^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13

History

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

2008Sc20: E=7.9,9.0,13.2 MeV beam from ELBE accelerator at the research centre Dresden-Rosendorf. Measured Eγ, Iγ, angular distributions, scattering cross sections, width parameters using four HPGe detectors.

2013Ru01: E= 7 − 11 MeV 100% linearly polarized and monoenergetic beam from High Intensity γ ray Source (HIγS) facility. Measured Eγ, Iγ, angular distribution using four 60% HPGe detectors, two perpendicular to the beam and two in horizontal plane at θ=135°. Deduced giant M1 resonance strength.

1984Be31: Polarized bremsstrahlung with E<15 MeV. Measured σ(Eγ,θ), θ=0°, 90°, 180°, 270°, semi, enriched target.

1972Me04,1974Me13: Bremsstrahlung with E<5.6 MeV. Measured σ(Eγ,θ), θ=98° and 127°, semi, natural and enriched targets.

1976CaYX: Bremsstrahlung with E<9.5 MeV. Measured σ(Eγ,θ), θ=90° and 127°, semi, natural and enriched targets.

Others: 1969Ra09, 1974Ar15, 1982Be18.

^{90}Zr Levels

E(level)[†]	J$^\pi$[‡]	Γ_0^2/Γ (eV)[@]	I$_s$ (eVb)[b]	E(level)[†]	J$^\pi$[‡]	Γ_0^2/Γ (eV)[@]	I$_s$ (eVb)[b]
0.0	0$^+$			7779.0 *6*	1	0.21 eV *5*	40 *9*
2186.2 *1*	2$^+$	0.00489[&] eV *28*	19 *4*	7807.9 *3*	1	0.66 eV *12*	125 *23*
3308.0 *2*	2$^+$	0.0034[&] eV *7*	4.7 *19*	7857.8 *7*	(1)	0.18 eV *5*	34 *9*
3842.0 *2*	2$^+$	0.024[&] eV *4*	26 *4*	7935.6 *3*	1	1.14 eV *20*	209 *36*
3932.4 *6*			8.3 *32*	7976.6 *4*	1	0.69 eV *12*	125 *23*
4507.0 *8*			21 *10*	8006.9 *8*	1	0.20 eV *5*	36 *9*
4578.3 *3*		0.024[&] eV *4*	16 *4*	8067.4 *5*	(1)	0.31 eV *7*	55 *13*
5183.0 *5*			7.1 *24*	8110.0 *8*	1$^-$[#]	0.70 eV *14*	124 *24*
5304.5 *3*		0.12[a] eV *5*	57 *8*	8131.9 *4*	(1$^-$)[#]	0.88 eV *16*	154 *28*
5503.6 *3*		0.048[&] eV *17*	34 *6*	8144 *2*			115 *75*
5785.0 *4*		0.145 eV *22*	50 *8*	8166.7 *5*	(1)	0.57 eV *11*	98 *19*
5807.9 *3*		0.23 eV *3*	78 *10*	8221.2 *8*	1	0.33 eV *7*	57 *12*
5884.4 *4*		0.143 eV *23*	48 *8*	8235.6 *3*	1	1.5 eV *3*	254 *44*
6295.8 *2*	1$^-$[#]	2.55 eV *22*	740 *63*	8250.7 *5*	1	0.50 eV *10*	85 *16*
6389.8 *3*	1	0.29 eV *5*	82 *15*	8295.3 *10*	(1)	0.24 eV *7*	40 *11*
6424.3 *2*	1$^-$[#]	1.72 eV *15*	479 *43*	8313.0 *7*	1	0.42 eV *10*	70 *15*
6565.7 *3*	1	0.25 eV *3*	66 *9*	8334.1 *5*	1	0.54 eV *12*	90 *20*
6669.2 *7*	1	0.11 eV *3*	29 *8*	8357.5 *18*	1	0.10 eV *4*	16 *7*
6761.4 *2*	1$^-$[#]	2.55 eV *24*	644 *60*	8382.1 *10*	(1)	0.16 eV *3*	25 *6*
6875.4 *2*	1$^-$[#]	0.81 eV *9*	198 *22*	8403.7 *11*		0.26 eV *4*	43 *7*
6960.4 *7*	1	0.18 eV *4*	44 *10*	8413.5 *4*	1	1.30 eV *24*	212 *38*
7042.0 *7*	1	0.11 eV *3*	25 *6*	8440.6 *4*	1	1.38 eV *25*	224 *40*
7085.6 *10*	(1)	0.13 eV *4*	30 *10*	8467.7 *15*		0.19 eV *11*	31 *17*
7198.2 *6*	1	0.20 eV *5*	45 *10*	8501.2 *4*	1$^-$[#]	2.2 eV *4*	346 *63*
7249.2 *3*	1$^-$[#]	0.45 eV *8*	99 *17*	8518 *3*		0.25 eV *10*	40 *16*
7280.9 *7*				8544 *4*		0.051 eV *19*	8 *3*
7361.0 *6*	1	0.15 eV *3*	33 *7*	8553.5 *12*	1	0.50 eV *5*	79 *8*
7387.6 *4*	1	0.36 eV *7*	75 *14*	8588.3 *7*	1	0.60 eV *13*	93 *21*
7424.5 *10*		0.069 eV *24*	14 *5*	8598.2 *10*	1	0.27 eV *8*	42 *12*
7433.8 *8*	1	0.09 eV *3*	19 *6*	8625.6 *10*	1	0.24 eV *7*	37 *11*
7468 *2*		0.061 eV *18*	12 *4*	8664.1 *5*	1	0.39 eV *9*	59 *14*
7474.9 *3*	(1)	0.62 eV *11*	127 *23*	8716.6 *5*	1$^-$[#]	1.16 eV *22*	176 *33*
7685.8 *4*	1	0.36 eV *7*	70 *13*	8751.0 *8*	1	0.41 eV *10*	62 *15*
7702.9 *3*	1$^-$[#]	0.82 eV *14*	158 *28*	8760.4 *5*	1	1.08 eV *20*	162 *31*
7723.1 *9*		0.11 eV *3*	20 *6*	8812.0 *13*	1	0.25 eV *9*	37 *13*
7759.7 *6*	(1)	0.20 eV *5*	38 *9*	8833.2 *8*	1	0.56 eV *13*	83 *20*

