Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, [1] and Jun Chen[2]	NDS 169, 1 (2020)	15-Oct-2020

Q(β^-)=−4473 *4*; S(n)=8908 *10*; S(p)=6146 *13*; Q(α)=3268.6 *6* 2017Wa10
S(2n)=15628 *5*, S(2p)=10747.2 *6* (2017Wa10).
Hyperfine structure and isotope-shift measurements: 1992Ki30, 1992Hi07 (also 1990Hi08), 1988Bo31, 1987Ne09, 1988Le22.
Mass measurement: 2016Ei01: using LEBIT Penning trap mass spectrometer at NSCL-MSU.
Mass excess from ^{190}Pt(p,d) reaction: 1980Ka19.
Additional information 1.
Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for about 150 primary references dealing with nuclear structure and other calculations.

^{190}Pt Levels

Band assignments and configurations are from 2014Li21 (also 2008Ma58) in ^{176}Yb(^{18}O,4nγ).
Additional information 2.

Cross Reference (XREF) Flags

A	^{190}Au ε decay (42.8 min)	E	Coulomb excitation
B	^{176}Yb(^{18}O,4nγ)	F	^{191}Ir(p,2nγ)
C	^{188}Os(α,2nγ)	G	^{192}Pt(p,t)
D	^{190}Os(α,4nγ)		

