

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. McCutchan		NDS 165,1 (2020)	1-Mar-2020

Q(β^-)=-6111.3; S(n)=11968.3; S(p)=8353.2 16; Q(α)=-6674.3 612 2017Wa10
 S(2n)=21286.5; S(2p)=15428.86 12 (2017Wa10).
 α : [Additional information 1.](#)

⁹⁰Zr Levels

Cross Reference (XREF) Flags

A	⁹⁰ Y β^- decay (64.00 h)	N	⁹⁰ Zr(α, α')	Others:	
B	⁹⁰ Y β^- decay (3.19 h)	O	⁹¹ Zr(³ He, α)	AA	⁹⁰ Zr(e, e')
C	⁹⁰ Nb ϵ decay	P	⁸⁹ Y(p, γ)	AB	⁹² Zr(p, t)
D	⁹⁰ Zr IT decay (809.2 ms)	Q	⁹⁰ Zr(e, e' p), (γ , p)	AC	⁹¹ Zr(d, t)
E	⁷⁶ Ge(¹⁸ O, 4n γ)	R	⁹⁰ Zr(γ , n)	AD	⁸⁸ Sr(³ He, n)
F	⁸⁷ Sr(α , n γ)	S	⁸⁹ Y(p, n), (p, n γ)	AE	⁸⁸ Sr(¹⁶ O, ¹⁴ C), (¹² C, ¹⁰ Be)
G	⁸⁹ Y(³ He, d)	T	⁸⁹ Y(p, p), (pol p, p)	AF	⁹⁰ Zr(n, n')
H	⁹⁰ Zr(t, t')	U	⁸⁹ Y(p, p'), (p, p' γ)	AG	⁹² Zr(α , ⁶ He)
I	⁹¹ Zr(p, d)	V	⁹⁰ Zr(p, p')	AH	⁹⁴ Mo(d, ⁶ Li)
J	⁹⁰ Zr(³ He, dp)	W	⁹⁰ Zr(p, p' γ)	AI	⁹² Mo(¹⁴ C, ¹⁶ O)
K	⁸⁹ Y(d, n)	X	⁹⁰ Zr(n, n' γ)	AJ	Coulomb excitation
L	⁹⁰ Zr(d, d')	Y	⁹³ Nb(p, α)	AK	⁹⁰ Zr(¹⁷ O, ¹⁷ O'), (¹⁷ O, ¹⁷ O' γ)
M	⁹⁰ Zr(³ He, ³ He')	Z	⁹⁰ Zr(γ , γ')	AL	²⁰⁸ Pb(⁹⁰ Zr, ⁹⁰ Zr' γ)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF	Comments
0	0 ⁺	stable	ABCDEFGHIJKLMN OP VWXYZ	XREF: Others: AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK
1760.74 14	0 ⁺	61.3 ns 25	A CDE GH KL P VWXY	XREF: Others: AB, AC, AD, AF, AH, AI, AK, AL T _{1/2} : from delayed coincidence in ⁹⁰ Zr(p, p'e). Other: 62 ns 4 (1959K146). J ^π : E0 1760.7 transition to 0 ⁺ .
2186.273 14	2 ⁺	87.9 fs 21	A CDEF HIJ LMNOP VWXYZ	XREF: Others: AA, AB, AE, AF, AG, AH, AI, AJ, AK, AL μ=2.5 4 T _{1/2} : from DSA measurements following projectile Coulomb excitation using ⁹⁰ Zr (2000Ja11). Others: 87.0 fs 28 from (e, e') Coulomb excitation (1984He02), 93 fs 5 from nuclear resonance fluorescence (1972Me04), 82 fs +16-12 from Doppler-Shift Attenuation in ⁸⁹ Y(p, γ) (1993Sa38) and 86.6 fs +49-42 from ⁹⁰ Zr(n, n' γ) (2013Pe16). μ: from Transient Field Integral Perturbed Angular Correlation (2000Ja11, 2014StZZ).
2319.000 9	5 ⁻	809.2 ms 20	BCDEFGH KL N P VWXY	J ^π : E2 2186 γ to 0 ⁺ . XREF: Others: AB, AE, AG, AH, AK, AL %IT=100 μ=6.25 13 T _{1/2} : from (n, n' γ). μ: From Nuclear Magnetic Resonance on Oriented Nuclei (1987Ed02, 1987Ra17, 2014StZZ).
2739.29 5	(4) ⁻		C EFG I K M O	J ^π : E5 2319.0 γ to 0 ⁺ . XREF: Others: AK, AL
2747.875 16	3 ⁻	15.2 ps 28	C EF H J L N P VWX	J ^π : 2252.9 γ from 2 ⁻ , 420.3 γ to 5 ⁻ . XREF: Others: AB, AE, AG, AH, AI, AK, AL

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Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF	Comments
3076.925 15	4 ⁺		C EF HI L NOP VWXY	μ=3.0 2 μ: From Nuclear Magnetic Resonance on Oriented Nuclei (2000Ja11,2014StZZ). J ^π : E3 2747.5γ to 0 ⁺ . XREF: Others: AA, AE, AF, AH, AK, AL
3308.10 8	2 ⁺	67.9 fs +42-35	F HI L NOP VWXYZ	J ^π : E2 890.6γ to 2 ⁺ . XREF: Others: AA, AE, AF, AG, AH, AK, AL T _{1/2} : from measurement with metallic sample in (n,n'γ) (2013Pe16). Others: 69 fs 13 from Coul. ex. in (e,e') (1984He02), 72 fs 21 from nuclear resonance fluorescence (1974Me13), 96 fs +6-5 from Doppler-Shift Attenuation in ⁸⁹ Y(p,γ) (1993Sa38), and 97 fs 14 from Doppler-Shift Attenuation in ⁹⁰ Zr(n,n'γ) (1993BeZL).
3448.230 14	6 ⁺	>1.46 ps	C EF H L N V XY	J ^π : E2 3308.1γ to 0 ⁺ . XREF: Others: AA, AH, AK, AL
3557 5			I	E(level): From ⁹¹ Zr(p,d).
3589.418 15	8 ⁺	131 ns 4	C EF H V XY	XREF: Others: AA, AH, AL Q=-0.51 3; μ=+10.84 6 T _{1/2} : weighted average of 125 ns 6 from delayed coincidence in ⁹⁰ Nb ε decay (1964Lo02) and 134 ns 4 from γ(t) (1977Ha49). Q: from time-differential Perturbed Angular Distribution (1977Ha49,1989Ra17,2014StZZ). μ: from time-differential Perturbed Angular Distribution, corrected for diamagnetic shift and Knight shift (1985Ra09,1989Ra17,2014StZZ).
3842.34 11	2 ⁺	15.1 fs 12	HI LMNOP VWXYZ	J ^π : E2 141.2γ to 6 ⁺ . XREF: Others: AA, AG, AH, AL T _{1/2} : weighted average of 15.1 fs 9 from Coul. ex. in (e,e') (1984He02), 19.0 fs 27 from nuclear resonance fluorescence, Γ _{γ0} /Γ _γ =1 was assumed, 14 fs +6-4 from Doppler-Shift Attenuation in ⁸⁹ Y(p,γ) (1993Sa38), 10 fs 3 from Doppler-Shift Attenuation in ⁹⁰ Zr(n,n'γ) (1993BeZL) and 24 fs 5 from DSA measurements in (n,n'γ) (2003Ga23). J ^π : E2 3842γ to 0 ⁺ .
3932.4 6				Z
3958.59 10	5 ⁻	33 fs 6	H L N V XY	XREF: Others: AA, AH J ^π : from DWBA analysis of σ(θ) in (e,e'), L(p,p')=5.
4058.07 9	4 ⁺	0.12 ps +6-4	H V X	XREF: Others: AA, AL
4124.49 14	0 ⁺		N P V XY	XREF: Others: AB, AG, AH J ^π : from L(p,p')=0, L(p,t)=0.
4223& 2	(2) ⁺		HI L Y	XREF: Others: AA, AK J ^π : from L(d,d')=2.
4225.35 12	(4) ⁻	20 fs 5	K N X	XREF: Others: AA J ^π : (M1+E2) 1905.5γ to 5 ⁻ , 1478.0γ to 3 ⁻ .
4229.05 9	2 ⁺	27 fs 3	G X	XREF: Others: AA, AG J ^π : E2 4229.3γ to 0 ⁺ .
4232.220 24	(6) ⁻	45 fs +37-19	C P V X	XREF: Others: AB J ^π : (M1+E2) 1913.19γ to 5 ⁻ , feeding from 8 ⁺ parent in ⁹⁰ Nb ε decay.

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Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF				Comments
4236.96 10	(1,2 ⁺)	104 fs 21				WX	J ^π : 2476.2γ to 0 ⁺ .
4262.37 8	(3 ⁺)	0.28 ps +13-7				X	J ^π : (M1+E2) 1185.6γ to 4 ⁺ , (M1+E2) 2076.2γ to 2 ⁺ .
4299.12 11	(5 ⁻)	31 fs 6				X	J ^π : (M1+E2) 1908.1γ to 5 ⁻ , (M1+E2) 1559.9γ to (4) ⁻ .
4305 [@] 6	4 ⁺				N	V	J ^π : from L(α,α')=4.
4319.2? 3			C	HI		Y	XREF: Others: AH
4331.93 9	4 ⁺	37 fs 6			NO	V X	XREF: Others: AA, AB, AG
							J ^π : from L(p,t)=4. Suggested to be the 4 ⁺ member of the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet.
4348.10 13	(4 ⁺)	29 fs 7			LM	X	J ^π : shape of excitation function consistent with J=4 in (n,n'γ), 2161.9γ to 2 ⁺ .
4375.07 6	7 ⁻		C	H	N	V XY	XREF: Others: AL
4426.43 13	0 ⁺	0.20 ps +24-8			K	P	J ^π : from L(α,α')=7. XREF: Others: AB, AH
4454.71 10	(5 ⁺)			HI	O	XY	J ^π : from L(p,t)=0. XREF: Others: AA
							J ^π : shape of excitation function in (n,n'γ) consistent with J=4 or 5; L(³ He,α)=(4) and suggested to be the 5 ⁺ member of the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet.
4455.58 10	(2)	0.14 ps +5-3				V XY	J ^π : D+Q 1707.9γ to 3 ⁻ .
4474.31 14	4 ⁺	0.15 ps +18-6			N	V XY	XREF: Others: AA
							J ^π : from comparison of DWBA calculations to σ(θ) in (e,e').
4494.79 12	(3 ⁻)	42 fs 8				V X	J ^π : D+Q 1755.5γ to (4) ⁻ , 1747.2γ to 3 ⁻ , L(p,p')=(3).
4500 ^f 15	0 ⁺ ,1 ⁺ ,2 ⁺			G		Z	J ^π : from L(³ He,d)=1.
4507.0 8							
4533.52 10	(3 ⁻)	69 fs +35-28		HI		X	J ^π : (M1+E2) 1794.2γ to (4) ⁻ , 2347.3γ to 2 ⁺ .
4537.70 11	(4 ⁻)	0.13 ps +7-5			K	XY	XREF: Others: AG, AH
							J ^π : (M1+E2) 2218.7γ to 5 ⁻ .
4541.37 3	6 ⁺	59 fs +17-12	C		NO	V X	XREF: Others: AA, AB
							J ^π : from L(p,t)=6; suggested to be the 6 ⁺ member of the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet.
4562.02 14	5	0.14 ps +10-4	G	I		X	XREF: Others: AA
							J ^π : shape of excitation function in (n,n'γ) consistent with J=5.
4578.93 13	(1)	5.1 fs 20			P	X Z	T _{1/2} : other=8.7 fs +13-9 from DSA in ⁸⁹ Y(p,γ). J ^π : population in (γ,γ').
4591.37 10	(3 ⁺)	0.14 ps +4-3		H	O	V X	J ^π : shape of excitation function in (n,n'γ) consistent with J=5; suggested to be the 3 ⁺ member of the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet in (³ He,α).
4614.42 13	(6 ⁺)					X	J ^π : shape of excitation function in (n,n'γ) consistent with J=6, 1537.6γ to 4 ⁺ .
4640.94 4	7,8		C			X	J ^π : feeding from 8 ⁺ parent in ⁹⁰ Nb beta decay, 1192.7γ to 6 ⁺ .
4646.7 3	1,2 ⁺	5 fs 4		GHI	P	V X	XREF: Others: AG, AH
							J ^π : 4646.6γ to 0 ⁺ .
4681.26 12	2 ⁺	31 fs 7			NOP	V X	XREF: Others: AA, AB, AK

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Adopted Levels, Gammas (continued)

<u>⁹⁰Zr Levels (continued)</u>						
E(level) [†]	J ^π	T _{1/2} [‡]	XREF			Comments
4701.10 10 4710@ 6	2 ⁺	46 fs 7			X V	J ^π : E2 4680.8γ to 0 ⁺ ; suggested to be the 2 ⁺ member of the configuration=(ν 1g _{9/2}) ⁻¹ (ν d _{5/2}) multiplet in (³ He,d). J ^π : E2 2940.6γ to 0 ⁺ . E(level): possibly the same as the 4701 level. L(p,p')=2 would be consistent with J ^π of 4701 level.
4774.29 13 4781.81 20	4,(3 ⁻)	14 fs +22-13	G		X V X	J ^π : shape of excitation function in (n,n'γ) consistent with J=3 or 4; 2462.8γ to 5 ⁻ .
4795.6 3 4814.44 11	2 ⁺ (3 ⁻)	7 fs +6-3	HI		X X	XREF: Others: AH J ^π : E2 4795.5γ to 0 ⁺ . XREF: Others: AB
4818.02 12	(3,4 ⁺)	0.14 ps +19-7		N	X	J ^π : from L(p,t)=3, assuming the 4814 level corresponds to that observed in (p,t). XREF: Others: AB, AG
4824.21 13 4840.27 14	2 ⁺ 5 ⁻	40 fs +10-8 83 fs +28-14			V X X	J ^π : shape of excitation function in (n,n'γ) consistent with J=3 or 4, 975.8γ to 2 ⁺ . J ^π : L(p,t)=2; 1747.2γ to 4 ⁺ , 4823.9γ to 0 ⁺ . J ^π : shape of excitation function in (n,n'γ) consistent with J=5, 2092.7γ to 3 ⁻ .
4849@ 6 4867.47 12	5 ⁺	0.14 ps +5-4			V X	J ^π : shape of excitation function in (n,n'γ) consistent with J=5, M1+E2 1790.7γ to 4 ⁺ .
4875@ 6 4932.6 4 4941.89 13 4992.36 12 5059.975 21	1,2 ⁺ (4 ⁺) 7 ⁺	0.18 ps +35-11 49 fs 10 0.21 ps +13-6		N G I P I NO	X V X V X V X	J ^π : 4932.5γ to 0 ⁺ . J ^π : from L(α,α')=4. XREF: Others: AA, AB
5068.6 6 5084.03 14	1,2 ⁺ 2,3	7 fs +13-6 46 fs +12-10	G	K	X V X	J ^π : E3 2741γ to 5 ⁻ , E1 827.7γ to 6 ⁻ ; suggested to be the 7 ⁺ member of the configuration=(ν 1g _{9/2}) ⁻¹ (ν d _{5/2}) multiplet in (³ He,α). J ^π : 5068.4γ to 0 ⁺ . XREF: Others: AA
5090.30 23 5107.92 21	(3 ⁻) (3),4 ⁺	0.07 ps +4-3	G I	P	XY X	J ^π : shape of excitation function in (n,n'γ) consistent with J=2 or 3. J ^π : shape of excitation function in (n,n'γ) consistent with J=3. XREF: Others: AB, AG
5112.6 14 5164.484 23 5171.90 16	3 ⁻ (8) ⁺ (4)	23 fs +8-6	C E	N	V X X	J ^π : 2368.6γ to (4) ⁻ , 2921.7γ to 2 ⁺ . J ^π : from L(α,α')=3. J ^π : (E2) 1717.3γ to 6 ⁺ , M1,E2 1575.0γ to 8 ⁺ . J ^π : shape of excitation function in (n,n'γ) consistent with J=4.
5175.8 3 5183.61 18 5222.97 23 5232.3 3 5247.52 4 5270.74 20	3,4 ⁺ 1,2 ⁺ (4 ⁺) 9 ⁺	22 fs +21-8 6.9 fs 35 34.0 fs 28 <28 ^g ps 17 fs +53-16	G	P H N	V X Z X Z V X X	J ^π : shape of excitation function in (n,n'γ) consistent with J=3 or 4, 2989.5γ to 2 ⁺ . J ^π : 5183.2γ to 0 ⁺ . J ^π : from L(p,p')=4.
5275.4 10 5305.97 20	(2 ⁺) 2 ⁺	0.80 ^h ps +20-11 17 fs 5	C E	P	X X Z	J ^π : E2(+M1) 1658.1γ to 8 ⁺ . J ^π : 5275γ (E2) to 0 ⁺ . J ^π : E2 5305.8γ to 0 ⁺ .

