Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 176, 1 (2021)	1-May-2021

Q(β^-)=3260.3 *22*; S(n)=6097 *6*; S(p)=10968 *10*; Q(α)=−2456.0 *24* 2021Wa16
S(2n)=11124 *5*, S(2p)=20976.0 *24* (2021Wa16).
Production: produced as a fission product from ^{235}U(n,F) (1986Ma12) ^{252}Cf SF decay (1987Gr12), and ^{9}Be(^{238}U,F) (2016Pa01). All studies utilized on-line isotope separation.
The data of ^{160}Sm are primarily from 2016Pa01 (^{160}Sm IT decay), completed with data from 2009Si21 (^{252}Cf SF decay).
1997Ha64 discuss the yrast (g.s.) band in ^{160}Sm, together with those in a number of other doubly even nuclides in this mass region, as being examples of identical or shifted-identical bands. See, also, 1997Do20, 1998HaZY and 2001Jo10. All of these studies involve many of the same authors.

^{160}Sm Levels

Cross Reference (XREF) Flags

A ^{160}Sm IT decay (1.8 μs)
B ^{252}Cf SF decay

E(level)[†]	J^{π}[‡]	$T_{1/2}$	XREF	Comments
0.0[#]	0^+	9.6 s *3*	AB	%β^-=100 $T_{1/2}$: 9.6 s *3* (1987Gr12, also quoted in 1988GrZY), 8.7 s *14* (1986Ma12), 10.1 s 11 (2017Wu04). Weighted average of the three values is 9.6 s *3*.
70.80[#] *20*	2^+		AB	
233.1[#] *3*	4^+		AB	
483.4[#] *4*	6^+		AB	
816.9[#] *4*	8^+		B	
1227.8[#] *5*	(10^+)		B	
1361.1 *5*	(5^-)	120 ns *46*	AB	$T_{1/2}$: from 2009Si21 in ^{252}Cf SF decay (by observing the intensity ratio of 1128γ/162γ and 878γ/250γ). Two-quasiparticle configuration=$\pi5/2^-[532]\otimes\pi5/2^+[413]$; according to blocked-BCS calculations (2016Pa01) this configuration is preferred instead of $\nu5/2[642]\otimes\nu5/2[523]$ (2009Si21, ^{252}Cf SF decay).
1468.6[@] *5*	(6^-)		A	Two-quasiparticle configuration=$\nu5/2^-[523]\otimes\nu7/2^+[633]$.
1602.2[@] *6*	(7^-)		A	
1710.0[#] *5*	(12^+)		B	
1754.8[@] *6*	(8^-)		A	
1926.3[@] *7*	(9^-)		A	
2116.7[@] *7*	(10^-)		A	
2258.9[#] *6*	(14^+)		B	
2325.8[@] *7*	(11^-)		A	
2757.9 *7*	(11^+)	1.8 μs *4*	A	$T_{1/2}$: γ(t) (2016Pa01). Four-quasiparticle configuration=$\nu5/2^-[523]\otimes\nu7/2^+[633]$.

[†] From least-squares fit to Eγ values.
[‡] For positive parity states: members of the 0^+ g.s. band, based on energy-spacing considerations (from 1995Zh15 and 1997Do20, SF decay). For negative parity states: (5^-) for the 120 ns isomer established from systematics and theoretical configurations; the upper states before the 1.8 μs isomer: theory, systematics, and members of strongly-coupled rotational band. (11^+) for the 1.8

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Adopted Levels, Gammas (continued)

^{160}Sm Levels (continued)

& μs isomer: based on theory and systematics. For states in ^{160}Sm IT decay 2009Si21 tacitly implied very tentatively-deduced multipolatiries.

Band(A): Ground-state rotational band. A=11.9 keV, B=−11 eV, computed from the 0^+, 2^+, and 4^+ level energies.

@ Band(B): Strongly-coupled rotational band based on (6^-). The assignment of (6^-) for bandhead rather than (5^-) is justified by 2016Pa01 by the lack of transition from (7^-) to (5^-).

