

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov, A. Rodionov and G. Shulyak		NDS 136, 163 (2016)	14-Jul-2016

Q(β⁻)=-8320 40; S(n)=11233 20; S(p)=5383 5; Q(α)=476 5 [2012Wa38](#)

Produced and identified by [1957Go78](#), [1957Go72](#). Spallation of Ta under bombardment with 660 MeV protons.

The even-even ¹⁴⁶Gd nucleus has closed shell with 82 neutrons. The level scheme was built on the basis of measurements of ¹⁴⁶Tb ε decays and of different reactions. The scheme contains about 160 excited states with assigned J_{max}=29⁺ and also two SD bands with J≈32/62. Detailed shell-model configurations for many levels are given in [1986Ya06](#).

¹⁴⁶Gd Levels

Cross Reference (XREF) Flags

A	¹⁴⁶ Tb ε decay (24.1 s)	E	¹⁴⁴ Sm(α,2nγ)	I	¹⁴⁴ Sm(¹² C, ¹⁰ Be)
B	¹⁴⁶ Tb ε decay (8 s)	F	¹⁴⁸ Sm(α,6nγ)	J	¹⁴⁴ Sm(¹⁶ O, ¹⁴ C)
C	¹⁵⁰ Dy α decay	G	¹⁴⁴ Sm(³ He,nγ)	K	(HI,xnγ)
D	¹⁴⁸ Gd(p,t)	H	Sm(³ He,xnγ)	L	(HI,xnγ):SD

E(level) [†]	J ^π	T _{1/2}	XREF	Comments
0.0	0 ⁺	48.27 d 9	ABCDEFGHIJK	%ε+%β ⁺ =100 T _{1/2} : from weighted average of 48.27 d 10 (γ(t), (X-ray)(Sm _K +Eu _K)(t) (1970Ch09)), 48.24 d 26 (weighted average of 47.34 d 67, 48.30 d 31, 48.94 d 64, 45.83 d 560, 45.12 d 916, 53.47 d 915, 42.46 d 999, 40.67 d 630, 45.12 d 916, 64.97 d 2994 for several γ-rays(t) (2013Bh07)).
1579.40 [‡] 5	3 ⁻	1.06 ns 12	AB DEFGHIJK	μ: +2.1 9 (1979Ke03 , TDPAD method. 2014StZZ). Other: +4.4 7 (1998FuZO , TIPAD method), g=0.62 12, derived by 1982Ha22 from shell-model calculations. J ^π : 1579.4γ E3 to J=0 ⁺ . T _{1/2} : weighted average from γγ(t) and e ⁻ γ(t) in (α,2nγ) and (α,6n) reactions (1978KI04). Other: 1.1 ns from ¹⁴⁶ Tb ε decay (1981StZO).
1972.02 7	2 ⁺	<0.7 ps	AB DE G IJ	XREF: J(1950). J ^π : 1972.0γ E2 to J=0 ⁺ , L=2 in (p,t). T _{1/2} : Doppler-shift effect, (1978Og03).
2164.72 12	0 ⁺	375 ps 40	B DE G	T _{1/2} : from ce(t) (1980Ju04). J ^π : 2164.7 E0 transition to J=0 ⁺ , 192.7γ E2 to 2 ⁺ .
2611.57 7	4 ⁺		A DE	J ^π : 1032.1γ E1 to 3 ⁻ , 639.6γ E2 to 2 ⁺ ; direct population in ¹⁴⁶ Tb ε decay (24 s) from J ^π =5 ⁻ . However, L=2,(4) in (p,t).
2658.04 [‡] 8	5 ⁻		A DEF HIJK	XREF: J(2690). J ^π : 1078.66γ E2 (ΔJ=2) to 3 ⁻ ; L=(5) in (p,t).
2967.52 24	4 ⁺		A E	J ^π : 1388.11γ E1 to 3 ⁻ ; log ft=6.7 in ¹⁴⁶ Tb ε decay (24 s) from J ^π =5 ⁻ .
2982.15 [‡] 9	7 ⁻	6.73 ns 10	A EF HI K	μ=8.76 26 μ: weighted average from g=+1.283 27 (1979Ha15), +1.13 9 (1979Fa01), +1.18 5 (1979Ke03), all measured by TDPAD method. J ^π : 324.09γ E2, ΔJ=2 to 5 ⁻ state; no γ to J<5. T _{1/2} : weighted average of 7.2 ns 4 (γ(t), ce(t) in (α,6nγ) (1979KI04)), 6.7 ns 1 (γ(t) in (α,2nγ) (1979Ha15)). Others: 6.7 ns 2 (1978KI04), 13.5 ns 35 (1972Ko42), 9.1 ns 20 (1973Kr10).
2986.4 2	2 ⁺		B DE	J ^π : from L(p,t)=(2).
2996.58 8	4 ⁻		A E	J ^π : 338.2γ M1 to 5 ⁻ , 1417.1γ M1 to 3 ⁻ .
3019.83 21	0 ⁺		DE	J ^π : E0 transition to 0 ⁺ , 1047.8γ E2 to 2 ⁺ ; L=0 in (p,t).
3031.16 9	3 ⁺		A E	J ^π : 1059.13γ M1 (ΔJ=1) to 2 ⁺ , 1451.8γ D+Q to 3 ⁻ .
3099.03 [‡] 9	6 ⁻		A E	J ^π : 116.77γ M1 to 7 ⁻ , 441.0γ M1 to 5 ⁻ .
3182.58 [‡] 10	8 ⁻		EF H K	J ^π : 200.43γ M1+E2 (ΔJ=1) to 7 ⁻ , 245.8γ M1+E2 from 9 ⁻ .
3185.95 10	2 ⁺		B DE	J ^π : L=2 in (p,t); 1606.5γ E1 to 3 ⁻ .

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Adopted Levels, Gammas (continued)

¹⁴⁶Gd Levels (continued)

E(level) [†]	J ^π	T _{1/2}	XREF	Comments
3232.5 4	2 ⁺		B DE	J ^π : L(p,t)=2; 3233γ to 0 ⁺ .
3287.29 11	3 ⁺		A E	J ^π : 675.71γ M1 (ΔJ=1) to 4 ⁺ , 1315.2γ (D+Q) (ΔJ=1) to 2 ⁺ .
3290.46 [#] 19	7 ⁻		E	J ^π : 308.29γ M1 (ΔJ=0) to 7 ⁻ .
3293.74 [#] 11	8 ⁻	<300 ps	EF H K	J ^π : 111.2γ M1+E2 (ΔJ=0) to 8 ⁻ , 311.6γ M1+E2 (ΔJ=1) to 7 ⁻ . T _{1/2} : from ce(t),γ(t) in (α,2nγ) (1979KI04).
3313.16 [#] 8	5 ⁻		A E	J ^π : 655.1γ M1 (ΔJ=0) to 5 ⁻ , 701.6γ E1 to 4 ⁺ .
3320 3			D	
3356.7 5	2 ⁺		DE	J ^π : from L=2 in (p,t).
3363.85 10	4		E	J ^π : 706.0γ D to 5 ⁻ , 1784.4γ D to 3 ⁻ .
3380.81 19	2 ⁺		DE	J ^π : from L=2 in (p,t).
3383 3			D	
3384.19 [#] 13	6 ⁻		A E	J ^π : 402.0γ M1 to 7 ⁻ , 726.2γ M1 to 5 ⁻ .
3388.73 [#] 12	(2,1,4 ⁺)		E	E(level): two levels of 3388.70 13, J ^π =3,(1) and 3388.7 4, J ^π =2,4 stated in 2010CaZZ. J ^π : 1416.7γ D (ΔJ=1, not excluded ΔJ=2 or 0) to 2 ⁺ , 357.6γ D (ΔJ=1) to 3 ⁺ , assignment to πh _{11/2} g _{7/2} ⁻¹ multiplet.
3411.84 [#] 10	4 ⁺		A E	J ^π : 380.9γ M1 (ΔJ=1) to 3 ⁺ , 415.3γ E1 (ΔJ=0) to 4 ⁻ .
3416.57 13	4 ⁺		E	J ^π : 804.9γ M1 (ΔJ=0) to 4 ⁺ , 1444.6γ E2 to 2 ⁺ .
3423.28 13	3 ⁻		A DE	J ^π : from L=3 in (p,t).
3428.42 [#] 12	9 ⁻	<300 ps	EF HI K	J ^π : 134.7γ M1+E2 (ΔJ=1) to 8 ⁻ , 446.3γ E2 to 7 ⁻ . T _{1/2} : from ce(t),γ(t) in (α,2nγ) (1979KI04).
3436.21 15	4 ⁺		A DE	J ^π : 1857.0γ (E1) to 3 ⁻ , 1464.1γ E2 to 2 ⁺ , 824.6γ ΔJ=0 to 4 ⁺ .
3456.60 15	4 ⁺		E	J ^π : 798.69γ E1 (ΔJ=1) to 5 ⁻ , 1877.0γ to 3 ⁻ .
3461.1 3	(5 ⁻)		dE	J ^π : 1881.7γ Q (E2, ΔJ=2) to 3 ⁻ ; no γ to J<3; however, L=(2) in (p,t).
3464.03 17	5 ⁻		dE	J ^π : 1884.6γ (E2) (ΔJ=2) to 3 ⁻ ; no γ to J<3; however, L=(2) in (p,t).
3469.1 3			A	
3478.4 10			E	
3481.8 6	3 ⁺		E	J ^π : 1902.4γ E1 (ΔJ=0) to 3 ⁻ .
3484.76 11	6 ⁺		DE	J ^π : 502.6γ E1 to 7 ⁻ , 826.7γ E1 to 5 ⁻ , 1905.8γ E3 to 3 ⁻ . L=0+6 in (p,t) including contribution from 3484.9 level.
3484.93 21	0 ⁺		B DE	J ^π : 3485 E0 transition to 0 ⁺ . L=0+6 in (p,t) including contribution from 3484.8 level.
3547.5 8	2 ⁺		DE	J ^π : from L=2 in (p,t).
3563.01 16	(4 ⁺ ,2 ⁺)		E	J ^π : 1983.1γ (ΔJ=1) to 3 ⁻ , 1591.1γ (ΔJ=0 or 2) to 2 ⁺ , 951.6γ (ΔJ=0 or 2) to 4 ⁺ .
3585.3 3	4		A E	J ^π : 2005.9γ D (ΔJ=1) to 3 ⁻ ; direct population in ¹⁴⁶ Tb ε decay (24 s) from J ^π =5 ⁻ .
3640.8 6	0 ⁺		DE G	J ^π : 3639 E0 transition to 0 ⁺ .
3656.31 12	3		E	J ^π : 1684.3γ D (ΔJ=1) to 2 ⁺ , 1044.6γ to 4 ⁺ .
3660.05 13	(6 ⁺)		E I	J ^π : 1002.0γ E1 (ΔJ=1) to 5 ⁻ ; no γ to J<5.
3686.6 8	5 ⁻		DE	J ^π : from L=(5) in (p,t), 2107.2γ E2 to 3 ⁻ .
3730.0 20			E	
3744.2 7	(2 ⁺ ,3 ⁻)		DE	J ^π : from L=(2,3) in (p,t).
3761.5 6	(4 ⁺)		DE	J ^π : 1789.5γ (E2) to 2 ⁺ ; L=(5) from (p,t) (1989Ma28), however, the inspection of σ(θ) by 2010CaZZ shows that it could be L=4.
3779.33 14	(8 ⁺)		E	J ^π : 797.18γ E1 (ΔJ=1) to 7 ⁻ ; no γ to J<7.
3783.78 13	(3,5) ⁺		E	J ^π : 1172.2γ M1 (ΔJ=1) to 4 ⁺ .
3789 3	(2 ⁻ ,3 ⁻ ,4 ⁻)		E	J ^π : 2210γ (M1) to 3 ⁻ .
3853.61 16	(3 ⁻)		dE	J ^π : 1244γ (E1) (ΔJ=1) to 4 ⁺ , 2274γ (ΔJ=0 or 2) to 3 ⁻ .
3854.24 12	7 ⁻		dE	J ^π : 671.7γ M1 (ΔJ=1) to 8 ⁻ , 872.0γ M1 (ΔJ=0) to 7 ⁻ .
3864.83 13	10 ⁺	<300 ps	EF HIJK	Q=-0.70 9 Q: estimated by 1982Ha22, (systematics, model calculations). J ^π : 436.4γ E1 (ΔJ=1) to 9 ⁻ , 1229.8γ M1+E2 from 11 ⁺ , 1583.0γ E2 from 12 ⁺ , 1485.7γ E2 from 12 ⁺ .

