
[b] Multiply placed with undivided intensity.
[c] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02

Level Scheme

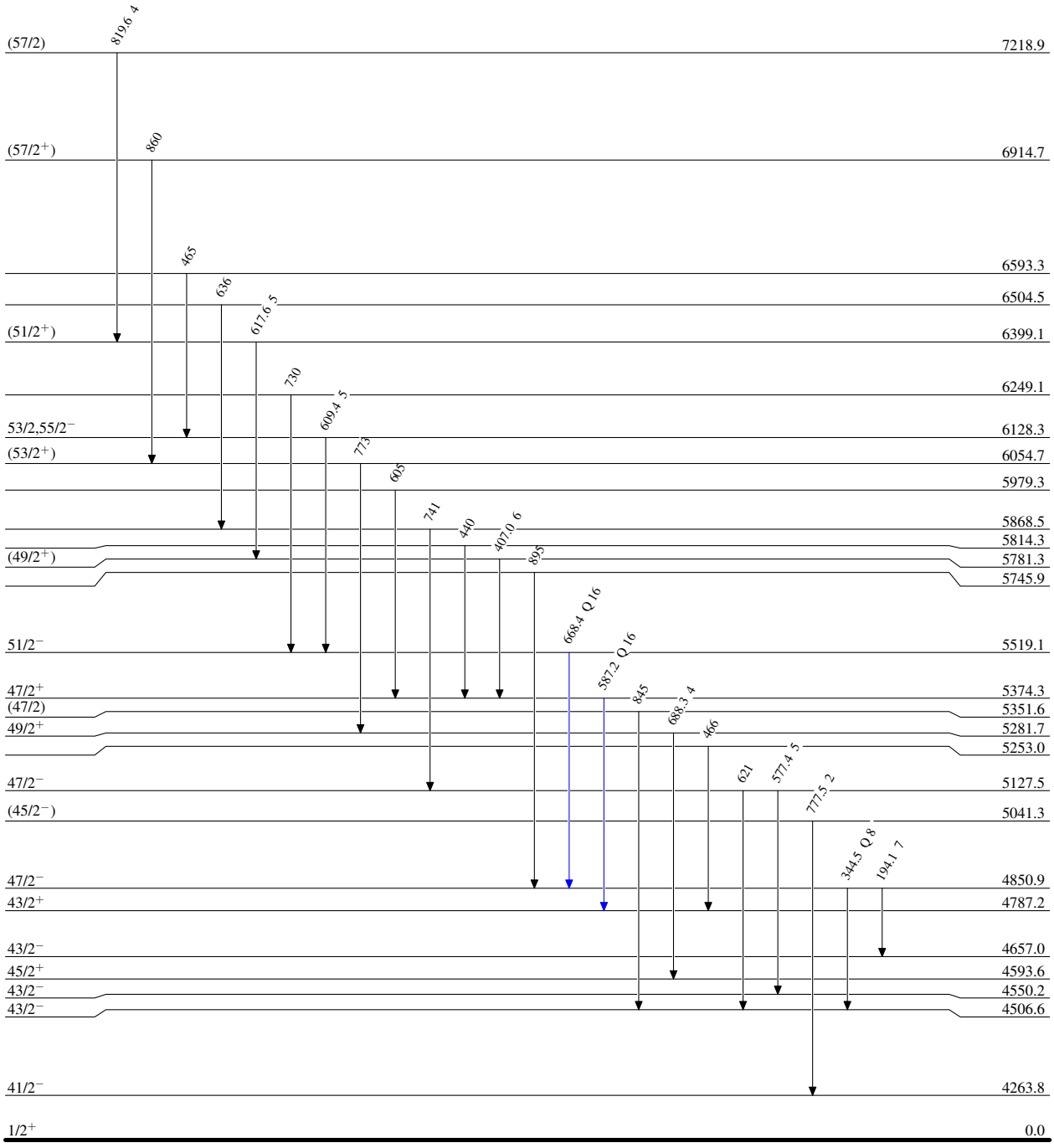
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