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Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF			Comments
5307.75 15	(3 ⁻ ,4 ⁺)	0.07 ps +8-2	G	P	X	J ^π : 2988.9γ to 5 ⁻ , 3121.3γ to 2 ⁺ .
5312.77 20	1,2 ⁺	59 fs 10		N	V X	XREF: Others: AB J ^π : 5312.6γ to 0 ⁺ .
5317.7 3	3 ⁻	0.19 ps +11-6		O	X	XREF: Others: AB, AH J ^π : from L(p,t)=3.
5359.22 19	3,4	22.9 fs 28			X	J ^π : shape of excitation function in (n,n'γ) consistent with J=3 or 4.
5379.8 3	(4 ⁺)	20 fs 4	H	N	V X	J ^π : from L(p,p')=L(α,α')=4.
5426.01 13	3 ⁻	52 fs +19-14	C G I		X	XREF: Others: AH J ^π : E2 3106.8γ to 5 ⁻ , 2118.1γ to 2 ⁺ .
5432.790 22	7 ⁺ ,8 ⁺		C			J ^π : feeding from 8 ⁺ parent in ⁹⁰ Nb ε decay, M1,E2 1843.3γ to 8 ⁺ , 1984.5γ to 6 ⁺ .
5437.33 13	2 ⁺	24.3 fs 35			V X	XREF: Others: AG XREF: V(5433). J ^π : from L(p,p')=2, E2 5436.9γ to 0 ⁺ .
5441 [#] 5	0 ⁺					XREF: Others: AB J ^π : from L(p,t)=0.
5457.70 18	(4 ⁺)	115.9 fs 28	H	N	V X	XREF: N(5464)V(5462). J ^π : from L(t,t')=4.
5504.75 19		7.7 fs 7	I	N	VWX Z	
5513.41 16	(3,4)	0.16 ps +8-6			X	XREF: Others: AB XREF: AB(5507). J ^π : from L(p,t)=3,4.
5564.2 4		7.6 fs 28	I		X	XREF: Others: AH
5582 [@] 6	(3 ⁻)			N	V	J ^π : from L(α,α')=(3).
5590.58 14	2 ⁺	15.9 fs 21			X	XREF: Others: AB J ^π : from L(p,t)=2.
5601.8 4		24 fs 4			X	
5607.6 4		14 fs +9-7	G	MN	X	XREF: Others: AA
5631 [@] 7	3 ⁻		I K		V	B(E3)↑=0.0068 10 (1975Si21) J ^π : from (e,e').
5644.02 4	10 ⁺	<28 ^g ps	E H			XREF: Others: AH, AL J ^π : E2 2054.6γ to 8 ⁺ .
5651.1 3		45 fs 5	G		X	
5666 [@] 7	3 ⁻			NO	V	J ^π : from L(α,α')=3.
5703 [@] 7					V	
5724.3 4		22 fs 4			X	
5753 [@] 7			G K		V	XREF: Others: AA
5775.1 5		24 fs +21-6	H N		X	
5781 [@] 7	3 ⁻				V	XREF: Others: AA B(E3)↑=0.00145 22 (1975Si21) J ^π : from (e,e'), L(p,p')=3.
5785.0 4					Z	
5792.05 3	(9 ⁺)		E			J ^π : (M1+E2) 2202.6γ to 8 ⁺ .
5808 4				O	Z	
5821.8 6					X	
5829 [@] 7					V	
5846.4 5		14 fs +44-13	G K		X	
5884.4 4				N	VW Z	
5938 [#] 5			HI N		V	XREF: Others: AB, AH J ^π : L(p,p')=3 and L(p,t)=(1) are in conflict.
5977 [@] 7					V	
6006 [@] 7					V	

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Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF		Comments
6020 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G	K	J ^π : L(³ He,d)=L(d,n)=2.
6058 [@] 7				V	
6070 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		GH		J ^π : L(³ He,d)=2.
6106 [@] 7				V	
6128 [@] 7				V	
6167 [@] 7				V	
6200 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G	K	J ^π : L(³ He,d)=2.
6229 [@] 7				V	
6250 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G	K	J ^π : L(³ He,d)=L(d,n)=2.
6279.70 8	11 ⁺		E		J ^π : E2 1032.2γ to 9 ⁺ .
6290 [@]				V	
6296 3	1 ⁻		H	O	Z
6308 [@] 7				V	
6320 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G		J ^π : L(³ He,d)=2.
6370 ^f 15			G		
6376.10 5	(10 ⁻)	<28 ^g ps	E		J ^π : E1(+M2) 818.2γ from (11 ⁺).
6389.8 3	1				Z J ^π : D 6389.6γ to 0 ⁺ .
6397 [@] 7			G		VW
6424.3 3	1 ⁻ⁱ		H		Z XREF: Others: AK
6479 [@]				V	
6496 [@] 7				V	
6517 [@]				V	
6547 [@] 7			H		V
6565.7 3	1				Z J ^π : D 6565.4γ to 0 ⁺ .
6574 [@] 7				V	E(level): Unresolved doublet.
6640.1 10	(2 ⁺)	21 ^h fs +7-6	G	P	V J ^π : (E2) 6640γ to 0 ⁺ .
6669.2 7	1		G	K	Z J ^π : D 6668.9γ to 0 ⁺ .
6694 [@]				V	
6710 ^f 15			G		V
6721.11 5	(10 ⁻)		E		J ^π : 1473.7γ to 9 ⁺ .
6742 [@]			G		V XREF: Others: AH
6761.4 2	1 ⁻ⁱ				Z
6769.51 14	(12 ⁺)		E		J ^π : (M1+E2) 489.8γ to (11 ⁺).
6794 [@] 7				V	
6810 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G	K	J ^π : L(³ He,d)=2.
6853 [@]				V	
6867 [@]				V	
6876 3	1 ⁻ⁱ		G		Z
6895 [@]				V	
6924 [@] 8				V	
6953.94 6	(11 ⁻)	<28 ^g ps	E		J ^π : E1(+M2) 1309.8γ to 10 ⁺ .
6960.4 7	1				Z J ^π : D 6960.1γ to 0 ⁺ .
6974 [@]				V	
7000 ^f 15	0 ⁻ ,1 ⁻		G	K	J ^π : L(³ He,d)=0.
7008.63 6	(11 ⁻)		E		J ^π : (E1(+M2)) 1364.7γ to 10 ⁺ .
7025.59 4	(10 ⁺)		E		J ^π : (E2) 1861.4γ to (8) ⁺ .
7042.0 7	1				Z J ^π : D 7041.7γ to 0 ⁺ .

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Adopted Levels, Gammas (continued)

<u>⁹⁰Zr Levels (continued)</u>					
E(level) [†]	J ^π	T _{1/2} [‡]	XREF		Comments
7047 [@]				V	
7060 [@]				V	
7085.6 10	(1)			Z	J ^π : (D) 7085.3γ to 0 ⁺ .
7089 [@]				V	
7110 ^f 15	0 ⁻ ,1 ⁻		G K		J ^π : from L(³ He,d)=0.
7120 [@]				V	
7136 [@] 8				V	
7151 [@]				V	
7160 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G	V	J ^π : from L(³ He,d)=2.
7194.35 4	(11 ⁺)	<28 ps	E		J ^π : M1+E2 168.8γ to (10 ⁺).
7198.2 6	1			Z	J ^π : D 7197.9γ to 0 ⁺ .
7200 [@]				V	
7223.89 6	(12 ⁺)	59 ps 10	E		J ^π : E1(+M2) 269.9γ to (11) ⁻ .
7235 [@]				V	
7250 3	1 ⁻ⁱ		G K	Z	
7263 [@]				V	
7275 [@]				V	
7280.9 7				Z	
7350 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G	V	J ^π : from L(³ He,d)=2.
7361.0 6	1			Z	J ^π : D 7360.8γ to 0 ⁺ .
7378 [@] 8				V	
7387.6 4	1			Z	J ^π : D 7387.3γ to 0 ⁺ .
7402 [@]				V	
7420 ^f 15			G	V	
7424.5 10				Z	
7433.8 8	1			Z	J ^π : D 7433.5γ to 0 ⁺ .
7437.82 7	(13 ⁺)	2.9 ^g ps 5	E		J ^π : M1+E2 213.9γ to (12) ⁺ .
7461 [@]				V	
7468 2				Z	
7474.9 3	(1)			Z	J ^π : (D) 7474.6γ to 0 ⁺ .
7480 ^f 15			G K		
7530 ^f 15			G	V	
7580 ^f 15			G		
7614 [@]				V	
7633 [@]				V	
7649.9 10	(2 ⁺)	0.55 ^h ps +9-7		P	J ^π : (E2) 7650γ to 0 ⁺ .
7650 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G		J ^π : from L(³ He,d)=2.
7685.8 4	1			Z	J ^π : D 7685.4γ to 0 ⁺ .
7702.9 3	1 ⁻ⁱ			Z	
7723.1 9				V Z	
7750 [@]				V	
7759.7 6	(1)			Z	J ^π : (D) 7759.3γ to 0 ⁺ .
7767 [@]			G	V	
7774 ^{&} 10			K		XREF: Others: AA
7779.0 6	1			Z	J ^π : D 7778.6γ to 0 ⁺ .
7796 [@]				V	
7806 ^{&} 10	(2 ⁻)				XREF: Others: AA

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF	Comments
7807.9 3	1			J ^π : from (e,e'). Z J ^π : D 7807.5γ to 0 ⁺ .
7840 ^f 15	1 ⁻ ,2 ⁻ ,3 ⁻		G K	J ^π : from L(³ He,d)=2.
7857.8 7	(1)			Z J ^π : (D) 7857.4γ to 0 ⁺ .
7868 ^{&} 10	(1 ⁺ ,2 ⁻)			XREF: Others: AA J ^π : from (e,e').
7877 [@]				V
7907 ^{&} 10			G	V XREF: Others: AA
7926 [@]				V
7935.6 3	1			Z J ^π : D 7935.2γ to 0 ⁺ .
7976.6 4	1			Z J ^π : D 7976.2γ to 0 ⁺ .
7984 [@]				V
7996 ^{&} 10	(3 ⁻)		G K	XREF: Others: AA J ^π : from (e,e').
8006.9 8	1			Z J ^π : D 8006.5γ to 0 ⁺ .
8032 ^{&} 10	2 ⁻		G	XREF: Others: AA J ^π : from (e,e').
8058.41 8	(14) ⁺	0.28 ^g ps 14	E	J ^π : M1+E2 620.6γ to (13) ⁺ .
8067.4 5	(1)			Z J ^π : (D) 8067.0γ to 0 ⁺ .
8110 3	1 ⁻ⁱ			Z XREF: Others: AA
8120 ^f 15			G	V
8131 3	(1 ⁻)			Z XREF: Others: AA J ^π : (E1) 8131.5γ to 0 ⁺ .
8144 2				Z
8166.7 5	(1)			V Z J ^π : (D) 8166.3γ to 0 ⁺ .
8221.2 8	1			Z J ^π : D 8220.8γ to 0 ⁺ .
8235.6 3	1			Z J ^π : D 8235.2γ to 0 ⁺ .
8250.7 5	1			Z J ^π : D 8250.3γ to 0 ⁺ .
8276 [@]				V
8291 ^{&} 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8295.3 10	(1)			Z J ^π : (D) 8294.9γ to 0 ⁺ .
8313.0 7	1			Z J ^π : D 8312.6γ to 0 ⁺ .
8316 ^{&} 10	(2 ⁻)			XREF: Others: AA J ^π : from (e,e').
8334.1 5	1			Z J ^π : D 8333.7γ to 0 ⁺ .
8357.5 18	1			Z J ^π : D 8357.1γ to 0 ⁺ .
8366 ^{&} 10	(1 ⁺)			XREF: Others: AA J ^π : from (e,e').
8382.1 10	(1)			Z J ^π : (D) 8381.7γ to 0 ⁺ .
8400 ^{&} 10	(2 ⁻)			XREF: Others: AA J ^π : from (e,e').
8403.7 11				Z
8413.5 4	1			V Z J ^π : D 8413.1γ to 0 ⁺ .
8430 [@]				V
8440.6 4	1			Z J ^π : D 8440.2γ to 0 ⁺ .
8442 ^{&} 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8467.7 15				Z
8501.2 4	1 ⁻ⁱ			Z XREF: Others: AA
8515 [@]				V

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{90}Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF	Comments
8518 3				Z
8542 & 10	2 ⁻		V	XREF: Others: AA J ^π : from (e,e').
8544 4				Z
8553.5 12	1			Z J ^π : D 8553.1γ to 0 ⁺ .
8588.3 7	1			Z J ^π : D 8587.9γ to 0 ⁺ .
8598.2 10	1			Z J ^π : D 8597.8γ to 0 ⁺ .
8625.6 10	1			Z J ^π : D 8625.2γ to 0 ⁺ .
8627 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8664.1 5	1			Z J ^π : D 8663.7γ to 0 ⁺ .
8701 & 10	(2 ⁻)			XREF: Others: AA J ^π : from (e,e').
8716.6 5	1 ⁻ⁱ			Z
8751.0 8	1			Z J ^π : D 8750.5γ to 0 ⁺ .
8760.4 5	1			Z J ^π : D 8759.9γ to 0 ⁺ .
8809 & 10	(2 ⁻)			XREF: Others: AA J ^π : from (e,e').
8812.0 13	1 ^j			Z
8833.2 8	1 ^j			Z
8853 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8874.9 9	1 ^j			Z
8882 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8903.0 8				Z
8911 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8927.4 4				Z
8934 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8958.13 15	(15) ⁻	0.5 ^g ps 3	E	J ^π : E1 899.7γ to (14) ⁺ .
8971 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
8978.4 9	(1)			Z J ^π : (D) 8977.9γ to 0 ⁺ .
8985 2				Z
9004.7 5	1 ^j			Z
9014.0 8				Z
9034.0 8				Z
9043.6 4	1 ^j			Z
9053.5 7				Z
9061 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
9085.1 3	1 ^j			Z
9101 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
9111.1 6	1 ^j			Z
9123.6 7				Z
9127 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
9137.5 7				Z

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Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF	Comments
9148.5 3	1 ⁻ⁱ		Z	XREF: Others: AA
9164.9 7			Z	
9177.5 5			Z	
9187 3			Z	
9196.5 3	(1 ⁻)		Z	J ^π : (E1) 9196.0γ to 0 ⁺ .
9260.5 6	1 ^j		Z	
9265 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
9292.8 5	1 ^j		Z	
9294 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
9309.4 7	1 ^j		Z	
9327 & 10	2 ⁻			XREF: Others: AA J ^π : from (e,e').
9333.4 6	1 ⁻ⁱ		Z	
9373.2 7			Z	XREF: Others: AA
9392.4 8	1 ^j		Z	
9409.4 11			Z	
9424.3 10			Z	
9444.7 4	1 ^j		Z	XREF: Others: AA
9465.1 5	1 ^j		Z	
9486.8 4	1 ^j		Z	
9489 & 10	2 ⁻			XREF: Others: AA
9510.5 13	(1)		Z	XREF: Others: AA J ^π : (D) 9510.0γ to 0 ⁺ .
9524.1 13	1 ^j		Z	
9539.2 5	1 ^j		Z	
9541 & 10	2 ⁻			XREF: Others: AA
9551.4 6	1 ^j		Z	
9563.0 6	1 ^j		Z	
9601 & 10	(1 ⁻ , 2 ⁻)			XREF: Others: AA
9609.2 7			Z	
9625.1 8			Z	
9640.4 8	1 ^j		Z	
9666.0 8	(1)		Z	J ^π : (D) 9665.4γ to 0 ⁺ .
9678.3 7	(1 ⁻)		Z	J ^π : (E1) 9677.7γ to 0 ⁺ .
9686.9 6	1 ^j		Z	
9694 & 10	2 ⁻			XREF: Others: AA
9707.00? 25	(16 ⁻)	0.49 ^g ps 14	E	J ^π : (M1+E2) 748.9γ to (15 ⁻).
9733.2 5	1 ^j		Z	
9741.7 7			Z	
9754.0 6	1 ^j		Z	
9784.6 5			Z	
9805.4 10			Z	
9836.01 18	(15) ⁺		E	J ^π : 1777.6γ to (14) ⁺ .
9843.4 6	1 ^j		Z	
9855.5 8	1 ^j		Z	
9863 & 10	(1 ⁻ , 2 ⁻)			XREF: Others: AA
9872.4 4	1 ^j		Z	

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Adopted Levels, Gammas (continued) ^{90}Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF	Comments
9890.7 13	(1)			Z J ^π : (D) 9890.1γ to 0 ⁺ .
9901.9 13				Z
9932.1 12	1j			Z
9962.8 5	1j			Z
9984.1 11				Z
10004.2 10	1j			Z
10019.6 11	1j			Z
10031 2				Z
10042.9 4	(1 ⁻)			Z J ^π : (E1) 10042.3γ to 0 ⁺ .
10083.8 6	1j			Z
10094.2 7	1j			Z
10104.9 12	(1)			Z J ^π : (D) 10104.3γ to 0 ⁺ .
10123.7 18	1j			Z
10125.84 18	(16) ⁺	0.6 ^g ps 2	E	J ^π : M1(+E2) 289.8γ to (15) ⁺ .
10146.8 9	1j			Z
10163.4 8	1j			Z
10193.0 5	1j			Z
10216.8 10	1j			Z
10233 4				Z
10241 2	(1)			Z J ^π : (D) 10240γ to 0 ⁺ .
10260.9 11				Z
10270.0 7				Z
10286.2 6	1j			Z
10298.3 10	(1)			Z J ^π : (D) 10297.7γ to 0 ⁺ .
10306.6 9	1j			Z
10315.1 4	1j			Z
10334.9 6	1j			Z
10361 2	(1)			Z J ^π : (D) 10360γ to 0 ⁺ .
10376.8 4	1j			Z
10402.5 9	1j			Z
10494.5 11	(1)			Z J ^π : (D) 10493.8γ to 0 ⁺ .
10507.9 8	1j			Z
10524.6 4	1j			Z
10595.0 7	1j			Z
10618.7 8	1j			Z
10638.5 9	1j			Z
10682.2 6	1j			Z
10713.2 12	(1)			Z J ^π : (D) 10712.5γ to 0 ⁺ .
10728.2 11	1j			Z
10764.9 4	(17 ⁺)	0.14 ^g ps 14	E	J ^π : (M1+E2) 639.0γ to (16) ⁺ .
10827.1 5	1j			Z
10914 2	(1)			Z J ^π : (D) 10913γ to 0 ⁺ .
10957 2	1j			Z
10987.0 10	1j			Z
11044 2				Z
11094.2 15				Z
11108.0 16				Z
11120.4 9	1j			Z

