^{90}Zr(^{90}Zr,nγ) 2002Ko09,2002KoZW

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 110, 265 (2009)	15-Nov-2008

2002Ko09, 2002KoZW: E=369, 380 MeV; GAMMASPHERE array (101 large volume Compton-suppressed Ge detectors); Argonne fragment-mass analyzer (FMA) and position-sensitive parallel grid avalanche counter for evaporation residue analysis; recoiling nuclei implanted in double-sided silicon strip detector; recoil decay tagging technique used for unambiguous nuclidic identification; measured Eγ, Iγ, mass-gated $\gamma\gamma$ coin and $\gamma\gamma\gamma$ coin, $\gamma(\theta)$, γ anisotropy ratio (R), Eα, α-γ correlations, g.s. $T_{1/2}$. See also 2001Ko13, 2005Ca43 and 2005CaZY.

^{179}Hg Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0.0[#]	7/2$^-$	1.00 s *5*	$T_{1/2}$: from α(t) (2002Ko09) for Eα=6286 *4* unhindered transition to (7/2$^-$) ^{175}Pt g.s.
0.0+x	(13/2$^+$)	6.4 μs *9*	E(level): x=171.4 *4* from Adopted Levels. $T_{1/2}$: from Adopted Levels. Oblate-deformed 13/2[606] level (2001Ko13).
0.0+y			
60.5 *5*	9/2$^-$		
120.88[#] *25*	9/2$^-$		
135.83+x[c] *14*	(11/2$^+$)		
184.6+y *5*			
257.14+x[b] *15*	(13/2$^+$)		
326.5 *4*	(9/2$^-$)		
378.19+x[c] *13*	(15/2$^+$)		
400.4+y[ad] *4*	(5/2$^-$)		
476.16[#] *24*	11/2$^-$		
479.95+x[b] *9*	(17/2$^+$)		
593.0+y[a] *5*	(9/2$^-$)		
603.3 *4*	13/2$^-$		
712.21+x[c] *15*	(19/2$^+$)		
807.7[&] *3*	15/2$^-$		
853.48+x[b] *13*	(21/2$^+$)		
856.0+y[a] *5*	(13/2$^-$)		
995.4[@] *3*	17/2$^-$		
1129.41+x[c] *19*	(23/2$^+$)		
1189.7+y[a] *5*	(17/2$^-$)		
1199.7[&] *3*	19/2$^-$		
1288.17+x[b] *16*	(25/2$^+$)		
1417.7[@] *3*	21/2$^-$		
1586.2+y[a] *5*	(21/2$^-$)		
1622.0+x[c] *3*	(27/2$^+$)		
1648.4[&] *3*	23/2$^-$		
1789.27+x[b] *19*	(29/2$^+$)		
1890.5[@] *4*	25/2$^-$		
2037.3+y[a] *6*	(25/2$^-$)		
2144.0[&] *4*	27/2$^-$		
2182.4+x[c] *4*	(31/2$^+$)		
2352.0+x[b] *3*	(33/2$^+$)		
2404.5[@] *4*	29/2$^-$		
2534.1+y[a] *6*	(29/2$^-$)		

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^{90}Zr(^{90}Zr,nγ) 2002Ko09,2002KoZW (continued)

^{179}Hg Levels (continued)

E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]
2677.6[&] 5	31/2⁻	3240.7[&] 6	35/2⁻	3845.2[&] 12	(39/2⁻)	4472.2?[&] 15	(43/2⁻)
2802.7+x[c] 5	(35/2⁺)	3476.2+x[c] 6	(39/2⁺)	4142.0[@] 13	(41/2⁻)	4877.4+y?[a] 12	(45/2⁻)
2953.7[@] 5	33/2⁻	3526.5[@] 7	(37/2⁻)	4190.8+x[c] 12	(43/2⁺)	≈4939.8+x?[c]	(47/2⁺)
2971.6+x[b] 4	(37/2⁺)	3639.4+y[a] 7	(37/2⁻)	4243.4+y[a] 8	(41/2⁻)	5095.5+x?[b] 8	(49/2⁺)
3066.5+y[a] 7	(33/2⁻)	3643.1+x[b] 5	(41/2⁺)	4356.9+x[b] 6	(45/2⁺)		

† From least-squares fit to Eγ. The energy offset x=171.4 4 (from Adopted Levels).

