Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. K. Tuli, E. Browne	NDS 157, 260 (2019)	1-Mar-2019

Q(β^-)=−11541 *SY*; S(n)=14243 *95*; S(p)=5207 *12*; Q(α)=−2882 *13* 2017Wa10
ΔQ(β^-)=300 syst (2017Wa10).
Theory:
2017Go13: Calculated rigidity and r0 parameters.
2016Ba43: Calculated 2-particle configurations.
2015Bh13: Calculated structure parameters using relativistic mean-field formualism.
2015Ku08,2014KuZS,2003Ge10: Calculated structure parameters using relativistic and nonrelativistic mean-field formualism.
2015Wu04: Calculated g.s. structure parameters.
2014Eb02: Calculated strength for E1 resonance.
2014Ta36: Calculated low-energy levels.
2014Zh43: Calculated deformation parameters.
2012Do04: Calculated rms radii.
2012Sm06: Calculated effective n, p sp energies, two-body shell model.
2012Zh09,2011Bh06: Calculated S(2n) using RMF.
2011Sa06,2008Pe31,2006Sa45: Calculated G-T strength distribution.
2010Zh02: Calculated GS band levels.
2008Pe30: Calculated yrast states.
2008Af02: Calculated structure parametes, cranked RMF theory.
2006Es02: Calculated levels, J^π.
2006Li13: Calculated n, p density distributions.
2004He24: Calculated nuclear charge radius.
2004Su08: Calculated band parameters, projected shell model.
2003La18: Calculated g.s. configuration using Shell Model Monte Carlo.
2001Pa14: Calculated rotational band energies.
2001Kh16, 2001Kh05: Calculated 2Λ-hypernuclii g.s., excited-state separation energies, g.s. rms radii.
1999Re12: Calculated potential-energy surface vs deformation.
1999Gu11: Calculated cluster-decay $T_{1/2}$.
1993Ch41, 1984He07, 1983Bu09: Interacting Boson Model.
1985Bo36: Hartree-Fock calculation of energy surfaces.
1985Na02: Microscopic description of deformations.
1984He07: Nilsson model.

^{82}Zr Levels

All data are from (HI,xnγ) (1997Ru03), unless given otherwise.

Cross Reference (XREF) Flags

A (HI,xnγ)
B ^{82}Nb ε decay

E(level)	J^π†#	$T_{1/2}$‡	XREF	Comments
0.0&	0^+	32 s *5*	AB	%ε+%β^+=100 $T_{1/2}$: from decay curves of gammas (1982Li17). Other: 1982De36 report 2.5 min *1* from positron activity but find no gammas.
407.00& *10*	2^+	22 ps *9*	A	$T_{1/2}$: from 1997Pa07 RDM. Other: 28 ps *3* (1993Ch41) RDM.
1040.84& *14*	4^+	3.3 ps *7*	A	$T_{1/2}$: from 1997Pa07 RDM. Other: 5.5 ps *14* (1993Ch41) RDM.

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Adopted Levels, Gammas (continued)

^{82}Zr Levels (continued)