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

⁹⁰Zr Levels (continued)

E(level) [†]	J ^π	T _{1/2} [‡]	XREF			Comments
11129.2	17				Z	
11140	2				Z	
11232.4	7				Z	
11243.2	6				Z	
11337.7	6				Z	
11403.9	6	0.21 ^g ps 11	E			J ^π : (M1+E2) 639.0γ to (17 ⁺).
11417.5	7				Z	J ^π : (D) 11416.7γ to 0 ⁺ .
11452.2	10				Z	
11479.7	8				Z	
11501	3				Z	
11510	7				Z	
11531	2				Z	
11627.9	9				Z	
11651.5	8				Z	J ^π : (D) 11650.7γ to 0 ⁺ .
11777.4	10				Z	
11788	3				Z	
11963.3	18				Z	J ^π : (D) 11962.4γ to 0 ⁺ .
11984	2				Z	
12020.6	8				Z	
12067.8	9				Z	
12110.7	6	0.14 ^g ps 5	E			
12208.3	12				Z	
12219.6	25			P		
12243.6	14				Z	
12496.3	18				Z	
12880.3	10				Z	
12964.7	7	20 ⁺	E			J ^π : 1560.8γ to (18 ⁺), 854.0γ to (19 ⁺).
13110.2 ^a	4	(2) ⁻		K P ST		E(level),J ^π : Probable analog of ⁹⁰ Y g.s. Additional information 2.
13310 ^a	4	(3) ⁻		K P STU		E(level),J ^π : Probable analog of ⁹⁰ Y, 203 keV.
13940 ^a					S	E(level): Possible analog of ⁹⁰ Y, 777 keV.
14090 ^a					S	E(level): Possible analog of ⁹⁰ Y, 954 keV.
14220 ^a					S	E(level): Possible analog of ⁹⁰ Y, 1048 keV.
14270 ^d	30	(0 ⁻ ,1 ⁻)		Q ST		E(level),J ^π : Probable analog of ⁹⁰ Y, 1212 keV.
14310 ^a					S	
14410 ^a					ST	
14430 ^b	(1 ⁻)			P S		E(level),J ^π : Probable analog of ⁹⁰ Y, 1371 keV.
14748 ^e	(3 ⁻)				U	
14878 ^e	(0 ⁻)				U	
14928 ^e	(1 ⁻)				U	
15500 ^b	30	2 ⁻ ,(1 ⁻)		P S		E(level),J ^π : Probable analog of ⁹⁰ Y, 2474 keV.
15700 ^b	30	1 ⁻ ,(2 ⁻)		P ST		E(level),J ^π : Probable analog of ⁹⁰ Y, 2624 keV.
15900 ^b	(2 ⁻)			P		
16148 ^e	(2 ⁻)				U	
16258 ^e	(1 ⁻)				U	E(level),J ^π : Possible analog of ⁹⁰ Y, 3145 keV.
16290 ^b				P		
17300 ^b				P		
19400 ^b				PQR		

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Adopted Levels, Gammas (continued) ${}^{90}\text{Zr}$ Levels (continued)

<u>E(level)[†]</u>	<u>XREF</u>
20800 ^b	P
21800 ^c	R
23700 ^c	R

[†] From least-squares fit to $E\gamma$, by evaluators, except where noted.

[‡] From DSAM measurements in ${}^{90}\text{Zr}(n,n'\gamma)$ reaction, except where noted.

From ${}^{92}\text{Zr}(p,t)$.

@ From ${}^{90}\text{Zr}(p,p')$.

& From ${}^{90}\text{Zr}(e,e')$.

^a From ${}^{89}\text{Y}(p,n),(p,n\gamma)$.

^b From ${}^{89}\text{Y}(p,\gamma)$.

^c From ${}^{90}\text{Zr}(\gamma,n)$.

^d From ${}^{89}\text{Y}(p,p)$.

^e From ${}^{89}\text{Y}(p,p'),(p,p'\gamma)$.

^f From ${}^{89}\text{Y}({}^3\text{He},d)$.

^g From Doppler-Shift Attenuation and Recoil-Distance measurements in ${}^{76}\text{Ge}({}^{18}\text{O},4n\gamma)$.

^h Doppler-shift attenuation in ${}^{89}\text{Y}(p,\gamma)$ (1993Sa38).

ⁱ From E1 transition to 0^+ ground state.

^j From D transition to 0^+ ground state.

Adopted Levels, Gammas (continued)

E _i (level)	J _i ^π	γ(⁹⁰ Zr)							Comments
		E _γ ^{†@}	I _γ [†]	E _f	J _f ^π	Mult. [‡]	δ [‡]	α	
1760.74	0 ⁺	1760.70 [#] 20	#	0	0 ⁺	E0 [#]			E _γ : from ⁹⁰ Nb ε decay. Probability of two-photon decay is 0.040% 5, see ⁹⁰ Y β ⁻ decay. Other: 0.018% 2 with a ratio <2E1>/<2M1> of 1.9 7 (1984Sc37). Probability of one-photon E0 transition for 1760.7 relative to internal conversion is 5×10 ⁻⁷ 2 (1990Zh20), see ⁹⁰ Y β ⁻ decay.
2186.273	2 ⁺	425.5 2	0.027 5	1760.74	0 ⁺	[E2] [#]		0.00688	α(K)=0.00602 9; α(L)=0.000713 10; α(M)=0.0001239 18; α(N)=1.732×10 ⁻⁵ 25 α(O)=1.117×10 ⁻⁶ 16 B(E2)(W.u.)=5.2 10
		2186.242 [#] 25	100.0 [#] 9	0	0 ⁺	E2 [#]		5.36×10 ⁻⁴	α(K)=0.0001223 18; α(L)=1.325×10 ⁻⁵ 19; α(M)=2.29×10 ⁻⁶ 4; α(N)=3.27×10 ⁻⁷ 5; α(O)=2.34×10 ⁻⁸ 4 B(E2)(W.u.)=5.38 13
2319.000	5 ⁻	132.716 [#] 18	5.04 [#] 5	2186.273	2 ⁺	E3(+M4) [#]	<0.07	3.0 9	α(K)=2.2 7; α(L)=0.65 19; α(M)=0.12 4; α(N)=0.015 5; α(O)=0.00037 21 B(E3)(W.u.)=0.180 10 δ: from ⁹⁰ Nb ε decay.
		2318.959 [#] 25	100.0 [#] 2	0	0 ⁺	E5 [#]		4.64×10 ⁻⁴	α(K)=0.000408 6; α(L)=4.63×10 ⁻⁵ 7; α(M)=8.04×10 ⁻⁶ 12; α(N)=1.141×10 ⁻⁶ 16; α(O)=7.97×10 ⁻⁸ 12 B(E5)(W.u.)=8.74 33
2739.29	(4) ⁻	420.28 [#] 5	100 [#]	2319.000	5 ⁻	#			B(E2)(W.u.)=0.53 +18-13
2747.875	3 ⁻	429.0 ^e 3	0.53 11	2319.000	5 ⁻	[E2]			B(E1)(W.u.)=1.17×10 ⁻⁴ +27-18
		561.604 11	100.0 3	2186.273	2 ⁺	E1			E _γ : from ⁹⁰ Nb ε decay. Mult.: D from γ(θ) in (n,n'γ); E1 from Δπ=yes.
3076.925	4 ⁺	2747.47 5	6.1 3	0	0 ⁺	E3			B(E3)(W.u.)=8.0 +18-13 Mult.: O from γ(θ) in (n,n'γ); M3 excluded by comparison to RUL.
		329.09 3	6.74 18	2747.875	3 ⁻	E1			E _γ : weighted average of 329.058 16 (⁹⁰ Nb ε decay) and 329.125 15 (⁹⁰ Zr(n,n'γ)). I _γ : weighted average of 6.82 23 (⁹⁰ Nb ε decay) and 6.6 3 (⁹⁰ Zr(n,n'γ)). Mult.: D from γ(θ) in (n,n'γ); Δπ=yes from level scheme.
		337.61 14	0.90 11	2739.29	(4) ⁻				E _γ : weighted average of 337.50 15 (⁹⁰ Nb ε decay) and 337.8 2 (⁹⁰ Zr(n,n'γ)). I _γ : weighted average of 1.4 5 (⁹⁰ Nb ε decay) and 0.88 11 (⁹⁰ Zr(n,n'γ)).

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger@}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	α	Comments
3076.925	4 ⁺	757.86 7	2.66 21	2319.000	5 ⁻				E_γ : weighted average of 757.95 5 (⁹⁰ Nb ϵ decay) and 757.80 4 (⁹⁰ Zr(n,n' γ)). I_γ : weighted average of 2.23 23 (⁹⁰ Nb ϵ decay) and 2.76 11 (⁹⁰ Zr(n,n' γ)).
		890.629 14	100.0 3	2186.273	2 ⁺	E2 ^b		8.82×10 ⁻⁴	$\alpha(K)=0.000777$ 11; $\alpha(L)=8.69\times 10^{-5}$ 13; $\alpha(M)=1.507\times 10^{-5}$ 22; $\alpha(N)=2.13\times 10^{-6}$ 3 $\alpha(O)=1.479\times 10^{-7}$ 21
3308.10	2 ⁺	1121.990 22	45 4	2186.273	2 ⁺	M1+E2	+0.25		B(E2)(W.u.)=3.5 +15-13; B(M1)(W.u.)=0.065 6 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.
		1547.5 3308.1 2	3.9 10 100 4	1760.74 0	0 ⁺ 0 ⁺	[E2] E2			B(E2)(W.u.)=1.03 26 B(E2)(W.u.)=0.589 38 Mult.: Q from $\gamma(\theta)$ in (n,n' γ); M2 excluded by comparison to RUL.
3448.230	6 ⁺	371.307 [#] 8	1.95 [#] 7	3076.925	4 ⁺	E2 [#]		0.01064	$\alpha(K)=0.00929$ 13; $\alpha(L)=0.001119$ 16; $\alpha(M)=0.000194$ 3; $\alpha(N)=2.71\times 10^{-5}$ 4; $\alpha(O)=1.712\times 10^{-6}$ 24 B(E2)(W.u.)<46
		1129.224 [#] 15	100.0 [#] 4	2319.000	5 ⁻	E1 [#]		2.42×10 ⁻⁴ 8	$\alpha(K)=0.000203$ 7; $\alpha(L)=2.20\times 10^{-5}$ 8; $\alpha(M)=3.82\times 10^{-6}$ 14; $\alpha(N)=5.42\times 10^{-7}$ 20; $\alpha(O)=3.86\times 10^{-8}$ 14 B(E1)(W.u.)<1.6×10 ⁻⁴
3589.418	8 ⁺	141.178 [#] 15	100.0 [#] 10	3448.230	6 ⁺	E2 [#]			$\alpha(K)=0.27$ 3; $\alpha(L)=0.040$ 5; $\alpha(M)=0.0071$ 9; $\alpha(N)=0.00095$ 13; $\alpha(O)=4.6\times 10^{-5}$ 7 B(E2)(W.u.)=2.41 7
		1270.396 [#] 18	1.94 [#] 4	2319.000	5 ⁻	(E3) [#]		7.63×10 ⁻⁴	$\alpha(K)=0.000667$ 10; $\alpha(L)=7.56\times 10^{-5}$ 11; $\alpha(M)=1.313\times 10^{-5}$ 19; $\alpha(N)=1.86\times 10^{-6}$ 3 $\alpha(O)=1.285\times 10^{-7}$ 18 B(E3)(W.u.)=0.0523 20
3842.34	2 ⁺	1656.05 11	17.0 15	2186.273	2 ⁺	M1+E2	+1.1	3.72×10 ⁻⁴ 10	$\alpha(K)=0.000208$ 5; $\alpha(L)=2.27\times 10^{-5}$ 5; $\alpha(M)=3.93\times 10^{-6}$ 8; $\alpha(N)=5.59\times 10^{-7}$ 12; $\alpha(O)=4.00\times 10^{-8}$ 10 B(E2)(W.u.)=10.0 +20-23; B(M1)(W.u.)=0.022 5 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.
		3842.2 10	100.0 15	0	0 ⁺	E2			B(E2)(W.u.)=1.60 +14-12 Mult.: Q from $\gamma(\theta)$ in (n,n' γ); M2 excluded by comparison to RUL.
3932.4		3932.3 ^a 6	100 ^a	0	0 ⁺	^a			
3958.59	5 ⁻	1219.33 3	53.8 12	2739.29	(4) ⁻	(M1+E2)	+0.08		B(E2)(W.u.)=0.59 +32-22; B(M1)(W.u.)=0.128 +29-20 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger @}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	α	Comments
3958.59	5 ⁻	1639.60 4	100.0 12	2319.000	5 ⁻	(M1+E2)	+0.06		B(E2)(W.u.)=0.14 +7-5; B(M1)(W.u.)=0.098 +22-15 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.
4058.07	4 ⁺	981.31 7	7.8 15	3076.925	4 ⁺	(M1+E2)	-0.11		B(E2)(W.u.)=0.18 +13-9; B(M1)(W.u.)=0.013 +7-5 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.
		1310.00 18	4.3 14	2747.875	3 ⁻	[E1]			B(E1)(W.u.)=4.7×10 ⁻⁵ +27-21
		1318.92 19	2.4 13	2739.29	(4) ⁻	[E1]			B(E1)(W.u.)=2.6×10 ⁻⁵ +20-14
		1871.90 3	100 3	2186.273	2 ⁺	E2			B(E2)(W.u.)=7.5 +38-25 Mult.: Q from $\gamma(\theta)$ in (n,n' γ); M2 excluded by comparison to RUL.
4124.49	0 ⁺	1938.26 6	100	2186.273	2 ⁺				
4225.35	(4) ⁻	1478.02 16	22 4	2747.875	3 ⁻				
		1485.75 14	100 4	2739.29	(4) ⁻	(M1+E2)	+0.31		B(E2)(W.u.)=10.7 45; B(M1)(W.u.)=0.21 +7-5 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
		1906.50 17	27 6	2319.000	5 ⁻	(M1+E2)	-0.57		B(E2)(W.u.)=2.1 +11-8; B(M1)(W.u.)=0.022 +9-6 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
4229.05	2 ⁺	1481.40 6	65 15	2747.875	3 ⁻				
		2042.73 4	100 12	2186.273	2 ⁺	M1+E2	+0.04		B(E2)(W.u.)=0.020 +10-8; B(M1)(W.u.)=0.050 8
		4229.3 2	28 5	0	0 ⁺	E2			B(E2)(W.u.)=0.094 +22-19 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
4232.220	(6) ⁻	643 ^{#e}	<1.5 [#]	3589.418	8 ⁺				
		784 ^{#e}	<0.5 [#]	3448.230	6 ⁺				
		1155 ^{#e}	<0.4 [#]	3076.925	4 ⁺				
		1493 ^{#e}	<0.7 [#]	2739.29	(4) ⁻				
		1913.194 [#] 25	100.0 [#] 13	2319.000	5 ⁻	(M1+E2)	+0.5	4.27×10 ⁻⁴ 16	$\alpha(K)$ =0.000158 3; $\alpha(L)$ =1.71×10 ⁻⁵ 4; $\alpha(M)$ =2.97×10 ⁻⁶ 6; $\alpha(N)$ =4.23×10 ⁻⁷ 8; $\alpha(O)$ =3.03×10 ⁻⁸ 7 B(E2)(W.u.)=4.0 +34-21; B(M1)(W.u.)=0.055 +40-25 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
4236.96	(1,2) ⁺	929.01 18	7.7 3	3308.10	2 ⁺				
		2050.81 9	27 5	2186.273	2 ⁺				
		2476.22 4	100 5	1760.74	0 ⁺				
		4237.0 ^e 15		0	0 ⁺				
4262.37	(3) ⁺	954.2 1	19.9 17	3308.10	2 ⁺	(M1+E2)	+0.06		E_γ : observed only in (p,p' γ) (1974Ce03). B(E2)(W.u.)=0.026 +15-13; B(M1)(W.u.)=0.0063 21 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger @}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	Comments
4262.37	(3 ⁺)	1185.56 5	41 4	3076.925	4 ⁺	(M1+E2)	-3.1	B(E2)(W.u.)=4.6 16; B(M1)(W.u.)=6.3×10 ⁻⁴ +39-26 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
		1514.8 1	43 7	2747.875	3 ⁻			
		1523.07 4	84.7 20	2739.29	(4) ⁻			
		2076.20 4	100 5	2186.273	2 ⁺	(M1+E2)	+0.6	B(E2)(W.u.)=0.20 9; B(M1)(W.u.)=0.0022 8 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
4299.12	(5 ⁻)	1559.91 7	50.4 17	2739.29	(4) ⁻	(M1+E2)	+0.34	B(E2)(W.u.)=2.9 +13-10; B(M1)(W.u.)=0.056 +14-10 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
		1980.06 8	100.0 17	2319.000	5 ⁻	(M1+E2)	+0.85	B(E2)(W.u.)=7.0 +24-19; B(M1)(W.u.)=0.035 +11-8 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
4319.2?		2000.2 ^{d#e} 3	100 ^{d#}	2319.000	5 ⁻			
4331.93	4 ⁺	1255.18 3	74.5 21	3076.925	4 ⁺	M1+E2		B(E2)(W.u.)<99; B(M1)(W.u.)<0.15 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), $\Delta\pi$ =no from level scheme.
		1584.25 4	100 3	2747.875	3 ⁻	[E1]		B(E1)(W.u.)=0.00118 +22-17
		2012.9 2	20 4	2319.000	5 ⁻	[E1]		B(E1)(W.u.)=1.15×10 ⁻⁴ +30-26
4348.10	(4 ⁺)	1608.8		2739.29	(4) ⁻			
		2161.87 3		2186.273	2 ⁺			
4375.07	7 ⁻	2055.77 7	100	2319.000	5 ⁻	E2		Mult.: Q from $\gamma(\theta)$ in (n,n' γ), $\Delta\pi$ =no from level scheme.
4426.43	0 ⁺	2240.20 5	100	2186.273	2 ⁺	[E2]		B(E2)(W.u.)=2.1 +15-11
4454.71	(5 ⁺)	1377.74 12	16 3	3076.925	4 ⁺			
		1715.73 14	19 7	2739.29	(4) ⁻			
		2135.70 5	100 7	2319.000	5 ⁻			
4455.58	(2)	1707.90 5	75 4	2747.875	3 ⁻	D+Q	+0.024	
		2269.40 4	100 4	2186.273	2 ⁺			
4474.31	4 ⁺	1726.68 7	100 5	2747.875	3 ⁻	[E1]		B(E1)(W.u.)=3.1×10 ⁻⁴ +21-16
		1735.0	40 5	2739.29	(4) ⁻	[E1]		B(E1)(W.u.)=1.2×10 ⁻⁴ +8-6
4494.79	(3 ⁻)	1747.2 2	5 3	2747.875	3 ⁻			
		1755.49 4	100 3	2739.29	(4) ⁻	D+Q	-0.02	
4507.0		4506.9 ^a 8	100 ^a	0	0 ⁺			
4533.52	(3 ⁻)	1225.3 ^e 2	17.7 22	3308.10	2 ⁺			
		1456.78 4	100 11	3076.925	4 ⁺			
		1794.15 6	39 4	2739.29	(4) ⁻	(M1+E2)	+2.0	B(E2)(W.u.)=3.4 +23-13; B(M1)(W.u.)=0.0025 +23-10 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
		2347.3	14 4	2186.273	2 ⁺			
4537.70	(4 ⁻)	1460.95 6	63 6	3076.925	4 ⁺			
		2218.65 7	100 6	2319.000	5 ⁻	(M1+E2)	-0.36	B(E2)(W.u.)=0.24 +18-11; B(M1)(W.u.)=0.008 +5-3 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), non zero value of δ suggests $\Delta\pi$ =no.
4541.37	6 ⁺	222 [#]	<1.0 [#]	4319.2?				
		309 ^{#e}	<1.4 [#]	4232.220	(6) ⁻	[E1]		B(E1)(W.u.)<0.0033
		952 ^{#e}	<1.4 [#]	3589.418	8 ⁺	[E2]		B(E2)(W.u.)<8.6

