(HI,xnγ) 2003Ca26,2003Do01,2006Ch09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. Kibedi and J. Timar	NDS 110,2815 (2009)	30-Sep-2009

The level scheme is as given by 2003Ca26, 2003Do01, 1995Ji08, 1993Ch41 which is mostly in agreement with the level scheme of 1983Pr08. The side band members with $J^{\pi}\geq 26^{+}$ are from 1997Jo03, 2003Ca26. The SD band is from 2006Ch09, 2003Le08 and 1995Ji08.

2006Ch09 (also 2005ChZZ): ^{58}Ni(^{32}S,α2pγ) E=140 MeV. Measured Eγ, Iγ, γγ, lifetimes using GAMMASPHERE array of 102 Compton-suppressed HPGe detectors and MICROBALL array. Deduced SD band and interconnecting transitions, also extended normal-deformed bands.

2003Ca26: ^{58}Ni(^{32}S,α2pγ) E=135 MeV. Measured Eγ, Iγ, γγγ, lifetimes by Doppler shift attenuation method, using the GAMMASPHERE array comprised of 95 high efficiency Ge detectors and the MICROBALL array comprised of 95 CsI(Tl) scintillators for evaporated charged particles.

2003Do01: ^{58}Ni(^{32}S,α2pγ) E=135 MeV and ^{59}Co(^{28}Si,p2nγ) E=99 MeV. Measured Eγ, Iγ, γγ, γγ(θ)(DCO), γ(θ) using five Compton-suppressed HPGe detectors and a LEPS detector.

2003Le08 (also 1999Le56): ^{58}Ni(^{29}Si,2pnγ) E=130 MeV. Measured Eγ, Iγ, γγ, particle-γ coin, lifetimes by DSAM using the GAMMASPHERE array comprising 100 Compton-suppressed HPGe detectors and the MICROBALL array of 95 CsI(Tl) detectors. Deduced SD band transitions and transition quadrupole moment.

2003Ai07: ^{58}Ni(^{32}S,α2pγ) E=120 MeV, methodology for Doppler correction, EUROGAM II array (for γ rays) and DIAMANT array for particle detection.

1997Jo03: ^{58}Ni(^{29}Si,2pnγ) E=110 MeV. Measured γ, γγ.

1995Ji08: ^{58}Ni(^{29}Si,2pnγ) E=128 MeV and ^{58}Ni(^{32}S,α2pγ) E=135 MeV. Measured Eγ, Iγ, γγ, particle-γ coincidences, $T_{1/2}$ by DSAM using the GAMMASPHERE array comprising 36 γ detectors and the MICROBALL array of 95 particle detectors. Many other normal band transitions are also reported.

1993Ch41 (also 1993Li26): ^{58}Ni(^{29}Si,2pnγ) E=110 MeV. Measured γ, γ(θ), γγ, γγ(θ)(DCO).

1986CoZQ: ^{58}Ni(^{32}S,2p$\alpha\gamma$), E=110 MeV. Ge(Li), measured Eγ, Iγ, angular distributions.

1983Pr08: ^{58}Ni(^{28}Si,2pγ), (^{29}Si,2pnγ). E=95 MeV to 110 MeV. E=95 MeV to 110 MeV. Ge(Li). Measured Eγ, recoil-distance Doppler-shift, Doppler-shift attenuation.

Others: lifetimes and g factors:

2001Zh44 (also 2000Zh28): ^{58}Ni(^{28}Si,2pγ) E=98 MeV. Measured g factors by transient-field technique. The values of g factors given in the two papers (2001Zh44 and 2000Zh28) are the same but the uncertainties are generally lower in 2000Zh28. The uncertainties from the more recent paper 2001Zh44 are listed in the dataset.

1999Te02: ^{58}Ni(^{32}S,α2pγ) E=110 MeV. Measured g factors by recoil-distance transient-field γγ coin technique.

1996Ch02: ^{59}Co(^{28}Si,p2nγ) E=98 MeV. Measured lifetimes by DSA.

1992Mo07: ^{54}Fe(^{33}S,2pn) E=105 MeV. Measured lifetimes by DSA, g-factors by transient-field technique.

1977Ko05: ^{58}Ni(^{32}S,2p$\alpha\gamma$), ^{74}Se(^{12}C,2nγ).

^{84}Zr Levels

E(level)	J^{π}[#]	$T_{1/2}$[†]	Comments
0[@]	0^{+}		
539.82[@] *9*	2^{+}	14.1 ps *8*	g=+0.48 *10* g factor: weighted average of +0.5 *1* (1992Mo07), +0.24 *35* (1999Te02), +0.5 *5* (2001Zh44). $T_{1/2}$: other: 16.6 ps *14* (1996Ch02).
1119.21[&] *11*	2^{+}		
1262.71[@] *13*	4^{+}	2.8 ps *4*	g=+0.51 *23* g factor: weighted average of +0.4 *3* (1992Mo07), +0.70 *65*, +1.0 *8* (1999Te02), +0.5 *5* (2001Zh44).
1575.46[a] *13*	3^{+}		J^{π}: from 2003Do01; 4^{+} was proposed earlier (1983Pr08,1993Ch41,1995Ji08).
1887.82[&] *20*	4^{+}		E(level): level from 2003Do01.
2136.29[@] *16*	6^{+}	1.8 ps *3*	g=+0.57 *35* g factor: weighted average of +1.9 *11* (1992Mo07), +0.20 *56* (1999Te02), +0.6 *5* (2001Zh44).

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(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

^{84}Zr Levels (continued)