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	XREF	Comments
0.0[&]	0$^+$	4.97×10^{11}[#@] y *16*	ABCDEFG	%α=100 %εβ$^+$=?. Double-beta decay mode is allowed, but only the lower limits of the half-life of this decay mode have been measured. Evaluated rms charge radius=5.4108 fm *30* (2013An02). Evaluated δ<r^2>(^{194}Pt,^{190}Pt)=−0.137 fm^2 *2* (2013An02). Δ<r^2>(^{194}Pt−^{190}Pt)=−0.132 fm^2 *8* (1992Hi07). See also 1992Ki30 for Δ<r^2> measurement.
295.78[&] *3*	2$^+$	62.3 ps *31*	ABCDEFG	μ=+0.57 *3* (1995An15,2014StZZ) J$^\pi$: E2 γ to 0$^+$. T$_{1/2}$: from B(E2)=1.82 *9*, weighted average of 1.82 *9* (1995An15, Coul. ex.); 2.5 *+13−6* (1972Fi12, from (ce)γ(t) in ε decay); 1.75 *22* (1966Gr20, Coul. ex., uncertainty from 2001Ra27 evaluation). 2016Pr01 evaluation gives B(E2)=1.854 *90*, and corresponding T$_{1/2}$=61.1 ps *+31−28*. μ,B(E2)↑: transient-field method in Coul. ex. (1995An15,1995AnZQ).
597.61[a] *4*	2$^+$		A CD FG	J$^\pi$: E2 γs to 0$^+$ and 2$^+$.
737.02[&] *5*	4$^+$		ABCD F	J$^\pi$: E2, ΔJ=2 γ to 2$^+$; not 0$^+$ from γ(θ).
916.57[a] *5*	3$^+$		A CD F	J$^\pi$: E2+M1 γs to 4$^+$ and 2$^+$.
920.83 *7*	0$^+$		A G	J$^\pi$: E0 transition to 0$^+$.
1128.16[a] *6*	(4$^+$)		A CD FG	XREF: A(?). J$^\pi$: L(p,t)=(4).
1202.62 *10*	2$^+$		A C F	J$^\pi$: E2 γ to 0$^+$.
1287.69[&] *7*	6$^+$		BCD F	J$^\pi$: ΔJ=2, E2 γ to 4$^+$; band member.
1353.33 *7*	3$^-$		A CD FG	J$^\pi$: E1 γs to 2$^+$ and 4$^+$.
1385.88 *14*	(2$^+$,3,4$^+$)		C F	J$^\pi$: γs to 2$^+$ and (4$^+$).
1395.09 *10*	2$^+$		A F	J$^\pi$: E2 γ to 0$^+$.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{190}Pt Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$	XREF	Comments
1449.80[a] *11*	(5$^+$)		CD F	J^{π}: probable band member; γs to 3$^+$ and (4$^+$).
1464.51 *6*	5$^-$		BCD F	J^{π}: E1, ΔJ=1 γ to 4$^+$; γ to 6$^+$.
1543 *5*	(2$^+$)		G	J^{π}: L(p,t)=(2).
1600.67 *21*	(2$^+$)		C F	XREF: C(?). J^{π}: γs to 0$^+$ and 4$^+$.
1601.99 *20*	(2,1)$^+$		A	J^{π}: γ to 0$^+$; M1+E2 γ to 2$^+$. Possible 864.5γ to 4$^+$ disfavors 1$^+$.
1624.85 *17*	(2$^+$,3,4)		C F	XREF: C(?). J^{π}: γs to 4$^+$, 3$^+$, and 3$^-$.
1628.04 *13*	(2$^+$,3,4)		C F	J^{π}: γs to 4$^+$, 3$^+$, and 3$^-$.
1631.09[c] *8*	7$^-$	0.79 ns *5*	BCD F	μ=+4.3 *6* (2006Le06,2014StZZ) J^{π}: E2, ΔJ=2 γ to 5$^-$; ΔJ=1 γ to 6$^+$. Possible configuration=ν3/2[512]⊗ν11/2[615]. $T_{1/2}$: ce(t) for 167γ in (α,4nγ). Weighted average of 0.77 ns *14* (1979Ri08) and 0.80 ns *5* (1978Ti02). Others: γ(t): <1 ns (1976Hj01), ≈1.2 ns (1976Cu02). μ: integral perturbed angular correlation (IPAC) method (2006Le06).
1670 *5*	0$^+$		G	J^{π}: L(p,t)=0.
1732.64[a] *18*	(6$^+$)		C	J^{π}: probable band member.
1736.92 *16*	1$^-$		A F	J^{π}: E1 γ to 0$^+$.
1833.83 *9*	(6$^-$)		CD F	J^{π}: ΔJ=1 γ to 5$^-$.
1842 *5*			G	
1876.77 *13*	1$^-$,2$^-$,3$^-$		A	J^{π}: E1 γ to 2$^+$. 3$^-$ less likely if ε feeding from 1$^-$ is correct.
1915.34[&] *10*	8$^+$		BCD F	J^{π}: E2, ΔJ=2 γ to 6$^+$; band member.
2043.81 *13*	(7,8,9$^-$)		CD F	J^{π}: γ to 7$^-$.
2078.30[d] *12*	8$^-$		BCD F	J^{π}: M1+E2, ΔJ=1 γ to 7$^-$.
2212.8? *4*	(1$^-$)		A	J^{π}: E1 γ to 0$^+$.
2216.0? *3*	(2$^+$,3,4$^+$)		A	J^{π}: M1 γ to 2$^+$.
2222.62[c] *12*	9$^-$		BCD	J^{π}: E2, ΔJ=2 γ to 7$^-$.
2297.45[d] *17*	(10$^-$)	48 ns *5*	BCD	μ=−0.02 *4* (2006Le06,2014StZZ) J^{π}: (E2), ΔJ=(2) γ to 8$^-$; γ to 9$^-$. μ: integral perturbed angular correlation (IPAC) method. Measured value is from 2006Le06. Other measurement: +0.09 *8* in (α,2nγ) (2001Ko41). Configuration=ν9/2[505]ν11/2[615] (2001Ko41) from consistency measured and calculated g factor. $T_{1/2}$: 219γ(t) in (α,2nγ) and (α,4nγ). Weighted average of 48 ns *5* (1976Hj01) and 47 ns *6* (1976Cu02).
2358.2 *3*	(2)$^+$		A	J^{π}: M1 γ to 2$^+$; (E0+E2+M1) γ to 2$^+$.
2382.58 *14*	(1)$^+$		A	J^{π}: M1 γ to 0$^+$.
2408.09? *19*	(1$^-$,2$^-$,3$^-$)		A	J^{π}: (M1,E2) 1054.7γ to 3$^-$; 1205.5γ to 2$^+$.
2497.69? *25*	(2$^+$)		A	J^{π}: (E2) γ to 0$^+$.
2535.28[b] *12*	10$^+$		BCD	J^{π}: ΔJ=2, E2 γ to 8$^+$.
2570.71[d] *23*	(11$^-$)		BCD	J^{π}: ΔJ=1 γ to (10$^-$).
2603.08 *16*	10$^+$		BCD	J^{π}: ΔJ=2 γ to 8$^+$; γ from 12$^+$.
2679.7? *4*	(1$^-$)		A	J^{π}: (E1) γ to 0$^+$.
2683.4 *5*	(10$^-$)		D	J^{π}: ΔJ=(2) γ to 8$^-$.
2701.94 *22*	(10)$^+$		BCD	J^{π}: E2, ΔJ=(2) γ to 8$^+$.
2723.35? *23*	(1$^-$)		A	J^{π}: (1$^-$) from E1 γ to 0$^+$, but γ to 4$^+$ requires E3.
2726.62[b] *14*	12$^+$	1.39 ns *12*	BCD	μ=−2.0 *14* (2006Le06,2014StZZ) J^{π}: E2, ΔJ=2 γ to 10$^+$. $T_{1/2}$: weighted average of 1.27 ns *9* (1978Ti02, ce(t) for 191γ) and 1.52 ns *9* (1979Ri08, ce(t) for 123γ and 191γ) in (α,4nγ). Others: γ(t): <1 ns (1976Hj01), ≈1.5 ns (1976Cu02). μ: integral perturbed angular correlation (IPAC) method (2006Le06).
2760.9[c] *3*	(11$^-$)		BCD	J^{π}: ΔJ=2 γ to 9$^-$.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{190}Pt Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
2796.89? *25*		A	Jπ: (3−) from E1 γ to 2+ and γ to 4+, but (M1) γ to 0+ suggests (1+). Note that all the gamma-ray placements are questionable, thus no Jπ is assigned for the 2797 level.
2820.3? *3*	(11+)	CD	Jπ: ΔJ=1 γ to 10+.
2821.8 *4*	(12−)	D	Jπ: ΔJ=(2) γ to (10−).
2875.14? *24*		A	
2942.7? *5*	(0−,1−,2−)	A	Jπ: M1 γ to (1−).
2980.9 *4*	1−	A	Jπ: E1 γ to 0+.
3013.88 *20*	(2)−	A	Jπ: E1 γs to 2+ and 3+; probable ε feeding from 1−.
3024.6 *6*	(12−)	D	Jπ: ΔJ=1 γ to (11−).
3049.19 *22*	(2)−	A	Jπ: E1 γs to 2+ and 3+; probable ε feeding from 1−.
3067.26 *20*	(1,2)−	A	Jπ: E1 γ to 2+; probable ε feeding from 1−.
3069.19[b] *20*	14+	BCD	Jπ: ΔJ=2, E2 γ to 12+; band member.
3111.7[d] *3*	(13−)	B D	Jπ: ΔJ=2 γ to (11−).
3233.4? *4*	(2−,3−)	A	Jπ: (M1(+E2)) γ to 3−; γ to 2+.
3344.6[c] *3*	(13−)	B D	Jπ: ΔJ=2, E2 γ to (11−); band member.
3414.86[f] *24*	(14+)	B D	Jπ: γs to 12+ and (14+).
3576.5[b] *4*	(16+)	B D	Jπ: ΔJ=2 γ to (14+); probable band member.
3666.1[f] *3*	(16+)	B D	Jπ: ΔJ=2, E2 γ to (14+).
3807.9[f] *4*	(18+)	B D	Jπ: ΔJ=2, (E2) γ to (16+).
3856.0[c] *4*	(15−)	B	Jπ: ΔJ=2 γ to (13−); ΔJ=1 γ to 14+; band member.
4055.5? *6*		B	Jπ: (16) from ΔJ=1 γ to (15−).
4083.2[e] *4*	(17−)	B D	Jπ: ΔJ=2, (E2) γ to (15−); ΔJ=1 γ to (16+); band member.
4133.8[f] *5*	(20+)	B	Jπ: ΔJ=2, (E2) γ to (18+); band member.
4214.6[b] *6*	(18+)	B D	Jπ: ΔJ=2 γ to (16+); band member.
4266.6[e] *5*	(19−)	B	
4612.3 *7*	(21+)	B	Jπ: ΔJ=1 γ to (20+).
4653.5[e] *6*	(21−)	B	
4929.7[f] *7*	(22+)	B	Jπ: ΔJ=2 γ to (20+); band member.
4958.2[b] *8*	(20+)	B	Jπ: ΔJ=2 γ to (18+); band member.
5330.1 *7*	(23+)	B	Jπ: ΔJ=1 γ to (22+).
5391.4?[f] *8*	(24+)	B	Jπ: ΔJ=2 γ to (22+); band member.
5448.0[e] *7*	(23−)	B	Jπ: ΔJ=2 γ to (21−); band member.
5720.4 *8*	(25+)	B	Jπ: ΔJ=2, (E2) γ to (23+).
6006.7?[e] *8*	(24−)	B	Jπ: ΔJ=1 γ to (23−); band member.
6282.2?[f] *8*	(26+)	B	Jπ: ΔJ=2 γ to (24+); band member.
6739.6?[e] *10*	(26−)	B	Jπ: ΔJ=2 γ to (24−); band member.
6790.5?[f] *10*	(28+)	B	Jπ: ΔJ=2 γ to (26+); band member.
7227.3?[e] *11*	(28−)	B	Jπ: ΔJ=2 γ to (26−); band member.
7469.1?[f] *11*	(30+)	B	Jπ: ΔJ=2 γ to (28+); band member.
7534.2?[e] *12*	(30−)	B	Jπ: ΔJ=2 γ to (28−); band member.
7957.1?[e] *13*	(32−)	B	Jπ: ΔJ=2 γ to (30−); band member.
7992.0?[f] *12*	(32+)	B	Jπ: ΔJ=2 γ to (30+); band member.
8130.9?[e] *14*	(33−)	B	Jπ: ΔJ=1 γ to (32−); band member.
8772.3?[e] *15*	(35−)	B	Jπ: ΔJ=2 γ to (33−); band member.

† From least-squares fit to Eγ values.

‡ When deduced from in-beam γ-ray datasets, it is assumed that levels with ascending spins are populated as the excitation energy increases. This is generally supported by systematics of such reactions and by decay modes. It is also assumed that transitions

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{190}Pt Levels (continued)

with quoted mult=D+Q and Q are M1+E2 and E2, respectively. The quoted ΔJ values are interpreted from $\gamma(\theta)$ data.