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Adopted Levels, Gammas (continued)

¹⁴⁶Gd Levels (continued)

E(level) [†]	J ^π	XREF	Comments
3866.68 18	5 ⁻	E	T _{1/2} : from ce(t),γ(t) in (α,2nγ), (α,6nγ) (1979K104).
3908.16 22	(3 ⁺)	A DE	J ^π : 381.7γ E1 (ΔJ=1) to 6 ⁺ , 1255.2γ (ΔJ=1) to 4 ⁺ . J ^π : 876.7γ (ΔJ=0 or 2) to 3 ⁺ , 1297γ (ΔJ=1) to 4 ⁺ ; direct population in ¹⁴⁶ Tb ε decay (24 s) from J ^π =5 ⁻ ; observed in (p,t). J ^π =(3 ⁻) deduced in (α,2nγ) data set (2010CaZZ).
3947.14 17	(6 ⁺)	E	J ^π : 483.1γ E1 to 5 ⁻ , 848.1γ (ΔJ=0) to 6 ⁻ .
3973.4 10	(3 ⁻)	DE	J ^π : from L=(3) in (p,t); 2394γ (ΔJ=0 or 2) to 3 ⁻ .
3987.4 10		E	
4006.7 5	(4 ⁺)	DE	J ^π : from L=(4,5) in (p,t); 2034.7γ to 2 ⁺ .
4026.71 21	(6,8)	E	J ^π : 736.0γ (ΔJ=1) to 7 ⁻ .
4076.8 5		E	
4107.51 14	8 ⁺	E	J ^π : 924.9γ E1 to 8 ⁻ , 1125.7γ (ΔJ=1) to 7 ⁻ .
4113.4 10		E	
4118.3 4		E	
4122.6 10	(5 ⁻)	DE	J ^π : from L=(4,5) in (p,t); 1511γ (ΔJ=1) to 4 ⁺ .
4131.2 10	(3,5)	E	J ^π : 1100γ (ΔJ=0 or 2) to 3 ⁺ , from measurements of asymmetry and pol (2010CaZZ).
4152.4 10	(2,4)	E	J ^π : 2573γ (ΔJ=1) to 3 ⁻ .
4166.6 3	(4,6)	E	J ^π : 1508.5γ (ΔJ=1) to 5 ⁻ .
4179.49 20	(6)	E	J ^π : 1521.6γ (ΔJ=1) to 5 ⁻ , 1197.3γ D to 7 ⁻ .
4216.4 5	(2,4)	DE	J ^π : 1185.2γ (ΔJ=1) to 3 ⁺ ; observed in (p,t).
4230.4 20	(5 ⁻)	DE	J ^π : from L=(5) in (p,t), 2651γ to 3 ⁻ .
4248.4 5	(7,9)	E	J ^π : 1065.8γ (ΔJ=1) to 8 ⁻ .
4259.8 5		E	
4286.4 20		E	
4299.8 3	(2 ⁺)	DE	J ^π : L=(2) in (p,t); 1688.2γ (ΔJ=0 or 2) to 4 ⁺ .
4318.95 22	(6 ⁻ ,7 ⁺ ,8 ⁻)	E	J ^π : 1336.8γ (E1, ΔJ=0; M1, ΔJ=1) to 7 ⁻ .
4326.6 20	(3,5)	E	J ^π : 1715γ (ΔJ=1) to 4 ⁺ .
4341.4 20	(4 ⁻)	DE	J ^π : from L=(4) in (p,t); 2762γ (possible M1) to 3 ⁻ .
4355.03 14	(5)	E	J ^π : 1256.0γ (ΔJ=1) to 6 ⁻ , 1742γ to 4 ⁺ .
4372.4 20	(4 ⁺)	DE	J ^π : from L=(4) in (p,t).
4376.1 10	(4 ⁺)	E	
4389.6 6	(5,7)	E	J ^π : 1290.6γ (ΔJ=1) to 6 ⁻ .
4399.5 3	(5 ⁻ ,7 ⁻)	DE	XREF: D(4394). J ^π : 1300.5γ (ΔJ=1) to 6 ⁻ , 1741γ to 5 ⁻ ; observed in (p,t).
4409 6		D	
4416.9 4	(10 ⁻ ,8 ⁻)	E	J ^π : 1123.2γ (M1, ΔJ=0 or E2, ΔJ=2) to 8 ⁻ , see comment for the level in the ¹⁴⁴ Sm(α,2nγ) dataset.
4459.09 20	(7 ⁻ ,9)	E	J ^π : 1276.5γ (ΔJ=1) to 8 ⁻ , 1030.7γ to 9 ⁻ .
4484.2 10	(4 ⁺)	DE	J ^π : from L=(4) in (p,t); 1826γ (ΔJ=1) to 5 ⁻ .
4484.9 4	(11 ⁻)	E	J ^π : 1056.5γ (ΔJ=0 or 2) to 9 ⁻ . No γ to J<9.
4501.97 20	10 ⁺	EF K	J ^π : 1073.6γ E1 (ΔJ=1) to 9 ⁻ , 592.8γ M1 from 11 ⁺ . J ^π =10 ⁻ from (α,6nγ).
4520.6 10		E	
4529.25 22		E	
4532.6 20	(3,5)	E	J ^π : 1921γ (ΔJ=1) to 4 ⁺ .
4534 6	0 ⁺	D	J ^π : from L=0 in (p,t).
4541.23 14	10 ⁺	EF K	J ^π : 1112.9γ E1 (ΔJ=1) to 9 ⁻ , 676.3γ (ΔJ=0 or 2) to 10 ⁺ ; no γ to J<9.
4580.3 8	7	E	J ^π : 1399γ (ΔJ=1) to 8 ⁻ , 1480γ (ΔJ=1) to 6 ⁻ .
4596 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
4608.4 6	8,10 ⁻	E	J ^π : 1314.7γ (ΔJ=0 or 2) to 8 ⁻ ; no γ to J<8.
4638 6	(5 ⁻ ,6 ⁺)	D	J ^π : from L=(5,6) in (p,t).
4645.79 18	(11 ⁻)	EF K	J ^π : 780.96γ (E1) (ΔJ=1) to 10 ⁺ , 802.1γ (E1) from 12 ⁺ .
4656 6		D	
4666.89 16	(12 ⁺)	E	J ^π : 802.0γ (ΔJ=0 or 2) to 10 ⁺ . No γ to J<10.
4686 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
4719.24 9	4 ⁻	A E	J ^π : 1431.7γ to 3 ⁺ , 2061.0γ to 5 ⁻ , 3139.9γ to 3 ⁻ ; population in ¹⁴⁶ Tb ε decay (24 s) from J ^π =5 ⁻ , log ft=4.58.

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Adopted Levels, Gammas (continued) ^{146}Gd Levels (continued)

E(level) [†]	J ^π	XREF	Comments
4726 6	(2 ⁺ ,3 ⁻)	D i	J ^π : from L=(2,3) in (p,t).
4729.64 23	(9 ⁺ ,7 ⁺)	E	J ^π : 1435.9γ E1 (ΔJ=1) to 8 ⁻ .
4747 6	(2 ⁺ ,3 ⁻)	D i	J ^π : from L=(2,3) in (p,t).
4780.54 23		E	
4782.2 10	8,6	E	J ^π : 1800γ D (ΔJ=1) to 7 ⁻ .
4793 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
4802.0 10		E	
4825 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
4828.64 13	(4,5) ⁻	A	J ^π : log ft=5.56 in ^{146}Tb ε decay (24 s) from J ^π =5 ⁻ .
4847.7 20	(9,7)	E	J ^π : 1554γ D (ΔJ=1) to 8 ⁻ .
4880 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
4880.2 4	(10,8)	E	J ^π : 1451.8γ D (ΔJ=1) to 9 ⁻ .
4898.3 3	(9,7)	E	J ^π : 1604.7γ D (ΔJ=1) to 8 ⁻ .
4905 6		D	
4941 6	(2 ⁺)	D	J ^π : from L=(2) in (p,t).
4942.6 10		E	
4976 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
5044 6	(2 ⁺)	D	J ^π : from L=(2) in (p,t).
5056.3 5		E	
5086 6	(2 ⁺ ,3 ⁻)	D	J ^π : from L=(2,3) in (p,t).
5094.70 19	11 ⁺	EF K	J ^π : 592.8γ M1 (ΔJ=1) to 10 ⁺ , 697.0γ E2 from 13 ⁺ .
5115 6		D	
5151 6		D	
5164.54 24	(11,9)	E	J ^π : 1299.7γ D (ΔJ=1) to 10 ⁺ .
5177 6		D	
5217 6		D	
5258 6	(2 ⁺)	D	J ^π : from L=(2) in (p,t).
5277.54 21	11 ⁺	EF K	J ^π : 1412.5γ M1+E2 (ΔJ=1) to 10 ⁺ , 514.2γ E2 from 13 ⁺ .
5289 6		D	
5320.7? 4		E	E(level): observed in (α,2nγ) by 1972Ko42, marked as tentative level.
5342 6	(4 ⁺ ,5 ⁻)	D	J ^π : from L=(4,5) in (p,t).
5350.67 22	12 ⁺	EF K	J ^π : 1485.7γ E2 (ΔJ=2) to 10 ⁺ , 543.6γ E2 from 14 ⁺ .
5388 6		D	
5443 6		D	
5447.88 18	12 ⁺	EF K	J ^π : 1583.0γ E2 (ΔJ=2) to 10 ⁺ , 446.4γ E2 from 14 ⁺ .
5482 6		D	
5528 6		D	
5529.0 3	(12 ⁺)	K	J ^π : 434.3γ (ΔJ=1, M1+E2) to 11 ⁺ .
5549 6		D	
5700.55 24	(12 ⁺)	K	J ^π : 1835.7γ (E2) (ΔJ=2) to 10 ⁺ .
5730.05 24	(12 ⁺)	K	J ^π : 1865.2γ (E2) (ΔJ=2) to 10 ⁺ .
5791.67 20	13 ⁺	EF K	J ^π : 697.0γ E2 (ΔJ=2) to 11 ⁺ , 440.9γ M1+E2 (ΔJ=1) to 12 ⁺ .
5894.16 22	14 ⁺	EF K	J ^π : 446.4γ E2 (ΔJ=2) to 12 ⁺ , 102.4γ D (ΔJ=1) to 13 ⁺ .
5996.1 3	14 ⁺	F K	J ^π : 645.3γ E2 (ΔJ=2) to 12 ⁺ , 124.0γ from 15 ⁺ , 402.9γ E2 from 16 ⁺ .
6120.1 3	15 ⁺	EF K	J ^π : 225.9γ D+Q (ΔJ=1) to 14 ⁺ , 278.8γ D from 16 ⁺ , π from 913.9γ E1 (ΔJ=1) from 16 ⁻ .
6399.0 3	16 ⁺	F K	J ^π : 402.9γ E2 (ΔJ=2) to 14 ⁺ , 1631.0γ E2 from 18 ⁺ , 1167.2γ E1 from 17 ⁻ , 765.9γ E1 from 17 ⁻ .
6470 30		I	
6820.3 3	17 ⁽⁺⁾	K	J ^π : 421.3γ (M1+E2) (ΔJ=1) to 16 ⁺ ; no γ to J<16.
7034.0 3	16 ⁻	F K	J ^π : 913.9γ E1 (ΔJ=1) to 15 ⁺ , 130.7γ M1+E2 (ΔJ=1) from 17 ⁻ .
7164.8 3	17 ⁻	F K	J ^π : 765.9γ E1 (ΔJ=1) to 16 ⁺ , 865.2γ E1 from 18 ⁺ ; no γ to J<16.
7202.0 11		K	
7513.3 3	16 ⁺	F K	J ^π : 1114.3γ M1+E2 (ΔJ=0) to 16 ⁺ , 516.8γ E2 from 18 ⁺ .
7566.2 3	17 ⁻	K	J ^π : ΔJ=1, E1 γ to 16 ⁺ , 463.9γ E1 from 18 ⁺ .
7659.1 4		K	