E(level)	J^{π}#	$T_{1/2}$†	Comments
			$T_{1/2}$: other: 1.9 ps *4* (1996Ch02).
2335.27[a] *20*	5^+		J^{π}: from 2003Do01, 6^+ was proposed earlier (1983Pr08,1993Ch41,1995Ji08).
2739.8[&] *11*	6^+		
2811.01 *19*	(4^-)		
2825.79[b] *21*	(5^-)	11 ps *4*	g=+1.2 *4* g-factor: weighted average of +1.4 *4* (Mountford's thesis, Manchester (1991) as quoted by 1993Ch41 and 1999Te02), +0.54 *72* (1999Te02).
3078.80 *21*	(6^-)		
3088.88[@] *19*	8^+	0.39[‡] ps *7*	g=+1.3 *6* g-factor: average of +1.5 *6* (1992Mo07), +1.0 *6* (2001Zh44). $T_{1/2}$: others: 1.25 ps *7* (1992Mo07), 1.5 ps *4* (1996Ch02), 1.4 ps *4* (1983Pr08).
3202.2[a] *3*	7^+		J^{π}: from 2003Do01, 8^+ was proposed earlier (1983Pr08,1993Ch41,1995Ji08).
3313.33[c] *23*	(6^-)		
3493.78[b] *21*	(7^-)	5.4 ps *21*	
3551.9 *3*	(7^-)		E(level): level from 2003Do01.
3722.4 *8*	(7^-)		E(level): level from 2003Do01.
4036.76[c] *24*	(8^-)		
4068.6[@] *3*	10^+	0.36[‡] ps *3*	g=+0.9 *5* g-factor: weighted average of +0.5 *8* (1992Mo07), +1.2 *7* (2001Zh44). $T_{1/2}$: others: 0.53 ps *3* (1992Mo07), 0.97 ps *21* (1996Ch02), 1.04 ps *21* (1983Pr08).
4137.6[a] *4*	9^+		J^{π}: from 2003Do01, 10^+ was proposed earlier (1983Pr08,1993Ch41,1995Ji08).
4378.59[b] *22*	(9^-)		
4587.5[d] *4*	(10^+)		
4869.27[c] *25*	(10^-)		
5135.8[@] *3*	12^+	248[‡] fs *22*	g=+0.8 *6* g-factor: average of +0.9 *7* (1992Mo07), +0.8 *6* (2001Zh44). $T_{1/2}$: others: 0.55 ps *14* (1996Ch02), 0.60 ps *3* (1992Mo07), 0.62 ps *14*(1983Pr08).
5150.2[a] *6*	11^+		J^{π}: from 2003Do01, 12^+ was proposed earlier (1983Pr08,1993Ch41,1995Ji08).
5316.29[b] *24*	(11^-)		
5616.0[d] *7*	(12^+)		
5785.2[c] *3*	(12^-)		
6248.2[a] *6*	(13^+)		J^{π}: from 2003Do01, 14^+ was proposed earlier (1993Ch41).
6302.3[@] *3*	14^+	157[‡] fs *15*	g=+1.0 *5* g-factor: weighted average of +1.3 *5* (1992Mo07), +0.5 *7* (2001Zh44). $T_{1/2}$: others: 0.42 ps *14* (1996Ch02), 0.340 ps *21* (1992Mo07), 0.35 ps *3* (1983Pr08).
6324.4[b] *4*	(13^-)	0.46[‡] ps *10*	
6643.5[d] *4*	(14^+)		
6796.8[c] *4*	(14^-)	0.51[‡] ps *8*	
7300.0[a] *5*	(15^+)		
7411.0[b] *5*	(15^-)	0.30[‡] ps *8*	
7497.9[@] *4*	16^+	166[‡] fs *15*	g=+0.5 *7* (2001Zh44) $T_{1/2}$: others: 0.15 ps *5* (1996Ch02), 0.12 ps (1992Mo07), 0.125 ps *14* (1983Pr08), g-factor estimated as +0.6 *1*.
7857.3[d] *7*	(16^+)		
7928.9[c] *6*	(16^-)	232[‡] fs *19*	
8499.1[a] *11*	(17^+)		
8608.0[b] *11*	(17^-)	0.16[‡] ps *5*	
8743.5[@] *4*	18^+	131[‡] fs *11*	$T_{1/2}$: others: 0.12 ps *4* (1996Ch02), 0.111 ps *7* (1983Pr08).
9196.6[c] *11*	(18^-)	107[‡] fs *23*	
9220.4[d] *8*	(18^+)		

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(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

^{84}Zr Levels (continued)

E(level)	Jπ#	T1/2†	Comments
9917.1[a] *15*	(19+)		
9936.1[b] *12*	(19−)	0.15‡ ps *4*	
10175.4[@] *5*	20+	64‡ fs *8*	T1/2: others: 0.069 ps *35* (1996Ch02), 0.021 ps *7* (1983Pr08).
10444.9[d] *8*	(20+)		
10597.5[c] *11*	(20−)	58‡ fs *17*	
11413.1[b] *15*	(21−)	0.09‡ ps *4*	
11552.1[a] *18*	(21+)		
11821.1[@] *6*	22+	30‡ fs *7*	T1/2: others: 0.035 ps *14* (1996Ch02), 0.014 ps *7* (1983Pr08).
12165.2[c] *12*	(22−)	39‡ fs *16*	
12257.8[d] *11*	(22+)		
13078.1[b] *18*	(23−)	44‡ fs *16*	
13666.2[@] *8*	24+	13‡ fs *9*	T1/2: other: <0.007 ps (1983Pr08).
13973.9[c] *12*	(24−)	21‡ fs *17*	
14253.7[d] *12*	(24+)		
14938.2[b] *21*	(25−)	84‡ fs *20*	
15659.9[@] *10*	26+	19‡ fs *9*	
15947.8[e] *12*	(26+)		
16060.0[c] *16*	(26−)	21‡ fs *21*	
17013.2[b] *23*	(27−)		
17717.7[f] *10*	(25−)	14 fs *+40−10*	Jπ: J≈(21) from 1995Ji08 and 2003Le08. T1/2: from Doppler-shift analysis (2006Ch09), details of this measurement are not yet available. 55% branching to normal-deformed states, but only about 2% is accounted for by three transitions from this level to the normal- deformed states.
17805.9[@] *14*	(28+)	10‡ fs *8*	
18032.3[e] *12*	(28+)		
18465.0[c] *19*	(28−)	56‡ fs *14*	
19244.7[f] *14*	(27−)		45% branching to normal-deformed states.
19551[b] *3*	(29−)		
20282.9[@] *17*	(30+)	33‡ fs *10*	
20618.4[e] *16*	(30+)		
20907.8[f] *18*	(29−)		
21293.1[c] *21*	(30−)		
22420[b] *3*	(31−)		
22717.8[f] *20*	(31−)		
23180.0[@] *20*	(32+)		
23235.4[e] *19*	(32+)		
24676.8[f] *23*	(33−)		
26790.9[f] *25*	(35−)		
26830.1[@] *23*	(34+)		
29062[f] *3*	(37−)		
31497[f] *3*	(39−)		
32164 *3*	(39−)		
34097[f] *3*	(41−)		
36877[f] *4*	(43−)		

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(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

^{84}Zr Levels (continued)

† From recoil-distance Doppler-shift and Doppler-shift attenuation from 1983Pr08, except where indicated otherwise.
‡ From Doppler-shift analysis (2003Ca26), gate from above (GFA) technique used, except for the two topmost transitions In each band.
# From stretched Q nature of intraband transitions, determined by DCO ratios. The side-band J^π are given in parentheses as their bandhead J^π are not well established.
@ Band(A): g.s. band. 1992Mo07 state that there exists strong correlation between the individually deduced g-factors and that it is more meaningful to quote a mean g-factor=+0.87 *10* for 8^+ to 14^+ states in this band.
& Band(B): γ band, even spin.
a Band(b): γ band, odd spin.
b Band(C): band based on 5^-, α=1.
c Band(c): band based on 6^-, α=0.
d Band(D): band based on (10^+), α=0. Dominant configuration=$\pi(g^2_{9/2}p^{-2}_{1/2})\nu(g^6_{9/2})$ (2003Ca26).
e Band(E): band based on (26^+).
f Band(F): SD band Band from 2006Ch09, 2003Le08 and 1995Ji08. Q(transition)=5.6 *+6−5* (1999Le56,2003Le08); 5.2 *10* (1995Ji08), 4.98 *+25−30* (2005ChZZ) (statistical uncertainty of 0.07 and systematic uncertainty of +0.24-0.29 combined In quadrature). Configuration=$\nu5^2\pi5^1$ (1999Le56). Percent population=3 in (^{32}S,α2pγ) (2006Ch09), 6.4 in (^{29}Si,2pnγ) (2003Le08), 4 (1995Ji08); 2 in (^{32}S,α2pγ) (1995Ji08).