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger @}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^\ddagger	Comments
4541.37	6 ⁺	1092.97 9	8.1 22	3448.230	6 ⁺			I_γ : other: 15.8 13 in ⁹⁰ Nb ϵ decay.
		1464 ^{#e}	<3.7 [#]	3076.925	4 ⁺	[E2]		B(E2)(W.u.)<2.6
		2222.43 3	100.0 22	2319.000	5 ⁻	[E1]		B(E1)(W.u.)=4.7×10 ⁻⁴ 11
4562.02	5	1822.74 5	100	2739.29	(4) ⁻			
4578.93	(1)	2818.33 10	100 8	1760.74	0 ⁺			
		4578.7 2	83 8	0	0 ⁺			
4591.37	(3 ⁺)	1843.70 5	100.0 12	2747.875	3 ⁻			
		2405.18 7	36.6 12	2186.273	2 ⁺	(M1+E2)	-0.07	B(E2)(W.u.)=0.0027 +15-11; B(M1)(W.u.)=0.0031 8 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ); $\Delta\pi$ =no from level scheme.
4614.42	(6 ⁺)	1166.24 12	100 10	3448.230	6 ⁺			
		1537.64 12	75 10	3076.925	4 ⁺			
		2295.5	75 8	2319.000	5 ⁻			
4640.94	7,8	409 ^{#e}	<4.2 [#]	4232.220	(6) ⁻			
		1051.53 ^{# 4}	100 ^{# 4}	3589.418	8 ⁺			
		1192.7 ^{# 1}	7.7 ^{# 8}	3448.230	6 ⁺			
		2322 ^{#e}	<3.8 [#]	2319.000	5 ⁻			
4646.7	1,2 ⁺	2884.8 13	100 3	1760.74	0 ⁺			
		4646.6 3	18 3	0	0 ⁺			
4681.26	2 ⁺	1933.77 8	100 10	2747.875	3 ⁻	[E1]		B(E1)(W.u.)=7.5×10 ⁻⁴ +23-15
		2495.1	42 6	2186.273	2 ⁺			
		4680.8 2	58 8	0	0 ⁺	E2		B(E2)(W.u.)=0.098 +32-21 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
4701.10	2 ⁺	1953.26 17	100 5	2747.875	3 ⁻	[E1]		B(E1)(W.u.)=4.0×10 ⁻⁴ 6
		2514.76 13	39 3	2186.273	2 ⁺			
		2940.60 12	95 4	1760.74	0 ⁺	E2		B(E2)(W.u.)=0.88 +15-12 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
		4701.2 3	19 4	0	0 ⁺	E2		B(E2)(W.u.)=0.0168 +46-40 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
4774.29		537.34 5	34 3	4236.96	(1,2 ⁺)			
		2587.96 25	100 3	2186.273	2 ⁺			
4781.81	4,(3 ⁻)	2462.81 19	100	2319.000	5 ⁻			
4795.6	2 ⁺	4795.5 3	100	0	0 ⁺	E2		B(E2)(W.u.)=1.3 +10-6 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
4814.44	(3 ⁻)	2066.95 8	100 7	2747.875	3 ⁻	D+Q	+0.34	
		2495.5	16 3	2319.000	5 ⁻			
		2628.01 10	16 3	2186.273	2 ⁺			
4818.02	(3,4 ⁺)	975.75 15	16 3	3842.34	2 ⁺			
		2070.39 7	100 3	2747.875	3 ⁻			
4824.21	2 ⁺	1747.2 2	8 5	3076.925	4 ⁺	[E2]		B(E2)(W.u.)=2.3 +15-12
		2638.07 11	100 5	2186.273	2 ⁺	M1+E2		B(E2)(W.u.)<5.0; B(M1)(W.u.)<0.032 Mult.: D+Q from $\gamma(q)$ in (n,n' γ), $\Delta\pi$ =no from level scheme.

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger @}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	α	Comments
4824.21	2 ⁺	4823.9 5	17 3	0	0 ⁺	[E2]			B(E2)(W.u.)=0.031 9
4840.27	5 ⁻	1763.46 6	100 6	3076.925	4 ⁺				
		2092.7	43 6	2747.875	3 ⁻				
4867.47	5 ⁺	1419.23 10	53 5	3448.230	6 ⁺	M1+E2	-1.0		B(E2)(W.u.)=4.6 +21-16; B(M1)(W.u.)=0.0086 +41-27 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), E1+M2 excluded by comparison to RUL.
		1790.73 8	100 8	3076.925	4 ⁺	M1+E2	+0.8		B(E2)(W.u.)=2.1 +10-8; B(M1)(W.u.)=0.0098 +45-29 Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), E1+M2 excluded by comparison to RUL.
4932.6	1,2 ⁺	2128.2	17 7	2739.29	(4) ⁻				
4941.89	(4 ⁺)	4932.5 4	100	0	0 ⁺				
		1865.03 8	100 3	3076.925	4 ⁺				
		2623.0 2	32 3	2319.000	5 ⁻	[E1]			B(E1)(W.u.)=9.2×10 ⁻⁵ +25-17
4992.36		1150.3	30 3	3842.34	2 ⁺				
		1684.35 8	100 5	3308.10	2 ⁺				
		2244.5 3	31 3	2747.875	3 ⁻				
		2252.9 2	20 3	2739.29	(4) ⁻				
5059.975	7 ⁺	518.60 [#] 6	29.0 [#] 21	4541.37	6 ⁺				
		827.74 [#] 4	46.6 [#] 7	4232.220	(6) ⁻	E1 [#]			$\alpha(\text{K})=0.000371$ 6; $\alpha(\text{L})=4.04\times 10^{-5}$ 6; $\alpha(\text{M})=6.99\times 10^{-6}$ 10; $\alpha(\text{N})=9.93\times 10^{-7}$ 14; $\alpha(\text{O})=7.02\times 10^{-8}$ 10
		1470.528 [#] 24	19.3 [#] 7	3589.418	8 ⁺				
		1611.76 [#] 3	100 [#] 3	3448.230	6 ⁺	M1,E2 [#]			$\alpha(\text{K})=0.000220$ 5; $\alpha(\text{L})=2.39\times 10^{-5}$ 5; $\alpha(\text{M})=4.14\times 10^{-6}$ 9; $\alpha(\text{N})=5.90\times 10^{-7}$ 13; $\alpha(\text{O})=4.21\times 10^{-8}$ 11
		2741.0 [#] 3	0.31 [#] 10	2319.000	5 ⁻	E3			$\alpha(\text{K})=0.0001277$ 18; $\alpha(\text{L})=1.391\times 10^{-5}$ 20; $\alpha(\text{M})=2.41\times 10^{-6}$ 4; $\alpha(\text{N})=3.43\times 10^{-7}$ 5; $\alpha(\text{O})=2.46\times 10^{-8}$ 4
5068.6	1,2 ⁺	5068.4 6	100	0	0 ⁺				
5084.03	2,3	2336.18 10	100 7	2747.875	3 ⁻				
		2345.7 3	37 7	2739.29	(4) ⁻				
5090.30	(3) ⁻	2904.03 23	100	2186.273	2 ⁺				
5107.92	(3),4 ⁺	2368.6		2739.29	(4) ⁻				
		2921.7 2		2186.273	2 ⁺				
5112.6	3 ⁻	2365.0 10	100	2747.875	3 ⁻	(M1+E2)	-0.1		Mult.: D+Q from $\gamma(\theta)$ in (n,n' γ), $\Delta\pi$ =no from level scheme.
5164.484	(8) ⁺	524 ^{#e}	<3.7 [#]	4640.94	7,8				
		623 ^{#e}	<3.7 [#]	4541.37	6 ⁺				
		932 ^{#e}	<22 [#]	4232.220	(6) ⁻				
		1575.035 [#] 23	100 [#] 4	3589.418	8 ⁺	M1,E2 [#]		3.64×10 ⁻⁴ 8	$\alpha(\text{K})=0.000230$ 5; $\alpha(\text{L})=2.50\times 10^{-5}$ 5; $\alpha(\text{M})=4.34\times 10^{-6}$ 9; $\alpha(\text{N})=6.17\times 10^{-7}$ 13; $\alpha(\text{O})=4.41\times 10^{-8}$ 11
		1716.27 [#] 3	97 [#] 4	3448.230	6 ⁺	(E2) [#]		3.91×10 ⁻⁴	$\alpha(\text{K})=0.000191$ 3; $\alpha(\text{L})=2.08\times 10^{-5}$ 3; $\alpha(\text{M})=3.61\times 10^{-6}$ 5; $\alpha(\text{N})=5.14\times 10^{-7}$ 8; $\alpha(\text{O})=3.66\times 10^{-8}$ 6

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger@$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^\ddagger	α	Comments
									$\alpha(\text{K})=0.000191\ 3$; $\alpha(\text{L})=2.08\times 10^{-5}\ 3$; $\alpha(\text{M})=3.61\times 10^{-6}\ 5$; $\alpha(\text{N})=5.14\times 10^{-7}\ 8$; $\alpha(\text{O})=3.66\times 10^{-8}\ 6$
5164.484	(8) ⁺	2845 ^{#e}	<0.3 [#]	2319.000	5 ⁻				
5171.90	(4)	2432.0 3	56 5	2739.29	(4) ⁻				
		2853.06 14	100 5	2319.000	5 ⁻				
5175.8	3,4 ⁺	2989.5 3	100	2186.273	2 ⁺				
5183.61	1,2 ⁺	2997.5 2	85 13	2186.273	2 ⁺				
		5183.2 3	100 13	0	0 ⁺				
5222.97	(4) ⁺	2483.67 19	100	2739.29	(4) ⁻				
5232.3		3046.0 3	100	2186.273	2 ⁺				
5247.52	9 ⁺	1658.10 ^b 4	100 ^b	3589.418	8 ⁺	E2(+M1) ^b	+14 14	3.80×10 ⁻⁴ 17	$\alpha(\text{K})=0.000205\ 8$; $\alpha(\text{L})=2.23\times 10^{-5}\ 7$; $\alpha(\text{M})=3.86\times 10^{-6}\ 13$; $\alpha(\text{N})=5.49\times 10^{-7}\ 19$; $\alpha(\text{O})=3.91\times 10^{-8}\ 17$ B(M1)(W.u.)>2.2×10 ⁻⁷
5270.74		2531.44 16	100	2739.29	(4) ⁻				
5275.4	(2) ⁺	5275.2	100 [@]	0	0 ⁺	(E2)		1.59×10 ⁻³	$\alpha(\text{K})=2.94\times 10^{-5}\ 5$; $\alpha(\text{L})=3.14\times 10^{-6}\ 5$; $\alpha(\text{M})=5.44\times 10^{-7}\ 8$; $\alpha(\text{N})=7.75\times 10^{-8}\ 11$; $\alpha(\text{O})=5.59\times 10^{-9}\ 8$ B(E2)(W.u.)=0.0072 +12-15 Mult.: from ⁸⁹ Y(p, γ). B(E2)(W.u.)=0.33 +14-7 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
5305.97	2 ⁺	5305.8 2	100	0	0 ⁺	E2			
5307.75	(3 ⁻ ,4 ⁺)	2560.2 4	13 5	2747.875	3 ⁻				
		2988.9 2	20 4	2319.000	5 ⁻				
		3121.3 2	100 7	2186.273	2 ⁺				
5312.77	1,2 ⁺	3551.4 ^e 6		1760.74	0 ⁺				
		5312.6 2		0	0 ⁺				
5317.7	3 ⁻	2570.2 4	100 12	2747.875	3 ⁻				
		3131.2 4	72 12	2186.273	2 ⁺	[E1]			B(E1)(W.u.)=2.5×10 ⁻⁵ 11
5359.22	3,4	2282.4 2	100	3076.925	4 ⁺				
5379.8	(4) ⁺	3193.6 3	100	2186.273	2 ⁺	[E2]			B(E2)(W.u.)=3.6 +9-6
5426.01	3 ⁻	2118.1 2	100 18	3308.10	2 ⁺	[E1]			B(E1)(W.u.)=3.3×10 ⁻⁴ +13-10
		3106.8 2	80 14	2319.000	5 ⁻	E2			B(E2)(W.u.)=0.60 +24-18 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
		3239.7 2	28 6	2186.273	2 ⁺	[E1]			B(E1)(W.u.)=2.6×10 ⁻⁵ +11-9
5432.790	7 ⁺ ,8 ⁺	268 ^{#e}	<0.6 [#]	5164.484	(8) ⁺				
		792.05 [#] 19	1.5 [#] 5	4640.94	7,8				
		891 ^{#e}	<8.3 [#]	4541.37	6 ⁺				
		1057.8 [#] 1	2.5 [#] 8	4375.07	7 ⁻				

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger@}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	α	Comments
5432.790	7 ⁺ ,8 ⁺	1201 ^{#e} 1843.342 [#] 22	<2.7 [#] 100.0 [#] 24	4232.220 (6 ⁻) 3589.418 8 ⁺					
		1984.54 [#] 3 3114 ^{#e}	99 [#] 4 <0.24 [#]	3448.230 6 ⁺ 2319.000 5 ⁻					
5437.33	2 ⁺	2690.08 23 3676.6 2	100 3 34 3	2747.875 3 ⁻ 1760.74 0 ⁺	[E1] E2				$\alpha(\text{K})=0.000170$ 4; $\alpha(\text{L})=1.84\times 10^{-5}$ 4; $\alpha(\text{M})=3.19\times 10^{-6}$ 6; $\alpha(\text{N})=4.54\times 10^{-7}$ 9; $\alpha(\text{O})=3.25\times 10^{-8}$ 8
		5436.9 2	29.1 18	0 0 ⁺	E2				B(E1)(W.u.)=4.5×10 ⁻⁴ 7 B(E2)(W.u.)=0.30 +6-4 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL. B(E2)(W.u.)=0.037 +7-5 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), M2 excluded by comparison to RUL.
5457.70	(4 ⁺)	2380.6 3 2710.2 2	52 17 100 17	3076.925 4 ⁺ 2747.875 3 ⁻	[E1]				B(E1)(W.u.)=9.6×10 ⁻⁵ 12
5504.75		3744.5 5 5504.5 2	100 5 75 5	1760.74 0 ⁺ 0 0 ⁺					
5513.41	(3,4)	2436.5 3 2765.8 2	53 13 100 13	3076.925 4 ⁺ 2747.875 3 ⁻					
5564.2		3377.9 4	100	2186.273 2 ⁺					
5590.58	2 ⁺	2842.9 2 3404.1 2 5590.9 3	35 6 100 5 57 3	2747.875 3 ⁻ 2186.273 2 ⁺ 0 0 ⁺	[E1] E2				B(E1)(W.u.)=1.68×10 ⁻⁴ +36-31 B(E2)(W.u.)=0.081 +13-11 Mult.: Q from $\gamma(\theta)$ in (n,n' γ), $\Delta\pi$ =no from level scheme.
5601.8		3415.5 4	100	2186.273 2 ⁺					
5607.6		2299.5 3	100	3308.10 2 ⁺					
5644.02	10 ⁺	2054.55 ^b 5	100 ^b	3589.418 8 ⁺	E2 ^b			4.88×10 ⁻⁴	$\alpha(\text{K})=0.0001368$ 20; $\alpha(\text{L})=1.484\times 10^{-5}$ 21; $\alpha(\text{M})=2.57\times 10^{-6}$ 4; $\alpha(\text{N})=3.66\times 10^{-7}$ 6; $\alpha(\text{O})=2.62\times 10^{-8}$ 4 B(E2)(W.u.)>0.023
5651.1		2911.8 3	100	2739.29 (4) ⁻					
5724.3		3538.0 4	100	2186.273 2 ⁺					
5775.1		3588.8 5	100	2186.273 2 ⁺					
5785.0		5784.8 ^a 4	100 ^a	0 0 ⁺					
5792.05	(9 ⁺)	2202.603 ^b 30	100 ^b	3589.418 8 ⁺	(M1+E2) ^b	-0.07 4		5.03×10 ⁻⁴	$\alpha(\text{K})=0.0001227$ 18; $\alpha(\text{L})=1.327\times 10^{-5}$ 19; $\alpha(\text{M})=2.30\times 10^{-6}$ 4; $\alpha(\text{N})=3.28\times 10^{-7}$ 5; $\alpha(\text{O})=2.36\times 10^{-8}$ 4 δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
5808		5807.7 ^a 3	100 ^a	0 0 ⁺					

