^{148}Sm(α,6nγ) 1979Kl04,1980BrZQ

History

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

1980BrZQ,1978Br15,1979Kl04,1978KlZP: ^{148}Sm(α,6nγ), Eα=70-90 MeV; measured Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma$ coin, γ(t), I(ce). ^{146}Gd; deduced levels, J^π, α(exp), $T_{1/2}$, γ branching, multipolarity, configurations.

The level scheme of ^{146}Gd is built by 1980BrZQ and 1979Kl04 up to E(level)=8916 keV with J≤20. The J^π assignment for the levels above 4 MeV are based on $\gamma(\theta)$ results only, but authors consider them to be firm up to E(level)=7.03 MeV, J^π=16$^+$. Probable shell model configurations were assigned in 1979Kl04 and 1980BrZQ.

^{146}Gd Levels

E(level)[†‡]	J^π[#]	$T_{1/2}$	Comments
0.0	0$^+$	48.27 d *9*	$T_{1/2}$: from 'Adopted Levels'.
1579.31[b] *10*	3$^-$	1.06 ns *12*	$T_{1/2}$: weighted average from $\gamma\gamma$(t) and e$^-\gamma$(t) in (α,2nγ) and (α,6n) reactions (1978Kl04).
2658.01[b] *15*	5$^-$		
2982.11[b] *18*	7$^-$	7.2 ns *4*	$T_{1/2}$: from ce(t),γ(t) (1979Kl04).
3182.64[b] *21*	8$^-$		
3293.83 *20*	8$^-$[&]		
3428.53 *21*	9$^-$[&]		
3864.95 *23*	10$^+$[a]		
4502.3 *3*	10$^-$		
4541.4 *3*	10$^+$		
4646.0 *4*			
5094.9 *3*	11$^+$		
5277.8 *3*	11$^+$		
5350.9 *3*	12$^+$		
5448.0 *3*	12$^+$		
5791.8 *3*	13$^+$		
5894.4 *4*	14$^+$		
5996.4 *4*	14$^+$		
6120.2 *4*	15$^+$		
6399.1 *4*	16$^+$		
7034.2 *5*	16$^-$		
7164.8 *5*	17$^-$		
7513.6 *5*			
7739.4 *9*			
8030.2 *6*	18	1.5[@] ns *6*	$T_{1/2}$: from γ(t) (1980BrZQ).
8915.9 *6*	≤20	4.3[@] ns *3*	$T_{1/2}$: from γ(t) (1980BrZQ).

[†] If ΔEγ not given, ±0.30 keV assumed for least-squares fitting.
[‡] From a least-squares fit to Eγ; normalized χ^2=0.9.
[#] From 1978Kl04 and 1980BrZQ; assigned configurations in 1980BrZQ.
[@] From γ(t) (1980BrZQ).
[&] Probable configuration $\pi h_{11/2} g^{-1}_{7/2}$ (1980BrZQ).
[a] Probable configuration $\pi h^2_{11/2} j^{-2}_{0+}$ (1980BrZQ).
[b] Band(A): Sequence of levels with probable configuration $\pi h_{11/2} d^{-1}_{5/2}$ (1980BrZQ).

^{148}Sm(α,6nγ) 1979Kl04,1980BrZQ (continued)

γ(^{146}Gd)