[#] Measured by 2017Br04 through the detection of the 3183-keV α emitted by ^{190}Pt with a total of 10103 *101* events, after subtraction of 77 background events, resulting in decay rate of 133.1 *13* counts per day from the decay of ^{190}Pt. The quoted uncertainty in half-life includes statistical as well as systematic, the two combined in quadrature. Authors compared their result with previous 13 measurements (eight from direct counting and five from geological methods), compiled and evaluated by 2006Ta01, and concluded that their measured value was in good agreement with an average value of 4.78×10^{11} y *5* from geological methods, but not with averaged 3.9×10^{11} y *2* from direct counting methods, which among themselves suffer from inconsistency. Others: 3.2×10^{11} y *1* (1997Ta33); 6.65×10^{11} y *28* (1987Al28,1986AlZT); 1966Ka23; 5.4×10^{11} y *6* (1963Gr08, 6.8×10^{11} y in 1961Gr37); 6.9×10^{11} y *5* (1961Ma05); 4.7×10^{11} y *17* (1961Pe23); 10×10^{11} y (1954Po24, also 1956Po16,1953Po01); $\approx5\times10^{11}$ y (1921Ho01). Geological measurements of half-life of ^{190}Pt: 8.8×10^{11} y *7* (1991Wa32); 4.49×10^{11} y *4* (1997Wa40; this value revised to 4.69×10^{11} y *4* by 2001Be81); 4.7×10^{11} y *3* (2002Mo47); 4.9×10^{11} y *1* and 4.90×10^{11} y *4* (2004Co30); revised to 5.1×10^{11} y *1* and 5.08×10^{11} y *5*, respectively by 2006Ta01, considering the revised half-life of ^{187}Re. Evaluators obtain a weighted averaged (NRM approach) value of 4.93×10^{11} y *10* from above 11 values listed with uncertainties, but using a minimum uncertainty of 0.1×10^{11}, with reduced χ^2=3.8, somewhat larger than the critical χ^2=1.8, implying that measured half-lives represent a discrepant dataset. See 2006Ta01 (also 2011Ta23) for compilation of experimental and theoretical α-decay half-lives of ^{190}Pt, statistical analysis and theoretical calculations. Partial measured half-lives to excited states of ^{186}Os: 2.6×10^{14} y *+4−3*(stat) *6*(syst) (2011Be08) for the decay to the first 2$^+$ state in ^{186}Os, and >3.6×10^{15} y (90% confidence level) to the first 4$^+$ level in ^{186}Os (2011Be08).

[@] Half-life measurements for double-beta decay: $\geq9.2\times10^{15}$ y (2011Be32) for two-neutrino $\varepsilon\beta^+$ decay mode to the g.s. of ^{190}Os. Also deduced in this work was the lower limit for 0-neutrino $\varepsilon\beta^+$ decay to the ground state of ^{190}Os: $T_{1/2}\geq9.0\times10^{15}$ y, and the lower limit for two-neutrino + 0-neutrino $\varepsilon\beta^+$ decay to the first excited state of ^{190}Os: $T_{1/2}\geq8.4\times10^{15}$ y. A lower limit for the resonant 2ε capture to the 1382.4 keV level of ^{190}Os was also set: $T_{1/2}\geq2.9\times10^{16}$ y, along with limits for double electron capture from various combinations of the K and L shells (see 2011Be32 for details). Others: $T_{1/2}(0\nu\beta\varepsilon)>3.1\times10^{11}$ (1952Fr23,2002Tr04).

[&] Band(A): g.s. band.

[a] Band(B): Possible γ band.

[b] Band(C): 2-qusiparticle band based on 10$^+$. Configuration=$\nu i_{13/2}^{-2}$.

[c] Seq.(E): γ cascade based on 7$^-$. Possible configuration=$\nu i_{13/2}^{-1}\otimes\nu(p_{3/2}^{-1}$ or $f_{5/2}^{-1})$ (2014Li21). Possible Nilsson configuration=ν3/2[512]$\otimes\nu$11/2[615].

[d] Seq.(F): γ cascade based on 8$^-$.

[e] Seq.(G): γ cascade based on 17$^-$. Possible configuration=$\nu i_{13/2}^{-3}\otimes\nu(p_{3/2}^{-1}$ or $f_{5/2}^{-1})$ (2014Li21, assignment based on total Routhian surface calculations).

[f] Band(D): Band based on 14$^+$. Possible configuration=$\nu i_{13/2}^{-2}\otimes\nu h_{9/2}^{-1}\otimes\nu(p_{3/2}^{-1}$ or $f_{5/2}^{-1})$ (2008Ma58, 2014Li21, assignment based on total Routhian surface calculations).

$\gamma(^{190}Pt)$

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ	α#	$I_{(\gamma+ce)}$	Comments
295.78	2^+	295.76 *3*	100	0.0	0^+	E2		0.1027		B(E2)(W.u.)=56.1 *28*
597.61	2^+	301.82 *3*	100.0 *23*	295.78	2^+	E2		0.0967		δ(E2/M1)=+6.8 *+30−12* from $\gamma(\theta)$ in (p,2nγ) (1972YoZZ).
		597.66 *7*	40 *3*	0.0	0^+	E2		0.01624		
737.02	4^+	441.22 *4*	100	295.78	2^+	E2		0.0339		
916.57	3^+	179.6 *3*	2.8 *3*	737.02	4^+	E2+M1	3 *+2−1*	0.60 *8*		δ: from α(K)exp in ε decay.
		318.93 *5*	100 *4*	597.61	2^+	E2+M1	3.1 *+18−7*	0.099 *10*		
		620.77 *7*	56 *4*	295.78	2^+	E2+M1	2.0 *+20−6*	0.030 *12*		δ: from α(K)exp in ε decay.
920.83	0^+	323.17 *7*	34.5 *21*	597.61	2^+	E2		0.0792		
		625.1 *2*	100 *5*	295.78	2^+	E2		0.01467		
		921.05 *14*		0.0	0^+	E0			2.1 *1*	E_γ: from ce data in ε decay. q^2_K(E0/E2)=1.45 *17*, X(E0/E2)=0.0143 *17* (2005Ki02).
1128.16	(4^+)	391.02 *9*	27.9 *22*	737.02	4^+	[M1,E2]		0.098 *52*		
		530.62 *12*	100 *5*	597.61	2^+	(E2)		0.0214		
		832.40 *21*	7.1 *20*	295.78	2^+					
1202.62	2^+	282.3 *8*	51 *4*	920.83	0^+	E2		0.1182 *20*		Eγ and branching ratio data of γ rays from 1203 level are from the ε decay dataset. Additional information 3.
		286.2 *3*	18 *8*	916.57	3^+	E2(+M1)	>5	0.118 *5*		δ: from α(K)exp in ε decay.
		466.0 *3*	32 *2*	737.02	4^+	E2		0.0295		
		604.56 *17*	100 *2*	597.61	2^+	M1(+E2)	<0.4	0.0452 *23*		E_γ: NRM weighted average of 605.21 *12* (ε decay), 604.48 *17* (α,2nγ) and 604.46 *17* (p,2nγ). Weighted average is 604.84 *26* with normalized χ^2=9.5. δ: from α(K)exp and K/(L1+L2) ratio in ε decay.
		906.61 *20*	96 *4*	295.78	2^+	E0+(E2,M1)		0.049 *6*		E_γ: NRM weighted average of 907.30 *9* (ε decay), 906.5 *2* (α,2nγ) and 906.5 *2* (p,2nγ). Weighted average is 907.07 *26* with normalized χ^2=11.4. I_γ: NRM weighted average of 97.2 *24* (ε decay), 46 *12* (α,2nγ) and 89 *11* (p,2nγ). Weighted average is 95 *7* with normalized χ^2=8.9.
		1203.4 *4*	14.2 *14*	0.0	0^+	(E2)				
1287.69	6^+	550.66 *5*	100	737.02	4^+	E2		0.0196		
1353.33	3^-	224.9 *3*	8.2 *9*	1128.16	(4^+)					
		616.20 *9*	43 *3*	737.02	4^+	E1				
		756.4 *2*	4.1 *10*	597.61	2^+	E1				
		1057.42 *10*	100 *6*	295.78	2^+	E1				
1385.88	$(2^+,3,4^+)$	257.6 *4*	6 *3*	1128.16	(4^+)					

$^{190}_{78}Pt_{112}$-5

Adopted Levels, Gammas (continued)