γ(^{84}Zr)

DCO′s, A_2 and A_4 are from 2003Do01 unless otherwise stated.

E_γ‡	I_γ†	E_i(level)	J^π_i	E_f	J^π_f	Mult.#	δ	Comments
226[b] *1*		3313.33	(6^-)	3088.88	8^+	[M2]		E_γ: γ not In 2003Do01.
253.1 *2*	1.4 *2*	3078.80	(6^-)	2825.79	(5^-)	D		DCO=0.58 *14* I_γ: 1.3 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
267.7 *2*	2.6 *2*	3078.80	(6^-)	2811.01	(4^-)	Q		I_γ: 2.8 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=1.05 *17*. A_2=+0.21 *7*, A_4=+0.04 *7*.
312.2 *3*	0.4 *2*	1887.82	4^+	1575.46	3^+			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
406 *1*		3493.78	(7^-)	3088.88	8^+			E_γ: γ not In 2003Do01.
415.0 *2*	1.1 *3*	3493.78	(7^-)	3078.80	(6^-)	D		I_γ: 1.1 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.25 *10*, 0.51 *18*.
449[b]		5316.29	(11^-)	4869.27	(10^-)			E_γ: from 1993Ch41 only.
456.2 *1*	3.2 *3*	1575.46	3^+	1119.21	2^+	M1+E2	≈+0.7	I_γ: 8.2 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.97 *10*, 1.02 *10*. A_2=+0.23 *12*, A_4=+0.09 *12*.
470 *1*	1.3 *4*	5785.2	(12^-)	5316.29	(11^-)			I_γ: 1.6 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
473 *1*	≈1	3551.9	(7^-)	3078.80	(6^-)			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
475.3 *5*	1.1 *3*	2811.01	(4^-)	2335.27	5^+			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
481[&]		5616.0	(12^+)	5135.8	12^+			
487.5 *1*	7.8 *4*	3313.33	(6^-)	2825.79	(5^-)	(M1+E2)	+0.06 *2*	I_γ: 7.8 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 8.0 *8* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.29 *4*, 0.35 *6*. A_2=−0.53 *11*, A_4=−0.09 *12*.
490.6 *3*	1.3 *2*	4869.27	(10^-)	4378.59	(9^-)			I_γ: 1.0 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO≤0.2.
518.9 *3*	2.5 *4*	4587.5	(10^+)	4068.6	10^+	D		I_γ: 2.2 *6* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). Mult.: DCO=0.74 *12*, ΔJ=0, transition.
521[@]		7928.9	(16^-)	7411.0	(15^-)			
539.8 *1*	100 *3*	539.82	2^+	0	0^+	E2		I_γ: 100 In ^{59}Co(^{28}Si,p2nγ) (2003Do01) and ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=1.03 *3*, 1.04 *4*. A_2=+0.23 *1*, A_4=−0.03 *1*.

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(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

γ(^{84}Zr) (continued)

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ	Comments
543.1 *2*	3.0 *3*	4036.76	(8$^-$)	3493.78	(7$^-$)	D+Q		I_γ: 2.7 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.28 *6*, 0.34 *12*. A_2=−0.75 *8*, A_4=+0.06 *9*.
557[&]		7857.3	(16$^+$)	7300.0	(15$^+$)			E_γ: γ not In 2003Do01.
579.3 *1*	5.6 *6*	1119.21	2$^+$	539.82	2$^+$	(M1+E2)	−0.03 *1*	I_γ: 8.9 *6* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=1.29 *10*, 1.02 *11*. A_2=−0.12 *6*, A_4=+0.02 *7*.
589[@]		9196.6	(18$^-$)	8608.0	(17$^-$)			
603[b] *1*	0.2 *1*	2739.8	6$^+$	2136.29	6$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
615[@]		7411.0	(15$^-$)	6796.8	(14$^-$)			
625.2 *3*	0.5 *3*	1887.82	4$^+$	1262.71	4$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
656 *1*	≈1	4378.59	(9$^-$)	3722.4	(7$^-$)			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
656.4 *4*	3.2 *4*	7300.0	(15$^+$)	6643.5	(14$^+$)	D		I_γ: 2.8 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.26 *7*, 0.47 *15*.
664[@]		10597.5	(20$^-$)	9936.1	(19$^-$)			
668.0 *2*	1.9 *2*	3493.78	(7$^-$)	2825.79	(5$^-$)	E2		DCO=1.22 *24* I_γ: 2.5 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 4.4 *5* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
677[@]		8608.0	(17$^-$)	7928.9	(16$^-$)			
722.9 *1*	81 *2*	1262.71	4$^+$	539.82	2$^+$	E2		I_γ: 79 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 88 *9* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.83 *2*. A_2=+0.36 *2*, A_4=−0.18 *2* (1993Ch41).
723.0 *4*	≈8	4036.76	(8$^-$)	3313.33	(6$^-$)	Q		I_γ: ≈6 In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 10.0 *15* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=1.01 *3*, 0.97 *4* for 722.9+723.3.
726.4 *4*	1.4 *3*	3551.9	(7$^-$)	2825.79	(5$^-$)			I_γ: 1.5 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
740[@]		9936.1	(19$^-$)	9196.6	(18$^-$)			
754[@]		12165.2	(22$^-$)	11413.1	(21$^-$)			E_γ: 759 quoted In level-scheme figure 1 of 2006Ch09 does not fit, it is too high by 4-5 keV. The evaluators have decreased energy to 754.
759.8 *2*	3.4 *3*	2335.27	5$^+$	1575.46	3$^+$	E2		I_γ: 6.1 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=1.05 *18*, 0.94 *12*. A_2=+0.36 *8*, A_4=−0.09 *8*.
768.5 *3*	1.4 *2*	1887.82	4$^+$	1119.21	2$^+$	(Q)		I_γ: 3.1 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.91 *17*. A_2=+0.13 *8*.
813[@]		11413.1	(21$^-$)	10597.5	(20$^-$)			
826.9 *3*	2.0 *4*	4378.59	(9$^-$)	3551.9	(7$^-$)	Q		I_γ: 1.3 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=1.04 *24*, 1.14 *19*.
832.5 *1*	12 *1*	4869.27	(10$^-$)	4036.76	(8$^-$)	Q		DCO=1.08 *13* I_γ: 8.3 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 17.0 *17* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
834		4036.76	(8$^-$)	3202.2	7$^+$			E_γ: from 1993Ch41 only.
852 *1*	0.9 *3*	2739.8	6$^+$	1887.82	4$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
866.9 *2*	3.9 *4*	3202.2	7$^+$	2335.27	5$^+$	Q		I_γ: 5.0 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=1.08 *11*, 1.15 *19*. A_2=+0.35 *10*, A_4=−0.22 *10*.
873.6 *1*	55 *2*	2136.29	6$^+$	1262.71	4$^+$	E2		I_γ: 55 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 63 *7* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.83 *2*. A_2=+0.32 *3*, A_4=−0.16 *3* (1993Ch41).
884.8 *1*	9.4 *5*	4378.59	(9$^-$)	3493.78	(7$^-$)	Q		I_γ: 7.6 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 14.0 *14* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.99 *9*, 0.93 *13*.
912[@]		13078.1	(23$^-$)	12165.2	(22$^-$)			