E_γ†	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	α@	Comments
102.5		5894.4	14+	5791.8	13+	D			Mult.: A_2<0 from 1978KlZP.
111.2 *1*	130 *7*	3293.83	8−	3182.64	8−	M1+E2	<0.5	1.51 *3*	α(L)exp=0.177 *14*; α(M)exp=0.041 *4* α(K)=1.22 *5*; α(L)=0.23 *5*; α(M)=0.051 *12* α(N)=0.0115 *25*; α(O)=0.0017 *3*; α(P)=8.9×10^{-5} *6* A_2=+0.32 *2*, A_4=−0.01 *2*.
124 *1*		6120.2	15+	5996.4	14+				
130.6		7164.8	17−	7034.2	16−				
134.7 *1*	450 *23*	3428.53	9−	3293.83	8−	M1+E2	0.07	0.862 *13*	α(L)exp=0.098 *10*; α(M)exp=0.033 *12* α(K)=0.727 *11*; α(L)=0.1056 *15*; α(M)=0.0230 *4* α(N)=0.00528 *8*; α(O)=0.000818 *12*; α(P)=5.41×10^{-5} *8* A_2=−0.27 *1*, A_4=−0.01 *1*.
200.5 *2*	340 *17*	3182.64	8−	2982.11	7−	M1+E2	0.1	0.284	α(K)exp=0.26 *2*; α(L)exp=0.039 *4* α(K)=0.240 *4*; α(L)=0.0345 *5*; α(M)=0.00750 *11* α(N)=0.001726 *25*; α(O)=0.000267 *4*; α(P)=1.78×10^{-5} *3* A_2=−0.01 *2*, A_4=−0.00 *4*.
225.9		6120.2	15+	5894.4	14+	D			Mult.: A_2<0 from 1978KlZP.
226 *1*		7739.4		7513.6					
245.8 *2*	20 *5*	3428.53	9−	3182.64	8−	M1+E2	0.9	0.1407	α(K)exp=0.13 *4* α(K)=0.1135 *16*; α(L)=0.0212 *3*; α(M)=0.00472 *7* α(N)=0.001076 *16*; α(O)=0.0001588 *23*; α(P)=7.89×10^{-6} *12* A_2=−1.03 *10*, A_4=+0.27 *12*.
278.8		6399.1	16+	6120.2	15+	D			Mult.: A_2<0 from 1978KlZP.
291 *1*		8030.2	18	7739.4					
311.7 *1*	450 *23*	3293.83	8−	2982.11	7−	M1+E2	0.16	0.0855	α(K)exp=0.076 *4*; α(L)exp=0.0107 *15* α(K)=0.0724 *11*; α(L)=0.01030 *15*; α(M)=0.00224 *4* α(N)=0.000515 *8*; α(O)=7.98×10^{-5} *12*; α(P)=5.33×10^{-6} *8* A_2=−0.26 *1*, A_4=−0.01 *1*.
324.1 *1*	850 *43*	2982.11	7−	2658.01	5−	E2		0.0476	α(K)exp=0.037; α(L)exp=0.0076 *7* α(K)=0.0369 *6*; α(L)=0.00837 *12*; α(M)=0.00189 *3* α(N)=0.000428 *6*; α(O)=6.12×10^{-5} *9*; α(P)=2.34×10^{-6} *4* α(K)exp: used for normalizing Iγ and Ice. A_2=+0.26 *1*, A_4=−0.07 *1*.
328 *1*		6120.2	15+	5791.8	13+				
343.5		5791.8	13+	5448.0	12+				
402 *1*		6399.1	16+	5996.4	14+				
436.4 *1*	630 *32*	3864.95	10+	3428.53	9−	E1		0.00643	α(K)exp=0.0062 *10* α(K)=0.00548 *8*; α(L)=0.000745 *11*; α(M)=0.0001605 *23* α(N)=3.68×10^{-5} *6*; α(O)=5.63×10^{-6} *8*; α(P)=3.58×10^{-7} *5* A_2=−0.21 *1*, A_4=−0.01 *1*.
441.1		5791.8	13+	5350.9	12+	D			Mult.: A_2<0 from 1978KlZP.
446.5 *2*	60 *6*	3428.53	9−	2982.11	7−	E2		0.0189	α(K)exp=0.013 *6*

Continued on next page (footnotes at end of table)

^{148}Sm(α,6nγ) 1979Kl04,1980BrZQ (continued)

γ(^{146}Gd) (continued)