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Adopted Levels, Gammas (continued)

¹⁴⁶Gd Levels (continued)

E(level) [†]	J ^π	T _{1/2}	XREF	Comments
7738.8 4	17 ⁺		F K	J ^π : 291.3γ M1+E2 (ΔJ=1) from 18 ⁺ , 226γ to 16 ⁺ .
7999.7 4	(18 ⁺)		K	J ^π : 260.9γ M1+E2 to 17 ⁺ , no γ to J<17.
8030.1 3	18 ⁺	1.5 ns 6	F K	J ^π : 516.8γ E2 (ΔJ=2) to 16 ⁺ , 865.2γ E1 (ΔJ=1) to 17 ⁻ . T _{1/2} : from γ(t) in (α,6nγ) (1980BrZQ).
8077.0 15			K	
8368.2 4	(18 ⁺)		K	J ^π : 629.4γ M1+E2 (ΔJ=1) to 17 ⁺ ; no γ to J<17.
8649.6 4	(19 ⁻)		K	J ^π : 649.9γ (E1) (ΔJ=1) to (18 ⁺); no γ to J<18.
8665.8 4	(19 ⁺)		K	J ^π : 297.6γ M1+E2 (ΔJ=1) to (18 ⁺); no γ to J<18.
8804.0 18			K	
8915.7 4	20 ⁻	4.3 ns 3	F K	μ=+12.7 18 μ: from weighted average of g=+0.63 9 (TDPAD method, 1979Ha15) and g=+0.7 4 (TDPAD method, 1979Ke03). μ: +12 2 for J=(19 ⁺) (2014StZZ). J ^π : 885.6γ M2+E3 (ΔJ=2) to 18 ⁺ ; no γ to J<18. T _{1/2} : from γ(t) in (α,6nγ) (1980BrZQ).
9083.5 4	(20 ⁺)		K	J ^π : 417.8γ M1+E2 (ΔJ=1) to (19 ⁺); no γ to J<18.
9225.5 4	(21 ⁻)		K	J ^π : 309.8γ M1+E2 (ΔJ=1) to 20 ⁻ ; no γ's to J<20.
9254.0 5			K	
9257.0 5	(21 ⁻)		K	J ^π : 173.5γ E1 (ΔJ=1) to (20 ⁺); no γ to J<20.
9482.3 5	(22 ⁻)		K	J ^π : 1288.1γ E2 (ΔJ=2) from (24 ⁻); no γ to J<20.
9495.0 20			K	
9526.8 5	(22 ⁻)		K	J ^π : 269.8γ M1+E2 (ΔJ=1) to (21 ⁻); no γ to J<21.
9745.0 20			K	
9962.7 4	(22 ⁻)		K	J ^π : 1047.1γ E2 (ΔJ=2) to 20 ⁻ ; no γ to J<21.
10006.2 6	(23 ⁻)		K	J ^π : 479.4γ M1+E2 (ΔJ=1) to (22 ⁻); no γ to J<22.
10087.0 4	(23 ⁻)		K	J ^π : 861.5γ E2 (ΔJ=2) to (21 ⁻); no γ to J<21.
10266.5 4	(23 ⁻)		K	J ^π : 1041.0γ E2 (ΔJ=2) to (21 ⁻); no γ to J<21.
10440.0 21			K	
10770.4 4	(24 ⁻)		K	J ^π : 807.7γ E2 (ΔJ=2) to (22 ⁻), 669.9 E1 from 25 ⁺ ; no γ's to J<22.
11023.8 4	(24 ⁺)		K	J ^π : 936.7γ E1 (ΔJ=1) to (23 ⁻), 505.6γ E1 from 25 ⁻ .
11099.0 23			K	
11244.1 5	25 ⁻		K	J ^π : 977.6γ E2 (ΔJ=2) to (23 ⁻), 393.8γ E1 from 26 ⁺ .
11440.2 5	25 ⁺		K	J ^π : 669.9γ E1 (ΔJ=1) to (24 ⁻), 197.8γ M1+E2 from 26 ⁺ .
11450.0 25			K	
11497.5 5	(25)		K	J ^π : 727.1γ (D+Q) to (24 ⁻), 140.2γ (D+Q) from 26 ⁺ .
11529.7 5	25 ⁻		K	J ^π : 505.6γ E1 to 24 ⁺ , 107.8γ E1 from 26 ⁺ .
11637.8 5	26 ⁺		K	J ^π : 197.8γ M1+E2 (ΔJ=1) to 25 ⁺ , 393.8γ E1 ΔJ=1 to 25 ⁻ .
11932.8 5	(27 ⁺)		K	J ^π : 295.0γ M1+E2 to 26 ⁺ ; no γ's to J<26.
12891.0 5	(29 ⁺)		K	J ^π : 958.2γ E2 (ΔJ=2) to (27 ⁺); no γ's to J<27.
13696.0 6			K	
14013.6 10			K	
14176.3 10			K	
14197.0 12			K	
14444.0 15			K	
14595.0 9			K	
15069.0 14			K	
15443.0 17			K	
15758.0 20			K	
16313.0 22			K	
0.0+x [@]	J1		L	Additional information 1. J ^π : J ₁ π=33 ⁻ . J ^π : 1993Ha19: all J's could be shifted jointly units of 2. From theoretical analysis, 1993Ra07 suggest J=31 or 33. Population of normal states of J=29, 27 and 26 by the band (1995Sc31) suggests J>31.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

¹⁴⁶Gd Levels (continued)

E(level) [†]	J ^π	XREF	Comments
			Percent population=0.65 19 (1993Ha19) in ¹²² Sn(²⁹ Si,5nγ), ≈1 (1990He14) in ¹¹⁰ Pd(⁴⁰ Ar,4nγ). Q(intrinsic)=13.9 4 (2001Cl05), 12 2 (1990He14).
826.3+x @ 3	J1+2	L	
1704.3+x @ 5	J1+4	L	
2634.8+x @ 5	J1+6	L	
3618.0+x @ 5	J1+8	L	
4656.6+x @ 6	J1+10	L	
5750.0+x @ 7	J1+12	L	
6898.8+x @ 7	J1+14	L	
8100.0+x @ 8	J1+16	L	
9350.3+x @ 9	J1+18	L	
10648.1+x @ 9	J1+20	L	
11993.2+x @ 10	J1+22	L	
13387.0+x @ 11	J1+24	L	
14833.2+x @ 12	J1+26	L	
16331.7+x @ 14	J1+28	L	
17885.3+x @ 17	J1+30	L	
0.0+y &	J2	L	Additional information 2. J ^π : J ₂ π=32 ⁻ . J ^π : 1993Ha19: all J's could be shifted jointly units of 2. From theoretical analysis, 1993Ra07 suggest J=30 or 32. 1995Sc31 suggest J>31, presumably from population of normal states by the SD band. Percent population=0.39 12 (1993Ha19) in ¹²² Sn(²⁹ Si,5nγ), ≈0.7 (1991Rz01) in ¹¹⁰ Pd(⁴⁰ Ar,4nγ). Q(intrinsic)=13.9 3 (2001Cl05), 8 2 (1992StZU).
806.2+y & 3	J2+2	L	
1663.2+y & 5	J2+4	L	
2571.7+y & 6	J2+6	L	
3532.8+y & 6	J2+8	L	
4549.0+y & 6	J1+10	L	
5621.2+y & 7	J2+12	L	
6749.0+y & 7	J2+14	L	
7933.8+y & 8	J2+16	L	
9176.4+y & 9	J1+18	L	
10475.7+y & 9	J1+20	L	
11832.6+y & 10	J1+22	L	
13246.1+y & 11	J2+24	L	
14718.8+y & 13	J2+26	L	
16248.7+y & 15	J1+28	L	
17830.7+y & 19	J1+30	L	
0.0+z? ^a	J3	L	Additional information 3. E(level): this band belongs to ¹⁴⁷ Gd or ¹⁴⁶ Gd (1995Sc31).
958.5+z? ^a 5	J3+2	L	
1964.6+z? ^a 8	J3+4	L	
3029.5+z? ^a 10	J3+6	L	
4153.0+z? ^a 13	J3+8	L	
5328.7+z? ^a 15	J3+10	L	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{146}Gd Levels (continued)

<u>E(level)[†]</u>	<u>J^π</u>	<u>XREF</u>
6554.3+z? ^a 18	J3+12	L
7832.3+z? ^a 23	J3+14	L
9155+z? ^a 3	J3+16	L
10524+z? ^a 4	J3+18	L

[†] From a least-squares fit to E γ , normalized $\chi^2=0.62$.

[‡] Sequence of the levels with probable configuration $\pi h_{11/2}d_{5/2}^{-1}$ (1986Ya06).

Sequence of the levels with probable configuration $\pi h_{11/2}g_{7/2}^{-1}$. The configuration assignments to 3389 keV, and 3412 keV are ambiguous (1986Ya06).

@ Band(A): SD-1 BAND (1995Sc31,1990He14,1993Ha19,2001Cl05). Q₀=13.9 4 (2001Cl05). Percent population=0.65 19 (1993Ha19).

& Band(B): SD-2 BAND (1995Sc31,1991Rz01,1993Ha19,2001Cl05). Q₀=13.9 3 (2001Cl05). Percent population=0.39 12 (1993Ha19).

^a Band(C): SD-3 BAND (?) (1995Sc31). this band belongs to ^{147}Gd or ^{146}Gd (1995Sc31). Population=1/8 of SD-1 (1995Sc31).