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(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

γ(^{84}Zr) (continued)

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
915.8 *2*	10 *1*	5785.2	(12$^-$)	4869.27	(10$^-$)	Q	I_γ: 7.4 *7* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 16.0 *16* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.94 *11*, 0.92 *17*.
922.9 *4*	1.5 *7*	2811.01	(4$^-$)	1887.82	4$^+$		I_γ: 2.0 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
935.4 *3*	2.8 *3*	4137.6	9$^+$	3202.2	7$^+$	Q	I_γ: 3.2 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=1.04 *15*, 1.12 *24*.
937.7 *1*	11 *1*	5316.29	(11$^-$)	4378.59	(9$^-$)	E2	I_γ: 7.0 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 19.0 *20* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=1.00 *9*, 1.08 *14*. A_2=+0.28 *6*, A_4=−0.03 *6*.
952.6 *1*	38 *1*	3088.88	8$^+$	2136.29	6$^+$	E2	I_γ: 32 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 43 *4* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.98 *5*, 0.95 *7* (2003Do01). A_2=+0.37 *3*, A_4=−0.10 *4* (1993Ch41).
957.9 *3*	1.3 *4*	4036.76	(8$^-$)	3078.80	(6$^-$)		I_γ: 1.1 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
979.7 *2*	30 *1*	4068.6	10$^+$	3088.88	8$^+$	E2	I_γ: 24 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 41 *4* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.87 *3*. A_2=+0.37 *3*, A_4=−0.10 *4* (1993Ch41).
1008.1 *3*	9.9 *7*	6324.4	(13$^-$)	5316.29	(11$^-$)	E2	DCO=1.01 *9* I_γ: 6.7 *6* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 9.0 *7* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
1011.6 *2*	5 *2*	6796.8	(14$^-$)	5785.2	(12$^-$)	E2	DCO=0.85 *9* I_γ: 4 *1* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 14.0 *14* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
1012.7 *5*	4 *2*	5150.2	11$^+$	4137.6	9$^+$	Q	DCO=0.95 *16* I_γ: 4 *2* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1028 *1*	≈1	5616.0	(12$^+$)	4587.5	(10$^+$)		I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1028 *1*	≈1	6643.5	(14$^+$)	5616.0	(12$^+$)		I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1035.8 *2*	2.1 *4*	1575.46	3$^+$	539.82	2$^+$		I_γ: 4.9 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.96 *10*, 1.09 *21*.
1051.9[&] *6*	1.4 *4*	7300.0	(15$^+$)	6248.2	(13$^+$)	Q	I_γ: 2.4 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1067.2 *1*	24 *1*	5135.8	12$^+$	4068.6	10$^+$	E2	I_γ: 16 *1* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 35 *4* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.99 *7*, 0.94 *9*.
1072.4 *3*	1.1 *3*	2335.27	5$^+$	1262.71	4$^+$	D	DCO=0.43 *18* I_γ: 1.9 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1086.6 *2*	5.1 *6*	7411.0	(15$^-$)	6324.4	(13$^-$)	E2	DCO=0.86 *16* I_γ: 4.0 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01), 11.0 *10* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
1098.1 *4*	1.7 *3*	6248.2	(13$^+$)	5150.2	11$^+$	Q	DCO=1.05 *21* I_γ: 2.2 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1119.3 *2*	2.6 *4*	1119.21	2$^+$	0	0$^+$		I_γ: 3.1 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1131.9 *5*	2.6 *5*	7928.9	(16$^-$)	6796.8	(14$^-$)	(E2)	DCO=0.88 *15* E_γ: 1134 (2006Ch09). I_γ: 2.9 *4* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1166.5 *1*	11 *1*	6302.3	14$^+$	5135.8	12$^+$	E2	DCO=0.93 *12* I_γ: 7.1 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 26 *3* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
1195.6 *1*	8 *1*	7497.9	16$^+$	6302.3	14$^+$	E2	I_γ: 5.4 *6* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 18.0 *20* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.86 *2* (1993Ch41).
1197 *1*	2 *1*	8608.0	(17$^-$)	7411.0	(15$^-$)		I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1199 *1*	≈1	8499.1	(17$^+$)	7300.0	(15$^+$)		I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1213 *1*	≈1	7857.3	(16$^+$)	6643.5	(14$^+$)		I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1224[&]		10444.9	(20$^+$)	9220.4	(18$^+$)		E_γ: 1225 (2006Ch09).

Continued on next page (footnotes at end of table)

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

γ(^{84}Zr) (continued)