E(level)	Jπ†#	$T_{1/2}$‡	XREF	Comments
1060.87? *22*			A	
1449.14@ *21*	$(3)^+$		A	
1887.87& *24*	6^+	0.5 ps *2*	A	$T_{1/2}$: from 1997Pa07 RDM.
2057.3 *6*			A	
2175.40@ *24*	$(5)^+$		A	
2691.6?a *8*	(4^-)		A	
2791.6b *3*	$5^{(-)}$		A	
2856.99c *23*	5^-		A	
2908.6& *4*	8^+	0.22 ps *6*	A	
3068.4@ *4*	$(7)^+$		A	
3128.2d *3*	6^-		A	
3287.3a *7*	(6^-)		A	
3480.8b *4*	$7^{(-)}$		A	
3506.8c *4*	7^-		A	
3946.7d *4*	8^-		A	
4022.6a *8*	(8^-)		A	
4036.9& *5*	10^+	0.16 ps *4*	A	
4086.4@ *6*	$(9)^+$		A	
4347.7b *5*	$9^{(-)}$		A	
4444.1c *8*	(9^-)		A	
4908.4d *6*	10^-		A	
4973.2a *9*	(10^-)		A	
5195.4@ *12*	$(11)^+$		A	
5213.4& *7*	12^+	0.13 ps *4*	A	
5361.4b *8*	$11^{(-)}$		A	
5550.1c *22*	(11^-)		A	
5989.2d *8*	12^-		A	
6100.2a *14*	(12^-)		A	
6406.4@ *16*	(13^+)		A	
6490.7& *7*	14^+	<0.27 ps	A	$T_{1/2}$: effective $T_{1/2}$, not corrected for feeding.
6535.9b *11*	$13^{(-)}$		A	
7041.7d *9*	14^-		A	
7345.2a *17*	(14^-)		A	
7680.4 *19*	$(15)^+$		A	
7687.9b *15*	(15^-)		A	
7750.4 *19*	(15^+)		A	
7859.7& *8*	16^+		A	
7907.9? *23*	(15^-)		A	
7992.5 *12*	(16^+)		A	
8113.7d *14*	16^-		A	
9046.9?b *18*	(17^-)		A	
9070? *3*	$(17)^+$		A	
9111.7& *13*	18^+		A	
9183? *3*	$(17)^+$		A	
9234.9? *25*	(17^-)		A	
9338.7d *17*	(18^-)		A	
9452.8 *12*	(18^+)		A	
10490.7& *17*	(20^+)		A	

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Adopted Levels, Gammas (continued)

^{82}Zr Levels (continued)

E(level)	J$^{\pi}$[†][#]	XREF
10752.7[d] *20*	(20$^-$)	A
12126.7[&] *19*	(22$^+$)	A
12365?[d] *3*	(22$^-$)	A
14013[&] *3*	(24$^+$)	A
16120?[&] *4*	(26$^+$)	A

[†] π=− BAND C and Band D are signature partners. Band E and Band F are signature partners.