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$

$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult.#	$\delta^{\#d}$	α^c	Comments
1579.40	3 ⁻	1579.38 5	100	0.0	0 ⁺	E3		0.00216	B(E3)(W.u.)=37 5
1972.02	2 ⁺	392.6 2	1.05@ 11	1579.40	3 ⁻				
		1972.00 11	100@ 11	0.0	0 ⁺	E2		1.01×10 ⁻³	B(E2)(W.u.)>0.59
2164.72	0 ⁺	192.7 1		1972.02	2 ⁺	E2		0.252	
		2164.7 3		0.0	0 ⁺	E0			
2611.57	4 ⁺	639.6 1	1.8 8	1972.02	2 ⁺	E2		0.00750	
		1032.10 11	100 10	1579.40	3 ⁻	E1		1.07×10 ⁻³	
2658.04	5 ⁻	1078.66 9	100	1579.40	3 ⁻	E2		0.00235	
2967.52	4 ⁺	1388.11 23	100	1579.40	3 ⁻	E1		7.56×10 ⁻⁴	
2982.15	7 ⁻	324.09 5	100	2658.04	5 ⁻	E2		0.0476	B(E2)(W.u.)=0.52 7
2986.4	2 ⁺	1014 1	<0.48	1972.02	2 ⁺	D			
		1407 1		1579.40	3 ⁻				
		2986.4 2	100 20	0.0	0 ⁺	E2		1.09×10 ⁻³	
2996.58	4 ⁻	338.2 4	1.1 4	2658.04	5 ⁻	M1		0.0696	
		1417.14 8	100 6	1579.40	3 ⁻	M1		0.00206	
3019.83	0 ⁺	1047.8 2		1972.02	2 ⁺	E2		0.00250	
		3020 2		0.0	0 ⁺	E0			
3031.16	3 ⁺	1059.13 9	100 10	1972.02	2 ⁺	M1		0.00399	
		1451.80 15	7.3 7	1579.40	3 ⁻	D+Q			
3099.03	6 ⁻	116.77 17	3.4 4	2982.15	7 ⁻	M1		1.292	
		440.99 5	100 10	2658.04	5 ⁻	M1		0.0349	
3182.58	8 ⁻	200.43 6	100	2982.15	7 ⁻	M1+E2	+0.151 +4-3	0.283	
3185.95	2 ⁺	1213.9 1	22.2@ 22	1972.02	2 ⁺	(D+Q)			
		1606.1 4	100@ 10	1579.40	3 ⁻	E1		7.76×10 ⁻⁴	
		3186.1 2	11.1@ 11	0.0	0 ⁺				
3232.5	2 ⁺	1260.2 8	20@ 2	1972.02	2 ⁺	[M1]		0.00266	
		1653.0 4	100@ 10	1579.40	3 ⁻	D			
		3233 1	20@ 2	0.0	0 ⁺				
3287.29	3 ⁺	675.71 9	100 11	2611.57	4 ⁺	M1		0.01188	
		1315.2 2	19.6 2	1972.02	2 ⁺	(D+Q)		0.00242	
3290.46	7 ⁻	308.29 17	100	2982.15	7 ⁻	M1		0.0890	
3293.74	8 ⁻	111.2 1	15.0 ^a 2	3182.58	8 ⁻	M1+E2	<0.5	1.51 3	
		311.6 1	100.0 ^a 2	2982.15	7 ⁻	M1+E2	-0.032 +12-13	0.0864 13	
3313.16	5 ⁻	655.12 1	100 10	2658.04	5 ⁻	M1		0.01282	
		701.6 2	7.4 15	2611.57	4 ⁺	E1		0.00227	
		1733.7 3	9.6 22	1579.40	3 ⁻	(Q)			
3356.7	2 ⁺	3356.7 5	100	0.0	0 ⁺	E2		1.18×10 ⁻³	
3363.85	4	706.0 2	21 4	2658.04	5 ⁻	D			
		752.2 2	11 2	2611.57	4 ⁺				
		1784.4 1	100 13	1579.40	3 ⁻	D			

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Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ †	I_γ ‡	E_f	J_f^π	Mult. #	δ #d	α^c	Comments
3380.81	2 ⁺	1408.8 2	28 3	1972.02	2 ⁺	M1		0.00209	
		1801.0 5	100 24	1579.40	3 ⁻	D			
		3381.5 8	79 30	0.0	0 ⁺	E2		1.19×10 ⁻³	
3384.19	6 ⁻	285.2 2	24 6	3099.03	6 ⁻	M1		0.1094	
		402.0 2	29 12	2982.15	7 ⁻	M1		0.0443	
		726.15 14	100 12	2658.04	5 ⁻	M1		0.00994	
3388.73	(2,1,4 ⁺)	357.6 3	70 13	3031.16	3 ⁺	D			
		1416.7 1	100 5	1972.02	2 ⁺	D			
3411.84	4 ⁺	380.9 3	85 15	3031.16	3 ⁺	M1		0.0510	
		415.3 1	100 30	2996.58	4 ⁻	E1		0.00722	
3416.57	4 ⁺	800.2 1	42 6	2611.57	4 ⁺				Mult.: $\Delta J=0$.
		804.9 2	8 3	2611.57	4 ⁺	M1		0.00773	
		1444.6 2	14 4	1972.02	2 ⁺	E2		1.37×10 ⁻³	
3423.28	3 ⁻	1837.2 2	100 8	1579.40	3 ⁻	(E1)		8.50×10 ⁻⁴	
		1843.90 12	100	1579.40	3 ⁻	D+Q			
3428.42	9 ⁻	134.70 7	100 9	3293.74	8 ⁻	M1+E2	-0.15 +4-6	0.863 13	
		245.77 15	3.9 6	3182.58	8 ⁻	M1+E2	0.9	0.1408	
		446.25 12	8.7 9	2982.15	7 ⁻	E2		0.0189	
3436.21	4 ⁺	824.6 2	18 2	2611.57	4 ⁺				
		1464.09 25	100 15	1972.02	2 ⁺	E2		1.35×10 ⁻³	
		1857.0 3	61 12	1579.40	3 ⁻	(E1)		8.58×10 ⁻⁴	
3456.60	4 ⁺	798.69 17	100 9	2658.04	5 ⁻	E1		1.75×10 ⁻³	
		1877.0 2	13 4	1579.40	3 ⁻				
3461.1	(5 ⁻)	1881.7 3	100	1579.40	3 ⁻	Q			
3464.03	5 ⁻	1884.6 2	100	1579.40	3 ⁻	(E2)		1.03×10 ⁻³	
3469.1		811.1 3	100	2658.04	5 ⁻				
3478.4		1899 1	100	1579.40	3 ⁻				
3481.8	3 ⁺	1902.4 6	100	1579.40	3 ⁻	E1		8.76×10 ⁻⁴	
3484.76	6 ⁺	502.6 1	7 3	2982.15	7 ⁻	E1		0.00466	
		826.7 1	100 7	2658.04	5 ⁻	E1		1.64×10 ⁻³	
		1905.8 6	6 3	1579.40	3 ⁻	E3		1.56×10 ⁻³	
3484.93	0 ⁺	1512.9 2		1972.02	2 ⁺	(E2)		1.28×10 ⁻³	
		3485 2		0.0	0 ⁺	E0			
3547.5	2 ⁺	3547.5 8	100	0.0	0 ⁺	E2		1.23×10 ⁻³	
3563.01	(4 ⁺ ,2 ⁺)	951.6 2	11 3	2611.57	4 ⁺				
		1591.1 3	27 8	1972.02	2 ⁺				
		1983.1 3	100 30	1579.40	3 ⁻	D			
3585.3	4	2005.9 3	100	1579.40	3 ⁻	D			
3640.8	0 ⁺	654.6 6		2986.4	2 ⁺	E2		0.00709	
		3639 2		0.0	0 ⁺	E0			
3656.31	3	1044.6 3	58 17	2611.57	4 ⁺				
		1684.3 1	100 17	1972.02	2 ⁺	D			
		2076 2	42 17	1579.40	3 ⁻				

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)								
$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult.#	α^c	Comments
3660.05	(6 ⁺)	1002.0 1	100	2658.04	5 ⁻	E1	1.13×10^{-3}	
3686.6	5 ⁻	2107.2 8	100	1579.40	3 ⁻	E2	9.89×10^{-4}	
3730.0		1758 2	100	1972.02	2 ⁺			
3744.2	(2 ⁺ , 3 ⁻)	1772 1	62 30	1972.02	2 ⁺			
		2165 1	100 30	1579.40	3 ⁻			
3761.5	(4 ⁺)	1789.5 6	100	1972.02	2 ⁺	(E2)	1.07×10^{-3}	
3779.33	(8 ⁺)	797.18 10	100	2982.15	7 ⁻	E1	1.76×10^{-3}	
3783.78	(3,5) ⁺	1172.2 1	100	2611.57	4 ⁺	M1	0.0026 6	
3789	(2 ⁻ , 3 ⁻ , 4 ⁻)	2210 3	100	1579.40	3 ⁻	(M1)	1.18×10^{-3}	
3853.61	(3 ⁻)	822.6 2	33 8	3031.16	3 ⁺			
		1244 2	79 17	2611.57	4 ⁺	(E1)	8.08×10^{-4}	
		1881.4 2	58 13	1972.02	2 ⁺			
		2274 1	100 21	1579.40	3 ⁻			
3854.24	7 ⁻	671.7 1	63 30	3182.58	8 ⁻	M1	0.01205	
		755.17 19	63 30	3099.03	6 ⁻	D		
		872.0 2	100 40	2982.15	7 ⁻	M1	0.00636	
3864.83	10 ⁺	436.35 7	100	3428.42	9 ⁻	E1	0.00643	B(E1)(W.u.) > 9.8×10^{-6}
3866.68	5 ⁻	381.7 3	100 40	3484.76	6 ⁺	E1	0.00882	
		1255.2 2	20 7	2611.57	4 ⁺	D		
3908.16	(3 ⁺)	876.7 3	100 & 11	3031.16	3 ⁺			
		1297 1	53 & 5	2611.57	4 ⁺			
		2329.0 3	100 & 11	1579.40	3 ⁻			
3947.14	(6 ⁺)	483.1 2	59 14	3464.03	5 ⁻	E1	0.00509	
		848.1 2	100 11	3099.03	6 ⁻			
		1289.2 5	51 14	2658.04	5 ⁻	D		
3973.4	(3 ⁻)	2394 1	100	1579.40	3 ⁻			
3987.4		2408 1	100	1579.40	3 ⁻			
4006.7	(4 ⁺)	2034.7 5	100 70	1972.02	2 ⁺			
		2427 1	67 30	1579.40	3 ⁻			
4026.71	(6,8)	736.0 5	11 6	3290.46	7 ⁻	D		
		1044.6 2	100 13	2982.15	7 ⁻	D		
4076.8		977.8 5	100	3099.03	6 ⁻			
4107.51	8 ⁺	924.87 10	85 15	3182.58	8 ⁻	E1	1.32×10^{-3}	
		1125.60 21	100 18	2982.15	7 ⁻	D		
4113.4		2534 1	100	1579.40	3 ⁻			
4118.3		1460.2 4	100	2658.04	5 ⁻			
4122.6	(5 ⁻)	1511 1	100	2611.57	4 ⁺	D		
4131.2	(3,5)	1100 1	100	3031.16	3 ⁺			
4152.4	(2,4)	2573 1	100	1579.40	3 ⁻	D		
4166.6	(4,6)	1508.5 3	100	2658.04	5 ⁻	D		
4179.49	(6)	1197.3 2	100 17	2982.15	7 ⁻	D		
		1521.6 4	93 17	2658.04	5 ⁻	D		