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^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13 (continued)

^{90}Zr Levels (continued)

E(level)[†]	Jπ[‡]	Γ_0^2/Γ (eV)[@]	I_s (eVb)[b]	E(level)[†]	Jπ[‡]	Γ_0^2/Γ (eV)[@]	I_s (eVb)[b]
8874.9 *9*	1	0.28 eV *8*	41 *11*	9962.8 *5*	1	1.5 eV *3*	172 *37*
8903.0 *8*		0.39 eV *4*	57 *6*	9984.1 *11*		0.6 eV *3*	69 *34*
8927.4 *4*		0.88 eV *9*	127 *13*	10004.2 *10*	1	0.61 eV *14*	70 *16*
8978.4 *9*	(1)	0.62 eV *22*	88 *31*	10019.6 *11*	1	0.82 eV *14*	94 *16*
8985 *2*		0.32 eV *9*	45 *13*	10031 *2*		0.60 eV *14*	69 *16*
9004.7 *5*	1	0.24 eV *8*	34 *11*	10042.9 *4*	$(1^-)^{\#}$	2.76 eV *31*	316 *36*
9014.0 *8*		0.17 eV *10*	24 *14*	10083.8 *6*	1	0.82 eV *12*	93 *13*
9034.0 *8*		0.25 eV *5*	35 *7*	10094.2 *7*	1	0.73 eV *12*	83 *14*
9043.6 *4*	1	0.50 eV *7*	71 *10*	10104.9 *12*	(1)	0.43 eV *12*	49 *13*
9053.5 *7*		0.27 eV *5*	38 *7*	10123.7 *18*	1	1.22 eV *89*	14×10^1 *10*
9085.1 *3*	1	0.93 eV *11*	129 *15*	10146.8 *9*	1	0.41 eV *11*	46 *13*
9111.1 *6*	1	1.02 eV *14*	141 *20*	10163.4 *8*	1	0.54 eV *15*	60 *16*
9123.6 *7*		0.91 eV *13*	126 *17*	10193.0 *5*	1	1.51 eV *22*	168 *25*
9137.5 *7*		1.34 eV *16*	185 *22*	10216.8 *10*	1	0.69 eV *16*	76 *18*
9148.5 *3*	$1^{-\#}$	5.10 eV *48*	703 *66*	10233 *4*		0.43 eV *35*	47 *38*
9164.9 *7*		0.78 eV *10*	107 *14*	10241 *2*	(1)	0.72 eV *3*	79 *34*
9177.5 *5*		1.18 eV *13*	162 *18*	10260.9 *11*		0.21 eV *5*	23 *6*
9187 *3*		0.33 eV *10*	45 *13*	10270.0 *7*		0.31 eV *8*	34 *9*
9196.5 *3*	$(1^-)^{\#}$	1.85 eV *19*	252 *25*	10286.2 *6*	1	0.39 eV *8*	42 *9*
9260.5 *6*	1	1.11 eV *14*	149 *19*	10298.3 *10*	(1)	0.29 eV *7*	32 *8*
9292.8 *5*	1	1.62 eV *18*	216 *24*	10306.6 *9*	1	0.43 eV *8*	46 *9*
9309.4 *7*	1	1.03 eV *14*	137 *18*	10315.1 *4*	1	0.95 eV *13*	103 *14*
9333.4 *6*	$1^{-\#}$	1.06 eV *15*	141 *19*	10334.9 *6*	1	0.47 eV *9*	51 *10*
9373.2 *7*		0.84 eV *16*	111 *21*	10361 *2*	(1)	0.50 eV *13*	54 *14*
9392.4 *8*	1	0.78 eV *15*	102 *19*	10376.8 *4*	1	2.24 eV *26*	240 *28*
9409.4 *11*		0.54 eV *12*	71 *16*	10402.5 *9*	1	0.80 eV *15*	85 *16*
9424.3 *10*		0.61 eV *13*	79 *17*	10494.5 *11*	(1)	0.41 eV *9*	43 *10*
9444.7 *4*	1	1.71 eV *22*	221 *28*	10507.9 *8*	1	0.47 eV *10*	49 *10*
9465.1 *5*	1	1.32 eV *19*	169 *25*	10524.6 *4*	1	1.38 eV *18*	143 *18*
9486.8 *4*	1	1.77 eV *25*	226 *32*	10595.0 *7*	1	0.90 eV *14*	92 *14*
9510.5 *13*	(1)	0.35 eV *12*	45 *16*	10618.7 *8*	1	0.65 eV *12*	67 *12*
9524.1 *13*	1	0.35 eV *11*	44 *14*	10638.5 *9*	1	0.58 eV *12*	59 *12*
9539.2 *5*	1	1.21 eV *18*	154 *22*	10682.2 *6*	1	0.42 eV *10*	42 *10*
9551.4 *6*	1	1.27 eV *19*	160 *23*	10713.2 *12*	(1)	0.37 eV *20*	37 *20*
9563.0 *6*	1	1.42 eV *22*	180 *28*	10728.2 *11*	1	1.0 eV *3*	102 *32*
9609.2 *7*		0.57 eV *18*	72 *22*	10827.1 *5*	1	1.07 eV *17*	105 *16*
9625.1 *8*		0.47 eV *13*	58 *16*	10914 *2*	(1)	1.17 eV *21*	113 *21*
9640.4 *8*	1	0.46 eV *12*	56 *14*	10957 *2*	1	1.22 eV *20*	118 *19*
9666.0 *8*	(1)	0.32 eV *7*	39 *9*	10987.0 *10*	1	1.69 eV *24*	161 *23*
9678.3 *7*	$(1^-)^{\#}$	0.55 eV *8*	67 *10*	11044 *2*		0.52 eV *18*	49 *17*
9686.9 *6*	1	0.59 eV *9*	72 *11*	11094.2 *15*		0.74 eV *11*	70 *10*
9733.2 *5*	1	0.45 eV *7*	55 *8*	11108.0 *16*		0.42 eV *8*	39 *8*
9741.7 *7*		0.28 eV *5*	33 *6*	11120.4 *9*	1	0.99 eV *18*	92 *17*
9754.0 *6*	1	0.41 eV *7*	50 *9*	11129.2 *17*		0.61 eV *20*	57 *18*
9784.6 *5*		0.92 eV *12*	111 *15*	11140 *2*		0.61 eV *10*	57 *9*
9805.4 *10*		0.34 eV *7*	41 *9*	11232.4 *7*	1	0.96 eV *15*	88 *13*
9843.4 *6*	1	0.70 eV *13*	84 *15*	11243.2 *6*	1	1.01 eV *15*	92 *14*
9855.5 *8*	1	0.49 eV *11*	58 *13*	11337.7 *6*	1	1.01 eV *17*	91 *15*
9872.4 *4*	1	1.07 eV *21*	126 *24*	11417.5 *7*	(1)	1.2 eV *3*	108 *25*
9890.7 *13*	(1)	0.7 eV *3*	81 *34*	11452.2 *10*	1	1.5 eV *3*	132 *28*
9901.9 *13*		0.59 eV *24*	70 *28*	11479.7 *8*	1	2.2 eV *4*	191 *33*
9932.1 *12*	1	1.1 eV *3*	123 *39*	11501 *3*		0.8 eV *4*	66 *37*

