Coulomb excitation 1996Wu07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. C. Batchelder and A. M. Hurst, M. S. Basunia	NDS 183, 1 (2022)	1-Mar-2022

Others: 1967Ca08 (^{16}O), 1967Gi02 (^{16}O), 1969Ca19 (^{16}O), 1972La16 (α,^{16}O,^{32}S), 1972Si43 (^{16}O), 1976Ba06 (α), 1982Le02 (^{32}S), 1993Cl04, 1996Wu08.

1996Wu07: ^{186}Os(^{40}Ca,^{40}Ca′γ), E(^{40}Ca)=155 MeV; (^{58}Ni,^{58}Ni′γ), E(^{58}Ni)=230 MeV; (^{136}Xe,^{136}Xe′γ), E(^{136}Xe)=624 MeV; enriched target; Ge, position sensitive avalanche and Si detectors; measured Eγ, particle-γ coin, particle-particle-γ coin, γ yields; deduced E2 static and transition matrix elements (supersedes 1984WuZX, 1985WuZY; see also 1996Wu08, 1993Cl04).

1982Le02: ^{186}Os(^{32}S,^{32}S′γ), E(^{32}S)≈80 MeV, 60% ^{186}Os target; measured the unperturbed particle-gamma angular distribution; deduced g(2$^+$).

1971Mi08: ^{186}Os(^{16}O,^{16}O′γ), E(^{16}O)=45.1 MeV; (p,p′γ), E(p)=3.03-5.04 MeV; 61.3% ^{186}Os target; measured Eγ, Iγ(0°, 90°), ^{16}O-γ coin.

1969Ca19: ^{186}Os(^{16}O,^{16}O′γ), E(^{16}O)=42-80 MeV (see also 1967Ca08).

^{186}Os Levels

1996Wu07 determined 38 matrix elements from 332 pieces of data (315 γ yields from 11 independent Coulomb excitation experiments combined with five lifetimes, eight branching ratios and four mixing ratios from the literature), obtaining a total χ^2 of 290. These are considered by the evaluators to embody the best information presently available from ^{186}Os Coulomb excitation. Consistency with earlier Coulomb excitation measurements is, in general, very good. Weighted averages with those data are not used here since the conclusions of 1996Wu07 may not be totally independent of those measurements.

B(E2): Data attributed to 1996Wu07 have been calculated by the evaluators from those authors′ reported matrix elements, assuming the level spins indicated in this data set. See also 1996Wu08 and 1996Wu10 for extraction and discussion of intrinsic E2 matrix elements between ΔK=2 bands.

B(E2): Measured values from reactions other than Coulomb excitation are also shown here to facilitate intercomparison of all B(E2) data; the reaction data set from which the datum is taken is specified in each of these cases.

E(level)[†]	J$^\pi$[#]	T$_{1/2}$[‡]	Comments
0.0[@]	0$^+$		
137.2[@]	2$^+$	0.91 ns *3*	B(E2)↑=2.80 *+8−7* (1996Wu07) g-factor: 0.262 *15* (1982Le02) from the unperturbed particle-gamma angular distribution, if T$_{1/2}$=0.830 ns, 0.274 *19* (1967Gi02). Others: 1972Si43. B(E2)↑: Other values: 3.1 *4* (1967Ca08), 3.0 *4* (1967Gi02), 3.21 *28* (1971Mi08), 2.9 *4* (1972La16), 3.10 *25* (1976Ba06), 3.15 *3* (muonic atom, 1977Ho23). Static matrix element, <2$^+$ M(E2) 2+> =−1.75 *+22−13* (1996Wu07).
434.0[@]	4$^+$	26.4 ps *12*	B(E2)↑=1.53 *7* (1996Wu07) B(E2)↑: For 2$^+$ to 4$^+$ excitation. Others: 1.51 *21* (1971Mi08), 1.69 *12* (1969Ca19). Static matrix element, <4$^+$ M(E2) 4+>=−2.02 *+39−18* (1996Wu07).
767.4[a]	2$^+$	1.88 ps *+14−11*	B(E2)↑=0.297 *+14−8* (1996Wu07) B(E2)↑: For excitation from g.s. Others: 0.188 *25* (1971Mi08), 0.244 *24* (1969Ca19). B(E2)(from 2$^+$ 137 keV level)=0.163 *+23−8* (1996Wu07). Others: 0.107 *11* (1969Ca19), 0.082 *12* (1971Mi08). Static matrix element, <2$^+$ M(E2) 2+> =+2.12 *+6−22* (1996Wu07).
868.9[@]	6$^+$	3.03 ps *+8−12*	B(E2)↑=1.68 *+7−4* (1996Wu07) B(E2)↑: for excitation from 4$^+$ 434 level. Other: 1.64 *25* (1969Ca19). Static matrix element, <6$^+$ M(E2) 6+> =−1.7 *3* (1996Wu07).
910.3[a]	3$^+$		
1061.0[b]	0$^+$	148 ps *+83−57*	1996Wu07 report B(E2)(from 2$^+$ 767)=0.032 *+20−12* assuming B(E2)(from first 2$^+$)/B(E2)(from second 2$^+$)=0.25 (estimated from systematics for second 0$^+$ levels in ^{188}Os, ^{190}Os and ^{192}Os); this implies B(E2)(from 2$^+$ 137)=0.13 *+8−5*, but 1996Wu07