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ †@	I_γ †	E_f	J_f^π	Mult. ‡	δ ‡	α	Comments
5821.8		3635.5 6	100	2186.273	2 ⁺				
5846.4		3660.1 5	100	2186.273	2 ⁺				
5884.4		5884.2 ^a 4	100 ^a	0	0 ⁺				
6279.70	11 ⁺	1032.19 ^b 10	100 ^b 4	5247.52	9 ⁺	E2 ^b		6.24×10 ⁻⁴	$\alpha(\text{K})=0.000551$ 8; $\alpha(\text{L})=6.11\times 10^{-5}$ 9; $\alpha(\text{M})=1.060\times 10^{-5}$ 15; $\alpha(\text{N})=1.502\times 10^{-6}$ 21 $\alpha(\text{O})=1.050\times 10^{-7}$ 15
6296	1 ⁻	6295.6 ^a 2	100 ^a	0	0 ⁺	E1 ^a			
6376.10	(10 ⁻)	584.04 ^b 8	^b	5792.05	(9 ⁺)				
		1128.2 ^b 7	^b	5247.52	9 ⁺				
6389.8	1	6389.6 ^a 3	100 ^a	0	0 ⁺	D ^a			
6424.3	1 ⁻	6424.1 ^a 3	100 ^a	0	0 ⁺	E1 ^a			
6565.7	1	6565.4 ^a 3	100 ^a	0	0 ⁺	D ^a			
6640.1	(2 ⁺)	6640.1	100 [@]	0	0 ⁺	(E2)			B(E2)(W.u.)=0.087 +34-22 Mult.: From ⁸⁹ Y(p, γ).
6669.2	1	6668.9 ^a 7	100 ^a	0	0 ⁺	D ^a			
6721.11	(10 ⁻)	345.24 ^b 20	100 ^b 8	6376.10	(10 ⁻)				
		441.42 ^{be} 13	≤ 11.6 ^b	6279.70	11 ⁺				
		929.03 ^{be} 9	≤ 23.3 ^b	5792.05	(9 ⁺)				
		1077.06 ^{be} 8	≤ 23.3 ^b	5644.02	10 ⁺				
		1473.65 ^b 20	45 ^b 5	5247.52	9 ⁺				
		1556.63 ^{be} 9	≤ 17.4 ^b	5164.484	(8) ⁺				
6761.4	1 ⁻	6761.1 ^a 2	100 ^a	0	0 ⁺	E1 ^a			
6769.51	(12 ⁺)	489.81 ^b 15	100 ^b	6279.70	11 ⁺	(M1+E2) ^b	-0.26 6	0.00342 6	$\alpha(\text{K})=0.00302$ 5; $\alpha(\text{L})=0.000337$ 6; $\alpha(\text{M})=5.86\times 10^{-5}$ 11; $\alpha(\text{N})=8.31\times 10^{-6}$ 15; $\alpha(\text{O})=5.85\times 10^{-7}$ 10
6876	1 ⁻	6876 ^a 3	100 ^a	0	0 ⁺	E1 ^a			
6953.94	(11) ⁻	1309.83 ^b 7	100 ^b	5644.02	10 ⁺	E1(+M2) ^b	+0.02 2	2.90×10 ⁻⁴ 5	$\alpha(\text{K})=0.0001560$ 23; $\alpha(\text{L})=1.687\times 10^{-5}$ 25; $\alpha(\text{M})=2.92\times 10^{-6}$ 5; $\alpha(\text{N})=4.15\times 10^{-7}$ 7; $\alpha(\text{O})=2.96\times 10^{-8}$ 5 B(E1)(W.u.)>5.3×10 ⁻⁶ δ : from $\gamma(\theta)$ in $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
6960.4	1	6960.1 ^a 7	100 ^a	0	0 ⁺	D ^a			
7008.63	(11 ⁻)	54.66 ^b 5	11.9 ^b 17	6953.94	(11) ⁻				
		287.55 ^b 7	100 ^b 3	6721.11	(10 ⁻)	M1+E2 ^b	-0.07 5	0.01235 21	$\alpha(\text{K})=0.01087$ 19; $\alpha(\text{L})=0.001231$ 23; $\alpha(\text{M})=0.000214$ 4; $\alpha(\text{N})=3.03\times 10^{-5}$ 6;

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger@}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	α	Comments
7008.63	(11 ⁻)	1364.73 ^b 20	73 ^b 3	5644.02	10 ⁺	(E1(+M2)) ^b	-0.01 2	3.12×10 ⁻⁴	$\alpha(\text{O})=2.13\times 10^{-6}$ 4 δ : from $\gamma(\theta)$ in $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ). $\alpha(\text{K})=0.0001452$ 21; $\alpha(\text{L})=1.569\times 10^{-5}$ 23; $\alpha(\text{M})=2.72\times 10^{-6}$ 4; $\alpha(\text{N})=3.86\times 10^{-7}$ 6; $\alpha(\text{O})=2.75\times 10^{-8}$ 4 δ : from $\gamma(\theta)$ in $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
7025.59	(10 ⁺)	1233.54 ^b 10 1381.78 ^b 30 1778.10 ^b 7 1861.37 ^b 30	28 ^b 4 9.6 ^b 10 100 ^b 10 26.8 ^b 13	5792.05 5644.02 5247.52 5164.484	(9 ⁺) 10 ⁺ 9 ⁺ (8) ⁺	(E2) ^b		4.26×10 ⁻⁴	$\alpha(\text{K})=0.0001642$ 23; $\alpha(\text{L})=1.785\times 10^{-5}$ 25; $\alpha(\text{M})=3.09\times 10^{-6}$ 5; $\alpha(\text{N})=4.40\times 10^{-7}$ 7; $\alpha(\text{O})=3.14\times 10^{-8}$ 5
7042.0	1	7041.7 ^a 7	100 ^a	0	0 ⁺	D ^a			
7085.6	(1)	7085.3 ^a 10	100 ^a	0	0 ⁺	(D) ^a			
7194.35	(11 ⁺)	168.760 ^b 4	44.5 ^b 15	7025.59	(10 ⁺)	M1+E2 ^b		0.11 6	$\alpha(\text{K})=0.09$ 5; $\alpha(\text{L})=0.012$ 8; $\alpha(\text{M})=0.0022$ 13; $\alpha(\text{N})=0.00030$ 18; $\alpha(\text{O})=1.6\times 10^{-5}$ 8 B(E2)(W.u.)>0.0017; B(M1)(W.u.)>4.5×10 ⁻⁸
		818.23 ^b 5	100.0 ^b 29	6376.10	(10 ⁻)	E1(+M2) ^b	-0.02 4	4.30×10 ⁻⁴ 10	$\alpha(\text{K})=0.000380$ 9; $\alpha(\text{L})=4.15\times 10^{-5}$ 10; $\alpha(\text{M})=7.18\times 10^{-6}$ 16; $\alpha(\text{N})=1.019\times 10^{-6}$ 23; $\alpha(\text{O})=7.20\times 10^{-8}$ 16 B(E1)(W.u.)>1.3×10 ⁻⁵ δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
		1402.27 ^b 7	<1.5 ^b	5792.05	(9 ⁺)				
		1550.27 ^b 30	5.1 ^b 5	5644.02	10 ⁺	D			
7198.2	1	7197.9 ^a 6	100 ^a	0	0 ⁺	D ^a			
7223.89	(12 ⁺)	29.57 8	18 3	7194.35	(11 ⁺)	(M1)		6.74 11	$\alpha(\text{K})=5.90$ 10; $\alpha(\text{L})=0.702$ 12; $\alpha(\text{M})=0.1222$ 20; $\alpha(\text{N})=0.0172$ 3; $\alpha(\text{O})=0.001165$ 19 B(M1)(W.u.)=0.90 +19-16 B(E1)(W.u.)=9.3×10 ⁻⁵ +24-16
		215.27 4	47 4	7008.63	(11 ⁻)	[E1]			
		269.93 5	100 3	6953.94	(11 ⁻)	E1(+M2)	-0.02 3	0.00651 16	$\alpha(\text{K})=0.00575$ 14; $\alpha(\text{L})=0.000638$ 17; $\alpha(\text{M})=0.000110$ 3; $\alpha(\text{N})=1.55\times 10^{-5}$ 5; $\alpha(\text{O})=1.06\times 10^{-6}$ 3 B(E1)(W.u.)=1.00×10 ⁻⁴ +22-16 δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
		1580.00 30	2.5 3	5644.02	10 ⁺	(E2)		3.70×10 ⁻⁴	$\alpha(\text{K})=0.000225$ 4; $\alpha(\text{L})=2.45\times 10^{-5}$ 4; $\alpha(\text{M})=4.25\times 10^{-6}$ 6; $\alpha(\text{N})=6.04\times 10^{-7}$ 9;

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger@}$	I_γ^\dagger	E_f	J_f^π	Mult. ‡	δ^\ddagger	α	Comments
									$\alpha(\text{K})=0.000225\ 4; \alpha(\text{L})=2.45\times 10^{-5}\ 4; \alpha(\text{M})=4.25\times 10^{-6}\ 6;$ $\alpha(\text{N})=6.04\times 10^{-7}\ 9; \alpha(\text{O})=4.29\times 10^{-8}\ 6$ $\text{B}(\text{E}2)(\text{W.u.})=3.5\times 10^{-4}\ +9-7$
7250	1 ⁻	7248.9 ^a 3	100 ^a	0	0 ⁺	E1 ^a			
7280.9		7280.6 ^a 7	100 ^a	0	0 ⁺				
7361.0	1	7360.8 ^a 6	100 ^a	0	0 ⁺	D ^a			
7387.6	1	7387.3 ^a 4	100 ^a	0	0 ⁺	D ^a			
7424.5		7424.2 ^a 10	100 ^a	0	0 ⁺				
7433.8	1	7433.5 ^a 8	100 ^a	0	0 ⁺	D ^a			
7437.82	(13) ⁺	213.93 ^b 4	100 ^b	7223.89	(12) ⁺	M1+E2 ^b	-0.07 3	0.0264 5	$\alpha(\text{K})=0.0232\ 4; \alpha(\text{L})=0.00265\ 5; \alpha(\text{M})=0.000461\ 8;$ $\alpha(\text{N})=6.53\times 10^{-5}\ 12; \alpha(\text{O})=4.55\times 10^{-6}\ 7$ $\text{B}(\text{E}2)(\text{W.u.})=9\times 10^1\ +9-6; \text{B}(\text{M}1)(\text{W.u.})=0.75\ +16-11$ δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O),4n γ).
7468		7468 ^a 2	100 ^a	0	0 ⁺				
7474.9	(1)	7474.6 ^a 3	100 ^a	0	0 ⁺	(D) ^a			
7649.9	(2) ⁺	7649.6	100	0	0 ⁺	(E2)			$\text{B}(\text{E}2)(\text{W.u.})=0.00164\ 24$ $E_\gamma, I_\gamma, \text{Mult.}$: from ⁸⁹ Y(p, γ).
7685.8	1	7685.4 ^a 4	100 ^a	0	0 ⁺	D ^a			
7702.9	1 ⁻	7702.5 ^a 3	100 ^a	0	0 ⁺	E1 ^a			
7723.1		7722.7 ^a 9	100 ^a	0	0 ⁺				
7759.7	(1)	7759.3 ^a 6	100 ^a	0	0 ⁺	(D) ^a			
7779.0	1	7778.6 ^a 6	100 ^a	0	0 ⁺	D ^a			
7807.9	1	7807.5 ^a 3	100 ^a	0	0 ⁺	D ^a			
7857.8	(1)	7857.4 ^a 7	100 ^a	0	0 ⁺	(D) ^a			
7935.6	1	7935.2 ^a 3	100 ^a	0	0 ⁺	D ^a			
7976.6	1	7976.2 ^a 4	100 ^a	0	0 ⁺	D ^a			
8006.9	1	8006.5 ^a 8	100 ^a	0	0 ⁺	D ^a			
8058.41	(14) ⁺	620.58 ^b 8	100 ^b 3	7437.82	(13) ⁺	M1+E2	-0.14 5	0.00209 16	$\alpha(\text{K})=0.00184\ 14; \alpha(\text{L})=0.000208\ 19; \alpha(\text{M})=3.6\times 10^{-5}\ 4;$ $\alpha(\text{N})=5.1\times 10^{-6}\ 5; \alpha(\text{O})=3.52\times 10^{-7}\ 22$ $\text{B}(\text{E}2)(\text{W.u.})=17\ +24-11; \text{B}(\text{M}1)(\text{W.u.})=0.32\ +27-11$ δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O),4n γ).
		834.51 ^e 8	<1.35	7223.89	(12) ⁺				
		1288.90 ^e 21	<1.35	6769.51	(12) ⁺				
8067.4	(1)	8067.0 ^a 5	100 ^a	0	0 ⁺	(D) ^a			
8110	1 ⁻	8109.6 ^a 8	100 ^a	0	0 ⁺	E1 ^a			
8131	(1 ⁻)	8131.5 ^a 4	100 ^a	0	0 ⁺	(E1) ^a			
8144		8144 ^a 2	100 ^a	0	0 ⁺	^a			
8166.7	(1)	8166.3 ^a 5	100 ^a	0	0 ⁺	(D) ^a			

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_{\gamma}^{\dagger @}$	I_{γ}^{\dagger}	E_f	J_f^π	Mult. [‡]	α	Comments
8221.2	1	8220.8 ^a 8	100 ^a	0	0 ⁺	D ^a		
8235.6	1	8235.2 ^a 3	100 ^a	0	0 ⁺	D ^a		
8250.7	1	8250.3 ^a 5	100 ^a	0	0 ⁺	D ^a		
8295.3	(1)	8294.9 ^a 10	100 ^a	0	0 ⁺	(D) ^a		
8313.0	1	8312.6 ^a 7	100 ^a	0	0 ⁺	D ^a		
8334.1	1	8333.7 ^a 5	100 ^a	0	0 ⁺	D ^a		
8357.5	1	8357.1 ^a 18	100 ^a	0	0 ⁺	D ^a		
8382.1	(1)	8381.7 ^a 10	100 ^a	0	0 ⁺	(D) ^a		
8403.7		8403.3 ^a 11	100 ^a	0	0 ⁺			
8413.5	1	8413.1 ^a 4	100 ^a	0	0 ⁺	D ^a		
8440.6	1	8440.2 ^a 4	100 ^a	0	0 ⁺	D ^a		
8467.7		8467.3 ^a 15	100 ^a	0	0 ⁺			
8501.2	1 ⁻	8500.8 ^a 4	100 ^a	0	0 ⁺	E1 ^a		
8518		8518 ^a 3	100 ^a	0	0 ⁺			
8544		8544 ^a 4	100 ^a	0	0 ⁺			
8553.5	1	8553.1 ^a 12	100 ^a	0	0 ⁺	D ^a		
8588.3	1	8587.9 ^a 7	100 ^a	0	0 ⁺	D ^a		
8598.2	1	8597.8 ^a 10	100 ^a	0	0 ⁺	D ^a		
8625.6	1	8625.2 ^a 10	100 ^a	0	0 ⁺	D ^a		
8664.1	1	8663.7 ^a 5	100 ^a	0	0 ⁺	D ^a		
8716.6	1 ⁻	8716.1 ^a 5	100 ^a	0	0 ⁺	E1 ^a		
8751.0	1	8750.5 ^a 8	100 ^a	0	0 ⁺	D ^a		
8760.4	1	8759.9 ^a 5	100 ^a	0	0 ⁺	D ^a		
8812.0	1	8811.5 ^a 13	100 ^a	0	0 ⁺	D ^a		
8833.2	1	8832.7 ^a 8	100 ^a	0	0 ⁺	D ^a		
8874.9	1	8874.4 ^a 9	100 ^a	0	0 ⁺	D ^a		
8903.0		8902.5 ^a 8	100 ^a	0	0 ⁺			
8927.4		8926.9 ^a 4	100 ^a	0	0 ⁺			
8958.13	(15) ⁻	899.71 ^b 20	100 ^b	8058.41	(14) ⁺	E1 ^b	3.71×10 ⁻⁴ 18	$\alpha(\text{K})=0.000328$ 16; $\alpha(\text{L})=3.58\times 10^{-5}$ 18; $\alpha(\text{M})=6.2\times 10^{-6}$ 4; $\alpha(\text{N})=8.8\times 10^{-7}$ 5; $\alpha(\text{O})=6.2\times 10^{-8}$ 4 B(E1)(W.u.)=9×10 ⁻⁴ +9-4
		1520.29 ^b 22	<1 ^b	7437.82	(13) ⁺			
8978.4	(1)	8977.9 ^a 9	100 ^a	0	0 ⁺	(D) ^a		
8985		8985 ^a 2	100 ^a	0	0 ⁺			
9004.7	1	9004.2 ^a 5	100 ^a	0	0 ⁺	D ^a		
9014.0		9013.5 ^a 8	100 ^a	0	0 ⁺			
9034.0		9033.5 ^a 8	100 ^a	0	0 ⁺			
9043.6	1	9043.1 ^a 4	100 ^a	0	0 ⁺	D ^a		