[‡] From Doppler-shift analysis (1997Ru03), unless given otherwise.
[#] From 1997Ru03 based on multipolarities determined by DCO ratios and band memberships.
[@] Band(A): π=+, α=1, side band.
[&] Band(B): π=+, α=0, g.s. band.
[a] Band(C): π=−, α=0.
[b] Band(D): π=−, α=1.
[c] Band(E): π=−, α=1.
[d] Band(F): π=−, α=0.

γ(^{82}Zr)

All data are from (HI,xnγ) (1997Ru03), unless given otherwise.

E$_i$(level)	J$_i^{\pi}$	E$_{\gamma}$	I$_{\gamma}$	E$_f$	J$_f^{\pi}$	Mult.[†]	α[#]	Comments
407.00	2$^+$	407.0 *1*	100	0.0	0$^+$	E2	0.00791	B(E2)(W.u.)=1.1×10^2 *5* α(K)=0.00692 *10*; α(L)=0.000825 *12*; α(M)=0.0001432 *20* α(N)=2.00×10^{-5} *3*; α(O)=1.282×10^{-6} *18*
1040.84	4$^+$	633.9 *1*	100	407.00	2$^+$	E2	0.00212	B(E2)(W.u.)=79 *17* α(K)=0.00186 *3*; α(L)=0.000213 *3*; α(M)=3.70×10^{-5} *6* α(N)=5.21×10^{-6} *8*; α(O)=3.52×10^{-7} *5*
1060.87?		653.8 *2*	100	407.00	2$^+$			
1449.14	(3)$^+$	387.7 *6*	43 *15*	1060.87?				
		408.3[‡] *3*	14 *8*	1040.84	4$^+$			
		1041.7 *3*	100 *15*	407.00	2$^+$	D+Q		
1887.87	6$^+$	847.0 *2*	100	1040.84	4$^+$	E2	9.96×10^{-4}	B(E2)(W.u.)=1.2×10^2 *5* α(K)=0.000878 *13*; α(L)=9.85×10^{-5} *14*; α(M)=1.708×10^{-5} *24* α(N)=2.42×10^{-6} *4*; α(O)=1.669×10^{-7} *24*
2057.3		1017[‡] *1*	100	1040.84	4$^+$			
2175.40	(5)$^+$	726.0 *2*	100 *10*	1449.14	(3)$^+$	(E2)	1.47×10^{-3}	α(K)=0.001296 *19*; α(L)=0.0001468 *21*; α(M)=2.55×10^{-5} *4* α(N)=3.59×10^{-6} *5*; α(O)=2.46×10^{-7} *4*
		1135.2 *3*	50 *10*	1040.84	4$^+$			
2691.6?	(4$^-$)	1651[@] *1*	100	1040.84	4$^+$			
2791.6	5$^{(-)}$	1750.7 *3*	100	1040.84	4$^+$	(E1)	5.47×10^{-4}	α(K)=9.63×10^{-5} *14*; α(L)=1.037×10^{-5} *15*; α(M)=1.79×10^{-6} *3* α(N)=2.55×10^{-7} *4*; α(O)=1.83×10^{-8} *3*; α(IPF)=0.000439 *7*