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult.#	α^c	Comments
4216.4	(2,4)	1185.2 5	100	3031.16	3 ⁺	D		
4230.4	(5 ⁻)	2651 2	100	1579.40	3 ⁻			
4248.4	(7,9)	1065.8 5	100	3182.58	8 ⁻	D		
4259.8		1277.6 5	100	2982.15	7 ⁻			
4286.4		2707 2	100	1579.40	3 ⁻			
4299.8	(2 ⁺)	1688.2 3	100	2611.57	4 ⁺			
4318.95	(6 ⁻ ,7 ⁺ ,8 ⁻)	1336.8 2	100	2982.15	7 ⁻			Mult.: E1, $\Delta J=0$ or M1, $\Delta J=1$ from anisotropy and pol. (2010CaZZ).
4326.6	(3,5)	1715 2	100	2611.57	4 ⁺	D		
4341.4	(4 ⁻)	2762 2	100	1579.40	3 ⁻			
4355.03	(5)	1256.0 1	100 21	3099.03	6 ⁻	D		
		1372.8 6	22 5	2982.15	7 ⁻			
		1742 2	18 5	2611.57	4 ⁺			
4372.4	(4 ⁺)	2793 2	100	1579.40	3 ⁻			
4376.1	(4 ⁺)	1718 1	100	2658.04	5 ⁻			
4389.6	(5,7)	1290.6 6	100	3099.03	6 ⁻	D		
4399.5	(5 ⁻ ,7 ⁻)	1300.5 3	100 18	3099.03	6 ⁻	D		
		1741 1	12 5	2658.04	5 ⁻			
4416.9	(10 ⁻ ,8 ⁻)	1123.2 3	100	3293.74	8 ⁻			
4459.09	(7 ⁻ ,9)	1030.7 5	38 24	3428.42	9 ⁻			
		1165.4 5	100 40	3293.74	8 ⁻			
		1276.5 2	75 13	3182.58	8 ⁻	D		
4484.2	(4 ⁺)	1826 1	100 25	2658.04	5 ⁻	D		
		2906 3	21 17	1579.40	3 ⁻			
4484.9	(11 ⁻)	1056.5 3	100	3428.42	9 ⁻			
4501.97	10 ⁺	1073.6 2	100	3428.42	9 ⁻	E1	9.96×10 ⁻⁴	
4520.6		1909 1	100	2611.57	4 ⁺			
4529.25		1547.1 2	100	2982.15	7 ⁻			
4532.6	(3,5)	1921 2	100	2611.57	4 ⁺			
4541.23	10 ⁺	676.3 2	0.10 5	3864.83	10 ⁺			
		1112.93 10	100	3428.42	9 ⁻	E1	9.35×10 ⁻⁴	
4580.3	7	1399 1	71 21	3182.58	8 ⁻	D		
		1480 1	100 25	3099.03	6 ⁻	D		
4608.4	8,10 ⁻	1314.7 6	100	3293.74	8 ⁻			
4645.79	(11 ⁻)	780.96 15	100	3864.83	10 ⁺	(E1)	0.00183	
4666.89	(12 ⁺)	125.9 2	10 3	4541.23	10 ⁺			
		802.0 1	100 23	3864.83	10 ⁺			
4719.24	4 ⁻	1296.4 4	23 & 2	3423.28	3 ⁻			
		1431.7 3	3.9 & 4	3287.29	3 ⁺			
		1688.0 2	2.7 & 3	3031.16	3 ⁺			
		2061.00 14	9 & 1	2658.04	5 ⁻			
		2107.9 2	2.4 & 3	2611.57	4 ⁺			
		3139.87 13	100 & 1	1579.40	3 ⁻			

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult. #	$\delta^{\#d}$	α^c
4729.64	(9 ⁺ ,7 ⁺)	1435.9 2	100 17	3293.74	8 ⁻	E1		7.53×10 ⁻⁴
		1547 1	42 8	3182.58	8 ⁻			
4780.54		1391.8 2	100	3388.73	(2,1,4 ⁺)	D		
4782.2	8,6	1800 1	100	2982.15	7 ⁻	D		
4802.0		1703 1	100	3099.03	6 ⁻			
4828.64	(4,5) ⁻	1831.85 14	100& 10	2996.58	4 ⁻			
		2170.9 2	49& 4	2658.04	5 ⁻			
		3249.4 3	57& 6	1579.40	3 ⁻			
4847.7	(9,7)	1554 2	100	3293.74	8 ⁻	D		
4880.2	(10,8)	1451.8 3	100	3428.42	9 ⁻	D		
4898.3	(9,7)	1604.7 6	100 30	3293.74	8 ⁻	D		
		1715.7 3	44 11	3182.58	8 ⁻			
4942.6		1760 1	100	3182.58	8 ⁻			
5056.3		1191.5 4	100	3864.83	10 ⁺			
5094.70	11 ⁺	592.8 2	33.6 ^a 4	4501.97	10 ⁺	M1		0.01646
		1229.8 2	100.0 ^a 4	3864.83	10 ⁺	M1+E2	-1.67 7	0.00208 4
5164.54	(11,9)	1299.7 2	100	3864.83	10 ⁺	D		
5277.54	11 ⁺	736.7 3		4541.23	10 ⁺			
		775 1		4501.97	10 ⁺			
		1412.5 3		3864.83	10 ⁺	M1+E2		0.0018 4
5320.7?		1412.5 3	100	3908.16	(3 ⁺)			
5350.67	12 ⁺	1485.7 3	100	3864.83	10 ⁺	E2		1.32×10 ⁻³
5447.88	12 ⁺	802.10 18	100.0 ^a 14	4645.79	(11 ⁻)	(E1)		1.74×10 ⁻³
		1583.0 2	95.4 ^a 15	3864.83	10 ⁺	E2		1.21×10 ⁻³
5529.0	(12 ⁺)	434.3 2	100	5094.70	11 ⁺	M1+E2	+0.07 +3-4	0.0362 6
5700.55	(12 ⁺)	1835.7 2	100	3864.83	10 ⁺	(E2)		1.05×10 ⁻³
5730.05	(12 ⁺)	1865.2 2	100	3864.83	10 ⁺	(E2)		1.04×10 ⁻³
5791.67	13 ⁺	343.7 2	10.4 ^a 3	5447.88	12 ⁺	M1+E2		0.053 14
		440.9 3	21.3 ^a 3	5350.67	12 ⁺	M1+E2		0.027 8
		514.2 2	41.5 ^a 3	5277.54	11 ⁺	E2		0.01295
		697.0 3	100.0 ^a 3	5094.70	11 ⁺	E2		0.00611
5894.16	14 ⁺	102.4 3	83.3 ^a 12	5791.67	13 ⁺	D		
		446.35 20	100.0 ^a 12	5447.88	12 ⁺	E2		0.0189
		543.6 2	86.9 ^a 12	5350.67	12 ⁺	E2		0.01123
5996.1	14 ⁺	645.30 21	100	5350.67	12 ⁺	E2		0.00734
6120.1	15 ⁺	124 1		5996.1	14 ⁺			
		225.9 2		5894.16	14 ⁺	D+Q		
		328 1		5791.67	13 ⁺			
6399.0	16 ⁺	278.8 3		6120.1	15 ⁺	D		
		402.9 2		5996.1	14 ⁺	E2		0.0252
		505.0 2		5894.16	14 ⁺	Q		
6820.3	17 ⁽⁺⁾	421.3 2	100	6399.0	16 ⁺	(M1+E2)	-0.13 +8-15	0.0390 11

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)									
$E_i(\text{level})$	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.#	$\delta^{#d}$	α^c	Comments
7034.0	16 ⁻	913.9 2	100	6120.1	15 ⁺	E1		1.35×10^{-3}	
7164.8	17 ⁻	130.7 2	17.7 ^a 4	7034.0	16 ⁻	M1+E2	+0.28 +21-5	0.939	
		765.9 2	100 ^a 4	6399.0	16 ⁺	E1		0.00190	
		1046 1	^a	6120.1	15 ⁺				
		1166 1	^a	5996.1	14 ⁺				
7202.0		803 1		6399.0	16 ⁺				
7513.3	16 ⁺	479.3 3		7034.0	16 ⁻				
		1114.3 2		6399.0	16 ⁺	M1+E2	+0.2 2	0.00348 15	
7566.2	17 ⁻	1167.2 2	100	6399.0	16 ⁺	E1		8.69×10^{-4}	
7659.1		838.8 2		6820.3	17 ⁽⁺⁾				
		1260 1		6399.0	16 ⁺				
7738.8	17 ⁺	226 1		7513.3	16 ⁺				
7999.7	(18 ⁺)	260.9 2	100	7738.8	17 ⁺	M1+E2	-0.07 +5-8	0.1387 22	
8030.1	18 ⁺	291.3 2	35.8 ^a 4	7738.8	17 ⁺	M1+E2	-0.021 +20-24	0.1034	B(M1)(W.u.)=0.00012 5; B(E2)(W.u.)=0.0004 +7-4
		463.9 2	3.9 ^a 4	7566.2	17 ⁻	E1		0.00559	B(E1)(W.u.)= 3.6×10^{-8} 15
		516.8 2	22.4 ^a 4	7513.3	16 ⁺	E2		0.01280	B(E2)(W.u.)=0.028 12
		865.2 2	100.0 ^a 4	7164.8	17 ⁻	E1		1.50×10^{-3}	B(E1)(W.u.)= 1.4×10^{-7} 6
		1631.0 2	14.7 ^a 4	6399.0	16 ⁺	E2		1.17×10^{-3}	B(E2)(W.u.)= 6.0×10^{-5} 24
8077.0		875 1	100	7202.0					
8368.2	(18 ⁺)	629.4 2	10.6 ^a 5	7738.8	17 ⁺	M1+E2	+4.5 +31-42	0.008 6	
		709.1 2	100.0 ^a 5	7659.1					
8649.6	(19 ⁻)	649.9 2	100	7999.7	(18 ⁺)	(E1)		0.00267	
8665.8	(19 ⁺)	297.6 2	100	8368.2	(18 ⁺)	M1+E2	-0.086 +23-28	0.0974	
8804.0		727 1	100	8077.0					
8915.7	20 ⁻	885.6 2	100	8030.1	18 ⁺	M2+E3	-0.13 +6-4	0.01570 24	B(M2)(W.u.)=0.47 4; B(E3)(W.u.)=9 8
9083.5	(20 ⁺)	417.8 2		8665.8	(19 ⁺)	M1+E2	-0.27 +4-6	0.0389 8	
		433.9 2		8649.6	(19 ⁻)	(E1)		0.00652	
9225.5	(21 ⁻)	309.8 2	100	8915.7	20 ⁻	M1+E2	-0.058 +15-17	0.0876	
9254.0		170.5 2	100	9083.5	(20 ⁺)	(D)			
9257.0	(21 ⁻)	173.5 2	100	9083.5	(20 ⁺)	E1		0.0662	
9482.3	(22 ⁻)	257 1	100	9225.5	(21 ⁻)				
9495.0		691 1	100	8804.0					
9526.8	(22 ⁻)	269.8 2	100	9257.0	(21 ⁻)	M1+E2		0.105 22	
9745.0		941 1	100	8804.0					
9962.7	(22 ⁻)	1047.1 2	100	8915.7	20 ⁻	E2		0.00250	
10006.2	(23 ⁻)	479.4 2	100	9526.8	(22 ⁻)	M1+E2	-0.47 +10-17	0.0259 15	
10087.0	(23 ⁻)	861.5 2	100	9225.5	(21 ⁻)	E2		0.00379	
10266.5	(23 ⁻)	1041.0 2	100	9225.5	(21 ⁻)	E2		0.00253	
10440.0		695 1		9745.0					
		945 1		9495.0					
10770.4	(24 ⁻)	807.7 2	63.2 ^a 18	9962.7	(22 ⁻)	E2		0.00436	
		1288.1 2	100.0 ^a 18	9482.3	(22 ⁻)	E2		1.67×10^{-3}	