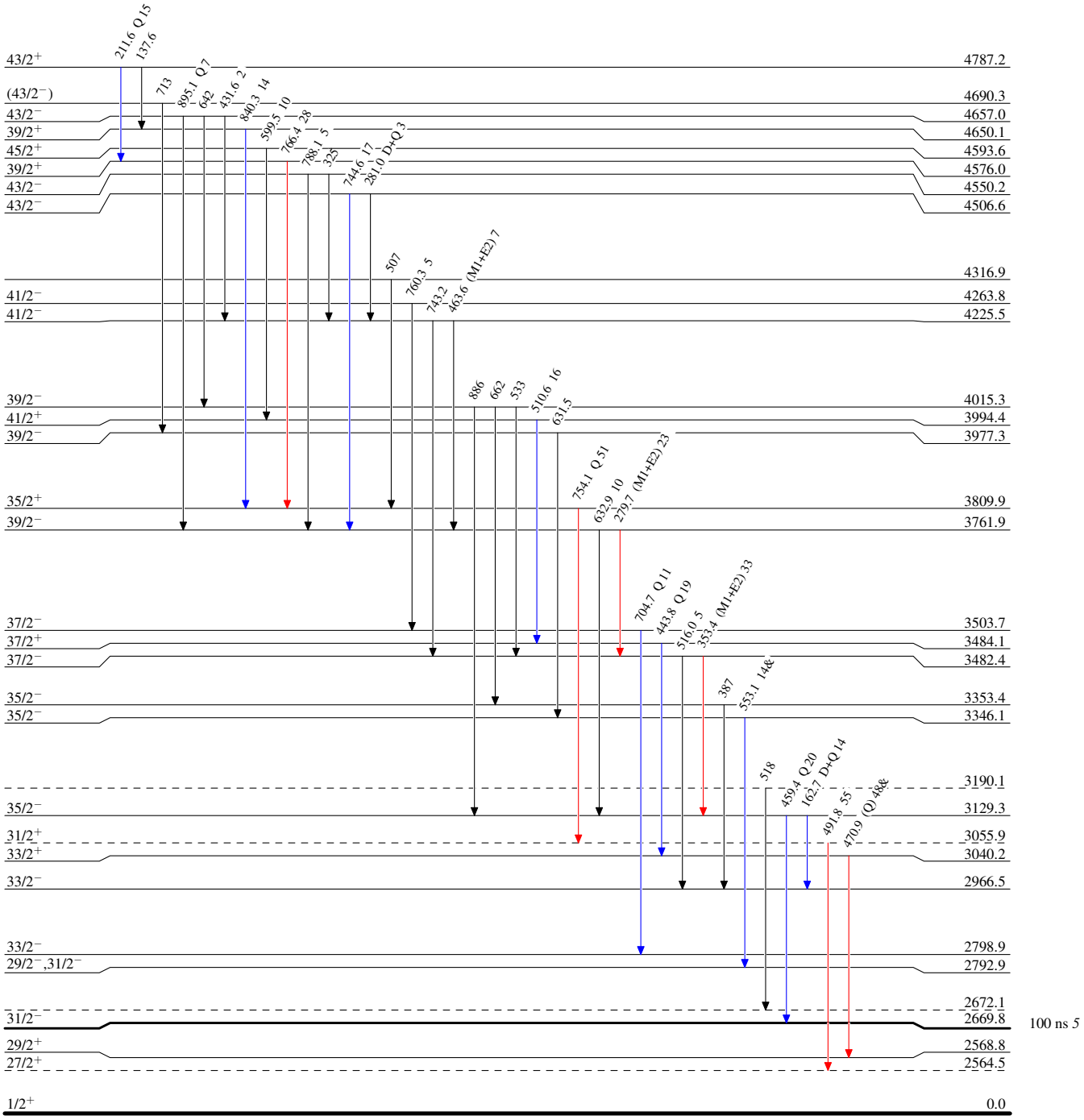
$^{187}_{79}Au_{108}$

^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