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger @$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^\ddagger	α	Comments
9053.5		9053.0 ^a 7	100 ^a	0	0 ⁺				
9085.1	1	9084.6 ^a 3	100 ^a	0	0 ⁺	D ^a			
9111.1	1	9110.6 ^a 6	100 ^a	0	0 ⁺	D ^a			
9123.6		9123.1 ^a 7	100 ^a	0	0 ⁺				
9137.5		9137.0 ^a 7	100 ^a	0	0 ⁺				
9148.5	1 ⁻	9148.0 ^a 3	100 ^a	0	0 ⁺	E1 ^a			
9164.9		9164.4 ^a 7	100 ^a	0	0 ⁺				
9177.5		9177.0 ^a 5	100 ^a	0	0 ⁺				
9187		9186 ^a 3	100 ^a	0	0 ⁺				
9196.5	(1 ⁻)	9196.0 ^a 3	100 ^a	0	0 ⁺	(E1) ^a			
9260.5	1	9260.0 ^a 6	100 ^a	0	0 ⁺	D ^a			
9292.8	1	9292.3 ^a 5	100 ^a	0	0 ⁺	D ^a			
9309.4	1	9308.9 ^a 7	100 ^a	0	0 ⁺	D ^a			
9333.4	1 ⁻	9332.9 ^a 6	100 ^a	0	0 ⁺	E1 ^a			
9373.2		9372.8 ^a 7	100 ^a	0	0 ⁺				
9392.4	1	9391.9 ^a 8	100 ^a	0	0 ⁺	D ^a			
9409.4		9408.9 ^a 11	100 ^a	0	0 ⁺				
9424.3		9423.8 ^a 10	100 ^a	0	0 ⁺				
9444.7	1	9444.2 ^a 4	100 ^a	0	0 ⁺	D ^a			
9465.1	1	9464.6 ^a 5	100 ^a	0	0 ⁺	D ^a			
9486.8	1	9486.3 ^a 4	100 ^a	0	0 ⁺	D ^a			
9510.5	(1)	9510.0 ^a 13	100 ^a	0	0 ⁺	(D) ^a			
9524.1	1	9523.6 ^a 13	100 ^a	0	0 ⁺	D ^a			
9539.2	1	9538.7 ^a 5	100 ^a	0	0 ⁺	D ^a			
9551.4	1	9550.9 ^a 6	100 ^a	0	0 ⁺	D ^a			
9563.0	1	9562.5 ^a 6	100 ^a	0	0 ⁺	D ^a			
9609.2		9608.6 ^a 7	100 ^a	0	0 ⁺				
9625.1		9624.5 ^a 8	100 ^a	0	0 ⁺				
9640.4	1	9639.8 ^a 8	100 ^a	0	0 ⁺	D ^a			
9666.0	(1)	9665.4 ^a 8	100 ^a	0	0 ⁺	(D) ^a			
9678.3	(1 ⁻)	9677.7 ^a 7	100 ^a	0	0 ⁺	(E1) ^a			
9686.9	1	9686.3 ^a 6	100 ^a	0	0 ⁺	D ^a			
9707.00?	(16 ⁻)	748.87 ^{be} 20	100 ^b	8958.13	(15) ⁻	(M1(+E2)) ^b	-0.15 15	1.27×10 ⁻³ 2	$\alpha(\text{K})=0.001119$ 17; $\alpha(\text{L})=0.0001234$ 19; $\alpha(\text{M})=2.14\times 10^{-5}$ 4; $\alpha(\text{N})=3.04\times 10^{-6}$ 5; $\alpha(\text{O})=2.17\times 10^{-7}$ 4 B(E2)(W.u.)=5 +16-4; B(M1)(W.u.)=0.105 +39-26
9733.2	1	9732.6 ^a 5	100 ^a	0	0 ⁺	D ^a			
9741.7		9741.1 ^a 7	100 ^a	0	0 ⁺				
9754.0	1	9753.4 ^a 6	100 ^a	0	0 ⁺	D ^a			

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger@}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	δ^{\ddagger}	α	Comments
9784.6		9784.0 ^a 5	100 ^a	0	0 ⁺				
9805.4		9804.8 ^a 10	100 ^a	0	0 ⁺				
9836.01	(15) ⁺	1777.6 ^b 3	100 ^b	8058.41	(14) ⁺				
9843.4	1	9842.8 ^a 6	100 ^a	0	0 ⁺	D ^a			
9855.5	1	9854.9 ^a 8	100 ^a	0	0 ⁺	D ^a			
9872.4	1	9871.8 ^a 4	100 ^a	0	0 ⁺	D ^a			
9890.7	(1)	9890.1 ^a 13	100 ^a	0	0 ⁺	(D) ^a			
9901.9		9901.3 ^a 13	100 ^a	0	0 ⁺				
9932.1	1	9931.5 ^a 12	100 ^a	0	0 ⁺	D ^a			
9962.8	1	9962.2 ^a 5	100 ^a	0	0 ⁺	D ^a			
9984.1		9983.5 ^a 11	100 ^a	0	0 ⁺				
10004.2	1	10003.6 ^a 10	100 ^a	0	0 ⁺	D ^a			
10019.6	1	10019.0 ^a 11	100 ^a	0	0 ⁺	D ^a			
10031		10030 ^a 2	100 ^a	0	0 ⁺				
10042.9	(1 ⁻)	10042.3 ^a 4	100 ^a	0	0 ⁺	(E1) ^a			
10083.8	1	10083.2 ^a 6	100 ^a	0	0 ⁺	D ^a			
10094.2	1	10093.6 ^a 7	100 ^a	0	0 ⁺	D ^a			
10104.9	(1)	10104.3 ^a 12	100 ^a	0	0 ⁺	(D) ^a			
10123.7	1	10123.1 ^a 18	100 ^a	0	0 ⁺	D ^a			
10125.84	(16) ⁺	289.83 ^b 6	57.2 ^b 23	9836.01	(15) ⁺	M1(+E2) ^b	-0.01 6	0.01205 18	$\alpha(\text{K})=0.01061$ 16; $\alpha(\text{L})=0.001199$ 19; $\alpha(\text{M})=0.000208$ 4; $\alpha(\text{N})=2.96\times 10^{-5}$ 5; $\alpha(\text{O})=2.07\times 10^{-6}$ 3 B(M1)(W.u.)=0.54 +25-14 δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
		1167.70 ^b 20	100 ^b 4	8958.13	(15) ⁻	E1(+M2) ^b	-0.02 5	2.42 $\times 10^{-4}$ 5	$\alpha(\text{K})=0.000191$ 5; $\alpha(\text{L})=2.07\times 10^{-5}$ 5; $\alpha(\text{M})=3.59\times 10^{-6}$ 9; $\alpha(\text{N})=5.10\times 10^{-7}$ 12; $\alpha(\text{O})=3.63\times 10^{-8}$ 9 B(E1)(W.u.)=2.2 $\times 10^{-4}$ +11-6 δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
		2067.4 ^b 3	<5.1 ^b	8058.41	(14) ⁺				
10146.8	1	10146.2 ^a 9	100 ^a	0	0 ⁺	D ^a			
10163.4	1	10162.9 ^a 8	100 ^a	0	0 ⁺	D ^a			
10193.0	1	10192.4 ^a 5	100 ^a	0	0 ⁺	D ^a			
10216.8	1	10216.2 ^a 10	100 ^a	0	0 ⁺	D ^a			
10233		10232 ^a 4	100 ^a	0	0 ⁺				
10241	(1)	10240 ^a 2	100 ^a	0	0 ⁺	(D) ^a			
10260.9		10260.3 ^a 11	100 ^a	0	0 ⁺				
10270.0		10269.4 ^a 7	100 ^a	0	0 ⁺				

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^{\dagger @}$	I_γ^\dagger	E_f	J_f^π	Mult. [‡]	Comments
10286.2	1	10285.6 ^a 6	100 ^a	0	0 ⁺	D ^a	
10298.3	(1)	10297.7 ^a 10	100 ^a	0	0 ⁺	D ^a	
10306.6	1	10306.0 ^a 9	100 ^a	0	0 ⁺	D ^a	
10315.1	1	10314.5 ^a 4	100 ^a	0	0 ⁺	D ^a	
10334.9	1	10334.3 ^a 6	100 ^a	0	0 ⁺	D ^a	
10361	(1)	10360 ^a 2	100 ^a	0	0 ⁺	(D) ^a	
10376.8	1	10376.2 ^a 4	100 ^a	0	0 ⁺	D ^a	
10402.5	1	10401.9 ^a 9	100 ^a	0	0 ⁺	D ^a	
10494.5	(1)	10493.8 ^a 11	100 ^a	0	0 ⁺	(D) ^a	
10507.9	1	10507.2 ^a 8	100 ^a	0	0 ⁺	D ^a	
10524.6	1	10523.9 ^a 4	100 ^a	0	0 ⁺	D ^a	
10595.0	1	10594.3 ^a 7	100 ^a	0	0 ⁺	D ^a	
10618.7	1	10618.0 ^a 8	100 ^a	0	0 ⁺	D ^a	
10638.5	1	10637.8 ^a 9	100 ^a	0	0 ⁺	D ^a	
10682.2	1	10681.5 ^a 6	100 ^a	0	0 ⁺	D ^a	
10713.2	(1)	10712.5 ^a 12	100 ^a	0	0 ⁺	(D) ^a	
10728.2	1	10727.5 ^a 11	100 ^a	0	0 ⁺	D ^a	
10764.9	(17 ⁺)	639.0 ^{cb} 8	100 ^b 23	10125.84	(16 ⁺)	(M1+E2) ^b	$\alpha(\text{K})=0.00171$ 12; $\alpha(\text{L})=0.000192$ 16; $\alpha(\text{M})=3.3\times 10^{-5}$ 3; $\alpha(\text{N})=4.7\times 10^{-6}$ 4; $\alpha(\text{O})=3.27\times 10^{-7}$ 18 B(E2)(W.u.) $>6.7\times 10^{-4}$; B(M1)(W.u.) $>2.7\times 10^{-7}$
		928.9 ^b 7	$<5.7^b$	9836.01	(15) ⁺		
		1806.7 ^b 8	$<4.5^b$	8958.13	(15) ⁻		
10827.1	1	10826.4 ^a 5	100 ^a	0	0 ⁺	D ^a	
10914	(1)	10913 ^a 2	100 ^a	0	0 ⁺	(D) ^a	
10957	1	10956 ^a 2	100 ^a	0	0 ⁺	D ^a	
10987.0	1	10986.3 ^a 10	100 ^a	0	0 ⁺	D ^a	
11044		11043 ^a 2	100 ^a	0	0 ⁺		
11094.2		11093.5 ^a 15	100 ^a	0	0 ⁺		
11108.0		11107.3 ^a 16	100 ^a	0	0 ⁺		
11120.4	1	11119.7 ^a 9	100 ^a	0	0 ⁺	D ^a	
11129.2		11128.5 ^a 17	100 ^a	0	0 ⁺		
11140		11139 ^a 2	100 ^a	0	0 ⁺		
11232.4	1	11231.6 ^a 7	100 ^a	0	0 ⁺	D ^a	
11243.2	1	11242.4 ^a 6	100 ^a	0	0 ⁺	D ^a	
11337.7	1	11336.9 ^a 6	100 ^a	0	0 ⁺	D ^a	
11403.9	(18 ⁺)	639.0 ^b 8	1.0×10^2 ^b 3	10764.9	(17 ⁺)	(M1+E2) ^b	$\alpha(\text{K})=0.00171$ 12; $\alpha(\text{L})=0.000192$ 16; $\alpha(\text{M})=3.3\times 10^{-5}$ 3; $\alpha(\text{N})=4.7\times 10^{-6}$ 4; $\alpha(\text{O})=3.27\times 10^{-7}$ 18

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ †@	I_γ †	E_f	J_f^π	Mult. ‡	δ ‡	α	Comments
									$\alpha(\text{K})=0.00171$ 12; $\alpha(\text{L})=0.000192$ 16; $\alpha(\text{M})=3.3\times 10^{-5}$ 3; $\alpha(\text{N})=4.7\times 10^{-6}$ 4; $\alpha(\text{O})=3.27\times 10^{-7}$ 18
11403.9	(18 ⁺)	1278.1 ^{cb} 10	<3.9 ^b	10125.84	(16) ⁺				
11417.5	(1)	11416.7 ^a 7	100 ^a	0	0 ⁺	(D) ^a			
11452.2	1	11451.4 ^a 10	100 ^a	0	0 ⁺	D ^a			
11479.7	1	11478.9 ^a 8	100 ^a	0	0 ⁺	D ^a			
11501		11500 ^a 3	100 ^a	0	0 ⁺				
11510		11509 ^a 7	100 ^a	0	0 ⁺				
11531	1	11530 ^a 2	100 ^a	0	0 ⁺	D ^a			
11627.9		11627.1 ^a 9	100 ^a	0	0 ⁺				
11651.5	(1)	11650.7 ^a 8	100 ^a	0	0 ⁺	(D) ^a			
11777.4	1	11776.6 ^a 10	100 ^a	0	0 ⁺	D ^a			
11788	1	11787 ^a 3	100 ^a	0	0 ⁺	D ^a			
11963.3	(1)	11962.4 ^a 18	100 ^a	0	0 ⁺	(D) ^a			
11984	1	11983 ^a 2	100 ^a	0	0 ⁺	D ^a			
12020.6	1	12019.7 ^a 8	100 ^a	0	0 ⁺	D ^a			
12067.8	1	12066.9 ^a 9	100 ^a	0	0 ⁺	D ^a			
12110.7	(19 ⁺)	706.8 ^b 3	100 ^b 10	11403.9	(18 ⁺)	(M1(+E2)) ^b	-0.3 5	0.00151 8	$\alpha(\text{K})=0.00133$ 7; $\alpha(\text{L})=0.000149$ 9; $\alpha(\text{M})=2.59\times 10^{-5}$ 16; $\alpha(\text{N})=3.66\times 10^{-6}$ 21; $\alpha(\text{O})=2.55\times 10^{-7}$ 9 B(M1)(W.u.)=0.39 +14-18 δ : from $\gamma(\theta)$ and $\gamma(\text{lin pol})$ in (¹⁸ O,4n γ).
12208.3	1	1345.9 ^b 8 12207.4 ^a 12	<9.8 ^b 100 ^a	10764.9	(17 ⁺)				
12219.6		8383 ^{&} 6 8919 ^{&} 6 9467 ^{&} 6 10033 ^{&} 6 10453 ^{&} 6 12212 ^{&} 6	18 26 16 47 40 100	3842.34 3308.10 2747.875 2186.273 1760.74 0	2 ⁺ 2 ⁺ 3 ⁻ 2 ⁺ 0 ⁺ 0 ⁺				
12243.6	1	12242.7 ^a 14	100 ^a	0	0 ⁺	D ^a			
12496.3		12495.4 ^a 18	100 ^a	0	0 ⁺				
12880.3		12879.3 ^a 10	100 ^a	0	0 ⁺				
12964.7	(20 ⁺)	854.00 ^b 30 1560.8 ^b 5	1.0 $\times 10^2$ ^b 3 <10.7 ^b	12110.7	(19 ⁺)				
13110.2	(2) ⁻	9270 ^{&} 9800 ^{&}		3842.34 3308.10	2 ⁺ 2 ⁺				

Adopted Levels, Gammas (continued)

$\gamma(^{90}\text{Zr})$ (continued)

<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_{γ}^{†@}</u>	<u>E_f</u>	<u>J_f^{π}</u>
13110.2	(2) ⁻	10360 ^{&}	2747.875	3 ⁻
		10920 ^{&}	2186.273	2 ⁺
		11350 ^{&}	1760.74	0 ⁺
		13110 ^{&}	0	0 ⁺

[†] From (n,n' γ), except where noted.

[‡] From $\gamma(\theta)$ in (n,n' γ) except where noted.

From ⁹⁰Nb ϵ decay.

@ From ⁸⁹Y(p, γ) reaction.

& From ⁸⁹Y(p, γ). From level energy difference for level 13110; not included in level energy fit.

^a From ⁹⁰Zr(γ,γ').

^b From ⁷⁶Ge(¹⁸O,4n γ).

^c Multiply placed.

^d Multiply placed with undivided intensity.

^e Placement of transition in the level scheme is uncertain.