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^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13 (continued)

^{90}Zr Levels (continued)

E(level)[†]	J$^\pi$[‡]	Γ_0^2/Γ (eV)[@]	I$_s$ (eVb)[b]	E(level)[†]	J$^\pi$[‡]	Γ_0^2/Γ (eV)[@]	I$_s$ (eVb)[b]
11510 *7*		0.38 eV *17*	33 *15*	11984 *2*	1	0.72 eV *17*	57 *13*
11531 *2*	1	0.85 eV *35*	74 *30*	12020.6 *8*	1	1.94 eV *26*	155 *21*
11627.9 *9*		0.52 eV *18*	44 *16*	12067.8 *9*	1	1.57 eV *24*	124 *19*
11651.5 *8*	(1)	0.56 eV *19*	48 *16*	12208.3 *12*	1	0.93 eV *21*	72 *16*
11777.4 *10*	1	1.5 eV *5*	124 *40*	12243.6 *14*	1	0.80 eV *19*	62 *15*
11788 *3*	1	0.9 eV *4*	73 *36*	12496.3 *18*		1.18 eV *24*	87 *18*
11963.3 *18*	(1)	0.85 eV *18*	68 *14*	12880.3 *10*		0.16 eV *5*	11 *3*

[†] From 2008Sc20, except as noted. The energy was deduced by 2008Sc20 from the γ-ray energy measured at 127° to the beam by including a recoil and Doppler correction.
[‡] As given by 2008Sc20, except where noted. Values for levels above 6 MeV are from measured $\gamma(\theta)$.
[#] From measured asymmetry with polarized photons (1984Be31).
[@] From 2008Sc20, except where noted.
[&] From 1974Me13.
[a] From 1976CaYX.
[b] Integrated scattering cross section. The values were deduced from data at kinetic energies of 7.9, 9.0 and 13.2 MeV for different excitation energy ranges, viz., up to 6.875 MeV, between 6.960 and 8.832 MeV and above 8.832 MeV (2008Sc20).

$\gamma(^{90}Zr)$

Ratios Iγ(90°)/Iγ(127°) are from 2008Sc20. Expected values are 0.74 for elastic pure dipole (0-1-0 spin sequence) and 2.18 for elastic quadrupole (0-2-0 spin sequence).

E$_\gamma$[†]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[‡]	Comments
2186.2 *1*	2186.2	2$^+$	0.0	0$^+$		
3307.9 *2*	3308.0	2$^+$	0.0	0$^+$		
3841.9 *2*	3842.0	2$^+$	0.0	0$^+$		
3932.3 *6*	3932.4		0.0	0$^+$		
4506.9 *8*	4507.0		0.0	0$^+$		
4578.2 *3*	4578.3		0.0	0$^+$		
5182.8 *5*	5183.0		0.0	0$^+$		
5304.3 *3*	5304.5		0.0	0$^+$		
5503.6 *3*	5503.6		0.0	0$^+$		
5784.8 *4*	5785.0		0.0	0$^+$		
5807.7 *3*	5807.9		0.0	0$^+$		
5884.2 *4*	5884.4		0.0	0$^+$		
6295.6 *2*	6295.8	1$^-$	0.0	0$^+$	E1[#]	Iγ(90°)/Iγ(127°)=0.75 *3*.
6389.6 *3*	6389.8	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.82 *8*.
6424.1 *2*	6424.3	1$^-$	0.0	0$^+$	E1[#]	Iγ(90°)/Iγ(127°)=0.74 *4*.
6565.4 *3*	6565.7	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.79 *15*.
6668.9 *7*	6669.2	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.64 *16*.
6761.1 *2*	6761.4	1$^-$	0.0	0$^+$	E1[#]	Iγ(90°)/Iγ(127°)=0.76 *3*.
6875.1 *2*	6875.4	1$^-$	0.0	0$^+$	E1[#]	Iγ(90°)/Iγ(127°)=0.73 *4*.
6960.1 *7*	6960.4	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.77 *11*.
7041.7 *7*	7042.0	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.74 *19*.
7085.3 *10*	7085.6	(1)	0.0	0$^+$	(D)	Iγ(90°)/Iγ(127°)=0.83 *21*.
7197.9 *6*	7198.2	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.49 *20*.
7248.9 *3*	7249.2	1$^-$	0.0	0$^+$	E1[#]	Iγ(90°)/Iγ(127°)=0.78 *7*.
7280.6 *7*	7280.9		0.0	0$^+$		
7360.8 *6*	7361.0	1	0.0	0$^+$	D	Iγ(90°)/Iγ(127°)=0.57 *17*.