‡ Authors′ values based on transition multipolarity, branching ratios, alignments, orbitals expected near Fermi surface and comparison with neighboring odd-A nuclides, assuming a 7/2⁻ g.s. for ^{179}Hg.

Band(A): g.s. band. Weakly-deformed prolate band; dominant configuration is probably (ν 7/2[514]) or (ν 7/2[503]).

@ Band(B): ν 5/2[512], α=+1/2 band. Nearly identical to 5/2[512] band In ^{177}Pt isotone; assignment supported by g_K=−0.36 3 deduced from measured branching ratios (2002Ko09). Prolate deformed band.

& Band(b): ν 5/2[512], α=−1/2 band. Please see comment on signature partner band.

a Band(C): ν 1/2[521], α=+1/2 band. Assignment based on orbitals available near Fermi surface, absence of a signature partner band (typical of low-Ω configuration) and similarities with structures In heavier odd-A Hg isotopes and In the isotone ^{177}Pt (2002Ko09). prolate deformed band.

b Band(D): ν 7/2[633], α=+1/2 band. Feeds (13/2⁺) isomer. signature splitting is consistent with $i_{13/2}$ excitation built on moderately deformed prolate shape. Assignment supported by observed alignment, by first band crossing At ħω≈0.37 MeV cf. ħω≈0.24 MeV for 5/2[512] and 1/2[521] bands, and by g_K=−0.05 1 deduced from measured branching ratios (2002Ko09). prolate deformed band.

c Band(d): ν 7/2[633], α=−1/2 band. Please see comment on signature partner band.

d the γ′s from this level appear to be associated with deexcitation to 7/2⁻ g.s., but actual placements are not established.

γ(^{179}Hg)

Eγ[†]	Iγ[‡]	Ei(level)	Jπi	Ef	Jπf	Mult.[#]	α[&]	Comments
61[a]		60.5	9/2⁻	0.0	7/2⁻			
102.0 3	4.0 10	479.95+x	(17/2⁺)	378.19+x	(15/2⁺)			
121.0 3		120.88	9/2⁻	0.0	7/2⁻			Mult.: R=0.71 11, A_2=−0.24 14 for 121.0γ+121.3γ.
121.1 3	20.2 15	378.19+x	(15/2⁺)	257.14+x	(13/2⁺)	D		Mult.: R=0.71 11; A_2=−0.24 14.
121.3 3	≈2.0	257.14+x	(13/2⁺)	135.83+x	(11/2⁺)	D		Mult.: R=0.71 11; A_2=−0.24 14.
136.2 3	7.6 7	135.83+x	(11/2⁺)	0.0+x	(13/2⁺)	M1+E2	2.4 9	Mult.: R=1.4 3; A_2=+0.32 20; to avoid negative feeding of the 136+x level, mult(136.2γ)=M1 with very little or No E2 admixture and mult(242.4γ) ≠ M2. from A_2, δ>0.
141.8 3	4.2 8	853.48+x	(21/2⁺)	712.21+x	(19/2⁺)	D		Mult.: R=0.8 3.
149.7 3	20.0 24	476.16	11/2⁻	326.5	(9/2⁻)			Mult.: R=0.74 8; A_2=+0.38 11.
158.7 3	5.5 8	1288.17+x	(25/2⁺)	1129.41+x	(23/2⁺)			Mult.: R=1.0 5.
187.9 2	16 3	995.4	17/2⁻	807.7	15/2⁻	D		Mult.: R=0.77 12; A_2=−0.36 9.
192.6 1	17.6 20	593.0+y	(9/2⁻)	400.4+y	(5/2⁻)	Q		Mult.: R=1.23 15; A_2=+0.18 10.
204.4 2	9.9 10	1199.7	19/2⁻	995.4	17/2⁻	D+Q		Mult.: R=0.85 8; A_2=−0.45 7.
205[a]		326.5	(9/2⁻)	120.88	9/2⁻			
215.8 3	11.5 15	400.4+y	(5/2⁻)	184.6+y		Q		Mult.: R=1.22 17; A_2=+0.23 13.
218.7 3	8.0 10	1417.7	21/2⁻	1199.7	19/2⁻			Mult.: R=0.45 20.
222.9 2	8.0 9	479.95+x	(17/2⁺)	257.14+x	(13/2⁺)	Q		Mult.: R=1.21 9; A_2=+0.25 8.
231.1 2	5.6 15	1648.4	23/2⁻	1417.7	21/2⁻			Mult.: R=0.69 7.