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ	Comments
1235.6 *2*	1.8 *3*	2811.01	(4$^-$)	1575.46	3$^+$	D		DCO=0.62 *11* I_γ: 2.6 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1245.7 *2*	3 *1*	8743.5	18$^+$	7497.9	16$^+$	E2		DCO=0.81 *2* (1993Ch41) I_γ: 1.5 *6* In ^{59}Co(^{28}Si,p2nγ) (2003Do01); 9.6 *9* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41).
1267 *1*	3 *1*	9196.6	(18$^-$)	7928.9	(16$^-$)			I_γ: 2 *1* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). E_γ: 1265 (2006Ch09).
1289.6 *4*	0.7 *3*	4378.59	(9$^-$)	3088.88	8$^+$			I_γ: 1.1 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1328.1 *3*		9936.1	(19$^-$)	8608.0	(17$^-$)			
1357.5 *3*	12 *1*	3493.78	(7$^-$)	2136.29	6$^+$	(E1+M2)	+0.06 *1*	I_γ: 11 *1* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.56 *7*, 0.54 *8*. A_2=−0.30 *9*.
1362[&]		9220.4	(18$^+$)	7857.3	(16$^+$)			E_γ: 1363 (2006Ch09).
1400.9 *3*		10597.5	(20$^-$)	9196.6	(18$^-$)			E_γ: 1402 (2006Ch09).
1415.5 *4*	4.6 *6*	3551.9	(7$^-$)	2136.29	6$^+$	D		I_γ: 4.1 *5* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.40 *11*, 0.50 *21*.
1418[&]		9917.1	(19$^+$)	8499.1	(17$^+$)			E_γ: other: 1422 *1*.
1431.9 *3*		10175.4	20$^+$	8743.5	18$^+$	E2		E_γ: 1433 (2006Ch09). I_γ: 8.8 *8* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.91 *3* (1993Ch41).
1477 *1*		11413.1	(21$^-$)	9936.1	(19$^-$)			E_γ: 1476 (2006Ch09).
1499 *1*	1.5 *4*	4587.5	(10$^+$)	3088.88	8$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1507.6 *3*	2.7 *4*	6643.5	(14$^+$)	5135.8	12$^+$			I_γ: 2.8 *3* In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1527 *1*	0.55[a] *5*	19244.7	(27$^-$)	17717.7	(25$^-$)			
1548 *1*	≈1	2811.01	(4$^-$)	1262.71	4$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1555 *1*	1.5 *4*	7857.3	(16$^+$)	6302.3	14$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1563.1 *3*	15 *1*	2825.79	(5$^-$)	1262.71	4$^+$	(E1+M2)	+0.05 *4*	I_γ: 15 *1* In ^{59}Co(^{28}Si,p2nγ) (2003Do01). DCO=0.54 *7*, 0.63 *9*. A_2=−0.43 *7*, A_4=+0.17 *8*.
1567 *1*		12165.2	(22$^-$)	10597.5	(20$^-$)			E_γ: 1568 (2006Ch09).
1586 *1*	≈1	3722.4	(7$^-$)	2136.29	6$^+$			I_γ: ≈1 In ^{59}Co(^{28}Si,p2nγ) (2003Do01).
1635 *1*		11552.1	(21$^+$)	9917.1	(19$^+$)			
1645.7 *3*		11821.1	22$^+$	10175.4	20$^+$	E2		I_γ: 4.4 *5* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.88 *4* (1993Ch41).
1663 *1*	1.00[a] *5*	20907.8	(29$^-$)	19244.7	(27$^-$)			
1665 *1*		13078.1	(23$^-$)	11413.1	(21$^-$)			E_γ: 1666 (2006Ch09).
1702[&]		10444.9	(20$^+$)	8743.5	18$^+$			
1723[&]		9220.4	(18$^+$)	7497.9	16$^+$			
1808 *1*		13973.9	(24$^-$)	12165.2	(22$^-$)			E_γ: 1810 (2006Ch09).
1810 *1*	1.00[a] *5*	22717.8	(31$^-$)	20907.8	(29$^-$)			E_γ: 1808 (2006Ch09).
1813[@]		12257.8	(22$^+$)	10444.9	(20$^+$)			
1845.3 *6*		13666.2	24$^+$	11821.1	22$^+$	E2		I_γ: 1.7 *8* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.87 *6* (1993Ch41).
1860 *1*		14938.2	(25$^-$)	13078.1	(23$^-$)			
1959 *1*	1.00[a] *5*	24676.8	(33$^-$)	22717.8	(31$^-$)			E_γ: 1958 (2006Ch09).
1993.5 *6*		15659.9	26$^+$	13666.2	24$^+$	E2		I_γ: 0.9 *3* In ^{58}Ni(^{29}Si,2pnγ) (1993Ch41). DCO=0.76 *8* (1993Ch41).
1996[@]		14253.7	(24$^+$)	12257.8	(22$^+$)			
2075[@]		17013.2	(27$^-$)	14938.2	(25$^-$)			
2085 *1*		18032.3	(28$^+$)	15947.8	(26$^+$)			
2086 *1*		16060.0	(26$^-$)	13973.9	(24$^-$)			E_γ: 2088 (2006Ch09).
2114 *1*	1.00[a] *5*	26790.9	(35$^-$)	24676.8	(33$^-$)			E_γ: 2113 (2006Ch09).
2146 *1*		17805.9	(28$^+$)	15659.9	26$^+$			E_γ: 2149 (2006Ch09).
2271 *1*	0.90[a] *5*	29062	(37$^-$)	26790.9	(35$^-$)			E_γ: 2272 (2006Ch09).

Continued on next page (footnotes at end of table)

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)

γ(^{84}Zr) (continued)

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
2282 *1*		15947.8	(26$^+$)	13666.2	24$^+$		
2372 *1*		18032.3	(28$^+$)	15659.9	26$^+$		
2405 *1*		18465.0	(28$^-$)	16060.0	(26$^-$)		E_γ: 2404 (2006Ch09).
2435 *1*	0.5[a] *1*	31497	(39$^-$)	29062	(37$^-$)		E_γ: 2434 (2006Ch09).
2477 *1*		20282.9	(30$^+$)	17805.9	(28$^+$)		E_γ: 2478 (2006Ch09).
2538[@]		19551	(29$^-$)	17013.2	(27$^-$)		
2586 *1*		20618.4	(30$^+$)	18032.3	(28$^+$)		
2600 *1*	0.3[a] *1*	34097	(41$^-$)	31497	(39$^-$)		E_γ: 2598 (2006Ch09).
2617 *1*		23235.4	(32$^+$)	20618.4	(30$^+$)		
2780[@]	0.06[a] *5*	36877	(43$^-$)	34097	(41$^-$)		E_γ: others: 2770 *1* (2003Le08), 2761 (1995Ji08).
2828[@]		21293.1	(30$^-$)	18465.0	(28$^-$)		
2869[@]		22420	(31$^-$)	19551	(29$^-$)		
2897[@]		23180.0	(32$^+$)	20282.9	(30$^+$)		
3102[@]		32164	(39$^-$)	29062	(37$^-$)		
3464[@]	0.004[a]	17717.7	(25$^-$)	14253.7	(24$^+$)		
3650[@]		26830.1	(34$^+$)	23180.0	(32$^+$)		
3743[@]	0.007[a]	17717.7	(25$^-$)	13973.9	(24$^-$)	D+Q	Mult.: A_2=+0.27 *18*, A_4=+0.34 *31* (2006Ch09) consistent with ΔJ=1, D+Q, most likely M1+E2 transition.
4052[@]	0.009[a]	17717.7	(25$^-$)	13666.2	24$^+$	D	Mult.: A_2=−0.28 *7*, A_4=0 (2006Ch09) consistent with ΔJ=1, dipole.