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^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13 (continued)

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

E_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
7387.3 *4*	7387.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.68 *10*.
7424.2 *10*	7424.5		0.0	0^+		Iγ(90°)/Iγ(127°)=1.4 *6*.
7433.5 *8*	7433.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.52 *21*.
7468 *2*	7468		0.0	0^+		Iγ(90°)/Iγ(127°)=1.5 *5*.
7474.6 *3*	7474.9	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.96 *10*.
7685.4 *4*	7685.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.65 *10*.
7702.5 *3*	7702.9	1^-	0.0	0^+	E1[#]	Iγ(90°)/Iγ(127°)=0.83 *7*.
7722.7 *9*	7723.1		0.0	0^+		Iγ(90°)/Iγ(127°)=0.9 *3*.
7759.3 *6*	7759.7	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.82 *19*.
7778.6 *6*	7779.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.77 *17*.
7807.5 *3*	7807.9	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.75 *6*.
7857.4 *7*	7857.8	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.84 *25*.
7935.2 *3*	7935.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.81 *6*.
7976.2 *4*	7976.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.67 *7*.
8006.5 *8*	8006.9	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.71 *25*.
8067.0 *5*	8067.4	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=1.0 *3*.
8109.6 *8*	8110.0	1^-	0.0	0^+	E1[#]	Iγ(90°)/Iγ(127°)=0.71 *9*.
8131.5 *4*	8131.9	(1^-)	0.0	0^+	(E1)[#]	Iγ(90°)/Iγ(127°)=0.74 *9*.
8144 *2*	8144		0.0	0^+		
8166.3 *5*	8166.7	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.89 *14*.
8220.8 *8*	8221.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.80 *13*.
8235.2 *3*	8235.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.74 *4*.
8250.3 *5*	8250.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.68 *7*.
8294.9 *10*	8295.3	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.9 *3*.
8312.6 *7*	8313.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.73 *18*.
8333.7 *5*	8334.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.72 *18*.
8357.1 *18*	8357.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.32 *18*.
8381.7 *10*	8382.1	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=1.1 *4*.
8403.3 *11*	8403.7		0.0	0^+		
8413.1 *4*	8413.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.87 *9*.
8440.2 *4*	8440.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.87 *10*.
8467.3 *15*	8467.7		0.0	0^+		Iγ(90°)/Iγ(127°)=1.0 *5*.
8500.8 *4*	8501.2	1^-	0.0	0^+	E1[#]	Iγ(90°)/Iγ(127°)=0.81 *8*.
8518 *3*	8518		0.0	0^+		Iγ(90°)/Iγ(127°)=1.6 *6*.
8544 *4*	8544		0.0	0^+		
8553.1 *12*	8553.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.12 *6*.
8587.9 *7*	8588.3	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.58 *13*.
8597.8 *10*	8598.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.59 *22*.
8625.2 *10*	8625.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.7 *3*.
8663.7 *5*	8664.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.68 *16*.
8716.1 *5*	8716.6	1^-	0.0	0^+	E1[#]	Iγ(90°)/Iγ(127°)=0.75 *6*.
8750.5 *8*	8751.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.36 *14*.
8759.9 *5*	8760.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.58 *10*.
8811.5 *13*	8812.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.76 *24*.
8832.7 *8*	8833.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.67 *15*.
8874.4 *9*	8874.9	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.37 *13*.
8902.5 *8*	8903.0		0.0	0^+		
8926.9 *4*	8927.4		0.0	0^+		
8977.9 *9*	8978.4	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.8 *4*.
8985 *2*	8985		0.0	0^+		
9004.2 *5*	9004.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.45 *23*.
9013.5 *8*	9014.0		0.0	0^+		
9033.5 *8*	9034.0		0.0	0^+		
9043.1 *4*	9043.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.44 *6*.

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^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13 (continued)

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

E_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
9053.0 *7*	9053.5		0.0	0^+		
9084.6 *3*	9085.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.60 *9*.
9110.6 *6*	9111.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.64 *15*.
9123.1 *7*	9123.6		0.0	0^+		
9137.0 *7*	9137.5		0.0	0^+		
9148.0 *3*	9148.5	1^-	0.0	0^+	E1[#]	Iγ(90°)/Iγ(127°)=0.60 *4*.
9164.4 *7*	9164.9		0.0	0^+		
9177.0 *5*	9177.5		0.0	0^+		
9186 *3*	9187		0.0	0^+		
9196.0 *3*	9196.5	(1^-)	0.0	0^+	(E1)[#]	Iγ(90°)/Iγ(127°)=0.72 *7*.
9260.0 *6*	9260.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.67 *9*.
9292.3 *5*	9292.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.65 *7*.
9308.9 *7*	9309.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.71 *10*.
9332.9 *6*	9333.4	1^-	0.0	0^+	E1[#]	Iγ(90°)/Iγ(127°)=0.67 *10*.
9372.8 *7*	9373.2		0.0	0^+		
9391.9 *8*	9392.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.45 *13*.
9408.9 *11*	9409.4		0.0	0^+		
9423.8 *10*	9424.3		0.0	0^+		
9444.2 *4*	9444.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.65 *8*.
9464.6 *5*	9465.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.66 *11*.
9486.3 *4*	9486.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.75 *10*.
9510.0 *13*	9510.5	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.9 *4*.
9523.6 *13*	9524.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.47 *22*.
9538.7 *5*	9539.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.85 *13*.
9550.9 *6*	9551.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.47 *9*.
9562.5 *6*	9563.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.64 *17*.
9608.6 *7*	9609.2		0.0	0^+		
9624.5 *8*	9625.1		0.0	0^+		
9639.8 *8*	9640.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.6 *3*.
9665.4 *8*	9666.0	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.7 *3*.
9677.7 *7*	9678.3	(1^-)	0.0	0^+	(E1)[#]	Iγ(90°)/Iγ(127°)=0.67 *19*.
9686.3 *6*	9686.9	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.66 *17*.
9732.6 *5*	9733.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.5 *3*.
9741.1 *7*	9741.7		0.0	0^+		
9753.4 *6*	9754.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.5 *3*.
9784.0 *5*	9784.6		0.0	0^+		Iγ(90°)/Iγ(127°)=1.4 *3*.
9804.8 *10*	9805.4		0.0	0^+		Iγ(90°)/Iγ(127°)=1.6 *6*.
9842.8 *6*	9843.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.77 *16*.
9854.9 *8*	9855.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.55 *17*.
9871.8 *4*	9872.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.49 *12*.
9890.1 *13*	9890.7	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.7 *5*.
9901.3 *13*	9901.9		0.0	0^+		
9931.5 *12*	9932.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.43 *14*.
9962.2 *5*	9962.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.57 *14*.
9983.5 *11*	9984.1		0.0	0^+		
10003.6 *10*	10004.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.42 *19*.
10019.0 *11*	10019.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.65 *16*.
10030 *2*	10031		0.0	0^+		
10042.3 *4*	10042.9	(1^-)	0.0	0^+	(E1)[#]	Iγ(90°)/Iγ(127°)=0.70 *8*.
10083.2 *6*	10083.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.78 *13*.
10093.6 *7*	10094.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.74 *19*.
10104.3 *12*	10104.9	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.7 *3*.
10123.1 *18*	10123.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.5 *3*.
10146.2 *9*	10146.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.6 *3*.