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^{90}Zr(^{90}Zr,nγ) 2002Ko09,2002KoZW (continued)

γ(^{179}Hg) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[&]	Comments
232.4 *2*	13.9 *20*	712.21+x	(19/2+)	479.95+x	(17/2+)	D		Mult.: R=0.69 *7*; A_2=−0.31 *12*.
242.3 *4*	7.0 *23*	1890.5	25/2−	1648.4	23/2−			
242.4 *1*	28.9 *16*	378.19+x	(15/2+)	135.83+x	(11/2+)	E2[@]	0.206	Mult.: Q from R=1.24 *5*; A_2=+0.25 *6*; A_4=−0.16 *9*. not M2 from intensity balance argument; see comment on mult(136.2γ).
257.4 *3*	≈4.0	257.14+x	(13/2+)	0.0+x	(13/2+)	[@]		Mult.: R=1.21 *8*; A_2=+0.39 *9*; A_4=+0.03 *12*. Consistent with ΔJ=0 or 2; placement requires the former.
263.0 *1*	41 *5*	856.0+y	(13/2−)	593.0+y	(9/2−)	Q[@]		Mult.: R=1.28 *5*; A_2=+0.25 *5*; A_4=−0.17 *7*.
276.1 *3*	7.4 *12*	1129.41+x	(23/2+)	853.48+x	(21/2+)	D		Mult.: R=0.45 *10*.
326[a]		326.5	(9/2−)	0.0	7/2−			
331.5 *1*	54 *6*	807.7	15/2−	476.16	11/2−	Q[@]		Mult.: R=1.33 *9*; A_2=+0.32 *9*.
333.7 *2*	40 *4*	1189.7+y	(17/2−)	856.0+y	(13/2−)	Q[@]		Mult.: R=1.26 *7*; A_2=+0.29 *7*; A_4=−0.05 *11*.
334.0 *2*	37.5 *18*	712.21+x	(19/2+)	378.19+x	(15/2+)	Q[@]		Mult.: R=1.26 *4*; A_2=+0.29 *7*; A_4=−0.05 *11*.
355.4 *3*	19.2 *26*	476.16	11/2−	120.88	9/2−			R not measured due to presence of ^{179}Au impurity.
373.5 *1*	82.1 *25*	853.48+x	(21/2+)	479.95+x	(17/2+)	Q[@]		Mult.: R=1.48 *15*; A_2=+0.35 *6*; A_4=−0.06 *9*.
378.1 *2*	22.0 *13*	378.19+x	(15/2+)	0.0+x	(13/2+)	D		Mult.: R=0.75 *11*; A_2=−0.20 *11*.
392.0 *1*	22 *3*	1199.7	19/2−	807.7	15/2−			Mult.: R=1.35 *9*; A_2=+0.30 *8*; A_4=−0.20 *11* for 392.1γ+392.0γ.
392.1 *3*	53 *5*	995.4	17/2−	603.3	13/2−			Mult.: R=1.35 *9*; A_2=+0.30 *8*; A_4=−0.20 *11* for 392.1γ+392.0γ.
396.5 *2*	39 *5*	1586.2+y	(21/2−)	1189.7+y	(17/2−)	Q		Mult.: R=1.42 *15*; A_2=+0.35 *9*.
400.4 *4*	13.1 *17*	400.4+y	(5/2−)	0.0+y		Q		Mult.: R=1.33 *18*; A_2=+0.33 *12*.
417.1 *2*	23.5 *18*	1129.41+x	(23/2+)	712.21+x	(19/2+)	Q		Mult.: R=1.27 *11*; A_2=+0.26 *9*.