E_γ †	I_γ †	E_i(level)	J^π_i	E_f	J^π_f	Mult. ‡	α @	Comments
								α(K)=0.01522 *22*; α(L)=0.00288 *4*; α(M)=0.000641 *9* α(N)=0.0001458 *21*; α(O)=2.14×10^{-5} *3*; α(P)=1.009×10^{-6} *15* A_2=+0.28 *12*, A_4=−0.06 *12*.
446.5		5894.4	14$^+$	5448.0	12$^+$			
479.3&		7513.6		7034.2	16$^-$			
504.9		6399.1	16$^+$	5894.4	14$^+$	Q		Mult.: A_2>0 from 1978KlZP.
514.0		5791.8	13$^+$	5277.8	11$^+$			
517& *1*		8030.2	18	7513.6				
543.7		5894.4	14$^+$	5350.9	12$^+$	Q		Mult.: A_2>0 from 1978KlZP.
592.8		5094.9	11$^+$	4502.3	10$^-$	D		Mult.: A_2<0 from 1978KlZP.
645.3		5996.4	14$^+$	5350.9	12$^+$			
697.0		5791.8	13$^+$	5094.9	11$^+$	Q		Mult.: A_2>0 from 1978KlZP.
736.8		5277.8	11$^+$	4541.4	10$^+$			
765.8		7164.8	17$^-$	6399.1	16$^+$	D		Mult.: A_2<0 from 1978KlZP.
775		5277.8	11$^+$	4502.3	10$^-$			
781.1#		4646.0		3864.95	10$^+$			
802# *1*		5448.0	12$^+$	4646.0				
865.4		8030.2	18	7164.8	17$^-$	D		Mult.: A_2<0 from 1978KlZP.
885.7		8915.9	≤20	8030.2	18			
914.0		7034.2	16$^-$	6120.2	15$^+$			
1046 *1*		7164.8	17$^-$	6120.2	15$^+$			
1073.6		4502.3	10$^-$	3428.53	9$^-$	D		Mult.: from A_2=−0.16 *6*, A_4=−0.19 *9* (1972Ko42, (α,2nγ)); D+Q from 1978KlZP.
1078.7 *1*	940 *47*	2658.01	5$^-$	1579.31	3$^-$	E2	0.00235	α(K)exp=0.0019 *1* α(K)=0.00199 *3*; α(L)=0.000284 *4*; α(M)=6.16×10^{-5} *9* α(N)=1.414×10^{-5} *20*; α(O)=2.17×10^{-6} *3*; α(P)=1.380×10^{-7} *20* A_2=+0.26 *1*, A_4=−0.07 *1*.
1113.2		4541.4	10$^+$	3428.53	9$^-$	D		A_2=−0.25 *20* (1972Ko42, (α,2nγ)).
1114.5		7513.6		6399.1	16$^+$			
1166 *1*		7164.8	17$^-$	5996.4	14$^+$			
1229.9		5094.9	11$^+$	3864.95	10$^+$	D		Mult.: A_2<0.
1412.8		5277.8	11$^+$	3864.95	10$^+$			
1486.0		5350.9	12$^+$	3864.95	10$^+$	Q		Mult.: A_2>0 from 1978KlZP.
1579.3 *1*	1000	1579.31	3$^-$	0.0	0$^+$	E3	0.00216	α(K)exp=0.0018 *1* α(K)=0.001778 *25*; α(L)=0.000262 *4*; α(M)=5.71×10^{-5} *8* α(N)=1.310×10^{-5} *19*; α(O)=2.01×10^{-6} *3*; α(P)=1.278×10^{-7} *18*; α(IPF)=4.64×10^{-5} *7* A_2=+0.44 *1*, A_4=+0.01 *4*.
1582.9		5448.0	12$^+$	3864.95	10$^+$			

† From 1978Kl04 and 1980BrZQ. For E(level)>3865 ΔEγ, Iγ are not given by 1980BrZQ. Evaluators assumed ΔE=0.3 keV when Eγ quoted to nearest tenth of a keV, if otherwise not stated.
‡ From α(exp) (1979Kl04), $\gamma(\theta)$ results from the same paper if otherwise not stated.
# Placement of 802γ and 781γ reversed as suggested in (^{24}Mg,4nγ) by 1994We01.
@ Additional information 1.
& Placement of transition in the level scheme is uncertain.