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Coulomb excitation 1996Wu07 (continued)

^{186}Os Levels (continued)

E(level)[†]	Jπ[#]	$T_{1/2}$[‡]	Comments
			do not specifically report this datum, even though this corresponds to the only γ they actually observed deexciting the 1061 level. If present, a 294-keV transition to the 767 level would presumably be masked by the strong 297γ connecting the 2+ and 4+ members of the g.s. band.
			$T_{1/2}$: 0.13 ps *+5−8* if branching to 137 keV level is 100%.
1070.4[a]	4+	1.83 ps *+31−23*	B(E2)↑=0.035 *+5−2* (1996Wu07) B(E2)↑: For excitation from 2+ 137 keV level. Other: 0.026 *6* (1969Ca19). B(E2)(from 4+ 434 level)=0.165 *+17−15* (1996Wu07). Other: 0.18 *5* (1969Ca19). B(E2)(from 2+ 768 level)=0.77 *+7−5* (1996Wu07). Other: 0.99 *35* (1969Ca19) is derived from authors′ B(E2)(from 4+ 434) and an obsolete Iγ(303)/Iγ(933) value. B(E2)(from 6+ 869 level)=0.035 *+5−2* (1996Wu07). Static matrix element, <4+ M(E2) 4+> =−1.12 *+25−23* (1996Wu07).
1352.0[c]	4+	3.2 ps *+10−7*	B(E2)↑=0.28 *+7−6* (1996Wu07) B(E2)↑: For excitation from 2+ 768 level. B(E2)(from 2+ 137 keV level)=0.0013 *+21−13* (1996Wu07). B(E2)(from 3+ 910 level)=0.33 *+14−4* (1996Wu07) assuming δ, branching from elsewhere. B(E2)(from 4+ 1071 level)=0.37 *+14−12* if pure E2 (1996Wu07). Static matrix element, <4+ M(E2) 4+> =+2.4 *+9−7* (1996Wu07).
1421.0[@]	8+	1.30 ps *6*	B(E2)↑=1.44 *7* (1996Wu07) B(E2)↑: For excitation from 6+ 867 level. Static matrix element, <8+ M(E2) 8+> =−2.26 *+24−108* (1996Wu07).
1491.0[a]	6+	1.77 ps *+63−43*	B(E2)↑=0.86 *+11−7* (1996Wu07) B(E2)↑: For excitation from 4+ 1070 level. B(E2)(from 6+ 869 level)=0.144 *+20−22* (1996Wu07). B(E2)(from 4+ 434 level)=0.0117 *+15−18* (1996Wu07).
1775.7[c]	6+		*Jπ* and band assignment inconsistent with adopted *Jπ*.
2015.5[a]	8+	1.8 ps *3*	B(E2)↑=0.82 *+19−13* (1996Wu07) B(E2)↑: For excitation from 6+ 1491 level.
2068.4[@]	10+	0.41 ps *12*	B(E2)↑=1.5 *+6−3* (1996Wu07) B(E2)↑: For excitation from 8+ 1421 level.
2625.5[a]	(10+)	1.17 ps *+33−43*	B(E2)↑=0.70 *+40−15* (1996Wu07) B(E2)↑: For excitation from 8+ 2016 level.
2781.5[@]	12+	0.29 ps *+23−4*	B(E2)↑=1.27 *+19−56* (1996Wu07) B(E2)↑: For excitation from 10+ 2068 level.
3440.3[&]	14+	≥0.92 ps	B(E2)↑≤0.55 (1996Wu07) B(E2)↑: For excitation from 12+ 2782 level. Probable member of a rotation-aligned band which becomes yrast for J≥14.
3558.3[@]	14+		Energy matches that expected for J=14 member of g.s. band.