422.4 *1*	49 *6*	1417.7	21/2−	995.4	17/2−	Q		Mult.: R=1.24 *9*; A_2=+0.31 *6*.
434.7 *1*	75.3 *23*	1288.17+x	(25/2+)	853.48+x	(21/2+)	Q[@]		Mult.: R=1.40 *7*; A_2=+0.40 *7*; A_4=−0.25 *9*.
448.2 *2*	28.2 *23*	1648.4	23/2−	1199.7	19/2−			Mult.: R=1.8 *6*.
451.1 *2*	18 *3*	2037.3+y	(25/2−)	1586.2+y	(21/2−)	Q		Mult.: R=1.3 *3*; A_2=+0.54 *20*.
472.7 *2*	25 *3*	1890.5	25/2−	1417.7	21/2−			Mult.: R=1.33 *17*.
476.0 *3*	25.7 *18*	476.16	11/2−	0.0	7/2−			R=1.1 *3* for multiplet.
479.9 *1*	100.0 *20*	479.95+x	(17/2+)	0.0+x	(13/2+)	Q[@]		Mult.: R=1.13 *7*; A_2=+0.23 *7*; A_4=−0.01 *9*.
492.6 *2*	20.9 *12*	1622.0+x	(27/2+)	1129.41+x	(23/2+)	Q[@]		Mult.: R=1.47 *26*; A_2=+0.51 *20*.
495.6 *2*		2144.0	27/2−	1648.4	23/2−			Mult.: R=1.5 *3*.
496.8 *2*	17 *4*	2534.1+y	(29/2−)	2037.3+y	(25/2−)	Q		Mult.: R=1.20 *13*.
501.1 *1*	46.3 *20*	1789.27+x	(29/2+)	1288.17+x	(25/2+)	Q		Mult.: R=1.7 *4*; A_2=+0.56 *11*.
514.0 *2*		2404.5	29/2−	1890.5	25/2−			Mult.: R=1.21 *16*.
532.4 *2*	9.4 *18*	3066.5+y	(33/2−)	2534.1+y	(29/2−)	Q		Mult.: R=1.6 *4*.
533.6 *2*	15 *3*	2677.6	31/2−	2144.0	27/2−			Mult.: R=1.5 *4*.
542.8 *2*	40 *3*	603.3	13/2−	60.5	9/2−	Q[@]		Mult.: R=1.18 *12*; A_2=+0.37 *12*; A_4=+0.11 *19*.
549.2 *3*		2953.7	33/2−	2404.5	29/2−			Mult.: R=1.47 *19*.
560.4 *3*	13.3 *15*	2182.4+x	(31/2+)	1622.0+x	(27/2+)	(Q)		Mult.: R=1.1 *3*.
562.7 *2*	31.2 *18*	2352.0+x	(33/2+)	1789.27+x	(29/2+)	Q		Mult.: R=1.33 *20*; A_2=+0.59 *16*.
563.1 *3*		3240.7	35/2−	2677.6	31/2−			Mult.: R=1.33 *20*.
572.8 *5*		3526.5	(37/2−)	2953.7	33/2−			Mult.: R=1.44 *17*.
572.9 *3*	3.0 *6*	3639.4+y	(37/2−)	3066.5+y	(33/2−)	Q		Mult.: R=1.43 *17*.
604.0 *4*	2.5 *6*	4243.4+y	(41/2−)	3639.4+y	(37/2−)	Q		Mult.: R=1.2 *3*.
604.5		3845.2	(39/2−)	3240.7	35/2−			
615.5		4142.0	(41/2−)	3526.5	(37/2−)			
619.6 *2*	16.7 *25*	2971.6+x	(37/2+)	2352.0+x	(33/2+)	Q		Mult.: R=1.7 *4*; A_2=+0.57 *20*.
620.3 *3*	6.5 *16*	2802.7+x	(35/2+)	2182.4+x	(31/2+)	Q		Mult.: R=1.7 *4*.