$\gamma(^{160}Sm)$

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α#	Comments
70.80	2^+	70.70 *5*	100	0.0	0^+	[E2]	8.53	α(K)=2.77 *4*; α(L)=4.46 *7*; α(M)=1.040 *15* α(N)=0.227 *4*; α(O)=0.0281 *4*; α(P)=0.0001171 *17*
233.1	4^+	162.15 *5*	100	70.80	2^+	[E2]	0.425	α(K)=0.286 *4*; α(L)=0.1079 *16*; α(M)=0.0246 *4* α(N)=0.00543 *8*; α(O)=0.000708 *10*; α(P)=1.353×10^{-5} *19*
483.4	6^+	250.00 *5*	100	233.1	4^+	[E2]	0.1001	α(K)=0.0757 *11*; α(L)=0.0191 *3*; α(M)=0.00428 *6* α(N)=0.000951 *14*; α(O)=0.0001287 *18*; α(P)=3.93×10^{-6} *6*
816.9	8^+	333.25 *5*	100	483.4	6^+	[E2]	0.0407	α(K)=0.0322 *5*; α(L)=0.00670 *10*; α(M)=0.001487 *21* α(N)=0.000331 *5*; α(O)=4.60×10^{-5} *7*; α(P)=1.760×10^{-6} *25*
1227.8	(10^+)	410.9 *2*	100	816.9	8^+	[E2]	0.0220	α(K)=0.0178 *3*; α(L)=0.00332 *5*; α(M)=0.000730 *11* α(N)=0.0001633 *23*; α(O)=2.31×10^{-5} *4*; α(P)=1.002×10^{-6} *14*
1361.1	(5^-)	877.8 *4*	24 *5*	483.4	6^+	[E1]	1.32×10^{-3}	α(K)=0.001137 *16*; α(L)=0.0001468 *21*; α(M)=3.12×10^{-5} *5* α(N)=7.06×10^{-6} *10*; α(O)=1.055×10^{-6} *15*; α(P)=6.57×10^{-8} *10* B(E1)(W.u.)=5.5×10^{-10} *+35−17*
		1127.9 *4*	100	233.1	4^+	[E1]	8.31×10^{-4}	α(K)=0.000711 *10*; α(L)=9.09×10^{-5} *13*; α(M)=1.93×10^{-5} *3* α(N)=4.37×10^{-6} *7*; α(O)=6.55×10^{-7} *10*; α(P)=4.12×10^{-8} *6*; α(IPF)=5.08×10^{-6} *10* B(E1)(W.u.)=1.1×10^{-9} *+7−3*
1468.6	(6^-)	107.5 *3*	100	1361.1	(5^-)	[M1]	1.374 *23*	α(K)=1.165 *19*; α(L)=0.165 *3*; α(M)=0.0354 *6* α(N)=0.00804 *13*; α(O)=0.001204 *20*; α(P)=7.43×10^{-5} *12*
1602.2	(7^-)	133.5 *3*	100	1468.6	(6^-)	[M1]	0.743 *12*	α(K)=0.630 *10*; α(L)=0.0890 *14*; α(M)=0.0191 *3* α(N)=0.00433 *7*; α(O)=0.000649 *10*; α(P)=4.02×10^{-5} *7*
1710.0	(12^+)	482.2 *2*	100	1227.8	(10^+)	[E2]	0.01413	α(K)=0.01157 *17*; α(L)=0.00201 *3*; α(M)=0.000440 *7* α(N)=9.86×10^{-5} *14*; α(O)=1.408×10^{-5} *20*; α(P)=6.64×10^{-7} *10*
1754.8	(8^-)	152.3 *4*	100 *20*	1602.2	(7^-)	[M1]	0.513 *9*	α(K)=0.435 *7*; α(L)=0.0613 *10*; α(M)=0.01317 *21*

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Adopted Levels, Gammas (continued)