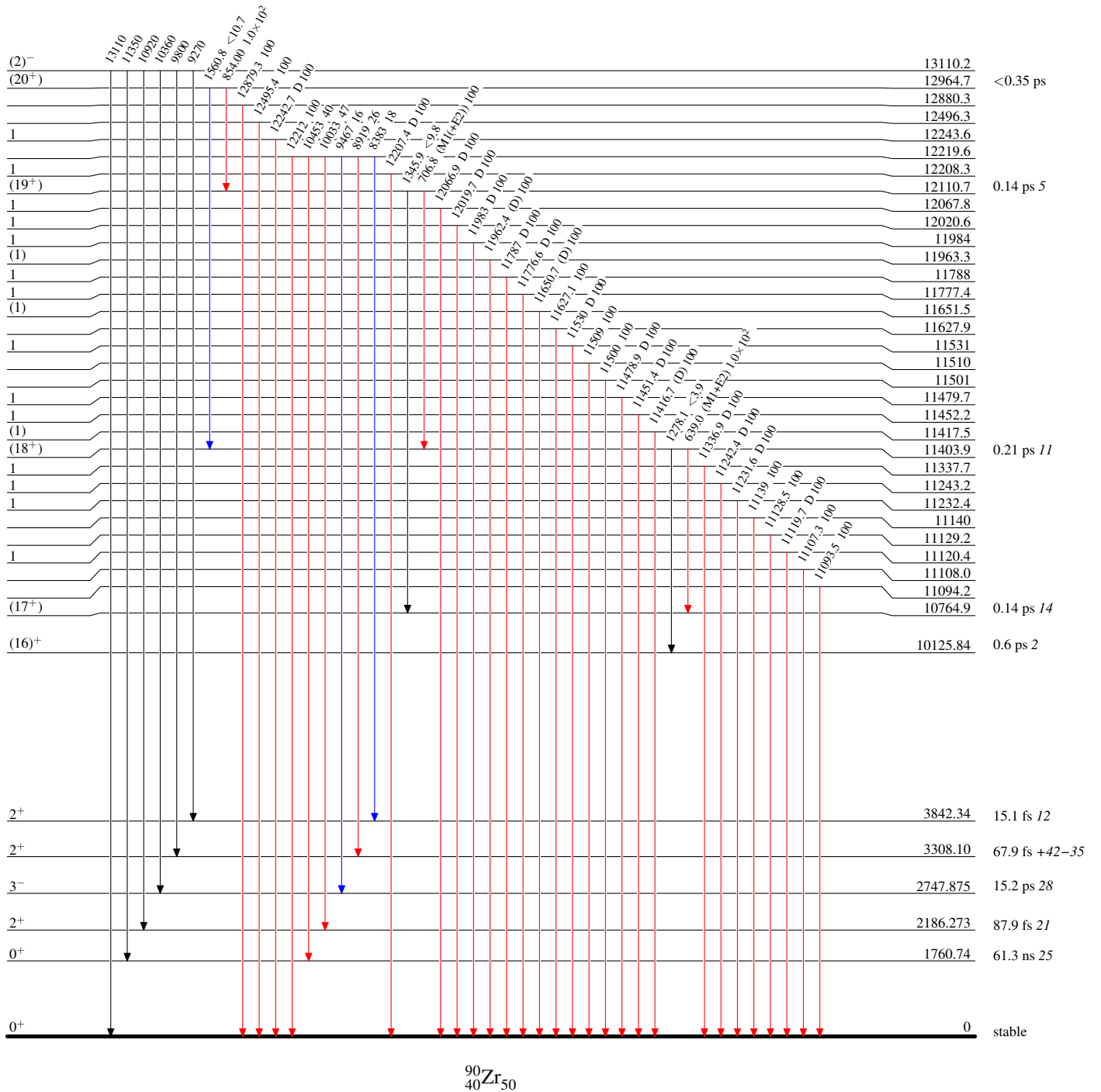
Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



$^{90}_{40}\text{Zr}_{50}$

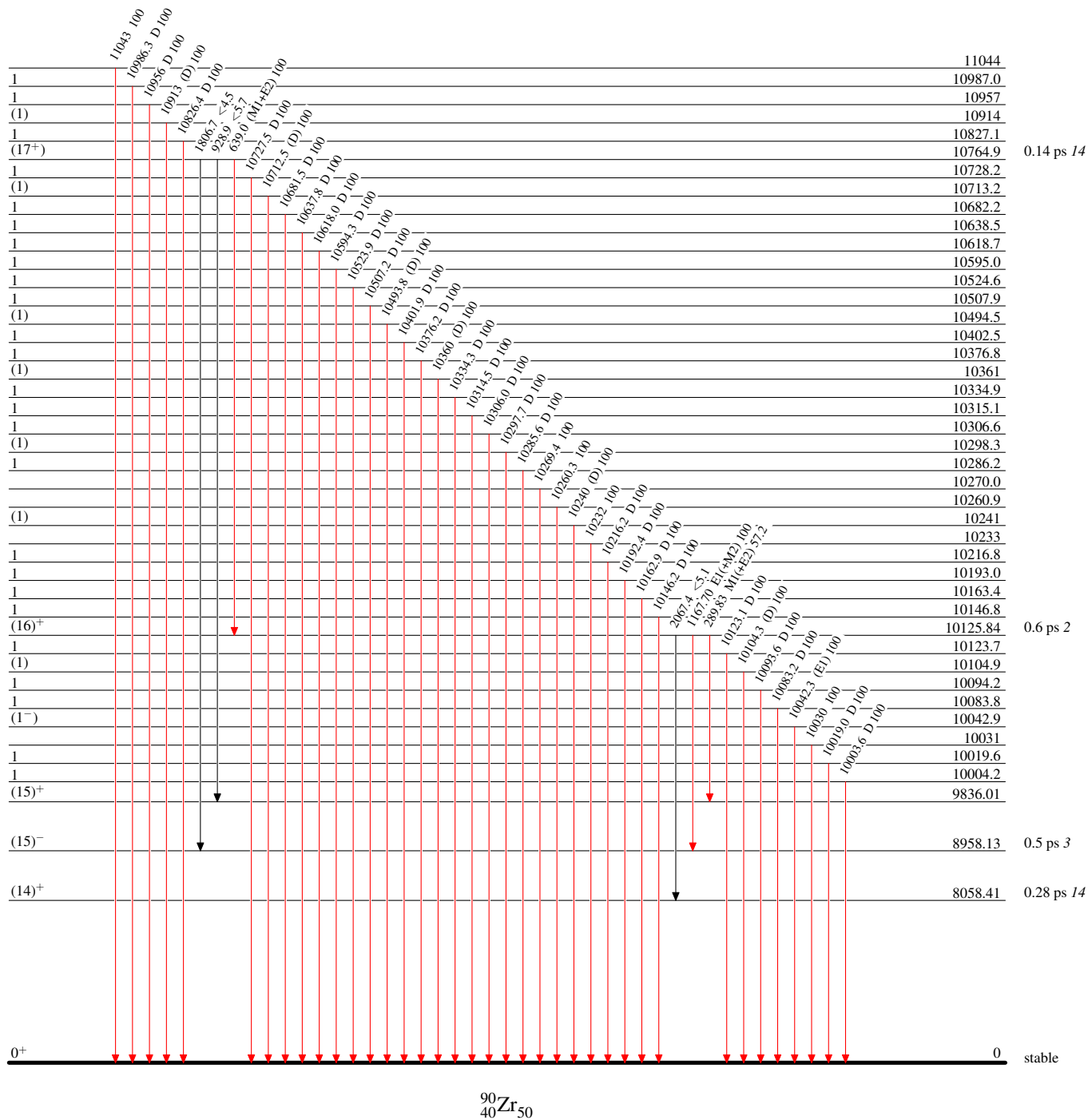
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



$^{90}_{40}\text{Zr}_{50}$

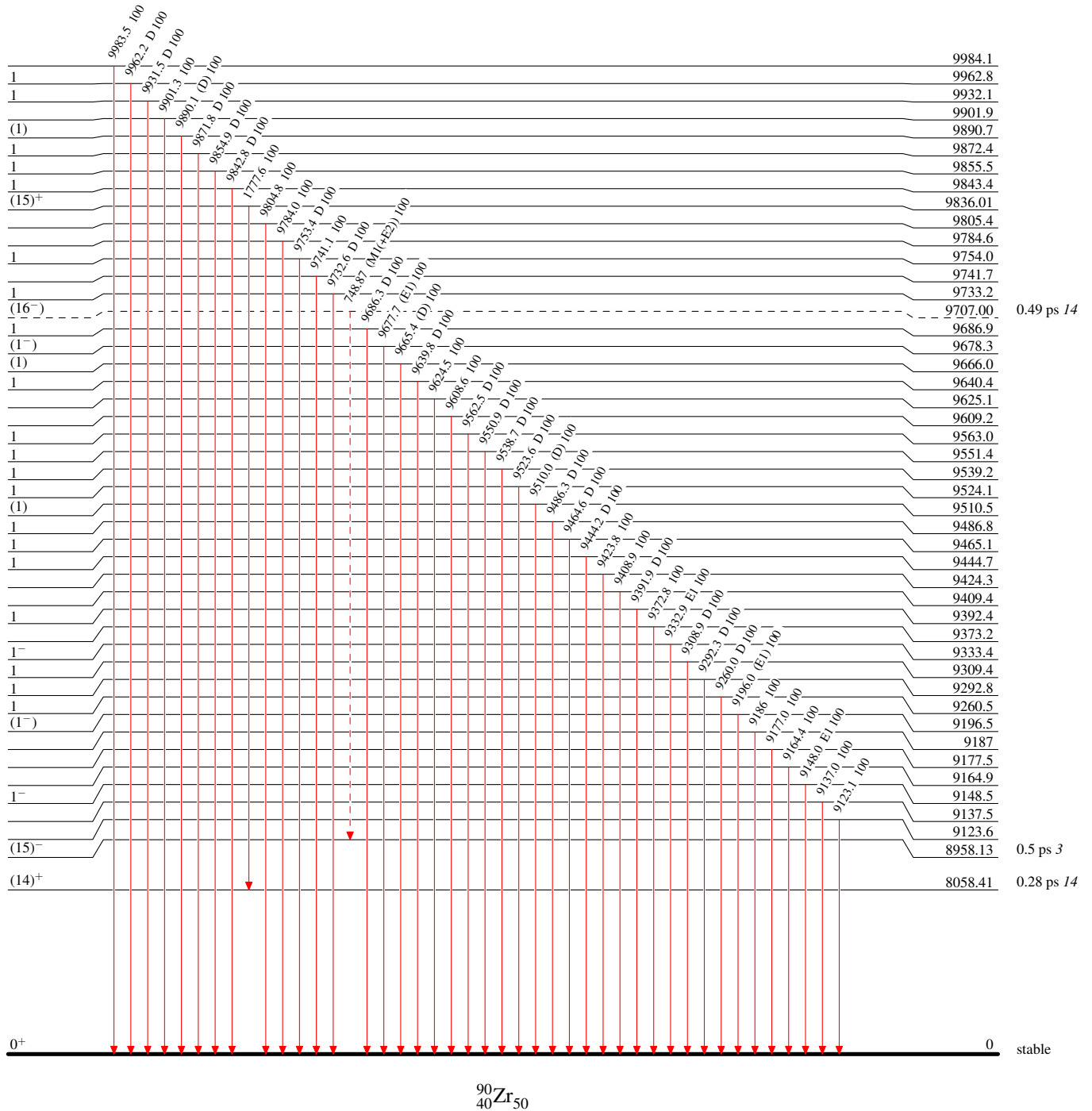
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

- ▶ I_γ < 2% × I_γ^{max}
- ▶ I_γ < 10% × I_γ^{max}
- ▶ I_γ > 10% × I_γ^{max}
- - -▶ γ Decay (Uncertain)



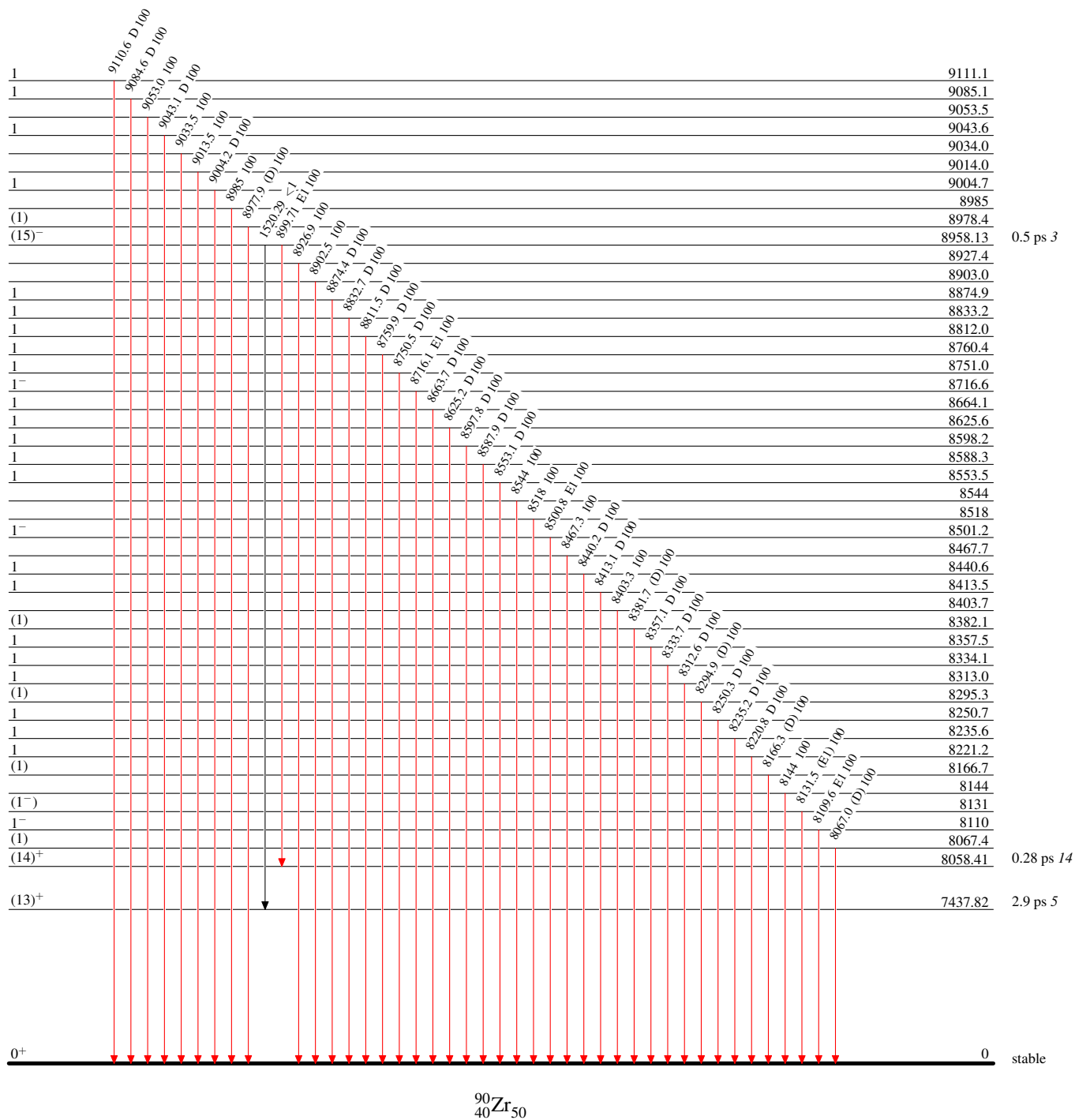
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



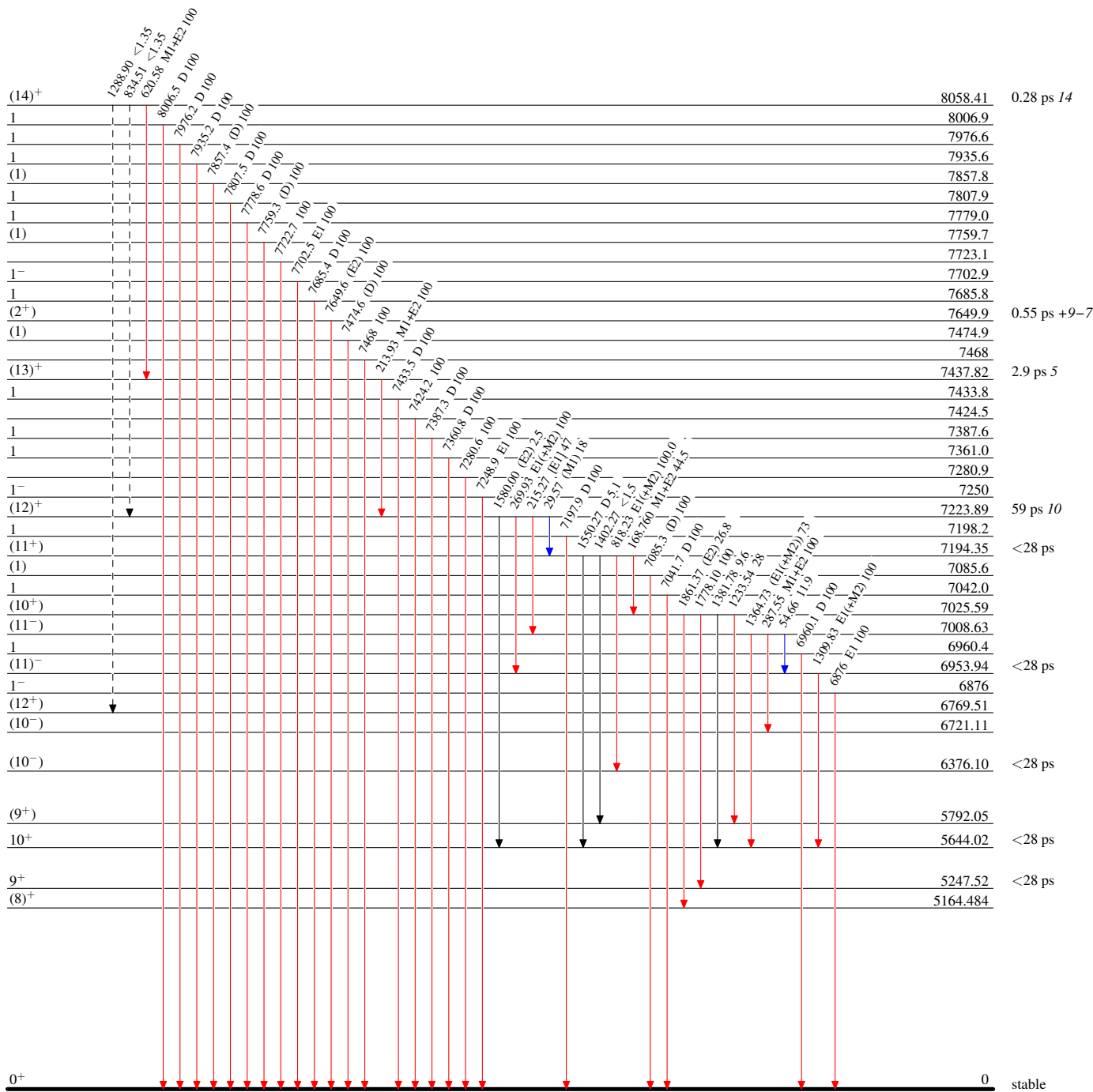
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