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^{90}Zr(^{90}Zr,nγ) 2002Ko09,2002KoZW (continued)

γ(^{179}Hg) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
627[a]		4472.2?	(43/2$^-$)	3845.2	(39/2$^-$)		
634.0[a] *8*	<1.0	4877.4+y?	(45/2$^-$)	4243.4+y	(41/2$^-$)		
671.5 *3*	5.0 *8*	3643.1+x	(41/2$^+$)	2971.6+x	(37/2$^+$)	Q	Mult.: R=1.7 *4*.
673.5 *3*	≈3.0	3476.2+x	(39/2$^+$)	2802.7+x	(35/2$^+$)	Q	Mult.: R=1.7 *5*.
713.8 *4*	3.0 *5*	4356.9+x	(45/2$^+$)	3643.1+x	(41/2$^+$)		
714.6 *10*	<1.0	4190.8+x	(43/2$^+$)	3476.2+x	(39/2$^+$)		
738.6[a] *5*	<2.0	5095.5+x?	(49/2$^+$)	4356.9+x	(45/2$^+$)		
≈749.0[a]		≈4939.8+x?	(47/2$^+$)	4190.8+x	(43/2$^+$)		

† Energies are from 2002Ko09, uncertainties from 2002KoZW.

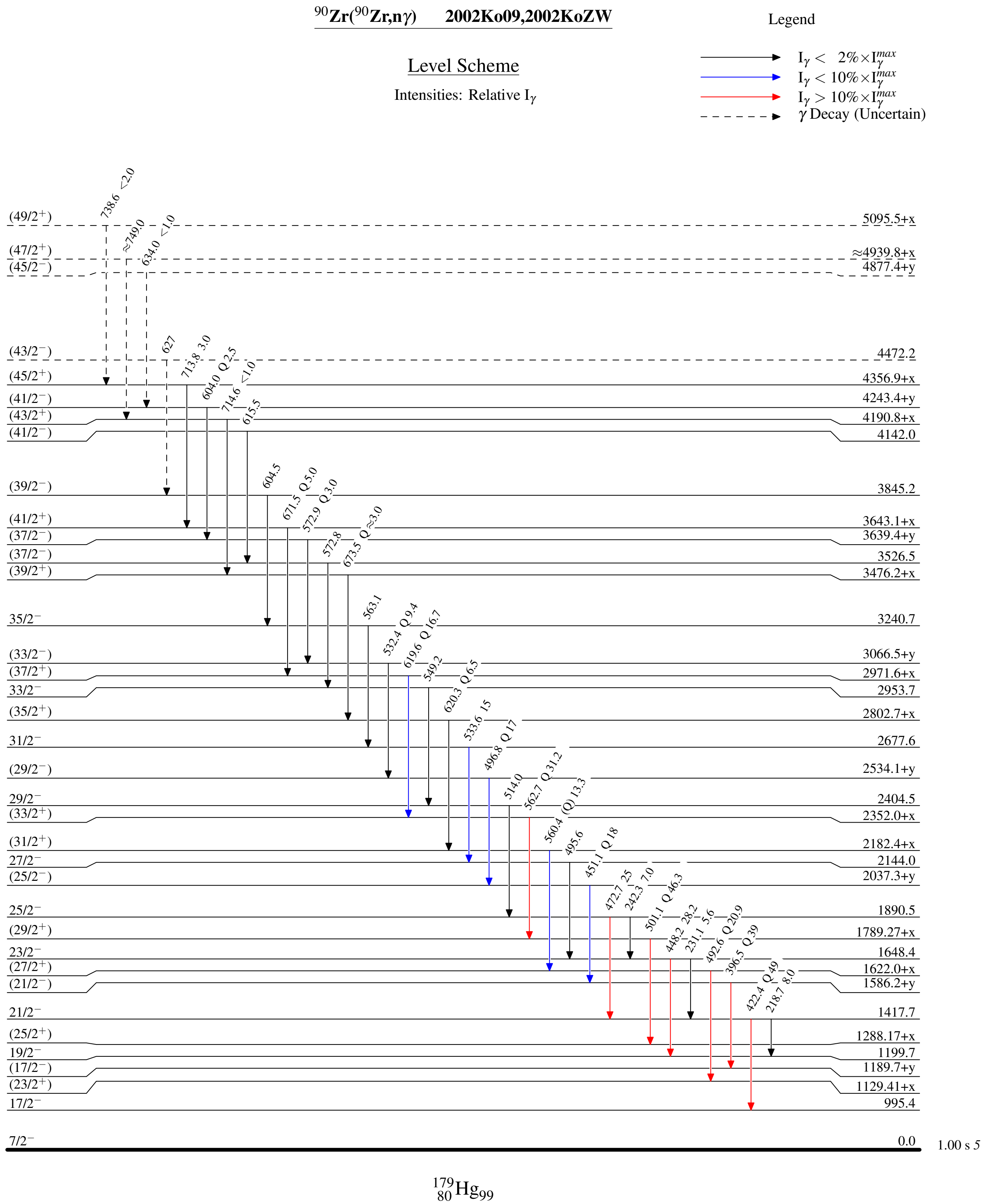
‡ From 2002KoZW. Iγ data are not reported In 2002Ko09.