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^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13 (continued)

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

E_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	Comments
10162.9 *8*	10163.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.50 *23*.
10192.4 *5*	10193.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.60 *12*.
10216.2 *10*	10216.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.57 *24*.
10232 *4*	10233		0.0	0^+		
10240 *2*	10241	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.9 *3*.
10260.3 *11*	10260.9		0.0	0^+		
10269.4 *7*	10270.0		0.0	0^+		
10285.6 *6*	10286.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.64 *19*.
10297.7 *10*	10298.3	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.8 *3*.
10306.0 *9*	10306.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.71 *21*.
10314.5 *4*	10315.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.63 *12*.
10334.3 *6*	10334.9	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.68 *21*.
10360 *2*	10361	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.9 *3*.
10376.2 *4*	10376.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.46 *7*.
10401.9 *9*	10402.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.72 *14*.
10493.8 *11*	10494.5	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.7 *3*.
10507.2 *8*	10507.9	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.6 *3*.
10523.9 *4*	10524.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.72 *10*.
10594.3 *7*	10595.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.80 *19*.
10618.0 *8*	10618.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.74 *23*.
10637.8 *9*	10638.5	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.41 *20*.
10681.5 *6*	10682.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.54 *16*.
10712.5 *12*	10713.2	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.8 *4*.
10727.5 *11*	10728.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.67 *20*.
10826.4 *5*	10827.1	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.82 *15*.
10913 *2*	10914	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.79 *21*.
10956 *2*	10957	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.35 *8*.
10986.3 *10*	10987.0	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.66 *13*.
11043 *2*	11044		0.0	0^+		
11093.5 *15*	11094.2		0.0	0^+		
11107.3 *16*	11108.0		0.0	0^+		
11119.7 *9*	11120.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.60 *16*.
11128.5 *17*	11129.2		0.0	0^+		
11139 *2*	11140		0.0	0^+		
11231.6 *7*	11232.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.45 *14*.
11242.4 *6*	11243.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.58 *15*.
11336.9 *6*	11337.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.85 *13*.
11416.7 *7*	11417.5	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.8 *4*.
11451.4 *10*	11452.2	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.42 *12*.
11478.9 *8*	11479.7	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.58 *15*.
11500 *3*	11501		0.0	0^+		
11509 *7*	11510		0.0	0^+		
11530 *2*	11531	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.42 *25*.
11627.1 *9*	11627.9		0.0	0^+		
11650.7 *8*	11651.5	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=1.0 *3*.
11776.6 *10*	11777.4	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.46 *22*.
11787 *3*	11788	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.4 *3*.
11962.4 *18*	11963.3	(1)	0.0	0^+	(D)	Iγ(90°)/Iγ(127°)=0.8 *3*.
11983 *2*	11984	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.57 *18*.
12019.7 *8*	12020.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.67 *14*.
12066.9 *9*	12067.8	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.63 *17*.
12207.4 *12*	12208.3	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.40 *15*.
12242.7 *14*	12243.6	1	0.0	0^+	D	Iγ(90°)/Iγ(127°)=0.57 *19*.
12495.4 *18*	12496.3		0.0	0^+		
12879.3 *10*	12880.3		0.0	0^+		

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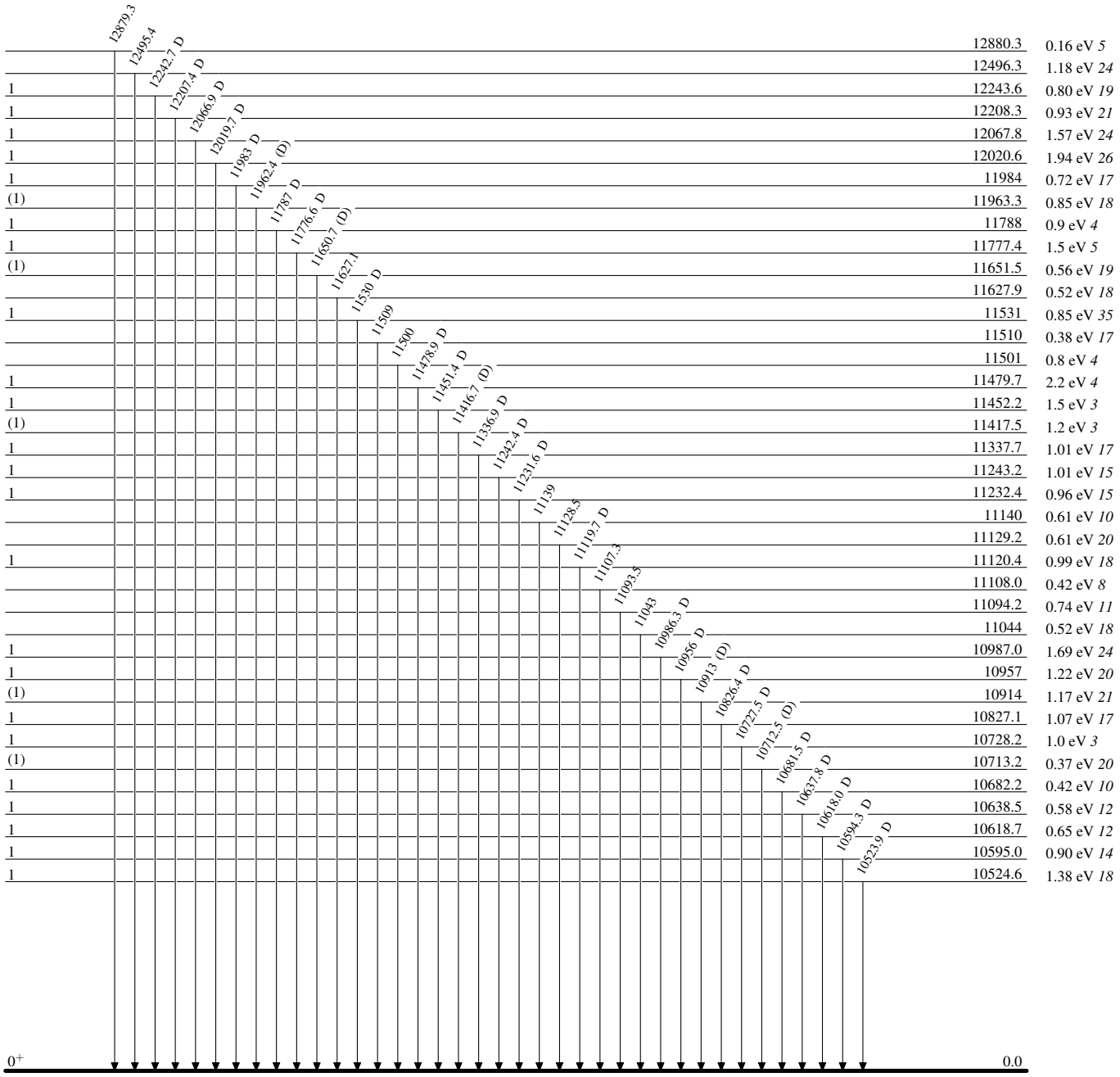
^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13 (continued)