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Adopted Levels, Gammas (continued)

γ(^{82}Zr) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	α[#]	Comments
2856.99	5⁻	800[@] *1*	11 *12*	2057.3				
		1816.1 *2*	100 *12*	1040.84	4⁺	(E1)	5.90×10^{-4}	α(K)=9.09×10⁻⁵ *13*; α(L)=9.79×10⁻⁶ *14*; α(M)=1.693×10⁻⁶ *24* α(N)=2.41×10⁻⁷ *4*; α(O)=1.726×10⁻⁸ *25*; α(IPF)=0.000487 *7*
2908.6	8⁺	1020.7 *3*	100	1887.87	6⁺	E2	6.40×10^{-4}	B(E2)(W.u.)=1.1×10² *3* α(K)=0.000565 *8*; α(L)=6.27×10⁻⁵ *9*; α(M)=1.087×10⁻⁵ *16* α(N)=1.541×10⁻⁶ *22*; α(O)=1.077×10⁻⁷ *15*
3068.4	(7)⁺	893.1 *3*	100 *8*	2175.40	(5)⁺	E2	8.76×10^{-4}	α(K)=0.000772 *11*; α(L)=8.63×10⁻⁵ *13*; α(M)=1.497×10⁻⁵ *21* α(N)=2.12×10⁻⁶ *3*; α(O)=1.469×10⁻⁷ *21*
		1180[‡] *1*	21 *8*	1887.87	6⁺			
3128.2	6⁻	271.1 *2*	100 *15*	2856.99	5⁻	D		
		336.6 *3*	14 *15*	2791.6	5⁽⁻⁾			
		1071[‡] *1*	29 *15*	2057.3				
3287.3	(6⁻)	219 *1*	17 *17*	3068.4	(7)⁺			
		596 *1*	17 *17*	2691.6?	(4⁻)			
		1399 *1*	100 *17*	1887.87	6⁺			
3480.8	7⁽⁻⁾	689 *1*	38 *13*	2791.6	5⁽⁻⁾			
		1593.0[‡] *3*	100 *13*	1887.87	6⁺	(E1)	4.44×10^{-4}	α(K)=0.0001121 *16*; α(L)=1.209×10⁻⁵ *17*; α(M)=2.09×10⁻⁶ *3* α(N)=2.98×10⁻⁷ *5*; α(O)=2.13×10⁻⁸ *3*; α(IPF)=0.000317 *5*
3506.8	7⁻	377.5 *6*	1.0×10² *4*	3128.2	6⁻	D+Q		
		650.1 *4*	1.0×10² *4*	2856.99	5⁻			
		1619[@] *2*	3.×10¹ *4*	1887.87	6⁺			
3946.7	8⁻	439.2 *7*	25 *13*	3506.8	7⁻			
		818.7 *3*	100 *13*	3128.2	6⁻	E2	1.08×10^{-3}	α(K)=0.000955 *14*; α(L)=0.0001073 *15*; α(M)=1.86×10⁻⁵ *3* α(N)=2.63×10⁻⁶ *4*; α(O)=1.81×10⁻⁷ *3*
4022.6	(8⁻)	735.3 *4*	100	3287.3	(6⁻)	E2	1.42×10^{-3}	α(K)=0.001254 *18*; α(L)=0.0001419 *20*; α(M)=2.46×10⁻⁵ *4* α(N)=3.48×10⁻⁶ *5*; α(O)=2.38×10⁻⁷ *4*
4036.9	10⁺	1128.3 *3*	100	2908.6	8⁺	E2	5.13×10^{-4}	B(E2)(W.u.)=91 *23* α(K)=0.000451 *7*; α(L)=4.99×10⁻⁵ *7*; α(M)=8.65×10⁻⁶ *13* α(N)=1.227×10⁻⁶ *18*; α(O)=8.61×10⁻⁸ *12*; α(IPF)=1.53×10⁻⁶ *3*
4086.4	(9)⁺	1017.9 *4*	100	3068.4	(7)⁺			
4347.7	9⁽⁻⁾	866.9 *3*	100 *12*	3480.8	7⁽⁻⁾	E2	9.41×10^{-4}	α(K)=0.000830 *12*; α(L)=9.29×10⁻⁵ *13*; α(M)=1.612×10⁻⁵ *23* α(N)=2.28×10⁻⁶ *4*; α(O)=1.578×10⁻⁷ *23*
		1439 *1*	44 *12*	2908.6	8⁺			
4444.1	(9⁻)	937 *1*	100	3506.8	7⁻			
4908.4	10⁻	464 *1*	13 *13*	4444.1	(9⁻)			
		961.7 *4*	100 *13*	3946.7	8⁻	E2	7.35×10^{-4}	α(K)=0.000648 *9*; α(L)=7.22×10⁻⁵ *11*; α(M)=1.251×10⁻⁵ *18* α(N)=1.773×10⁻⁶ *25*; α(O)=1.234×10⁻⁷ *18*
4973.2	(10⁻)	950.6 *4*	100	4022.6	(8⁻)			
5195.4	(11)⁺	1109[‡] *1*	100	4086.4	(9)⁺	E2	5.32×10^{-4}	α(K)=0.000469 *7*; α(L)=5.19×10⁻⁵ *8*; α(M)=8.99×10⁻⁶ *13*