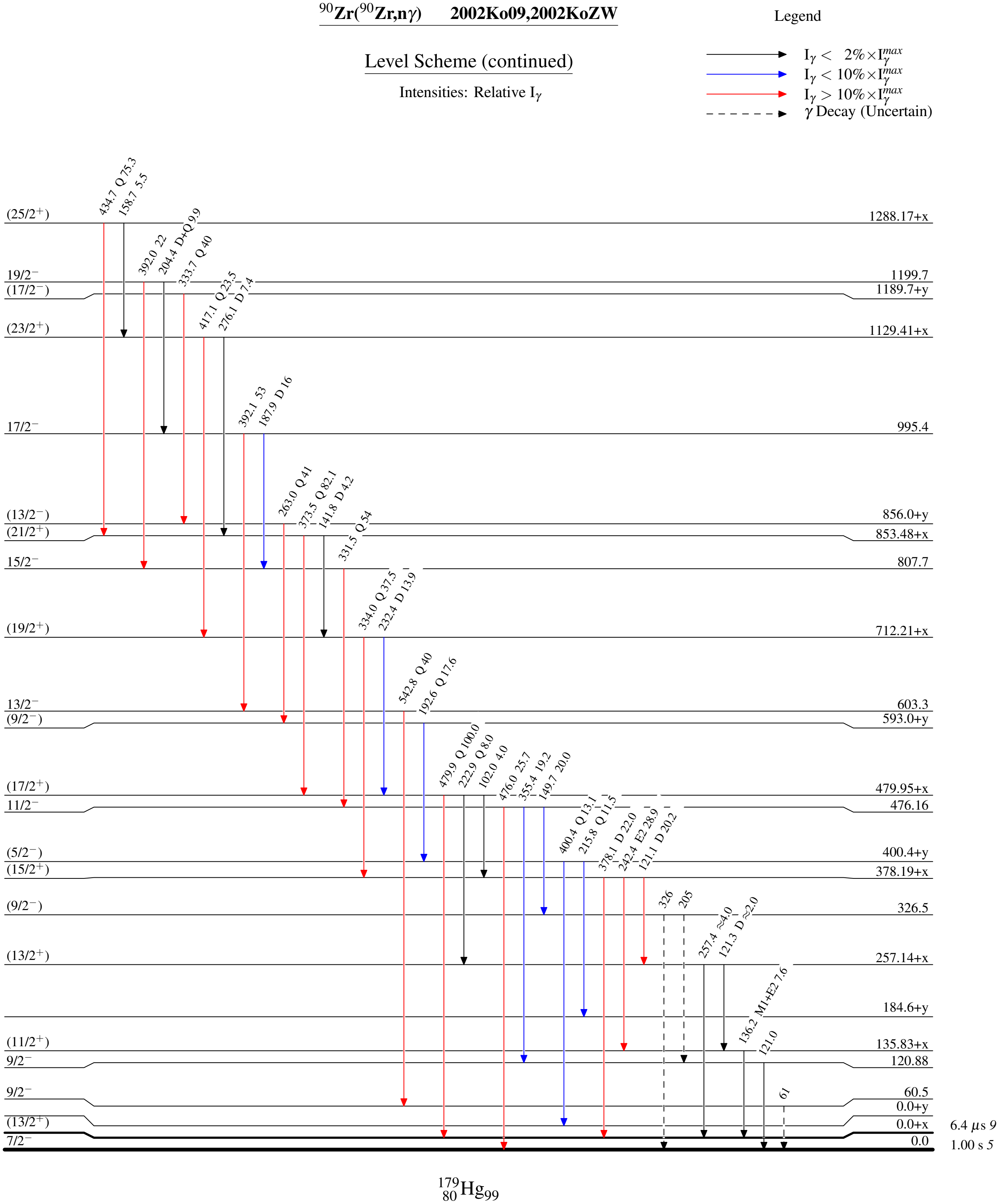
Assigned by evaluator based on $\gamma(\theta)$ and γ anisotropy ratio R=Iγ(31.7°, 37.4°, 162.7°)/Iγ(79.2°, 80.7°, 90.0°) (As defined In 2000Ko48), except As noted. assignments have not been made for lines for which 2002KoZW gave No assignment.