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

† Deduced by the evaluators from level energies given by 2008Sc20 and with recoil correction removed which varies from 1.0 keV at the highest of 12.9 MeV to 0.03 keV at 2.2 MeV excitation.
‡ From Iγ(90°)/Iγ(127°)ratios from 2008Sc20.
# From measured asymmetry with polarized photons (1984Be31).

^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13

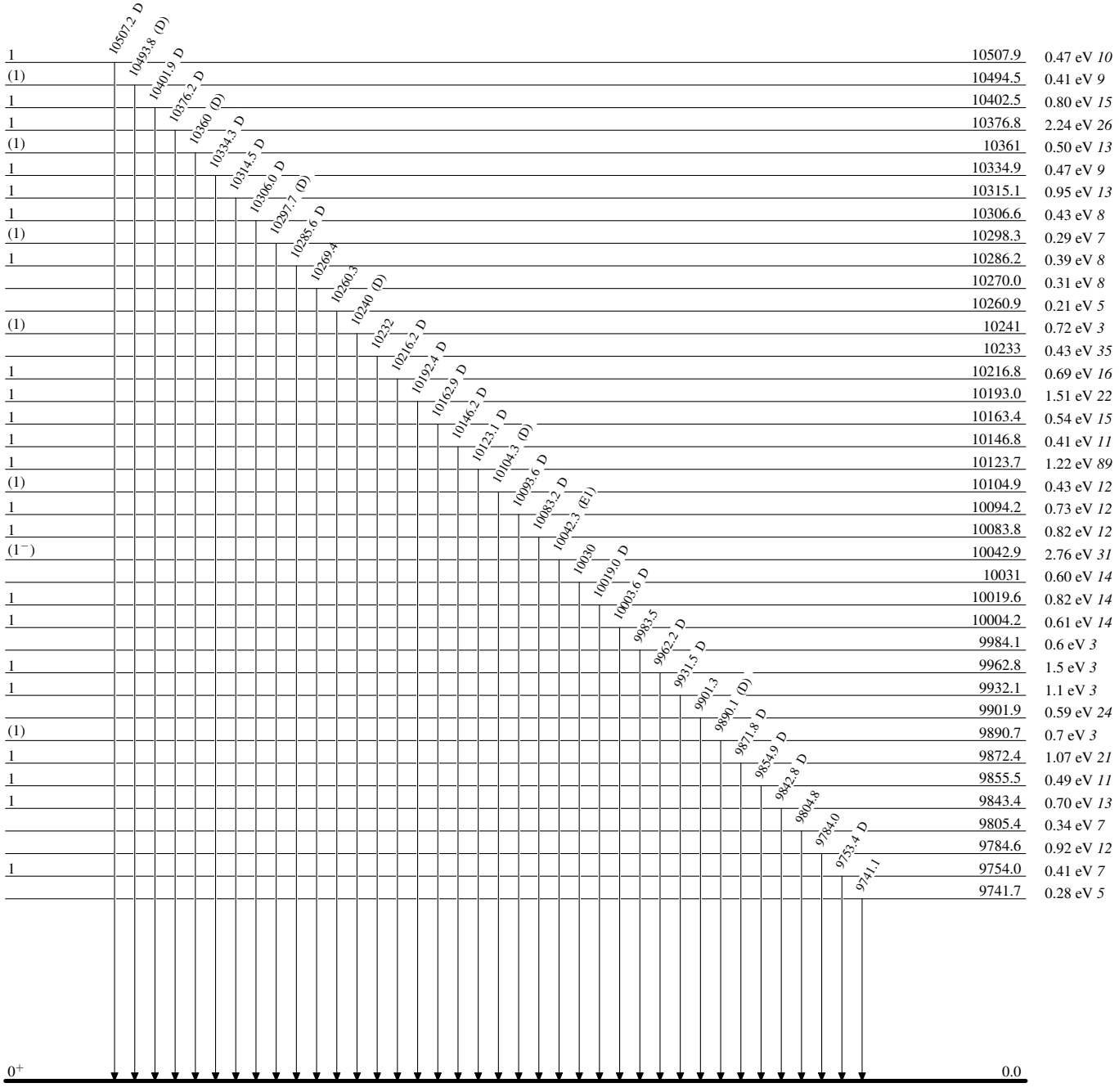
Level Scheme



$^{90}_{40}Zr_{50}$

^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13

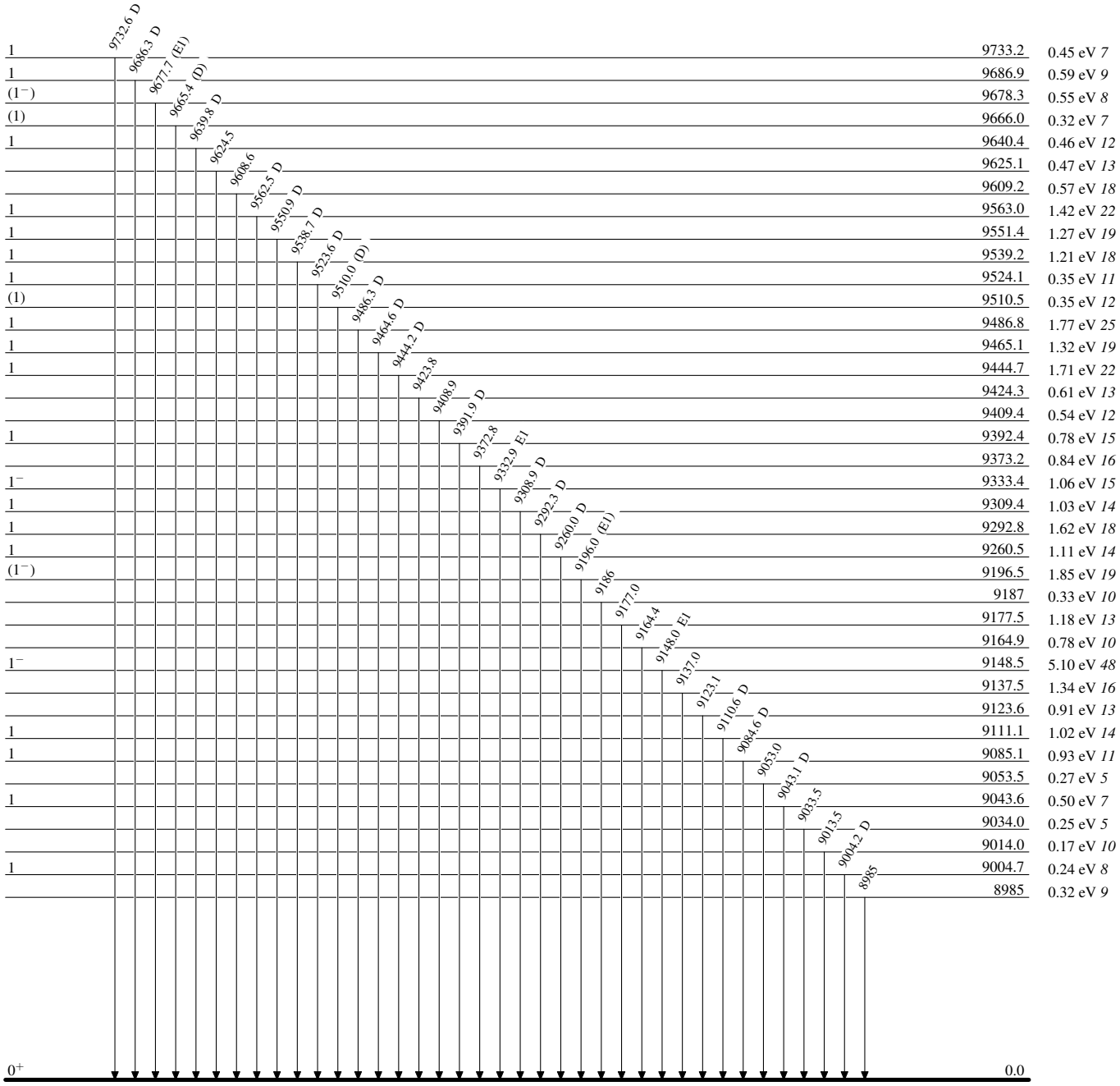
Level Scheme (continued)



$^{90}_{40}Zr_{50}$

^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13

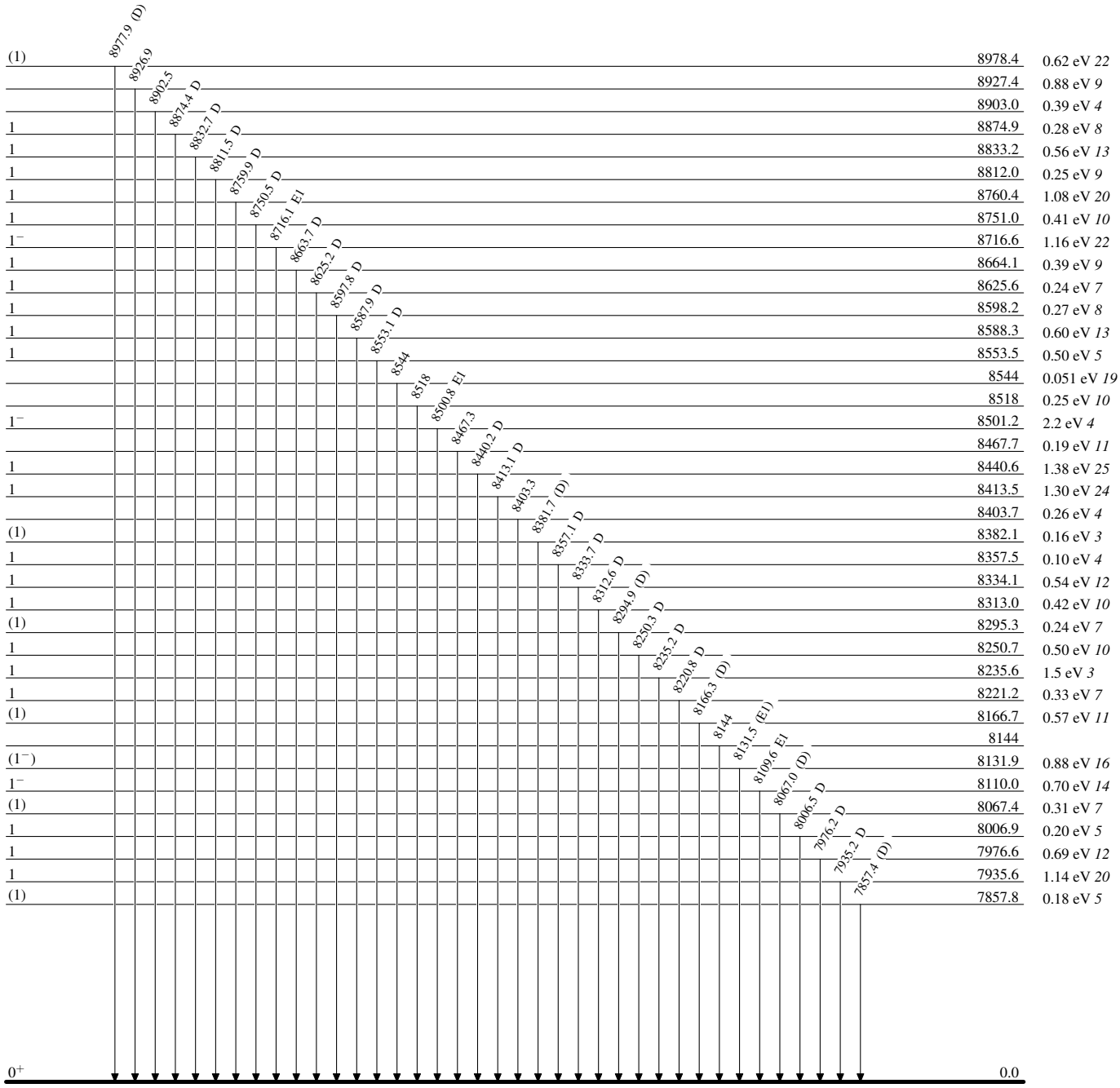
Level Scheme (continued)