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Adopted Levels, Gammas (continued)

γ(^{82}Zr) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.[†]	α[#]	Comments
								α(N)=1.275×10^{-6} *18*; α(O)=8.94×10^{-8} *13*; α(IPF)=8.6×10^{-7} *3*
5213.4	12$^+$	1176.5 *4*	100	4036.9	10$^+$	E2	4.72×10^{-4}	B(E2)(W.u.)=9.E+1 *3* α(K)=0.000412 *6*; α(L)=4.55×10^{-5} *7*; α(M)=7.88×10^{-6} *11* α(N)=1.118×10^{-6} *16*; α(O)=7.86×10^{-8} *11*; α(IPF)=5.02×10^{-6} *9*
5361.4	11$^{(-)}$	1013.7 *6*	100	4347.7	9$^{(-)}$	E2	6.50×10^{-4}	α(K)=0.000574 *8*; α(L)=6.38×10^{-5} *9*; α(M)=1.105×10^{-5} *16* α(N)=1.566×10^{-6} *22*; α(O)=1.094×10^{-7} *16*
5550.1	(11$^-$)	1106 *2*	100	4444.1	(9$^-$)			
5989.2	12$^-$	1080.8 *5*	100	4908.4	10$^-$	E2	5.63×10^{-4}	α(K)=0.000497 *7*; α(L)=5.50×10^{-5} *8*; α(M)=9.53×10^{-6} *14* α(N)=1.351×10^{-6} *19*; α(O)=9.47×10^{-8} *14*
6100.2	(12$^-$)	1127 *1*	100	4973.2	(10$^-$)			
6406.4	(13$^+$)	1211 *1*	100	5195.4	(11)$^+$			
6490.7	14$^+$	1277.3 *3*	100	5213.4	12$^+$	E2	4.13×10^{-4}	B(E2)(W.u.)>29 α(K)=0.000346 *5*; α(L)=3.80×10^{-5} *6*; α(M)=6.59×10^{-6} *10* α(N)=9.36×10^{-7} *14*; α(O)=6.60×10^{-8} *10*; α(IPF)=2.19×10^{-5} *4*
6535.9	13$^{(-)}$	1174.4 *7*	100	5361.4	11$^{(-)}$			
7041.7	14$^-$	1052.5 *5*	100	5989.2	12$^-$	E2	5.97×10^{-4}	α(K)=0.000527 *8*; α(L)=5.84×10^{-5} *9*; α(M)=1.013×10^{-5} *15* α(N)=1.436×10^{-6} *21*; α(O)=1.005×10^{-7} *15*
7345.2	(14$^-$)	1245 *1*	100	6100.2	(12$^-$)			
7680.4	(15)$^+$	1274 *1*	100	6406.4	(13$^+$)			
7687.9	(15$^-$)	1152 *1*	100	6535.9	13$^{(-)}$			
7750.4	(15$^+$)	1344 *1*	100	6406.4	(13$^+$)			
7859.7	16$^+$	1368.9 *4*	100	6490.7	14$^+$	E2	3.82×10^{-4}	α(K)=0.000299 *5*; α(L)=3.28×10^{-5} *5*; α(M)=5.69×10^{-6} *8* α(N)=8.08×10^{-7} *12*; α(O)=5.72×10^{-8} *8*; α(IPF)=4.32×10^{-5} *7*
7907.9?	(15$^-$)	1372[@] *2*	100	6535.9	13$^{(-)}$			
7992.5	(16$^+$)	1502 *1*	100	6490.7	14$^+$			
8113.7	16$^-$	1072 *1*	100	7041.7	14$^-$	E2	5.73×10^{-4}	α(K)=0.000506 *8*; α(L)=5.60×10^{-5} *8*; α(M)=9.71×10^{-6} *14* α(N)=1.377×10^{-6} *20*; α(O)=9.64×10^{-8} *14*
9046.9?	(17$^-$)	1359[@] *1*	100	7687.9	(15$^-$)			
9070?	(17)$^+$	1390[@] *2*	100	7680.4	(15)$^+$			
9111.7	18$^+$	1252 *1*	100	7859.7	16$^+$	E2	4.25×10^{-4}	α(K)=0.000361 *5*; α(L)=3.97×10^{-5} *6*; α(M)=6.88×10^{-6} *10* α(N)=9.77×10^{-7} *14*; α(O)=6.89×10^{-8} *10*; α(IPF)=1.67×10^{-5} *3*
9183?	(17)$^+$	1433[@] *2*	100	7750.4	(15$^+$)			
9234.9?	(17$^-$)	1327[@] *1*	100	7907.9?	(15$^-$)			
9338.7	(18$^-$)	1225 *1*	100	8113.7	16$^-$			
9452.8	(18$^+$)	1461 *2*	7.×10^1 *4*	7992.5	(16$^+$)			
		1593 *1*	1.0×10^2 *4*	7859.7	16$^+$			
10490.7	(20$^+$)	1379 *1*	100	9111.7	18$^+$			
10752.7	(20$^-$)	1414 *1*	100	9338.7	(18$^-$)			
12126.7	(22$^+$)	1636 *1*	100	10490.7	(20$^+$)			

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Adopted Levels, Gammas (continued)

$\gamma(^{82}Zr)$ (continued)