@ Assigned As E2 In 2002KoZW.

& 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.

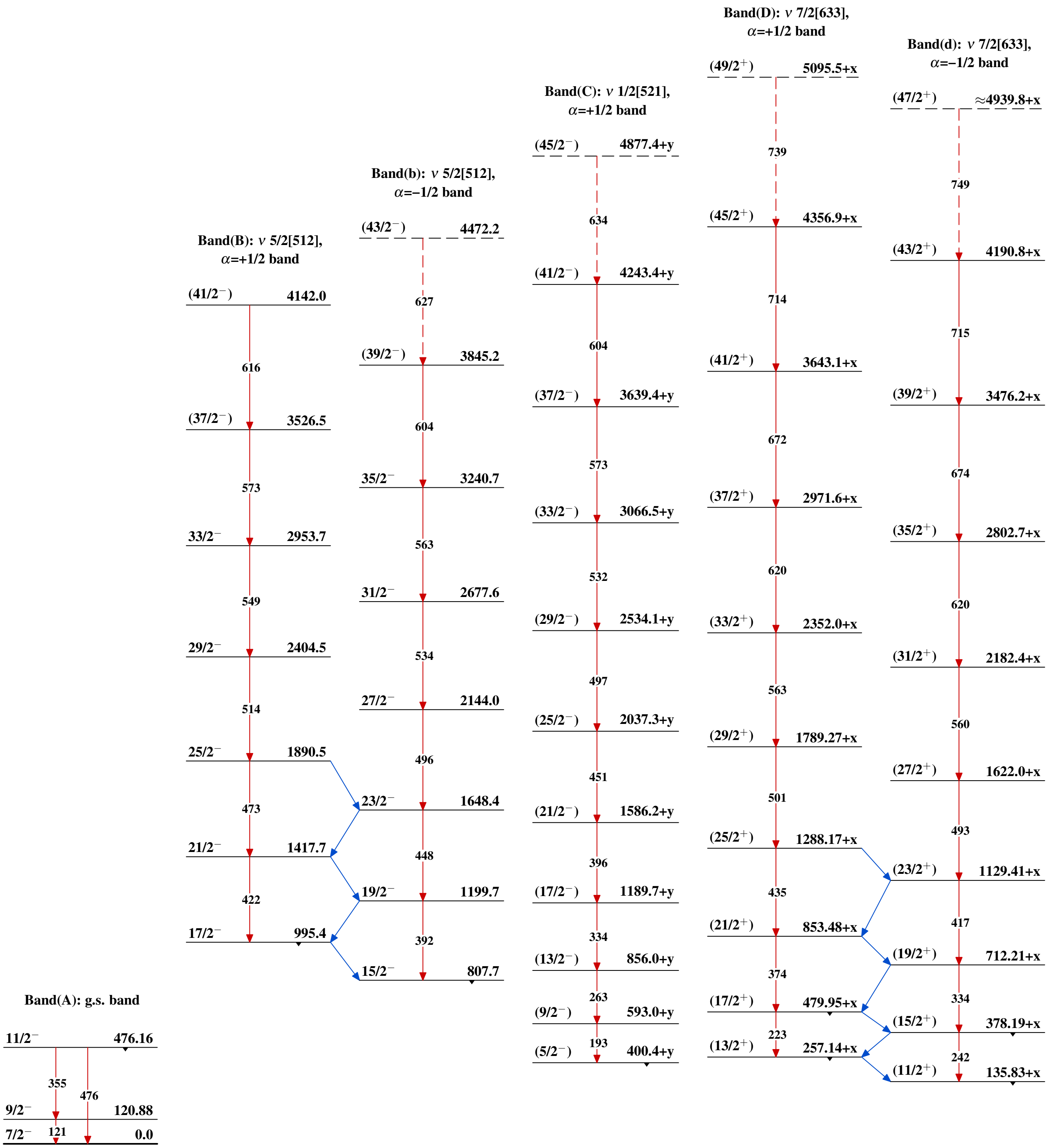
a Placement of transition in the level scheme is uncertain.