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	Mult.#	$\delta^{#d}$	α^c
11023.8	(24 ⁺)	757.1 2	24.6 ^a 15	10266.5	(23 ⁻)	E1		0.00195
		936.7 2	100.0 ^a 15	10087.0	(23 ⁻)	E1		1.28×10 ⁻³
11099.0		659 1	100	10440.0				
11244.1	25 ⁻	474	100 ^a	10770.4	(24 ⁻)			
		977.6 2	33 ^a 1	10266.5	(23 ⁻)	E2		0.00289
11440.2	25 ⁺	416.6 2	30 ^a 2	11023.8	(24 ⁺)	M1+E2	-0.25 +6-8	0.0394 9
		669.9 2	100 ^a 2	10770.4	(24 ⁻)	E1		0.00250
11450.0		351 1	100	11099.0				
11497.5	(25)	727.1 2	100	10770.4	(24 ⁻)	(D+Q)		
11529.7	25 ⁻	505.6 2	100	11023.8	(24 ⁺)	E1		0.00460
11637.8	26 ⁺	107.8 2	18 ^a 2	11529.7	25 ⁻	E1		0.239
		140.2 2	36 ^a 2	11497.5	(25)	(D+Q)		
		197.8 2	36 ^a 2	11440.2	25 ⁺	M1+E2		0.26 4
		393.8 2	100 ^a 2	11244.1	25 ⁻	E1		0.00819
11932.8	(27 ⁺)	295.0 2	100	11637.8	26 ⁺	M1+E2	+0.042 +12-13	0.0999 15
12891.0	(29 ⁺)	958.2 2	100	11932.8	(27 ⁺)	E2		0.00301
13696.0		805.0 2	100	12891.0	(29 ⁺)			
14013.6		1123 1	100	12891.0	(29 ⁺)			
14176.3		163 1		14013.6				
		480 1		13696.0				
14197.0		1306 1	100	12891.0	(29 ⁺)			
14444.0		247 1	100	14197.0				
14595.0		899 1		13696.0				
		1704 1		12891.0	(29 ⁺)			
15069.0		474 1	100	14595.0				
15443.0		374 1	100	15069.0				
15758.0		315 1	100	15443.0				
16313.0		555 1	100	15758.0				
826.3+x	J1+2	826.3 3	100	0.0+x	J1			
1704.3+x	J1+4	878.0 3	100	826.3+x	J1+2			
2634.8+x	J1+6	930.5 2	100	1704.3+x	J1+4			
3618.0+x	J1+8	983.2 2	100	2634.8+x	J1+6			
4656.6+x	J1+10	1038.6 3	100	3618.0+x	J1+8	E2 ^b		
5750.0+x	J1+12	1093.4 3	100	4656.6+x	J1+10	E2 ^b		
6898.8+x	J1+14	1148.8 2	100	5750.0+x	J1+12	E2 ^b		
8100.0+x	J1+16	1201.2 3	100	6898.8+x	J1+14	E2 ^b		
9350.3+x	J1+18	1250.3 4	100	8100.0+x	J1+16	E2 ^b		
10648.1+x	J1+20	1297.8 3	100	9350.3+x	J1+18	E2 ^b		
11993.2+x	J1+22	1345.1 3	100	10648.1+x	J1+20	E2 ^b		
13387.0+x	J1+24	1393.7 4	100	11993.2+x	J1+22			
14833.2+x	J1+26	1446.2 5	100	13387.0+x	J1+24			

Adopted Levels, Gammas (continued)

$\gamma(^{146}\text{Gd})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π	$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\ddagger	E_f	J_f^π
16331.7+x	J1+28	1498.5 7	100	14833.2+x	J1+26	13246.1+y	J2+24	1413.4 4	100	11832.6+y	J1+22
17885.3+x	J1+30	1553.6 9	100	16331.7+x	J1+28	14718.8+y	J2+26	1472.7 6	100	13246.1+y	J2+24
806.2+y	J2+2	806.2 3	100	0.0+y	J2	16248.7+y	J1+28	1529.9 8	100	14718.8+y	J2+26
1663.2+y	J2+4	857.0 3	100	806.2+y	J2+2	17830.7+y	J1+30	1582.0 11	100	16248.7+y	J1+28
2571.7+y	J2+6	908.5 3	100	1663.2+y	J2+4	958.5+z?	J3+2	958.5 5	100	0.0+z?	J3
3532.8+y	J2+8	961.1 2	100	2571.7+y	J2+6	1964.6+z?	J3+4	1006.1 6	100	958.5+z?	J3+2
4549.0+y	J1+10	1016.2 2	100	3532.8+y	J2+8	3029.5+z?	J3+6	1064.9 6	100	1964.6+z?	J3+4
5621.2+y	J2+12	1072.2 2	100	4549.0+y	J1+10	4153.0+z?	J3+8	1123.5 8	100	3029.5+z?	J3+6
6749.0+y	J2+14	1127.8 3	100	5621.2+y	J2+12	5328.7+z?	J3+10	1175.7 8	100	4153.0+z?	J3+8
7933.8+y	J2+16	1184.8 3	100	6749.0+y	J2+14	6554.3+z?	J3+12	1225.6 10	100	5328.7+z?	J3+10
9176.4+y	J1+18	1242.6 3	100	7933.8+y	J2+16	7832.3+z?	J3+14	1278.0 14	100	6554.3+z?	J3+12
10475.7+y	J1+20	1299.3 4	100	9176.4+y	J1+18	9155+z?	J3+16	1322.4 11	100	7832.3+z?	J3+14
11832.6+y	J1+22	1356.9 4	100	10475.7+y	J1+20	10524+z?	J3+18	1368.9 19	100	9155+z?	J3+16

[†] Weighted average of ¹⁴⁶Tb ϵ decays (23 s and 8 s), ($\alpha,2n\gamma$), ($\alpha,6n\gamma$) and (HI,xn γ) reactions data when it is available.

[‡] % photon branching from each level from ($\alpha,2n\gamma$) data set, except as noted. In the cases of the stated $I(\gamma+ce)$ in papers, the evaluators calculated I_γ using measured α , when they were known, or theoretical α for the transitions, the multipolarities which were evident from the scheme. I_γ 's of SD-bands are relative within each band.

[#] From $\alpha(\text{exp})$, $\gamma(\theta)$ and lin pol, also from shell model treatments.

[@] From ¹⁴⁶Tb ϵ decay (8 s).

[&] From ¹⁴⁶Tb ϵ decay (23 s).

^a From (HI,xn γ).

^b Stretched quadrupole from $I_\gamma(34^\circ/146^\circ)/I_\gamma(\sum 0^\circ)$ ratios (1987He16).

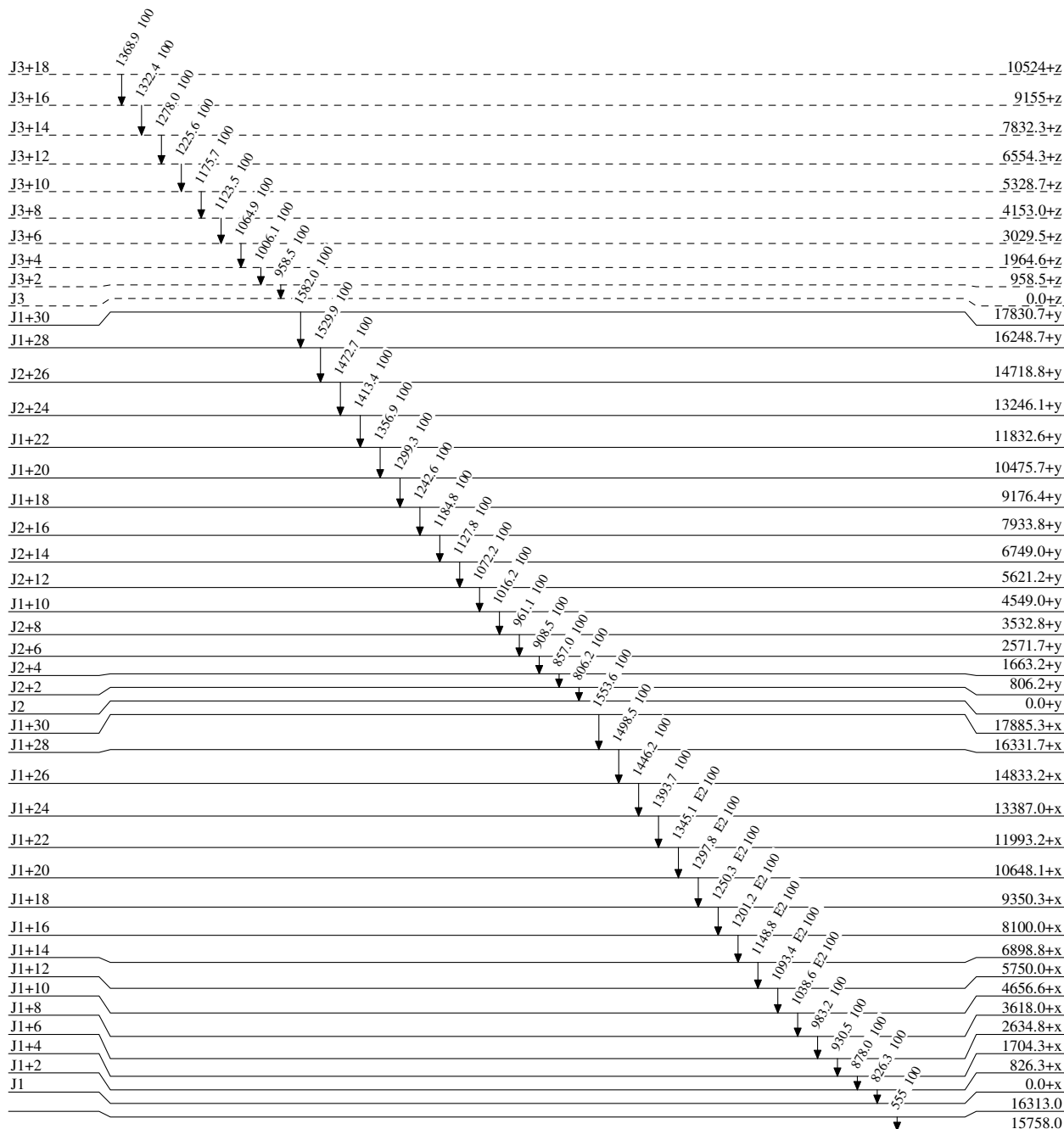
^c Additional information 4.