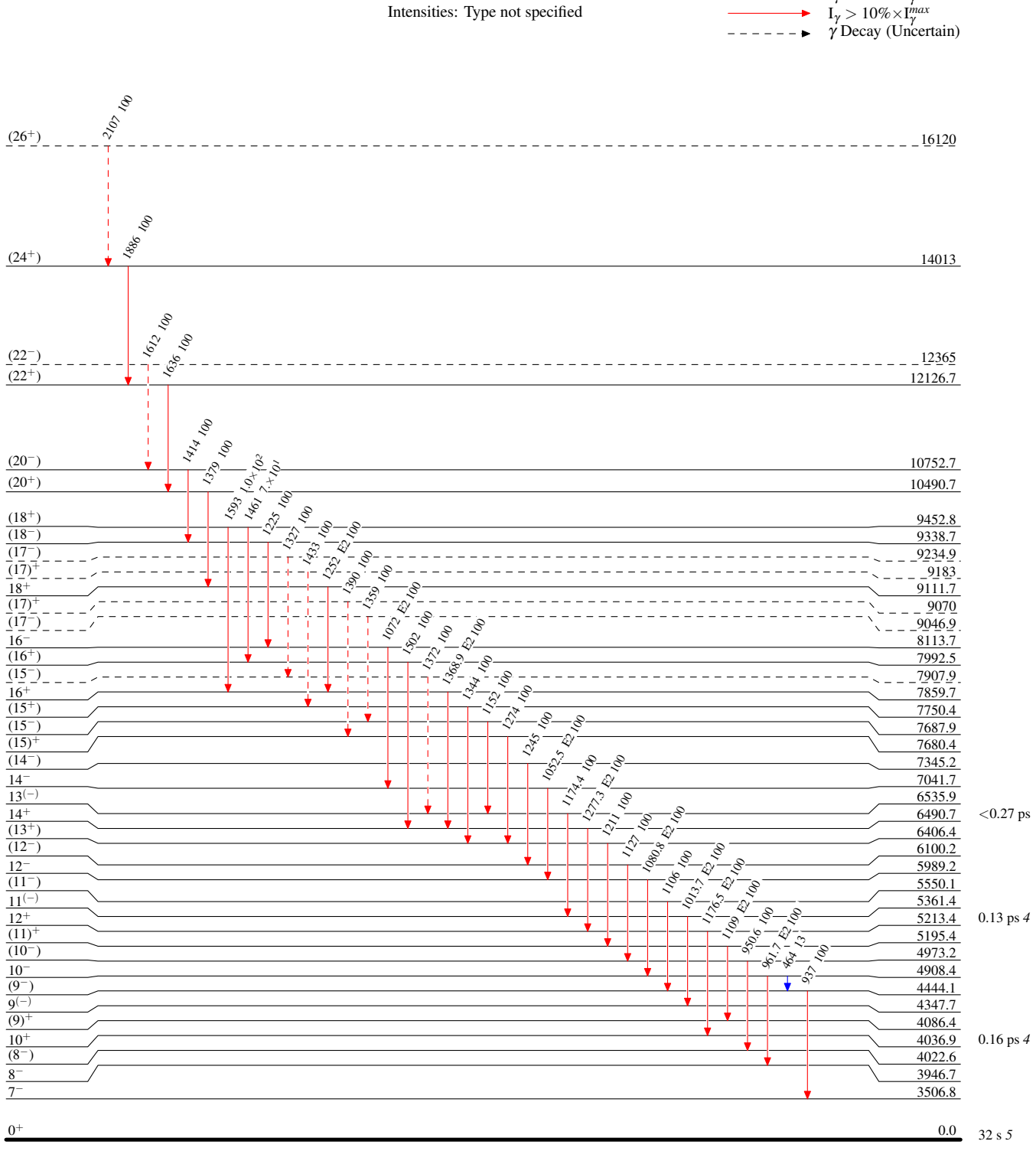
E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π
12365?	(22^-)	1612[@] *2*	100	10752.7	(20^-)
14013	(24^+)	1886 *2*	100	12126.7	(22^+)
16120?	(26^+)	2107[@] *3*	100	14013	(24^+)

† Multipolarities are derived from DCO ratios as D and Q in (HI,xnγ) Q are taken as E2′s as mostly M2 are unlikely on basis of RUL. D are taken as E1 by level-scheme placement.
‡ Complex.
# Additional information 1.
@ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