$^{90}Zr(^{90}Zr,n\gamma)$ 2002Ko09,2002KoZW
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)
(49/2+) 5095.5+x
(47/2+) ≈4939.8+x
(45/2−) 4877.4+y
(43/2−) 4472.2
(45/2+) 4356.9+x
(41/2−) 4243.4+y
(43/2+) 4190.8+x
(41/2−) 4142.0
(39/2−) 3845.2
(41/2+) 3643.1+x
(37/2−) 3639.4+y
(37/2−) 3526.5
(39/2+) 3476.2+x
35/2− 3240.7
(33/2−) 3066.5+y
(37/2+) 2971.6+x
33/2− 2953.7
(35/2+) 2802.7+x
31/2− 2677.6
(29/2−) 2534.1+y
29/2− 2404.5
(33/2+) 2352.0+x
(31/2+) 2182.4+x
27/2− 2144.0
(25/2−) 2037.3+y
25/2− 1890.5
(29/2+) 1789.27+x
23/2− 1648.4
(27/2+) 1622.0+x
(21/2−) 1586.2+y
21/2− 1417.7
(25/2+) 1288.17+x
19/2− 1199.7
(17/2−) 1189.7+y
(23/2+) 1129.41+x
17/2− 995.4
7/2− 0.0 1.00 s 5
738.6 <2.0
≈749.0
634.0 <1.0
627
713.8 3.0
604.0 Q 2.5
714.6 <1.0
615.5
604.5
671.5 Q 5.0
572.9 Q 3.0
572.8
673.5 Q ≈3.0
563.1
532.4 Q 9.4
619.6 Q 16.7
549.2
620.3 Q 6.5
533.6 15
496.8 Q 17
514.0
562.7 Q 31.2
560.4 (Q) 13.3
495.6
451.1 Q 18
472.7 25
242.3 7.0
501.1 Q 46.3
448.2 28.2
231.1 5.6
492.6 Q 20.9
396.5 Q 39
422.4 Q 49
218.7 8.0
$^{179}_{80}Hg_{99}$



$^{90}Zr(^{90}Zr,n\gamma)$ 2002Ko09,2002KoZW
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)
(25/2+) 1288.17+x
19/2− 1199.7
(17/2−) 1189.7+y
(23/2+) 1129.41+x
17/2− 995.4
(13/2−) 856.0+y
(21/2+) 853.48+x
15/2− 807.7
(19/2+) 712.21+x
13/2− 603.3
(9/2−) 593.0+y
(17/2+) 479.95+x
11/2− 476.16
(5/2−) 400.4+y
(15/2+) 378.19+x
(9/2−) 326.5
(13/2+) 257.14+x
184.6+y
(11/2+) 135.83+x
9/2− 120.88
9/2− 60.5
0.0+y
(13/2+) 0.0+x 6.4 μs 9
7/2− 0.0 1.00 s 5
434.7 Q 75.3
158.7 5.5
392.0 22
204.4 D+Q 9.9
333.7 Q 40
417.1 Q 23.5
276.1 D 7.4
392.1 53
187.9 D 16
263.0 Q 41
373.5 Q 82.1
141.8 D 4.2
331.5 Q 54
334.0 Q 37.5
232.4 D 13.9
542.8 Q 40
192.6 Q 17.6
479.9 Q 100.0
222.9 Q 8.0
102.0 4.0
476.0 25.7
355.4 19.2
149.7 20.0
400.4 Q 13.1
215.8 Q 11.5
378.1 D 22.0
242.4 E2 28.9
121.1 D 20.2
326
205
257.4 ≈4.0
121.3 D ≈2.0
136.2 M1+E2 7.6
121.0
61
$^{179}_{80}Hg_{99}$

$^{90}Zr(^{90}Zr,n\gamma)$ 2002Ko09,2002KoZW



$^{179}_{80}Hg_{99}$