$\gamma(^{190}Pt)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ	α[#]	Comments
1385.88	(2+,3,4+)	469.0 5	100 18	916.57	3+				
		788.30 14	53 12	597.61	2+				
1395.09	2+	192.2 3	3.8 4	1202.62	2+	[M1,E2]		0.73 32	
		478.2 2	16 3	916.57	3+	M1(+E2)	<0.8	0.076 12	δ: from α(K)exp in ε decay.
		657.9 3	5.3 6	737.02	4+	(E2)		0.01309	
		797.5 3	5.0 6	597.61	2+	E0+(E2,M1)		0.28 4	
		1099.5 2	43 6	295.78	2+	E0+(E2,M1)		0.041 6	
		1395.2 3	100 11	0.0	0+	E2			
1449.80	(5+)	321.76 13	22 7	1128.16	(4+)	[M1,E2]		0.166 87	I_γ: from (p,2nγ). Iγ=89 20 in (α,2nγ).
		533.08 15	100 7	916.57	3+				
1464.51	5−	176.8 3	2.4 10	1287.69	6+	[E1]		0.0956	
		336.32 5	18.0 12	1128.16	(4+)	D			
		727.53 6	100 4	737.02	4+	E1			
1600.67	(2+)	863.8 4	16 4	737.02	4+				
		1003.4 5	16 8	597.61	2+				
		1304.8 3	100 16	295.78	2+				
		1599.8 8	8 4	0.0	0+				
1601.99	(2,1)+	206.1 3	12 1	1395.09	2+	[M1,E2]		0.59 27	
		864.5[a] 3	20 2	737.02	4+				Mult.: (E0+E2+M1) from ce data is inconsistent with ΔJ^π.
		1005.4 4	100 19	597.61	2+	M1+E2	0.7 5	0.0104 22	δ: from α(K)exp in ε decay.
		1307.6 5	67 7	295.78	2+	M1			
		1601.5 4	30 4	0.0	0+	(M1,E2)			
1624.85	(2+,3,4)	271.5 2	100 17	1353.33	3−				
		422.5[a] 3		1202.62	2+				γ reported in (α,2nγ) only.
		496.8 4	67 17	1128.16	(4+)				γ reported in (p,2nγ) only.
		708.4 4	83 33	916.57	3+				γ reported in (p,2nγ) only.
		887.5 6	67 33	737.02	4+				γ reported in (p,2nγ) only.
1628.04	(2+,3,4)	274.73 14	50 9	1353.33	3−				
		711.5 3	100 14	916.57	3+				
		890.9 3	23 5	737.02	4+				
1631.09	7−	166.6 1	100 4	1464.51	5−	E2		0.681	B(E2)(W.u.)=36.7 24
		343.35 6	65 3	1287.69	6+	(E1)		0.0190	B(E1)(W.u.)=1.78×10^{-6} 14 I_γ: from (α,4nγ). Iγ=130 13 in (p,2nγ).
1732.64	(6+)	604.48 17	100	1128.16	(4+)				
1736.92	1−	816.1 2	10.4 9	920.83	0+	E1			
		1139.2 3	36.5 13	597.61	2+	E1			
		1441.2 3	100 10	295.78	2+	E1			
1833.83	(6−)	369.32 6	100	1464.51	5−	(M1+E2)	+0.3 1	0.164 7	δ: from $\gamma(\theta)$ data in (α,4nγ).
1876.77	1−,2−,3−	523.28 13	18.8 16	1353.33	3−	E2(+M1)	>1	0.034 12	δ: from α(K)exp in ε decay.
		1279.5 3	100 18	597.61	2+	(E1)			
		1581.5 3	78 6	295.78	2+	E1			
1915.34	8+	627.70 7	100	1287.69	6+	E2		0.01454	
2043.81	(7,8,9−)	412.72 10	100	1631.09	7−				

Adopted Levels, Gammas (continued)

γ(^{190}Pt) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ	α[#]	Comments
2078.30	8⁻	447.21 *9*	100	1631.09	7⁻	M1+E2	+0.56 *16*	0.087 *8*	δ: from γ(θ) data in (α,4nγ).
2212.8?	(1⁻)	2212.8[a] *4*	100	0.0	0⁺	E1			
2216.0?	(2⁺,3,4⁺)	1013.1[@a] *4*	<8.0[@]	1202.62	2⁺				
		1920.4[a] *4*	100 *20*	295.78	2⁺	M1			
2222.62	9⁻	591.43 *10*	100	1631.09	7⁻	E2		0.01663	
2297.45	(10⁻)	75.0 *5*	43 *13*	2222.62	9⁻	[M1]		2.73 *7*	B(M1)(W.u.)=1.6×10⁻⁴ *6*
		219.14 *14*	100 *6*	2078.30	8⁻	(E2)		0.264	B(E2)(W.u.)=0.125 *+50−34*
2358.2	(2)⁺	1760.7 *3*	100 *6*	597.61	2⁺	M1(+E2)	<0.8		δ: from α(K)exp in ε decay.
		2061.1[@] *13*	<30[@]	295.78	2⁺	(E0+E2+M1)		0.0094 *18*	
2382.58	(1)⁺	987.4 *2*	13.1 *7*	1395.09	2⁺	M1(+E2)	<1	0.0115 *20*	δ: from α(K)exp in ε decay.
		1461.6 *4*	11.5 *11*	920.83	0⁺	M1			δ: <1.1 from ce data, but ΔJ^π requires δ=0.
		1784.9 *3*	40.4 *21*	597.61	2⁺	M1			
		2087.3 *4*	22 *4*	295.78	2⁺	M1,E2			
		2382.6 *3*	100 *8*	0.0	0⁺	(M1)			Mult.: ce data give (M1,E2); but ΔJ^π requires M1.
2408.09?	(1⁻,2⁻,3⁻)	1013.1[@a] *4*	<24[@]	1395.09	2⁺	(E1)		0.008 *5*	Mult.: (D,E2) from ce data in ^{190}Au ε decay, but ΔJ^π requires E1.
		1054.7[a] *3*	100 *10*	1353.33	3⁻	(M1,E2)		0.0082 *33*	
		1205.5[a] *4*	82 *8*	1202.62	2⁺				
		1810.7[@a] *5*	<42[@]	597.61	2⁺				
		2111.9[a] *6*	46 *6*	295.78	2⁺				
2497.69?	(2⁺)	1760.7[a] *3*		737.02	4⁺				
		2497.6[a] *4*	100 *13*	0.0	0⁺	(E2)		1.49×10⁻³	
2535.28	10⁺	620.00 *8*	100	1915.34	8⁺	E2		0.01494	
2570.71	(11⁻)	273.27 *16*	100	2297.45	(10⁻)	(M1+E2)	−0.2 *1*	0.384 *13*	δ: from γ(θ) data in (α,4nγ).
2603.08	10⁺	380.0[a] *2*	56 *8*	2222.62	9⁻				γ not reported in (^{18}O,4nγ).
		687.90 *24*	100 *32*	1915.34	8⁺	Q			
2679.7?	(1⁻)	2081.6[a] *5*	76 *8*	597.61	2⁺				
		2680.2[a] *5*	100 *16*	0.0	0⁺	(E1)			
2683.4	(10⁻)	605.1 *4*	100	2078.30	8⁻	(Q)			
2701.94	(10)⁺	786.6 *2*	100	1915.34	8⁺	E2			
2723.35?	(1⁻)	1802.8[a] *3*	100 *12*	920.83	0⁺	E1			
		1985.8[a] *5*	49 *6*	737.02	4⁺	[E3]			
		2125.0[a] *6*	21.2 *15*	597.61	2⁺				
		2428.0[a] *7*	91 *11*	295.78	2⁺				
2726.62	12⁺	123.2 *2*	5.8 *13*	2603.08	10⁺	[E2]		2.11 *4*	B(E2)(W.u.)=8.0 *+32−25*
		191.40 *9*	100 *6*	2535.28	10⁺	E2		0.418	B(E2)(W.u.)=15.3 *14*
2760.9	(11⁻)	538.3 *3*	100	2222.62	9⁻	Q			
2796.89?		1401.9[a] *3*	100 *5*	1395.09	2⁺	E1			
		1880.0[@a] *4*	<120[@]	916.57	3⁺	(M1)			δ(E2/M1)<1 from α(K)exp in ε decay.
		2061.1[@a] *13*	<47[@]	737.02	4⁺				