$^{90}_{40}Zr_{50}$

^{90}Zr(γ,γ′) 2008Sc20,1984Be31,1974Me13

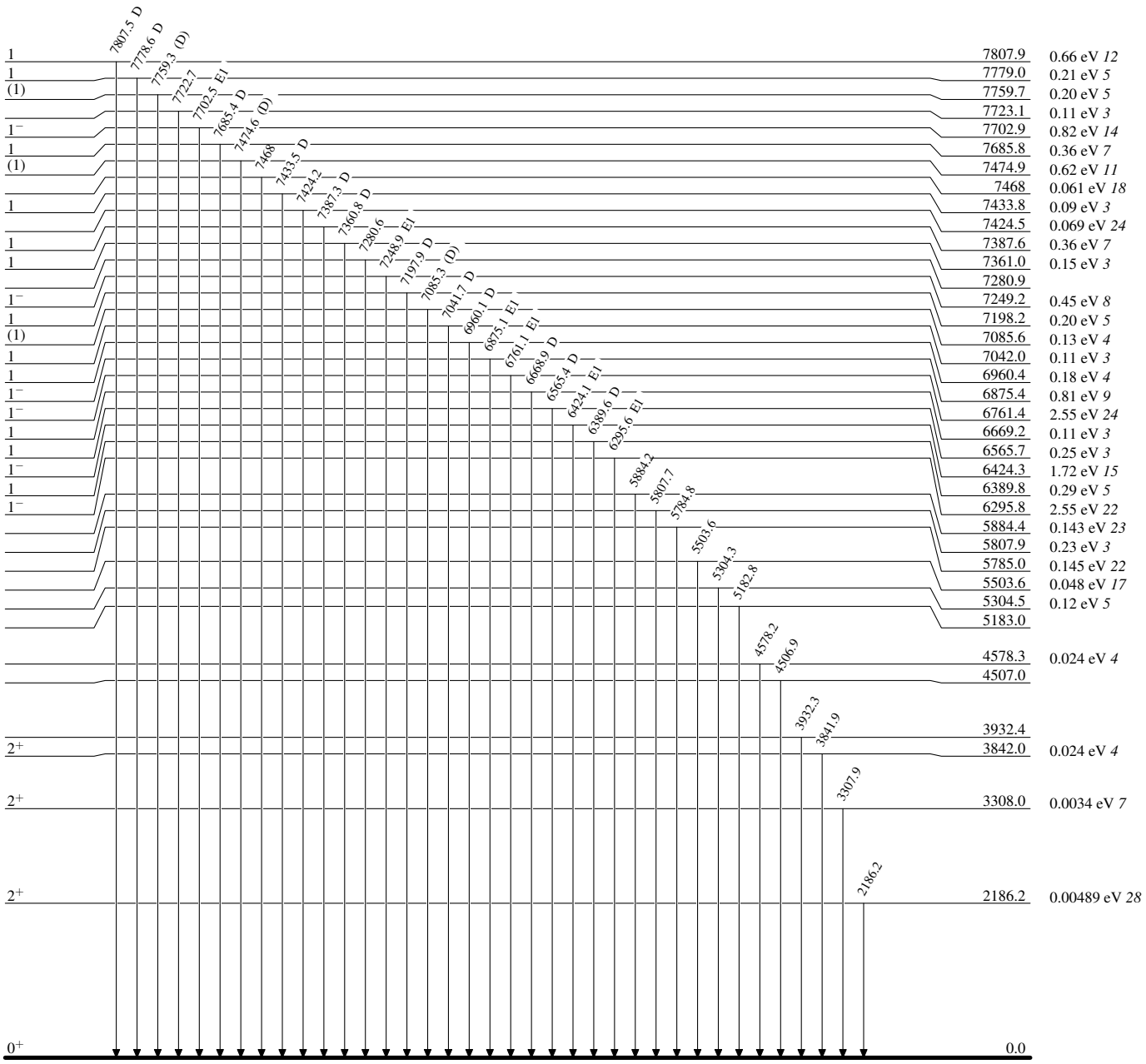
Level Scheme (continued)



$^{90}_{40}Zr_{50}$

^{90}Zr(γ,γ') 2008Sc20,1984Be31,1974Me13

Level Scheme (continued)



$^{90}_{40}Zr_{50}$