[†] Based on stated Eγ for observed transitions, giving equal weight to all data.
[‡] Calculated by the evaluators from measured transition matrix elements (1996Wu07) and adopted γ-ray properties. Error bars include errors from reported matrix elements and adopted branching ratios.
[#] From 1996Wu07.
[@] Band(A): K=0 g.s. band.
[&] Band(B): Kπ=0+ band.
[a] Band(C): K=2 γ band.
[b] Band(D): Kπ=0+ band.
[c] Band(E): Probable K=4 γγ band.

Coulomb excitation 1996Wu07 (continued)

$\gamma(^{186}Os)$

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ	α[@]	Comments
137.2	2^+	137.2		0.0	0^+	E2		1.27	
434.0	4^+	296.7		137.2	2^+	E2		0.094	
767.4	2^+	630.2	82 *4*	137.2	2^+	M1+E2	−16 *+3−5*	0.0133 *2*	I_γ: From 1969Ca19. Other: 101 *+15−3* (1996Wu07 − from E2 transition matrix elements). δ: From <2+(137) M(E2) 2+(767)> =+0.897 *+64−14* and <2+(137) M(M1) 2+(767)> =−0.029 *+4−5* (1996Wu07). Other: >25 from A_2=−0.17 *4*, A_4=−0.49 *7* (1969Ca19).
		767.4	100	0.0	0^+	E2		0.0086	
868.9	6^+	434.9		434.0	4^+	E2		0.0324	
910.3	3^+	773.1		137.2	2^+				
1061.0	0^+	(293.5)		767.4	2^+				E_γ: from level energy difference; expected by 1996Wu07 (based on systematics), but not observed in this or any other reaction or decay. Not included in adopted gammas.
		923.8		137.2	2^+				
1070.4	4^+	(201.5)	≤0.20	868.9	6^+	[E2]		0.328	E_γ: from level energy difference. γ not observed in any reaction or decay; not included in adopted gammas. I_γ: 0.10 *+10−3* (1996Wu07).
		302.9	6.4 *6*	767.4	2^+	[E2]		0.089	E_γ: From adopted gammas (rounded off).
		636.4	100 *11*	434.0	4^+	M1+E2	+15 *+30−8*	0.013	I_γ: ΔI_γ is +11-8. δ: from <4+(434) M(E2) 4+(1071)> =+1.22 *6* <4+(434) M(M1) 4+(1071)> =+0.042 *+40−27* (1996Wu07). γ not observed in Columb excitation.
		933.3	80 *11*	137.2	2^+	E2		0.0057	I_γ: ΔI_γ is +11-6. Other: 54 *13* (1969Ca19); inconsistent with adopted value.
1352.0	4^+	(281.3)	6.1 *23*	1070.4	4^+				E_γ: from adopted gammas; γ not observed in 1996Wu07. I_γ: ΔI_γ is +23-20.
		(441.5)	40 *17*	910.3	3^+				E_γ: from adopted gammas (rounded off); γ not observed in 1996Wu07. I_γ: ΔI_γ is +17-5.
		584.6	100 *25*	767.4	2^+				I_γ: ΔI_γ is +25-21.
		(1214.8)	≈18	137.2	2^+				E_γ: from level energy difference; not observed in 1996Wu07. Not included in adopted gammas. I_γ: ΔI_γ is +29-18.
1421.0	8^+	552.1		868.9	6^+				
1491.0	6^+	420.6	59 *8*	1070.4	4^+				I_γ: ΔI_γ is +8-5.
		622.1	100 *15*	868.9	6^+				I_γ: ΔI_γ is +14-15.
		1057.0	80 *12*	434.0	4^+				I_γ: ΔI_γ is +10-12.
1775.7	6^+	423.6		1352.0	4^+				
		705.3		1070.4	4^+				
2015.5	8^+	524.5		1491.0	6^+				
2068.4	10^+	647.4		1421.0	8^+				
2625.5	(10^+)	610		2015.5	8^+				
2781.5	12^+	713.1		2068.4	10^+				

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Coulomb excitation **1996Wu07 (continued)**

$\gamma(^{186}Os)$ (continued)

E_i(level)	J_i^π	E_γ †	E_f	J_f^π
3440.3	14^+	658.8	2781.5	12^+
3558.3	14^+	776.8	2781.5	12^+

† From 1996Wu07 (uncertainty unstated), except as noted.
‡ Relative photon branching; deduced by evaluators from E2 transition matrix elements of 1996Wu07, except as noted.
# From 1969Ca19, based on $\gamma(\theta)$ and excitation probabilities.
@ 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.