[†] From 2003Do01 in ^{58}Ni(^{32}S,α2pγ), except for SD band. For the SD band, values are relative intensities within the SD band, read from a graph (divided by a factor of 4) given by 1995Ji08. Intensities available from other reactions are given under comments relative to 100 for 540γ. All intensities are considered for adopted branchings listed in 'adopted gammas'.

[‡] From weighted average of 2003Do01 and 1993Ch41 whenever possible, otherwise values are from 2003Do01 up to 9197 keV and from 2003Ca26 above this energy. Exceptions are noted. For SD band, values are from 2003Le08, unless otherwise stated. The values from 2006Ch09 and 1995Ji08 are in general agreement. The transitions connecting SD band to normal bands are from 2006Ch09.

[#] Stretched Q from DCO ratios (1993Ch41,2003Do01) are assigned as E2. Mixed transitions with δ are from γ(θ) observed in ^{58}Ni(^{32}S,2pαγ) (1986CoZQ).

[@] From 2006Ch09.

[&] From 2003Ca26.

[a] Relative intensity within the SD band. The values are read from a graph (divided by a factor of 4) given by 1995Ji08, except for the interconnecting three transitions from the SD bandhead which are from 2006Ch09.

[b] Placement of transition in the level scheme is uncertain.

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09

Level Scheme

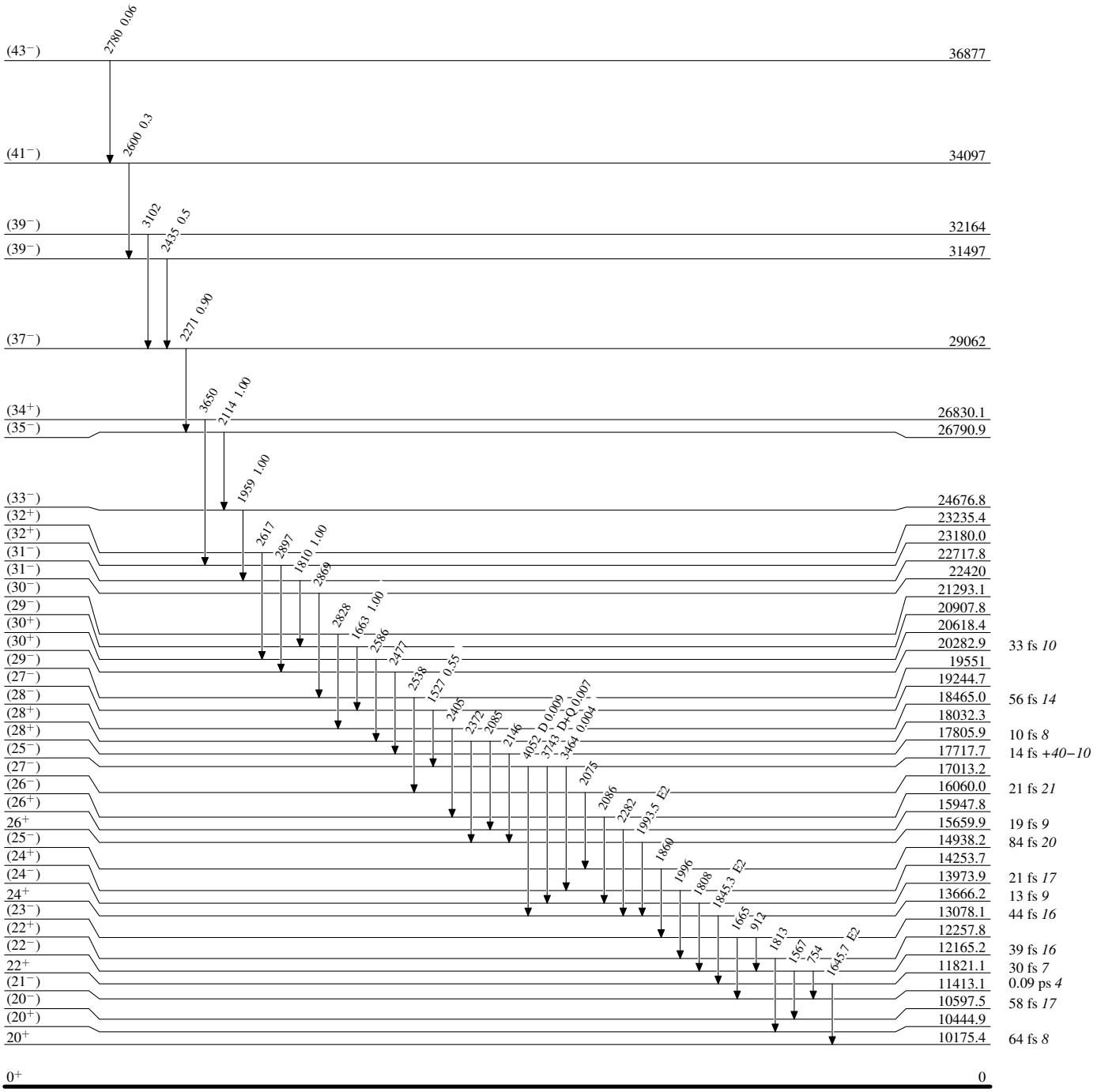
Intensities: Relative I_γ

Legend

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

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

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



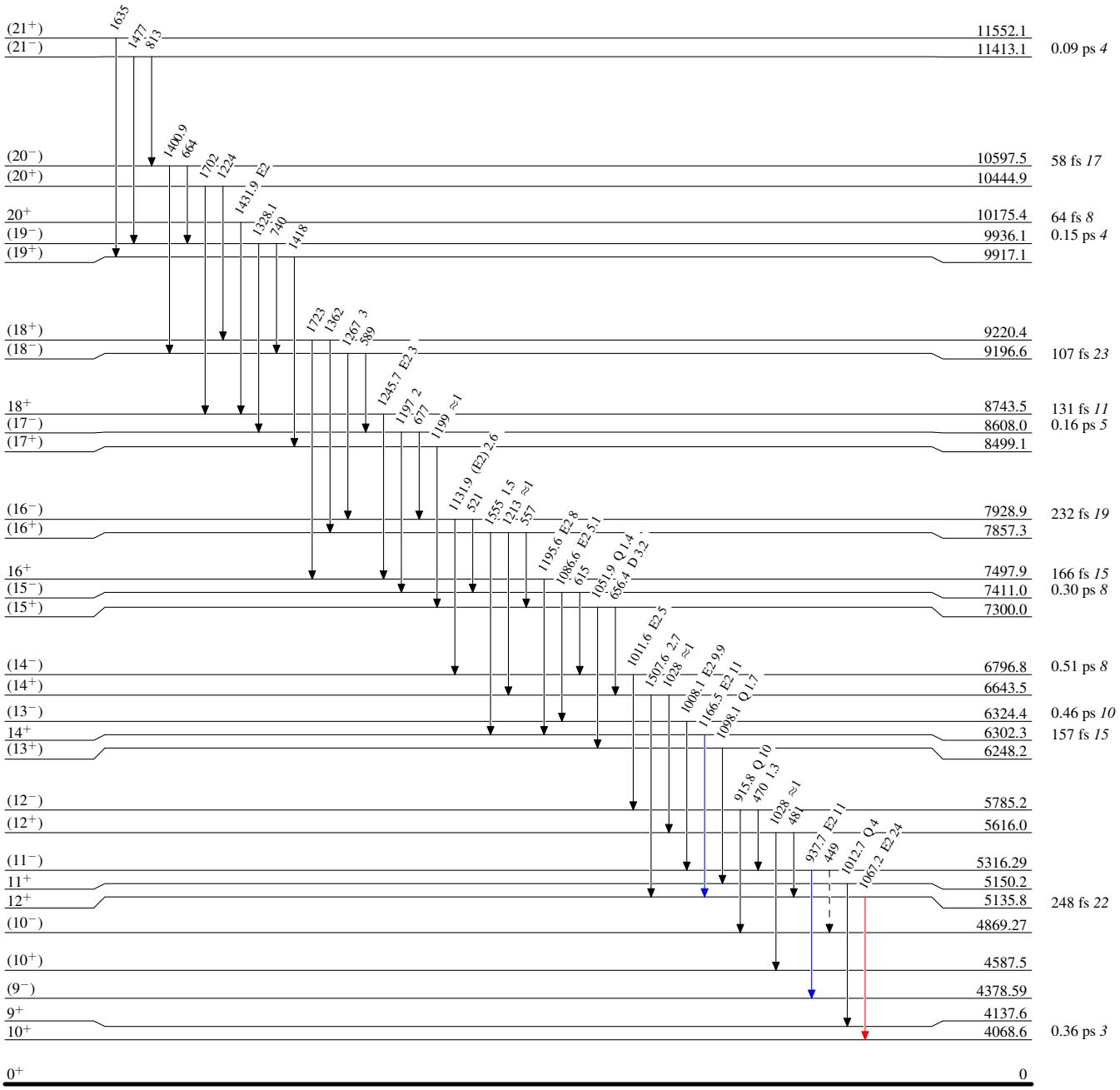
$^{84}_{40}Zr_{44}$

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09

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)



$^{84}_{40}Zr_{44}$

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09

Level Scheme (continued)

Intensities: Relative I_γ

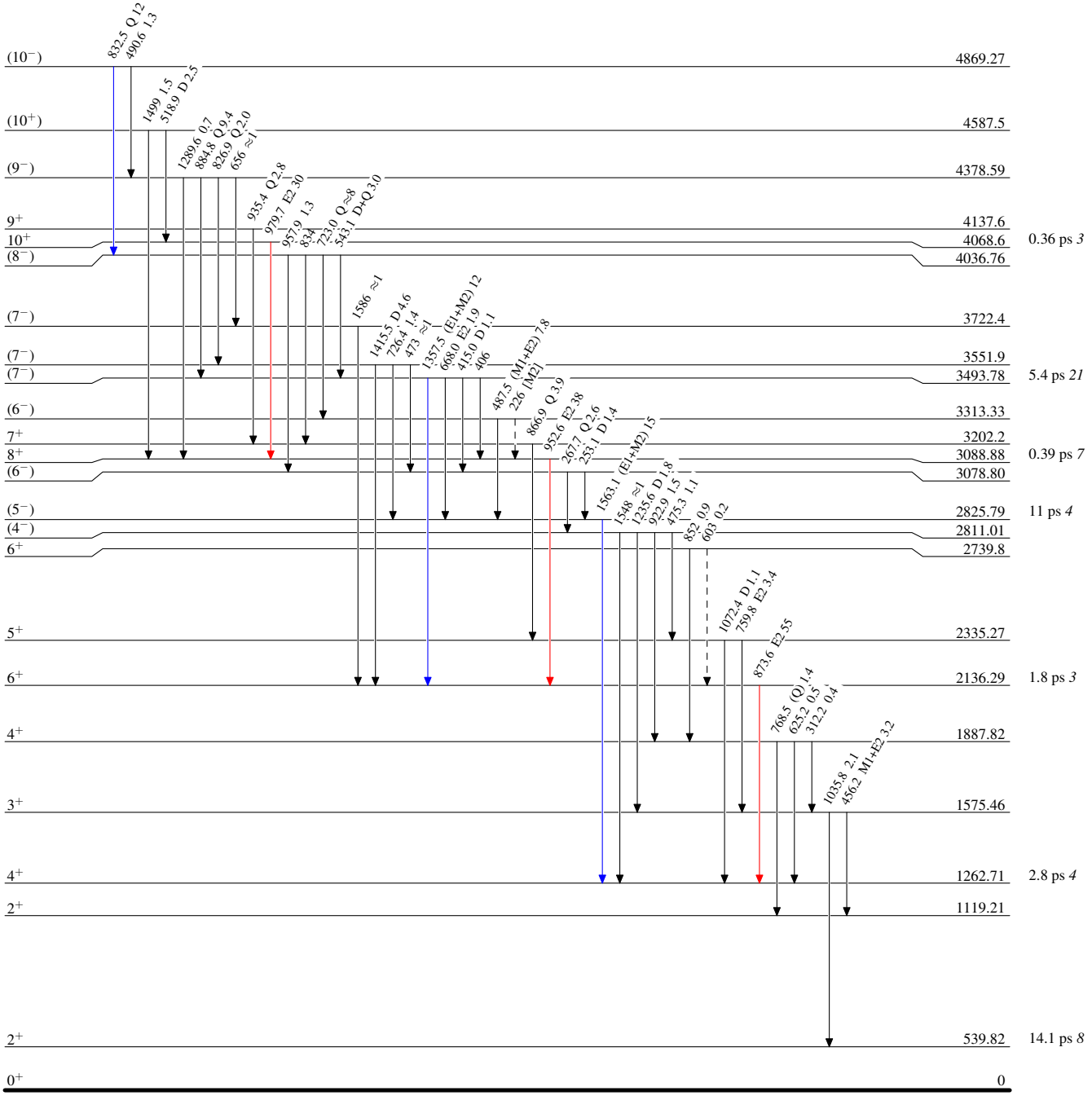
Legend

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

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

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

γ Decay (Uncertain)