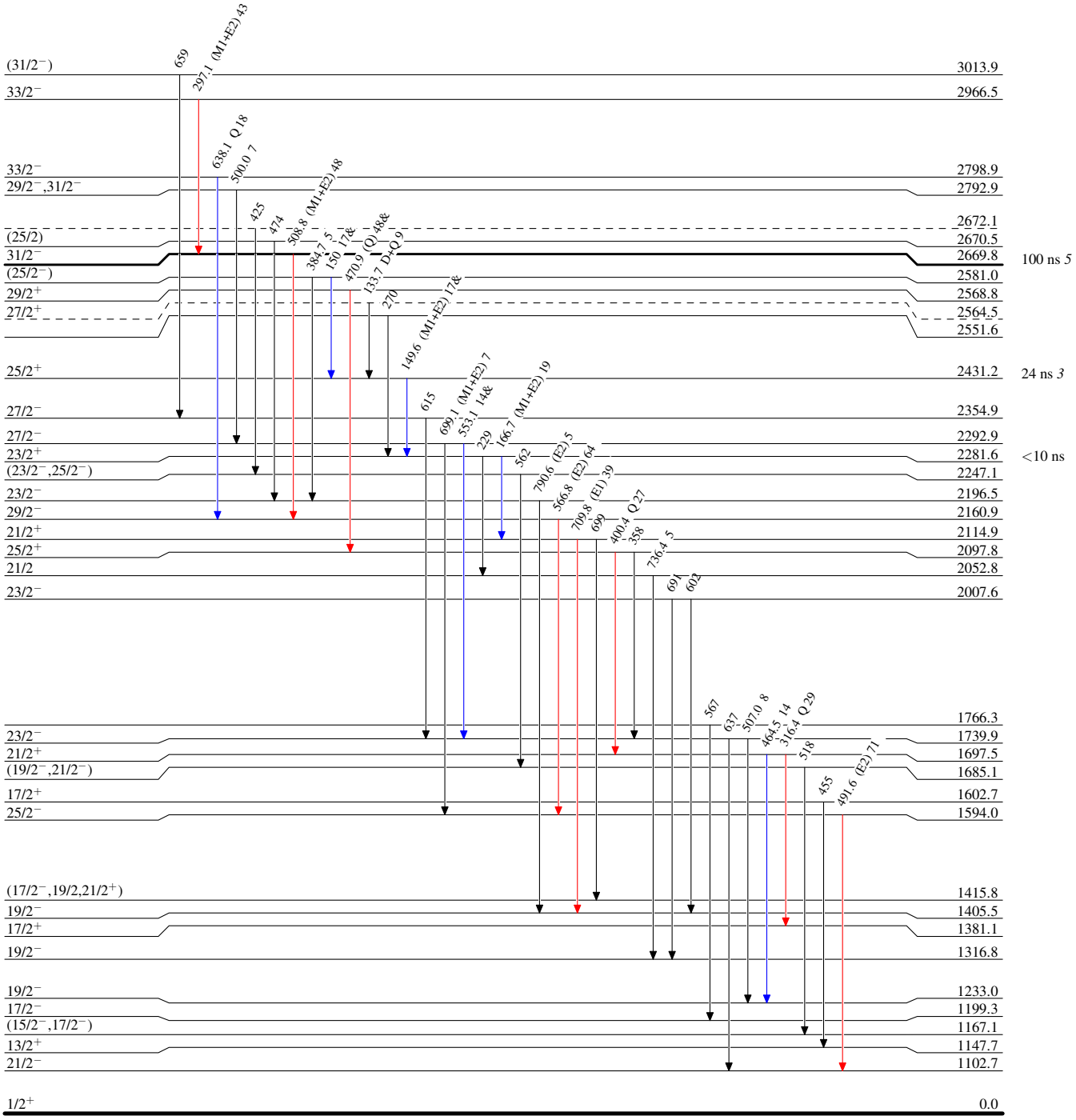
$^{187}_{79}Au_{108}$

^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



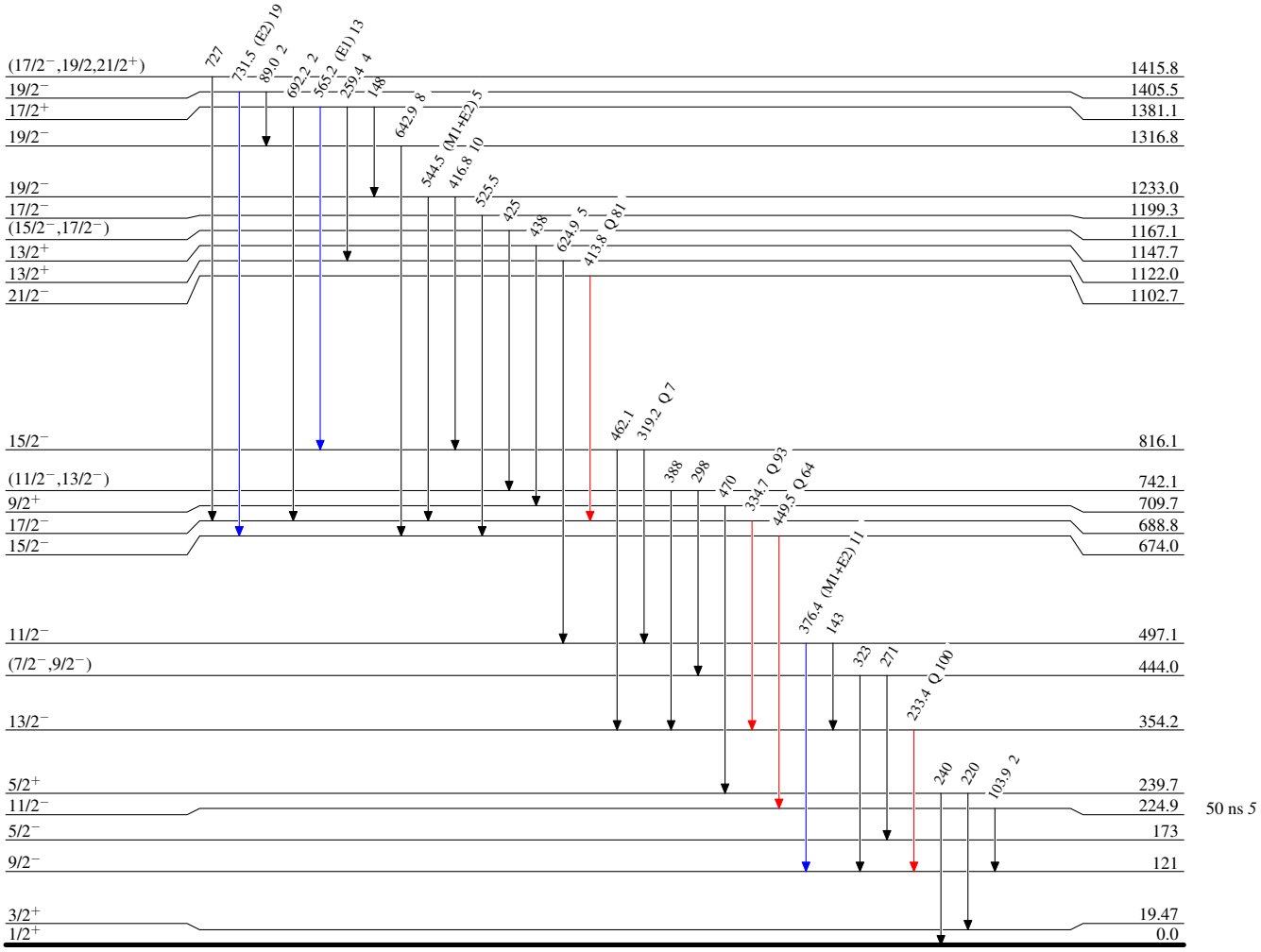
$^{187}_{79}Au_{108}$

^{172}Yb(^{19}F,4nγ) 1989Bo10,1989Jo02

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



$^{187}_{79}Au_{108}$