From ENSDF

$^{190}_{78}Pt_{112}$-7

$\gamma(^{190}Pt)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[#]	Comments
2820.3?	(11^+)	217.2 2	100	2603.08	10^+	(M1+E2)	0.51 24	
2821.8	(12^-)	524.3 3	100	2297.45	(10^-)			
2875.14?		1672.4[a] 3		1202.62	2^+			
		1958.8[a] 5	100 11	916.57	3^+			
		2277.6[@a] 7	<285[@]	597.61	2^+			
		2579.4[a] 8	33 7	295.78	2^+			
2942.7?	$(0^-,1^-,2^-)$	729.88[a] 17	100	2212.8?	(1^-)	M1	0.0292	
2980.9	1^-	2685.1 5	100 11	295.78	2^+	E1		
		2980.9 6	83 16	0.0	0^+	E1		
3013.88	$(2)^-$	1810.7[@] 5	<3.1[@]	1202.62	2^+			
		2097.2 3	46 6	916.57	3^+	E1		
		2277.6[@] 7	<11[@]	737.02	4^+			
		2416.4 3	100 9	597.61	2^+	E1		
3024.6	(12^-)	453.9 5	100	2570.71	(11^-)	D+Q		
3049.19	$(2)^-$	2132.5 3	23 4	916.57	3^+	E1		
		2452.0 5	30 5	597.61	2^+	E1		
		2753.3 4	100 10	295.78	2^+	E1		
3067.26	$(1,2)^-$	1672.4 3	49 7	1395.09	2^+	E1		
		1864.5 4	82 18	1202.62	2^+	(E1)		
		2469.5 4	100 18	597.61	2^+	E1		
		2771.2 5	61 11	295.78	2^+	E1		
3069.19	14^+	342.57 17	100	2726.62	12^+	E2	0.0670	
3111.7	(13^-)	541.0 3	100	2570.71	(11^-)	Q		
3233.4?	$(2^-,3^-)$	1880.0[@a] 4	<92[@]	1353.33	3^-	(M1)	0.0027 3	δ(E2/M1)<1 from α(K)exp in ε decay.
		2636.2[a] 8	100 11	597.61	2^+			
3344.6	(13^-)	583.7 3	100 8	2760.9	(11^-)	E2	0.01715	
		618.1 5		2726.62	12^+			γ only from (^{18}O,4nγ).
3414.86	(14^+)	303.2 4	38 7	3111.7	(13^-)	D		I_γ: from (^{18}O,4nγ) for all γ rays from 3415 level.
		345.7 3	93 11	3069.19	14^+	(M1,E2)	0.137 72	
		688.2[&] 4	100[&] 8	2726.62	12^+	Q		
3576.5	(16^+)	507.3 3	100	3069.19	14^+	Q		
3666.1	(16^+)	251.2 2	100 9	3414.86	(14^+)	E2	0.1698	
		596.8 5		3069.19	14^+			γ only from (^{18}O,4nγ).
3807.9	(18^+)	141.8 2	100	3666.1	(16^+)	(E2)		
3856.0	(15^-)	441.2 5		3414.86	(14^+)			
		511.4 5	100 10	3344.6	(13^-)	Q		
		786.8 5	50 9	3069.19	14^+	D		
4055.5?		199.5 5	100	3856.0	(15^-)	D		
4083.2	(17^-)	(27.7)		4055.5?				
		227.2 5	34 3	3856.0	(15^-)	(E2)		
		417.1 3	100 8	3666.1	(16^+)	D		
		506.6 5		3576.5	(16^+)			

$^{190}_{78}Pt_{112}$-8

Adopted Levels, Gammas (continued)

$\gamma(^{190}Pt)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡
4133.8	(20$^+$)	325.9 *3*	100	3807.9	(18$^+$)	(E2)
4214.6	(18$^+$)	638.1 *4*	100	3576.5	(16$^+$)	Q
4266.6	(19$^-$)	183.4 *3*	100	4083.2	(17$^-$)	(E2)
4612.3	(21$^+$)	478.5 *5*	100	4133.8	(20$^+$)	D
4653.5	(21$^-$)	386.9 *3*	100	4266.6	(19$^-$)	(E2)
4929.7	(22$^+$)	795.9 *5*	100	4133.8	(20$^+$)	Q
4958.2	(20$^+$)	743.6 *5*	100	4214.6	(18$^+$)	Q
5330.1	(23$^+$)	400.4 *5*	100 *11*	4929.7	(22$^+$)	D
		717.8 *5*	≤66	4612.3	(21$^+$)	
5391.4?	(24$^+$)	461.7 *5*	100	4929.7	(22$^+$)	Q
5448.0	(23$^-$)	794.5 *3*	100	4653.5	(21$^-$)	Q
5720.4	(25$^+$)	390.3 *5*	100	5330.1	(23$^+$)	(E2)
6006.7?	(24$^-$)	558.7 *5*	100	5448.0	(23$^-$)	D
6282.2?	(26$^+$)	561.8 *5*		5720.4	(25$^+$)	
		890.8 *5*	100 *9*	5391.4?	(24$^+$)	Q
6739.6?	(26$^-$)	732.9 *5*	100	6006.7?	(24$^-$)	Q
6790.5?	(28$^+$)	508.3 *5*	≤100	6282.2?	(26$^+$)	Q
7227.3?	(28$^-$)	487.7 *5*	100	6739.6?	(26$^-$)	Q
7469.1?	(30$^+$)	678.6 *5*	100	6790.5?	(28$^+$)	Q
7534.2?	(30$^-$)	306.9 *5*	100	7227.3?	(28$^-$)	Q
7957.1?	(32$^-$)	422.9 *5*	100	7534.2?	(30$^-$)	Q
7992.0?	(32$^+$)	522.9 *5*	100	7469.1?	(30$^+$)	Q
8130.9?	(33$^-$)	173.8 *5*	100	7957.1?	(32$^-$)	D
8772.3?	(35$^-$)	641.4 *5*	100	8130.9?	(33$^-$)	Q

† Weighted averages of values from γ-ray datasets, when data are available from more than one dataset. Above 2850 keV, data are mainly available from (^{18}O,4nγ).

‡ From ce data in ^{190}Au ε decay and (α,4nγ); $\gamma(\theta)$ data in (α,4nγ), and $\gamma\gamma(\theta)$(ADO) data in (^{18}O,4nγ). Below 400 keV, ΔJ=2 (stretched) quadrupole transitions are assigned mult=(E2) in preference to M2, as no level lifetimes >10 ns or so are indicated in $\gamma\gamma$-coin data in in-beam γ-ray data.

Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

@ Multiply placed with undivided intensity.

& Multiply placed with intensity suitably divided.