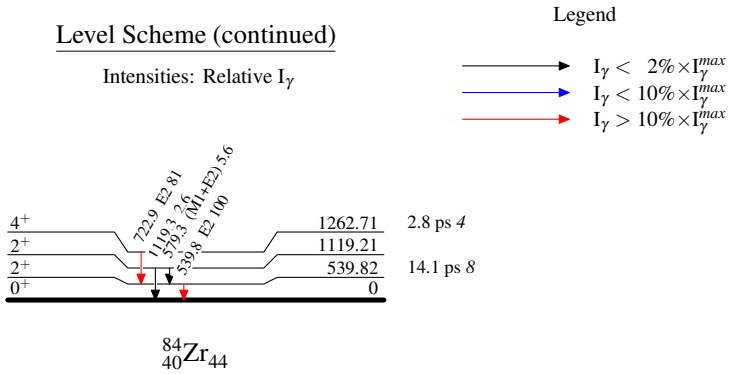


$^{84}_{40}Zr_{44}$

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09

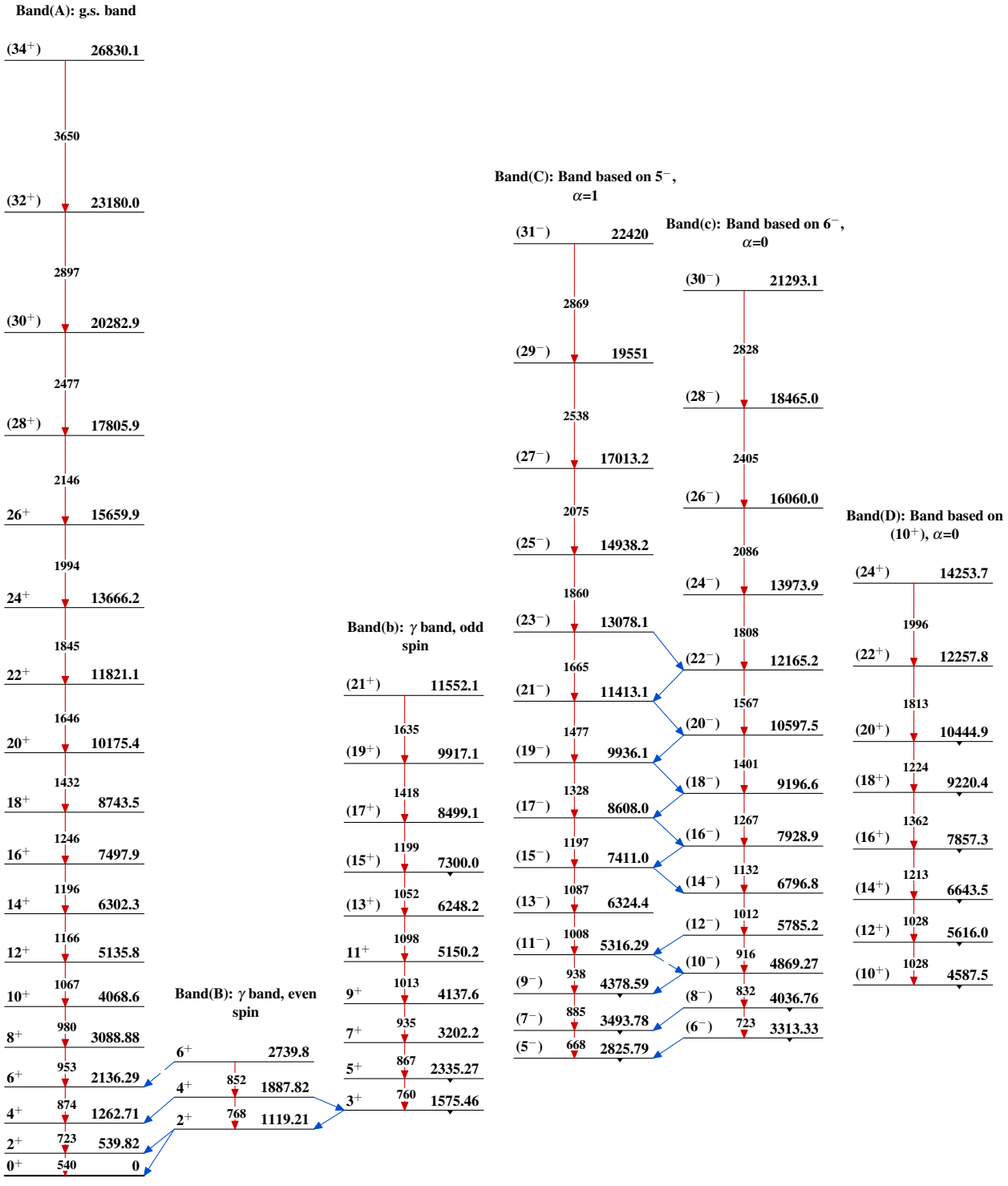
Level Scheme (continued)

Intensities: Relative I_γ



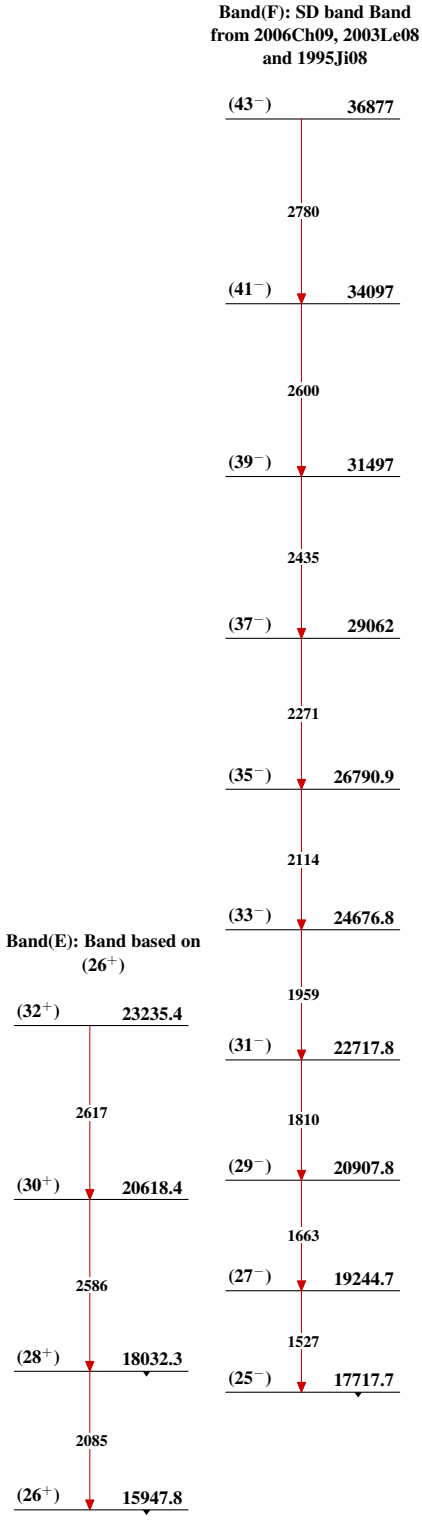
$^{84}_{40}Zr_{44}$

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09



$^{84}_{40}Zr_{44}$

(HI,xnγ) 2003Ca26,2003Do01,2006Ch09 (continued)



$^{84}_{40}Zr_{44}$