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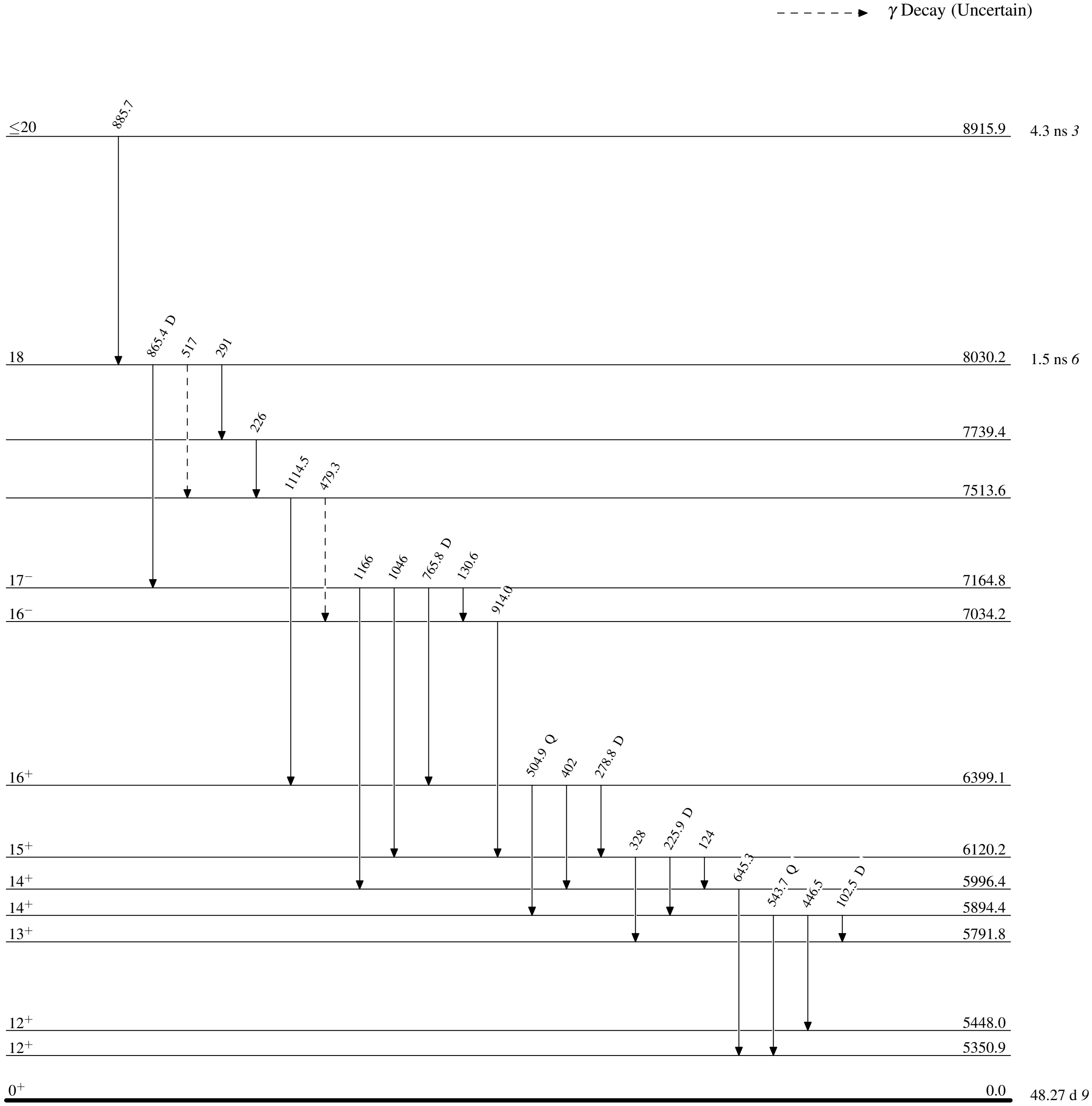
Level Scheme