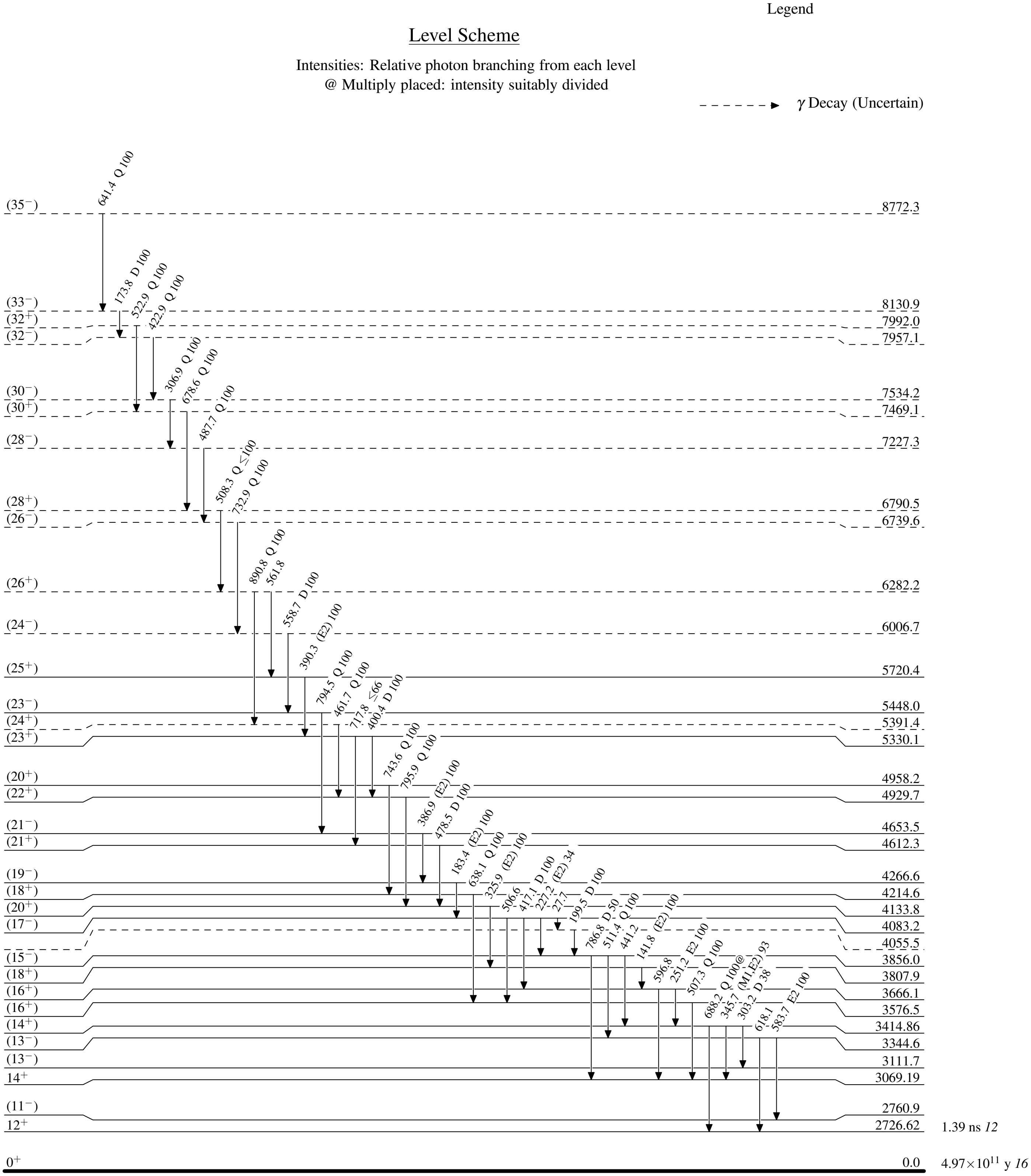
^{a} Placement of transition in the level scheme is uncertain.

$^{190}_{78}Pt_{112}$-9

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



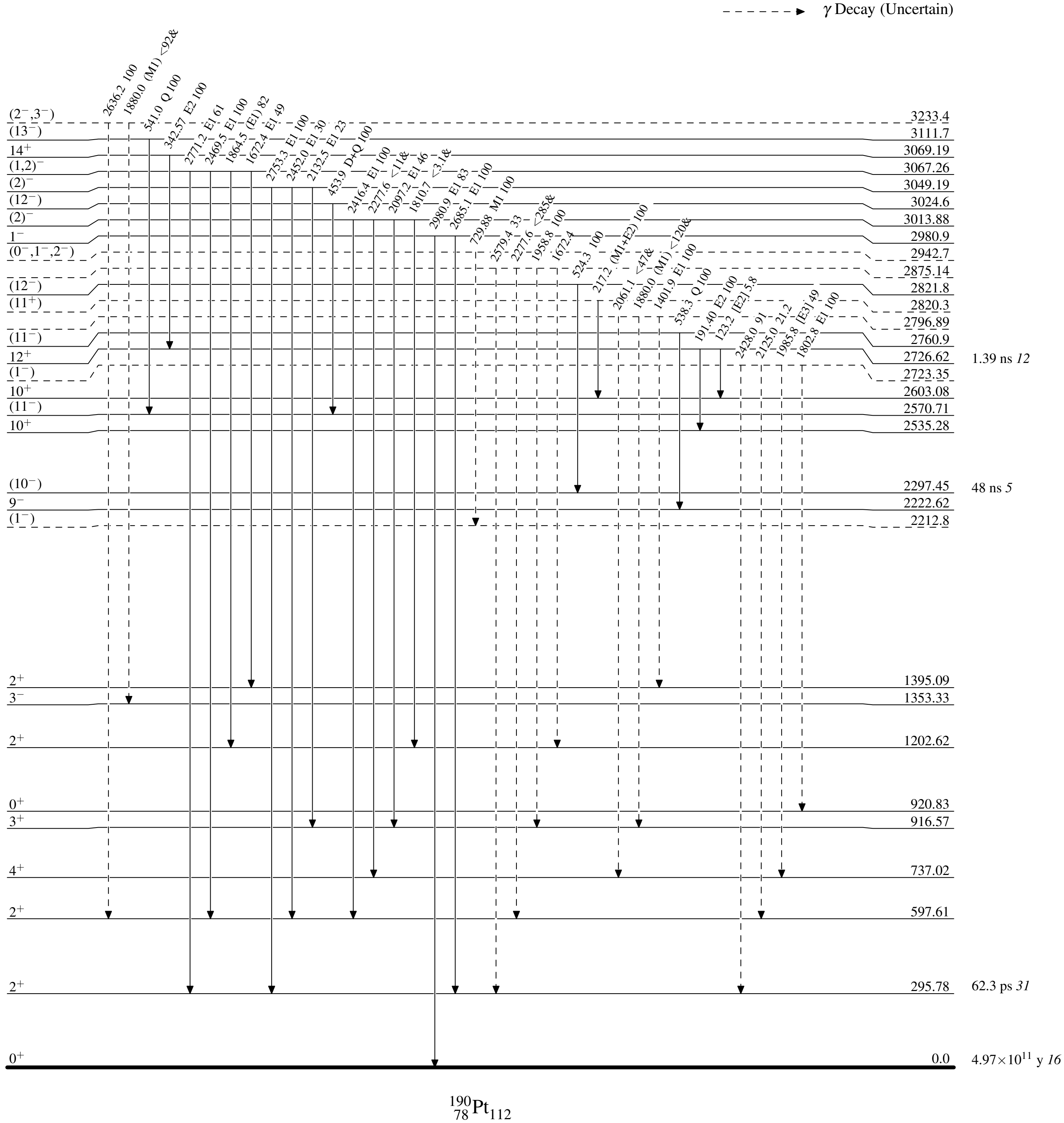
$^{190}_{78}Pt_{112}$

Adopted Levels, Gammas

Level Scheme (continued)