- ▶ $I_\gamma < 2\% \times I_\gamma^{\max}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{\max}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{\max}$
- - - -▶ γ Decay (Uncertain)



$^{90}_{40}\text{Zr}_{50}$

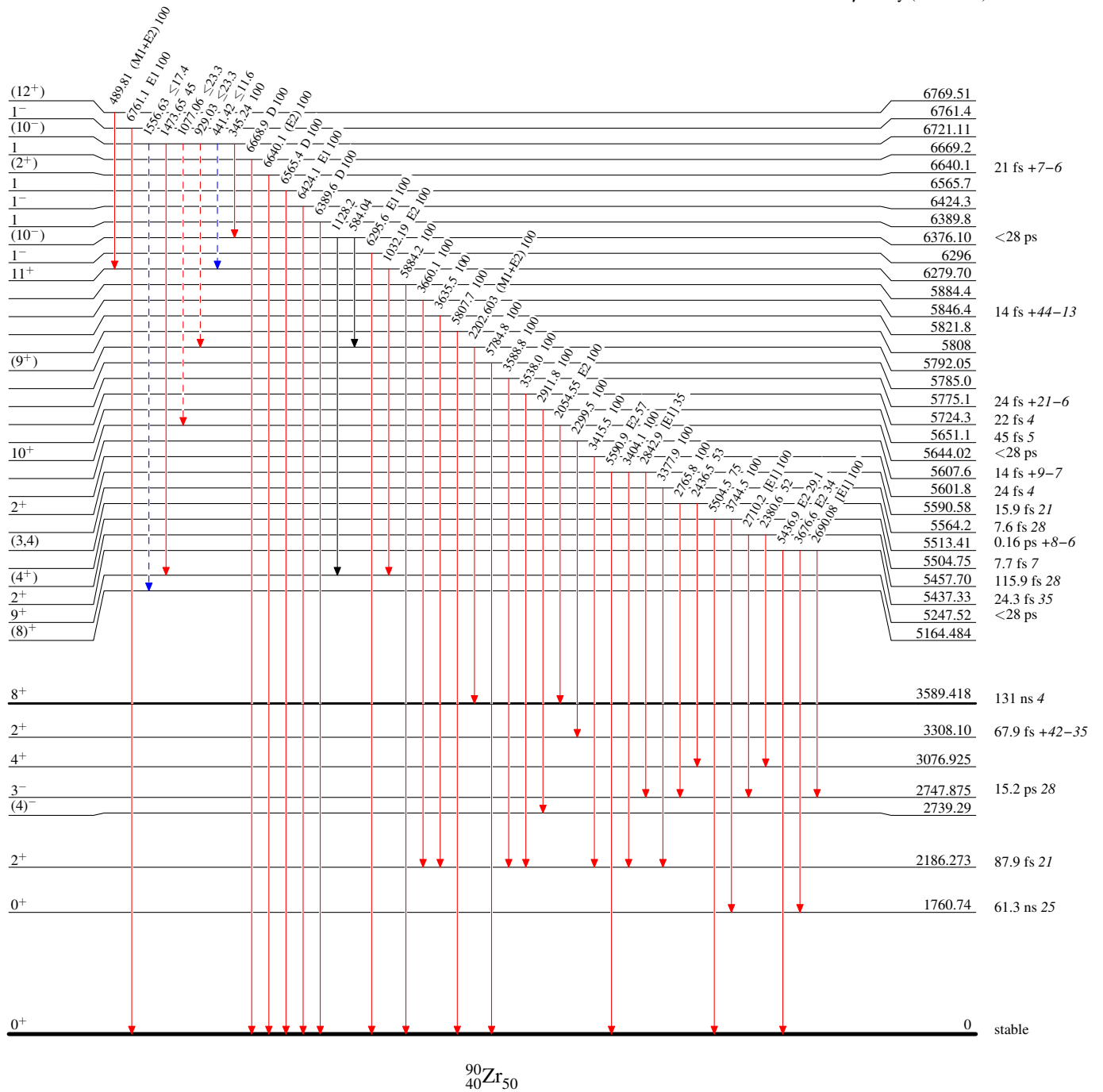
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- - - - - γ Decay (Uncertain)



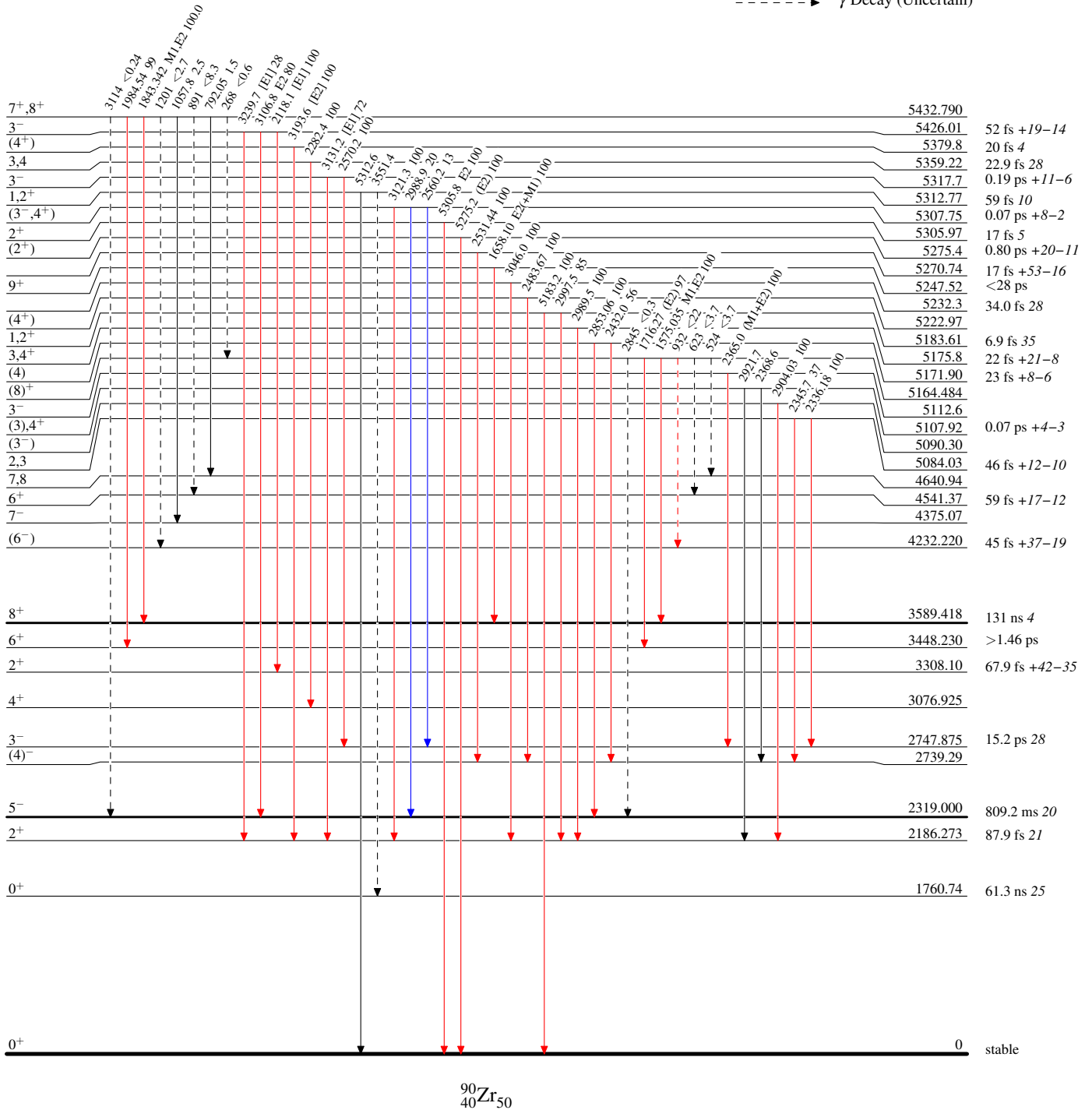
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

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)



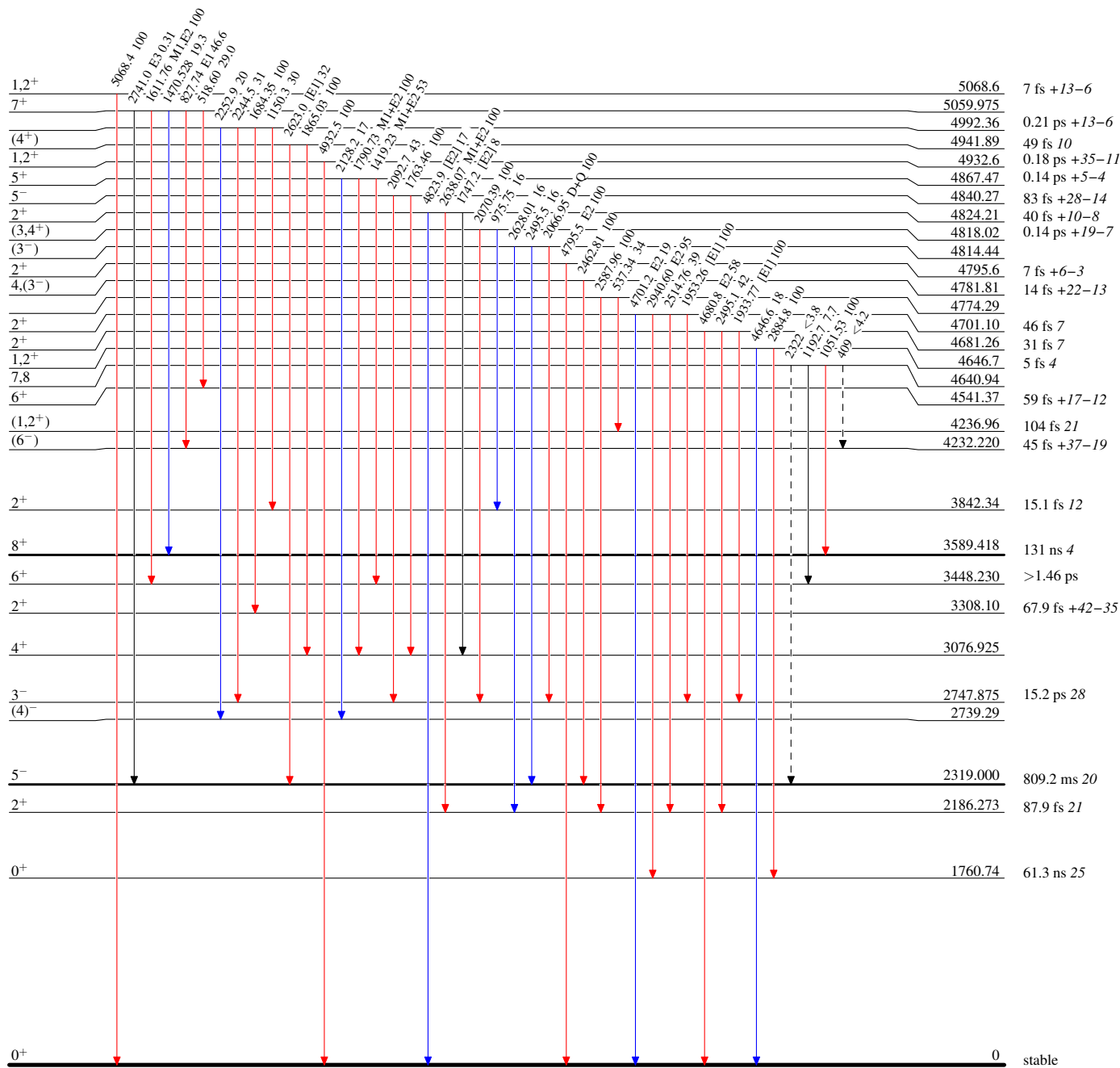
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

- I_γ < 2% × I_γ^{max}
- I_γ < 10% × I_γ^{max}
- I_γ > 10% × I_γ^{max}
- - - - -→ γ Decay (Uncertain)



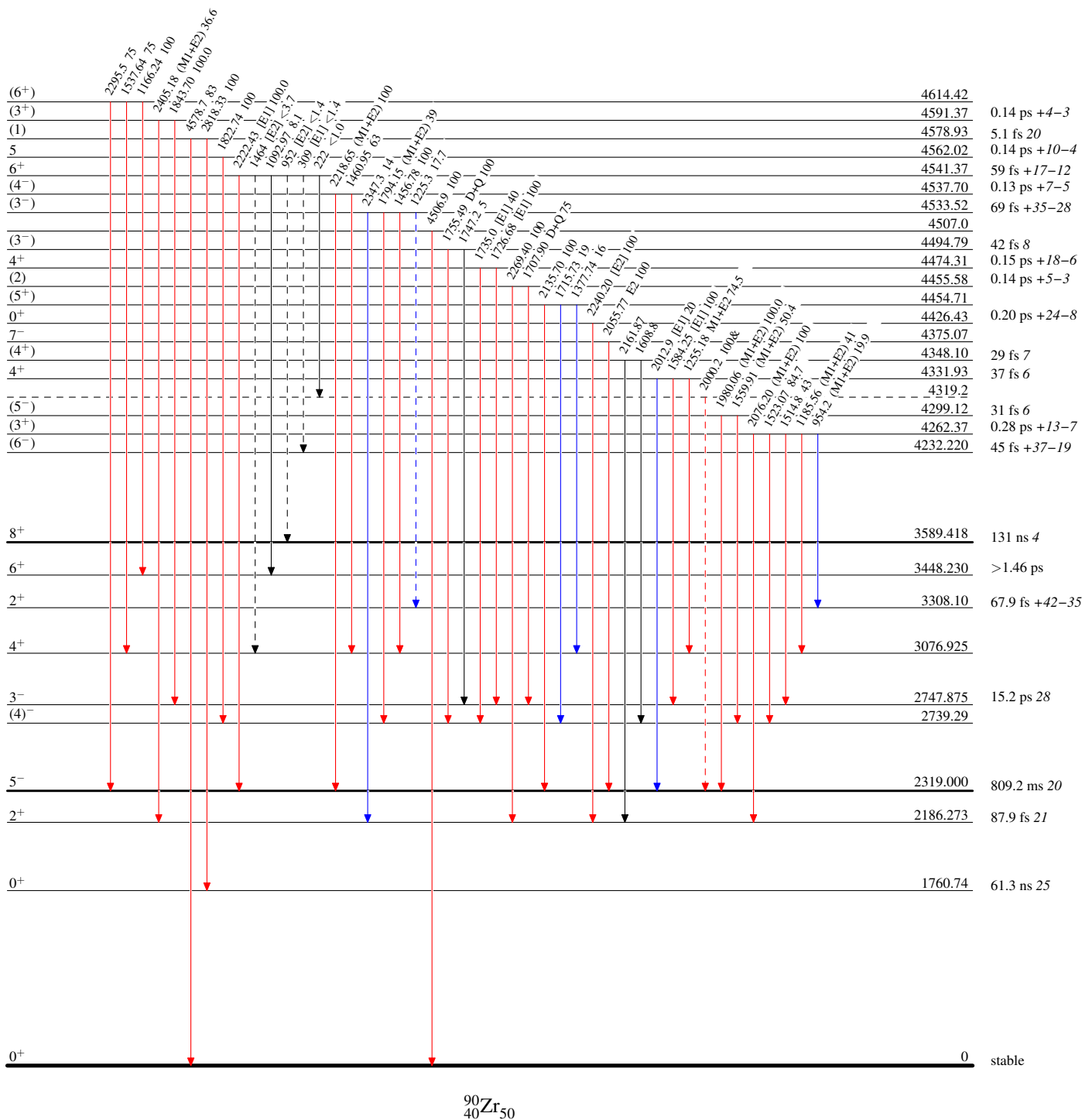
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

Legend

- ▶ I_γ < 2% × I_γ^{max}
- ▶ I_γ < 10% × I_γ^{max}
- ▶ I_γ > 10% × I_γ^{max}
- - - -▶ γ Decay (Uncertain)



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given

- 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)