Intensities: Relative I_γ

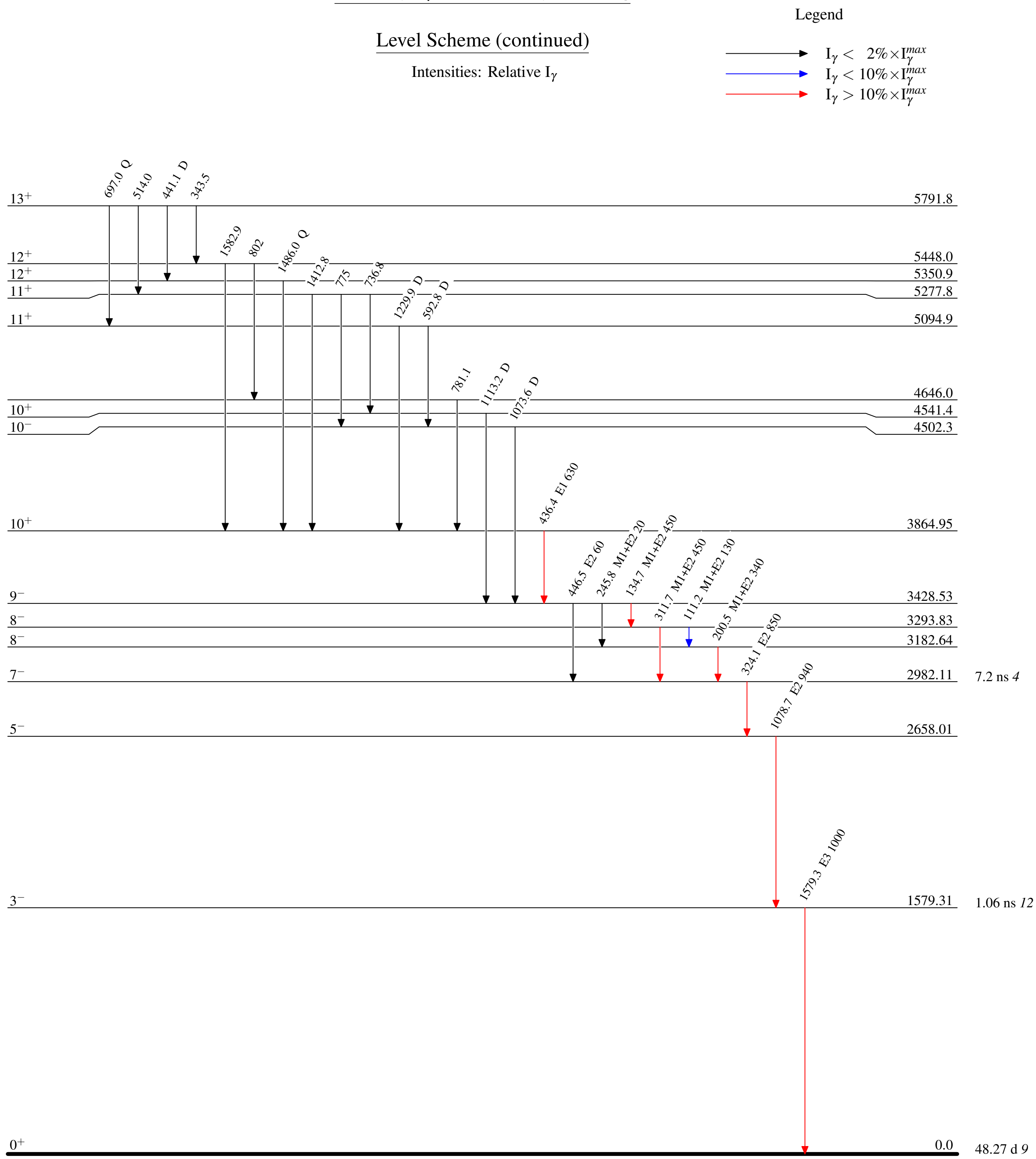


$^{146}_{64}Gd_{82}$

^{148}Sm(α,6nγ) 1979Kl04,1980BrZQ

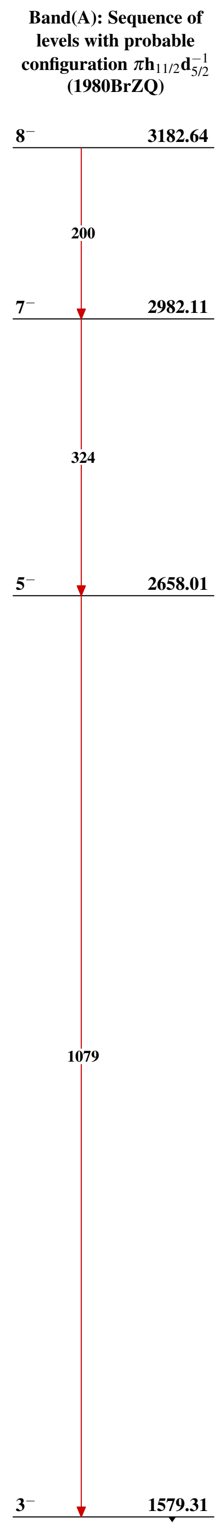
Level Scheme (continued)

Intensities: Relative I_γ



$^{146}_{64}Gd_{82}$

^{148}Sm(α,6nγ) 1979Kl04,1980BrZQ



$^{146}_{64}Gd_{82}$