Legend

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



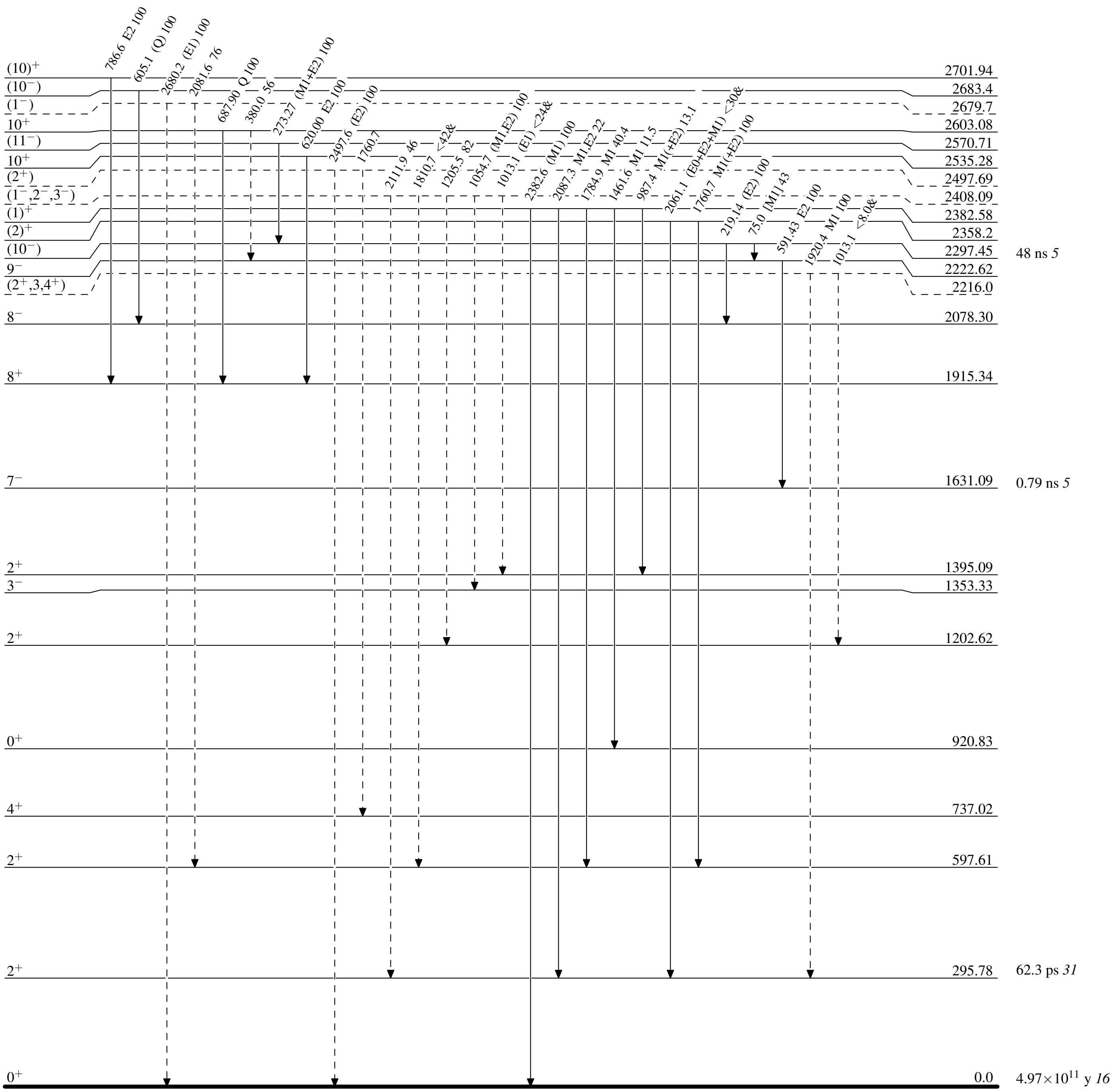
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

γ Decay (Uncertain)

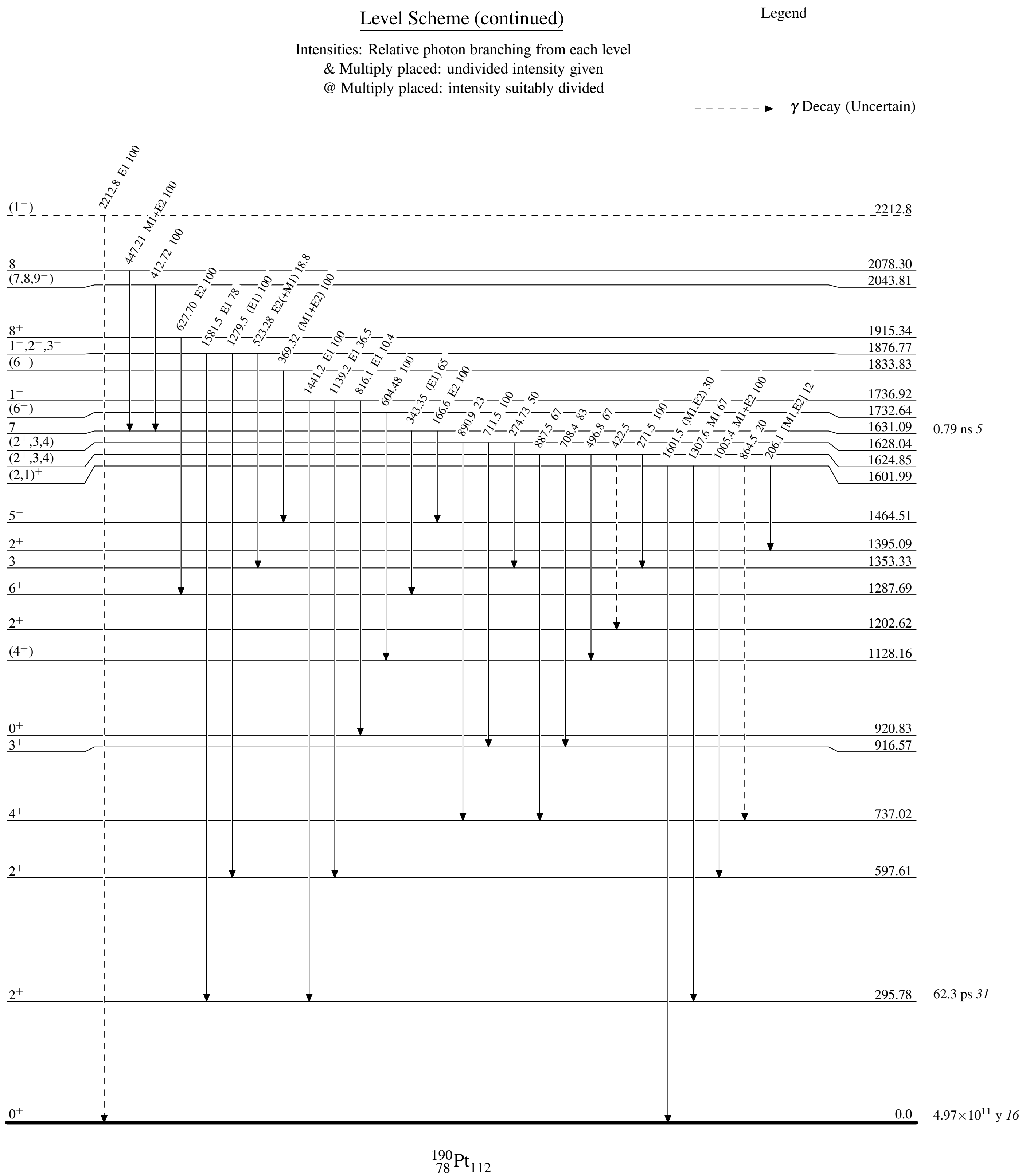


$^{190}_{78}Pt_{112}$

Adopted Levels, Gammas

Level Scheme (continued)