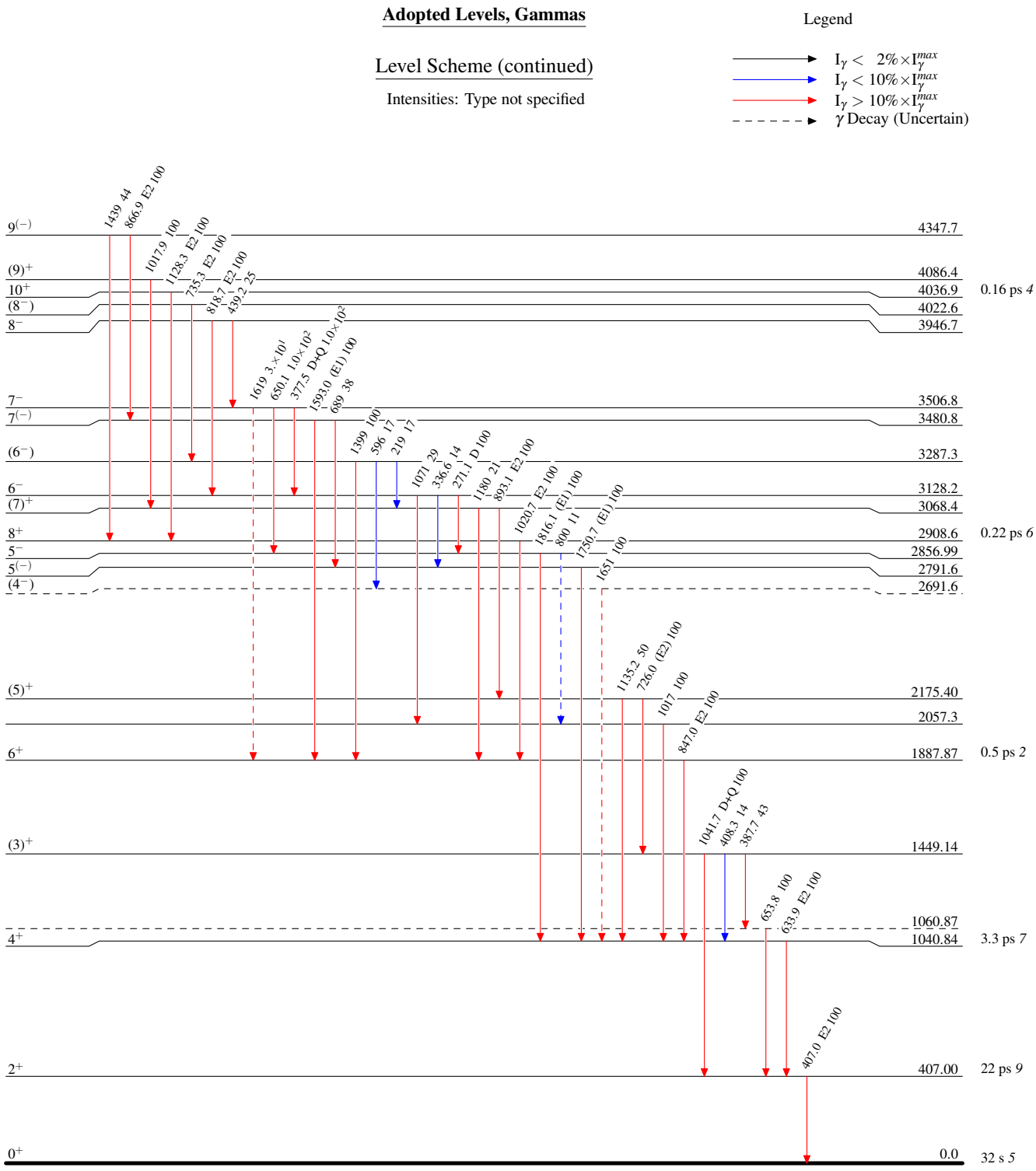


$^{82}_{40}Zr_{42}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified



$^{82}_{40}Zr_{42}$

Adopted Levels, Gammas