^d If No value given it was assumed $\delta=1.00$ for E2/M1.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



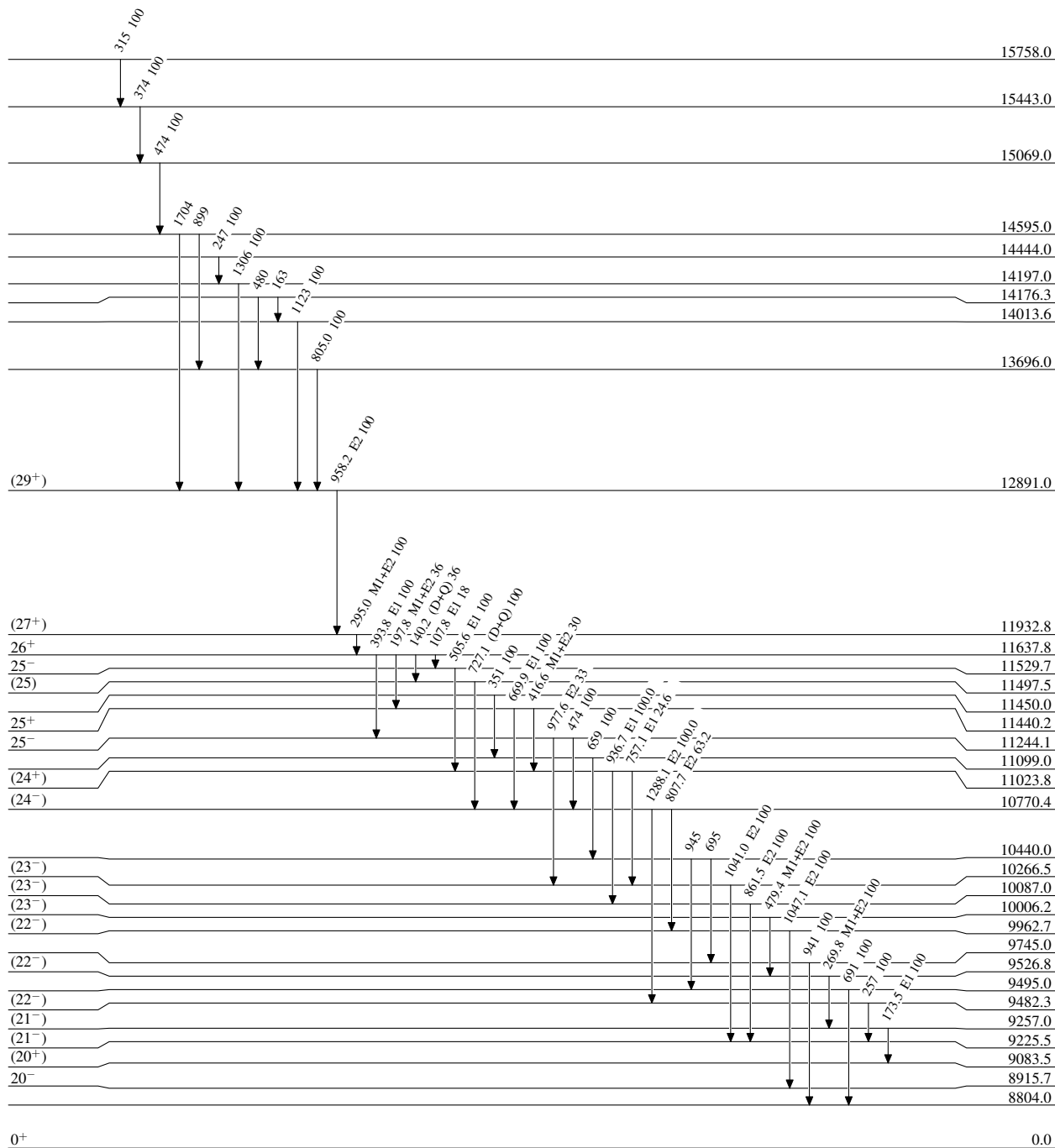
0+ 0.0

48.27 d 9

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



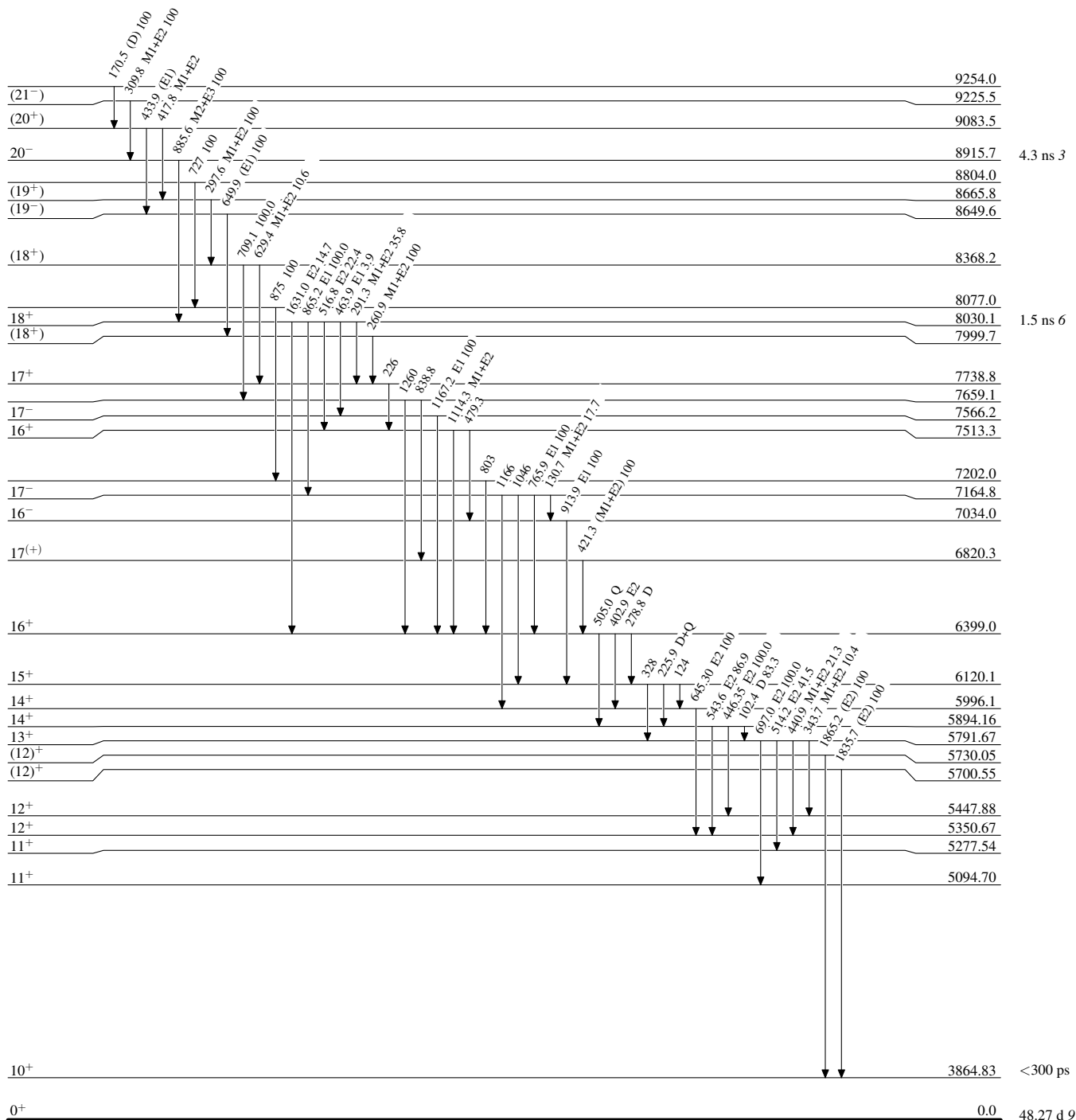
4.3 ns 3

48.27 d 9

Adopted Levels, Gammas

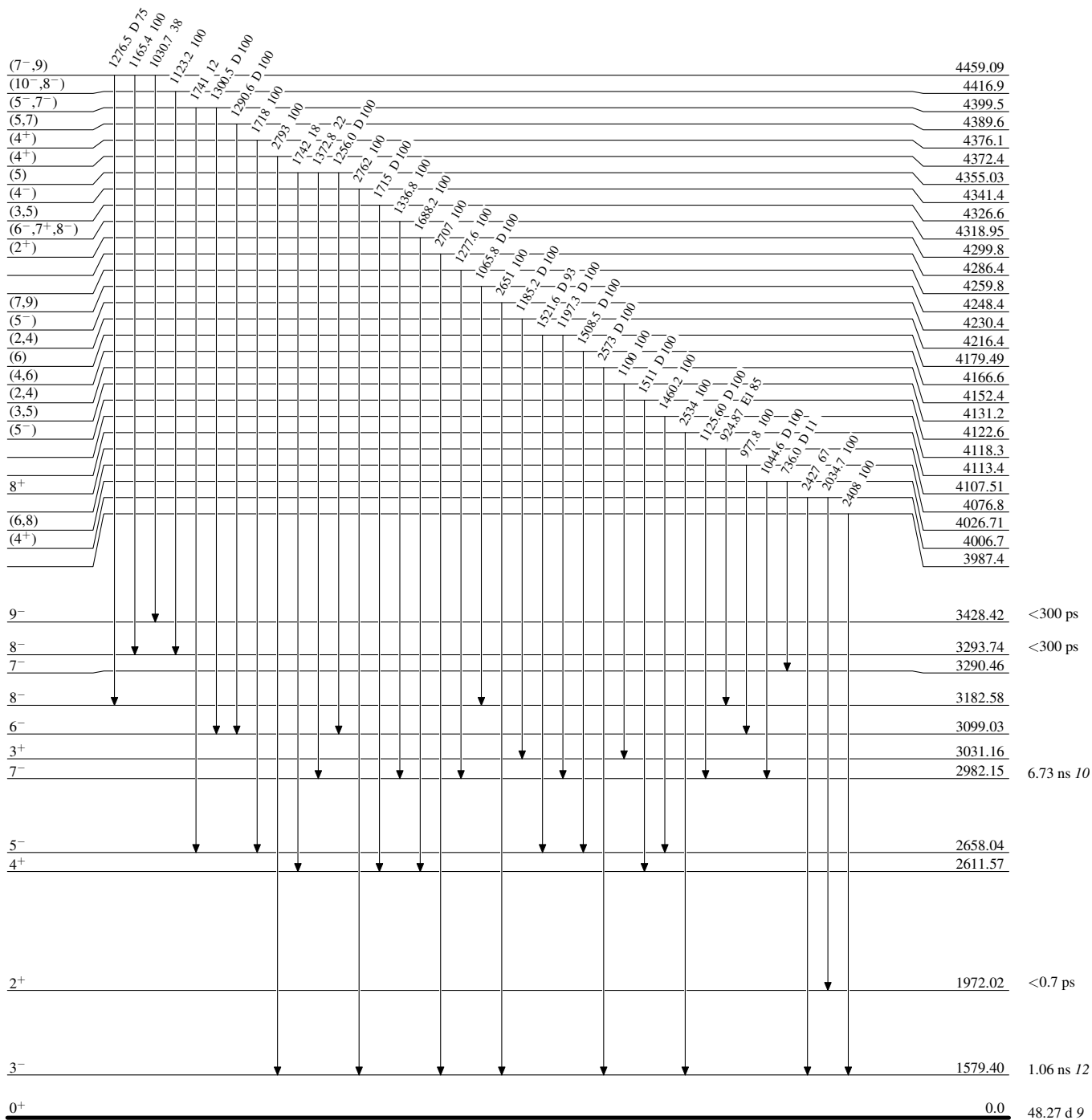
Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas**Level Scheme (continued)**