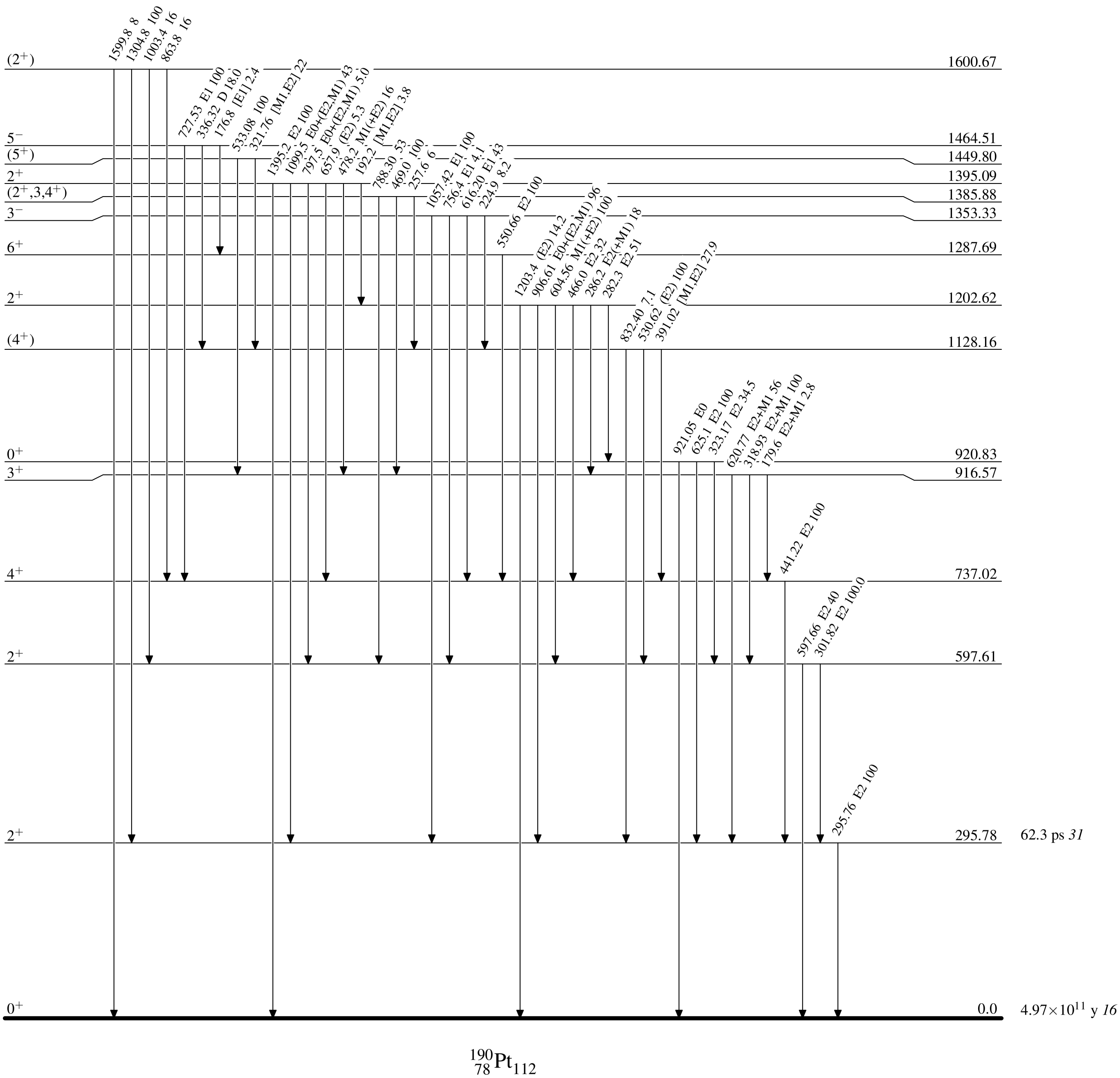
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



Adopted Levels, Gammas

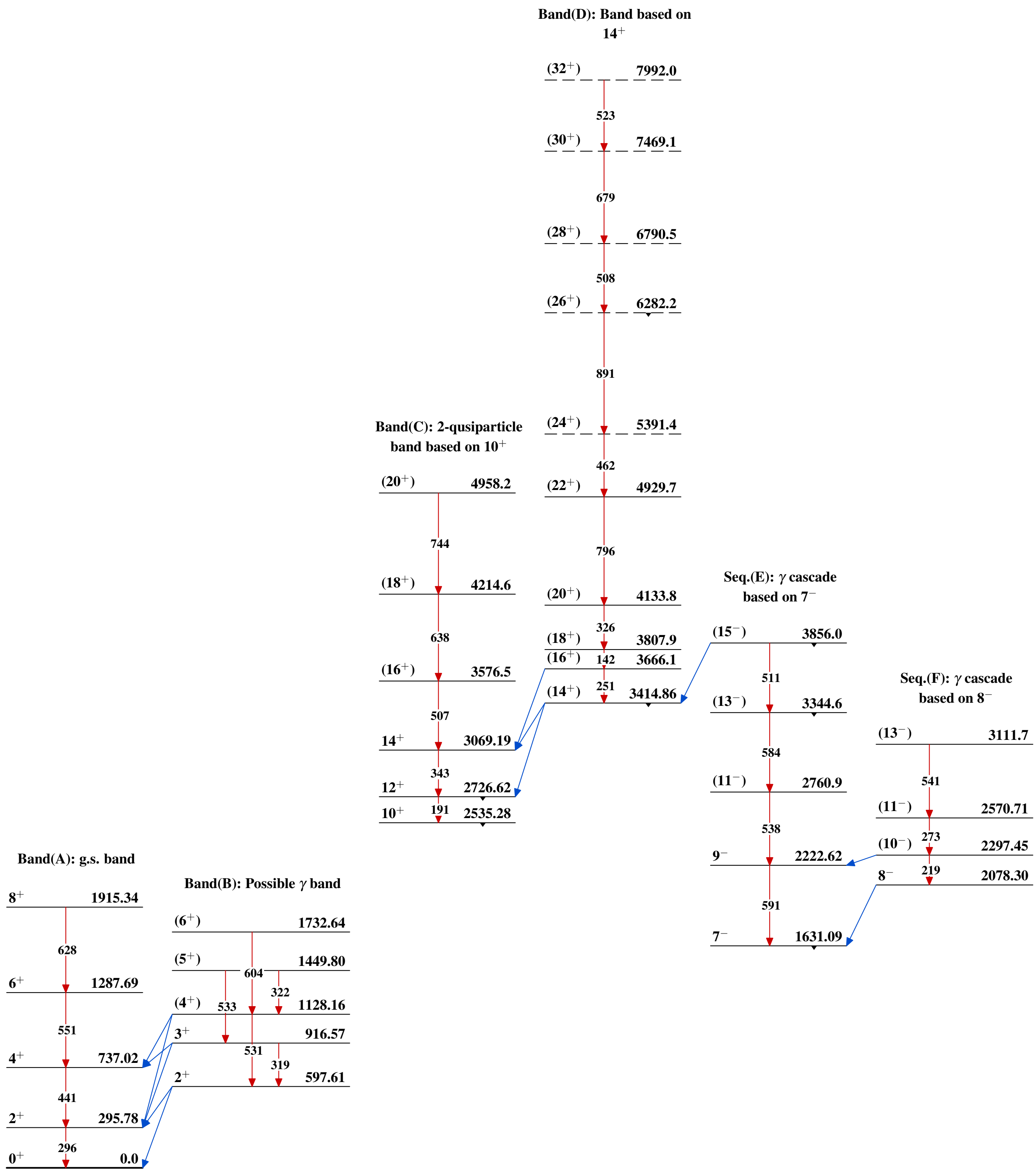
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



$^{190}_{78}Pt_{112}$

Adopted Levels, Gammas



Adopted Levels, Gammas (continued)