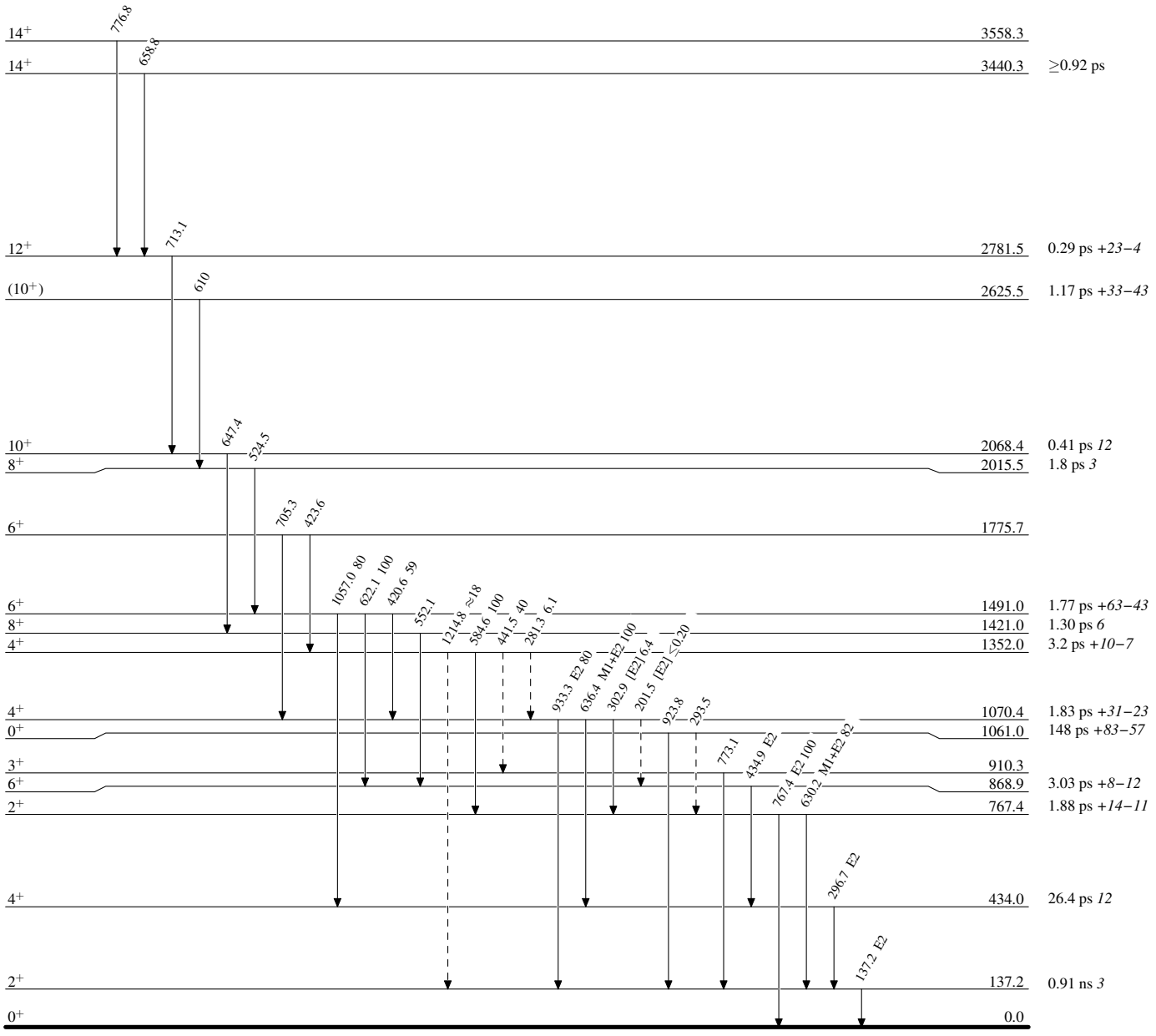
Coulomb excitation 1996Wu07

Legend

Level Scheme

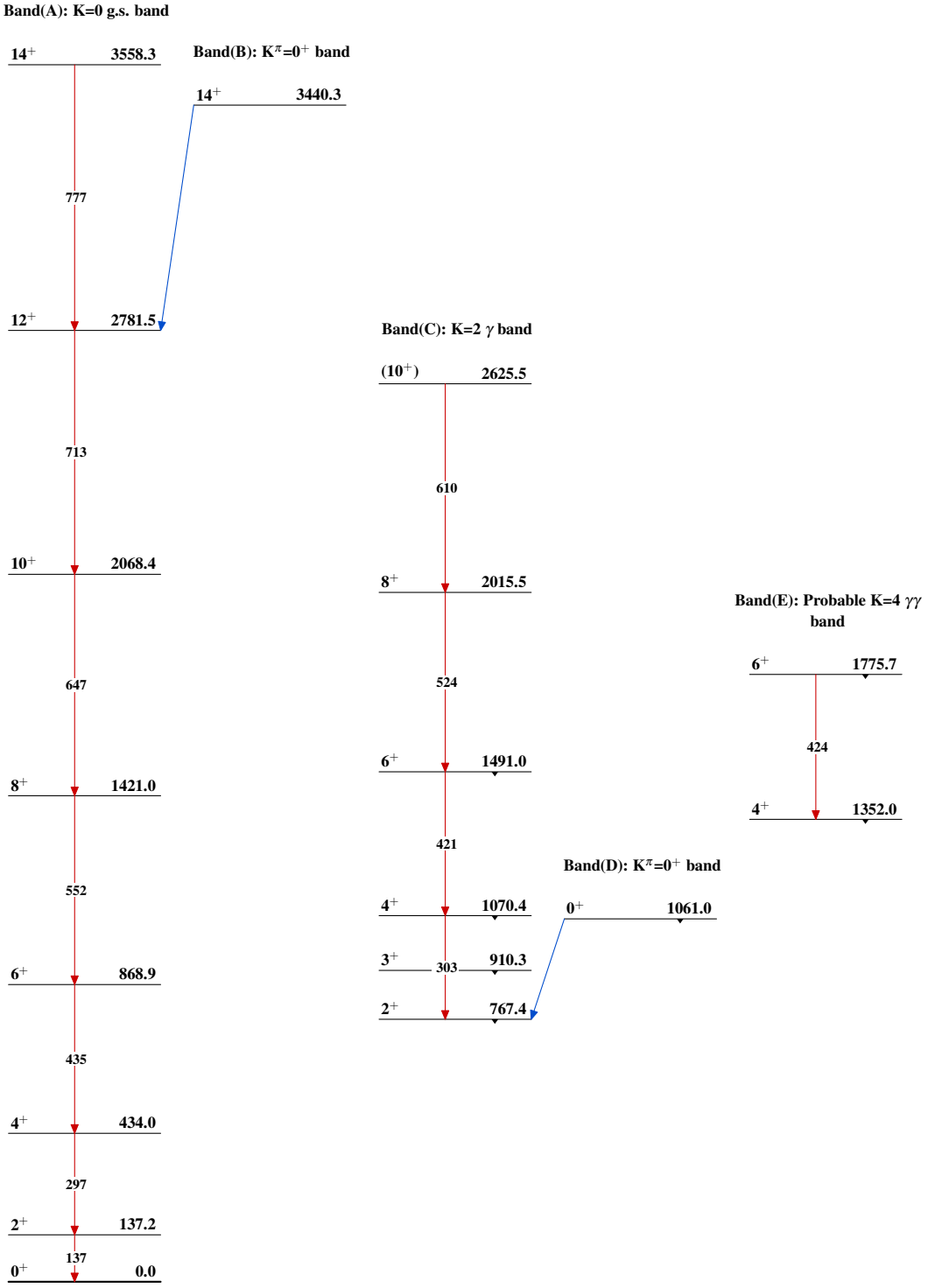
Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{186}_{76}Os_{110}$

Coulomb excitation 1996Wu07



$^{186}_{76}Os_{110}$