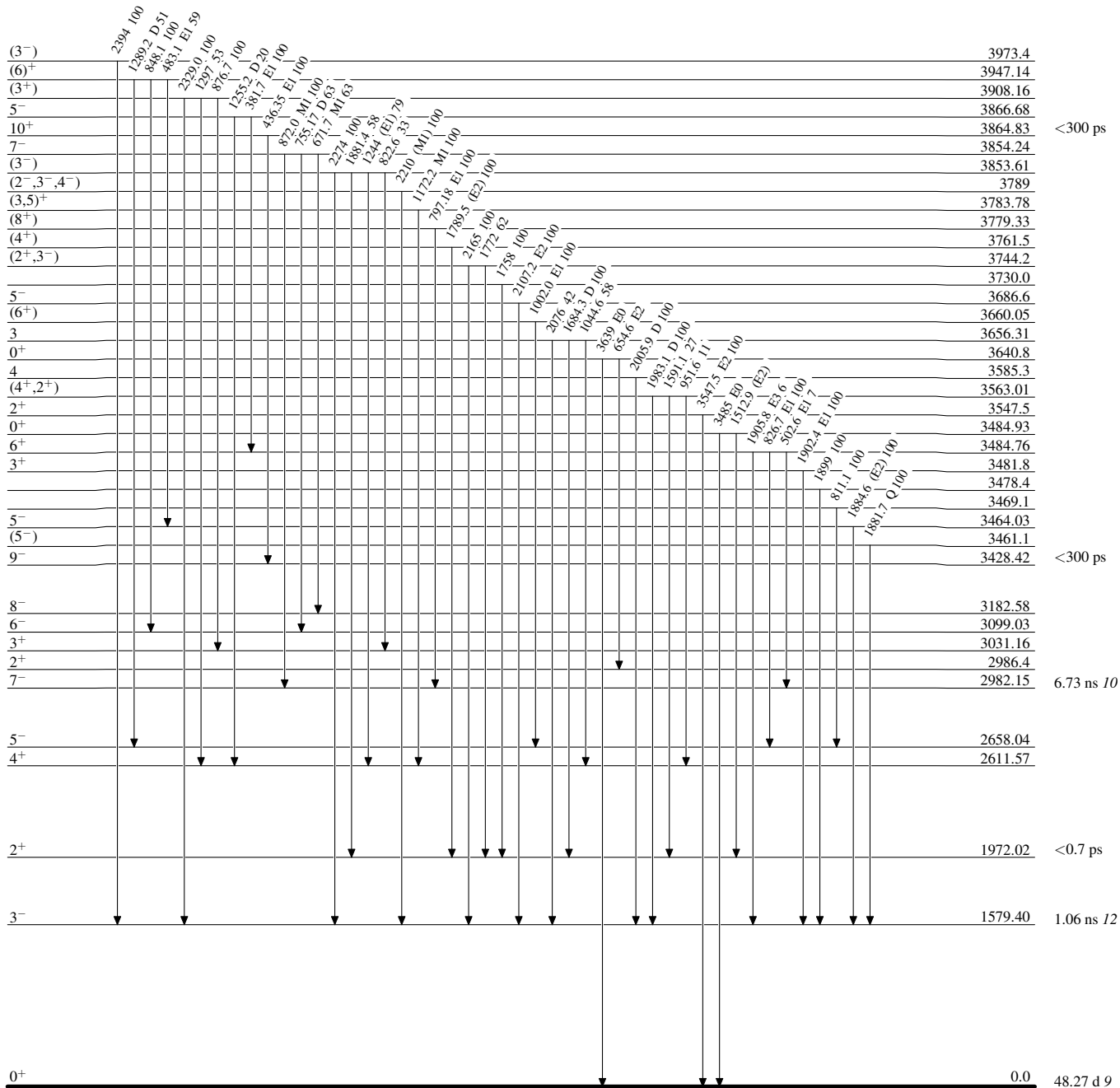
Intensities: Relative photon branching from each level

 $^{146}_{64}\text{Gd}_{82}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

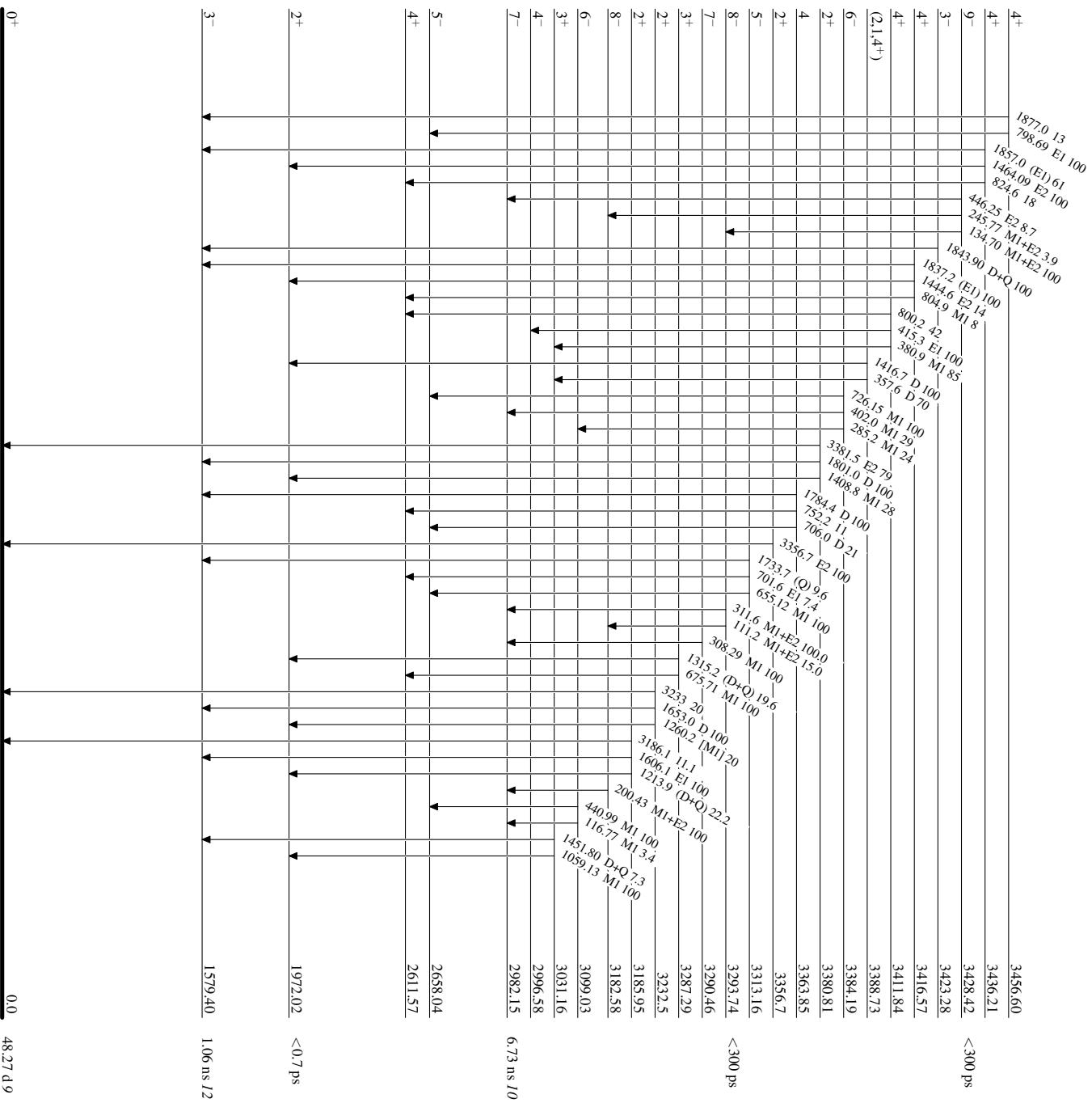


¹⁴⁶₆₄Gd₈₂

Adopted Levels, Gammas

Level Scheme (continued)

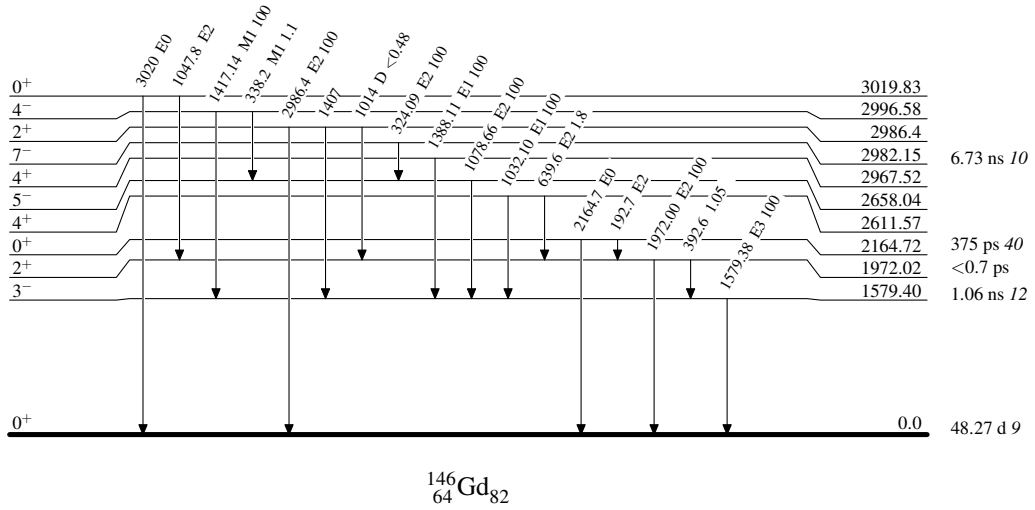
Intensities: Relative photon branching from each level



¹⁴⁶Gd₈₂

Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



Adopted Levels, Gammas

		Band(C): SD-3 BAND (?) (1995Sc31)	
		J3+18	10524+z
		J3+16	1369 9155+z
		J3+14	1322 7832.3+z
		J3+12	1278 6554.3+z
		J3+10	1226 5328.7+z
		J3+8	1176 4153.0+z
		J3+6	1124 3029.5+z
		J3+4	1065 1964.6+z
		J3+2	1006 958.5+z
		J3	958 0.0+z
		Band(B): SD-2 BAND (1995Sc31,1991Rz01, 1993Ha19,2001Cl05)	
J1+30	17830.7+y		
J1+28	1582 16248.7+y		
J2+26	1530 14718.8+y		
J2+24	1473 13246.1+y		
J1+22	1413 11832.6+y		
J1+20	1357 10475.7+y		
J1+18	1299 9176.4+y		
J2+16	1243 7933.8+y		
J2+14	1185 6749.0+y		
J2+12	1128 5621.2+y		
J1+10	1072 4549.0+y		
J2+8	1016 3532.8+y		
J2+6	961 2571.7+y		
J2+4	908 1663.2+y		
J2+2	857 806.2+y		
J2	806 0.0+y		
		Band(A): SD-1 BAND (1995Sc31,1990He14, 1993Ha19,2001Cl05)	
J1+30	17885.3+x		
J1+28	1554 16331.7+x		
J1+26	1498 14833.2+x		
J1+24	1446 13387.0+x		
J1+22	1394 11993.2+x		
J1+20	1345 10648.1+x		
J1+18	1298 9350.3+x		
J1+16	1250 8100.0+x		
J1+14	1201 6898.8+x		
J1+12	1149 5750.0+x		
J1+10	1093 4656.6+x		
J1+8	1039 3618.0+x		
J1+6	983 2634.8+x		
J1+4	930 1704.3+x		
J1+2	878 826.3+x		
J1	826 0.0+x		