$\gamma(^{160}Sm)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	α #	Comments
								α(N)=0.00299 *5*; α(O)=0.000448 *7*; α(P)=2.77×10^{-5} *5*
1754.8	(8$^-$)	286.4 *4*	27 *7*	1468.6	(6$^-$)	[E2]	0.0650	α(K)=0.0503 *8*; α(L)=0.01150 *18*; α(M)=0.00257 *4* α(N)=0.000571 *9*; α(O)=7.82×10^{-5} *12*; α(P)=2.68×10^{-6} *4*
1926.3	(9$^-$)	171.4 *4*	100 *21*	1754.8	(8$^-$)	[M1]	0.369	α(K)=0.313 *5*; α(L)=0.0441 *7*; α(M)=0.00946 *15* α(N)=0.00214 *4*; α(O)=0.000322 *5*; α(P)=1.99×10^{-5} *3*
		324.1 *4*	83 *21*	1602.2	(7$^-$)	[E2]	0.0443	α(K)=0.0349 *5*; α(L)=0.00738 *11*; α(M)=0.001640 *24* α(N)=0.000366 *6*; α(O)=5.06×10^{-5} *8*; α(P)=1.90×10^{-6} *3*
2116.7	(10$^-$)	190.4 *4*	86 *17*	1926.3	(9$^-$)	[M1]	0.276	α(K)=0.234 *4*; α(L)=0.0329 *5*; α(M)=0.00706 *11* α(N)=0.001601 *25*; α(O)=0.000240 *4*; α(P)=1.491×10^{-5} *23*
		362.0 *3*	100 *17*	1754.8	(8$^-$)	[E2]	0.0318	α(K)=0.0254 *4*; α(L)=0.00504 *8*; α(M)=0.001115 *16* α(N)=0.000249 *4*; α(O)=3.48×10^{-5} *5*; α(P)=1.405×10^{-6} *20*
2258.9	(14$^+$)	548.9 *2*	100	1710.0	(12$^+$)	[E2]	0.01004	α(K)=0.00830 *12*; α(L)=0.001370 *20*; α(M)=0.000299 *5* α(N)=6.71×10^{-5} *10*; α(O)=9.66×10^{-6} *14*; α(P)=4.81×10^{-7} *7*
2325.8	(11$^-$)	209.1 *5*	46 *31*	2116.7	(10$^-$)	[M1]	0.214 *4*	α(K)=0.181 *3*; α(L)=0.0254 *4*; α(M)=0.00545 *9* α(N)=0.001235 *20*; α(O)=0.000185 *3*; α(P)=1.152×10^{-5} *18*
		399.5 *5*	100 *31*	1926.3	(9$^-$)	[E2]	0.0239	α(K)=0.0192 *3*; α(L)=0.00363 *6*; α(M)=0.000801 *12* α(N)=0.000179 *3*; α(O)=2.52×10^{-5} *4*; α(P)=1.079×10^{-6} *16*
2757.9	(11$^+$)	432.1 *4*	33 *8*	2325.8	(11$^-$)	[E1]	0.00604	α(K)=0.00516 *8*; α(L)=0.000689 *10*; α(M)=0.0001469 *21* α(N)=3.31×10^{-5} *5*; α(O)=4.90×10^{-6} *7*; α(P)=2.91×10^{-7} *5* B(E1)(W.u.)=3.9×10^{-10} *+14−11*
		641.1 *3*	100 *14*	2116.7	(10$^-$)	[E1]	0.00250	α(K)=0.00215 *3*; α(L)=0.000281 *4*; α(M)=5.98×10^{-5} *9* α(N)=1.351×10^{-5} *19*; α(O)=2.01×10^{-6} *3*; α(P)=1.229×10^{-7} *18* B(E1)(W.u.)=3.6×10^{-10} *+11−7*

† From ^{252}Cf SF decay for transitions of the g.s. rotational band. From 2016Pa01 (^{160}Sm IT decay) for transitions from the negative parity-levels, and from the (11$^+$) isomer.

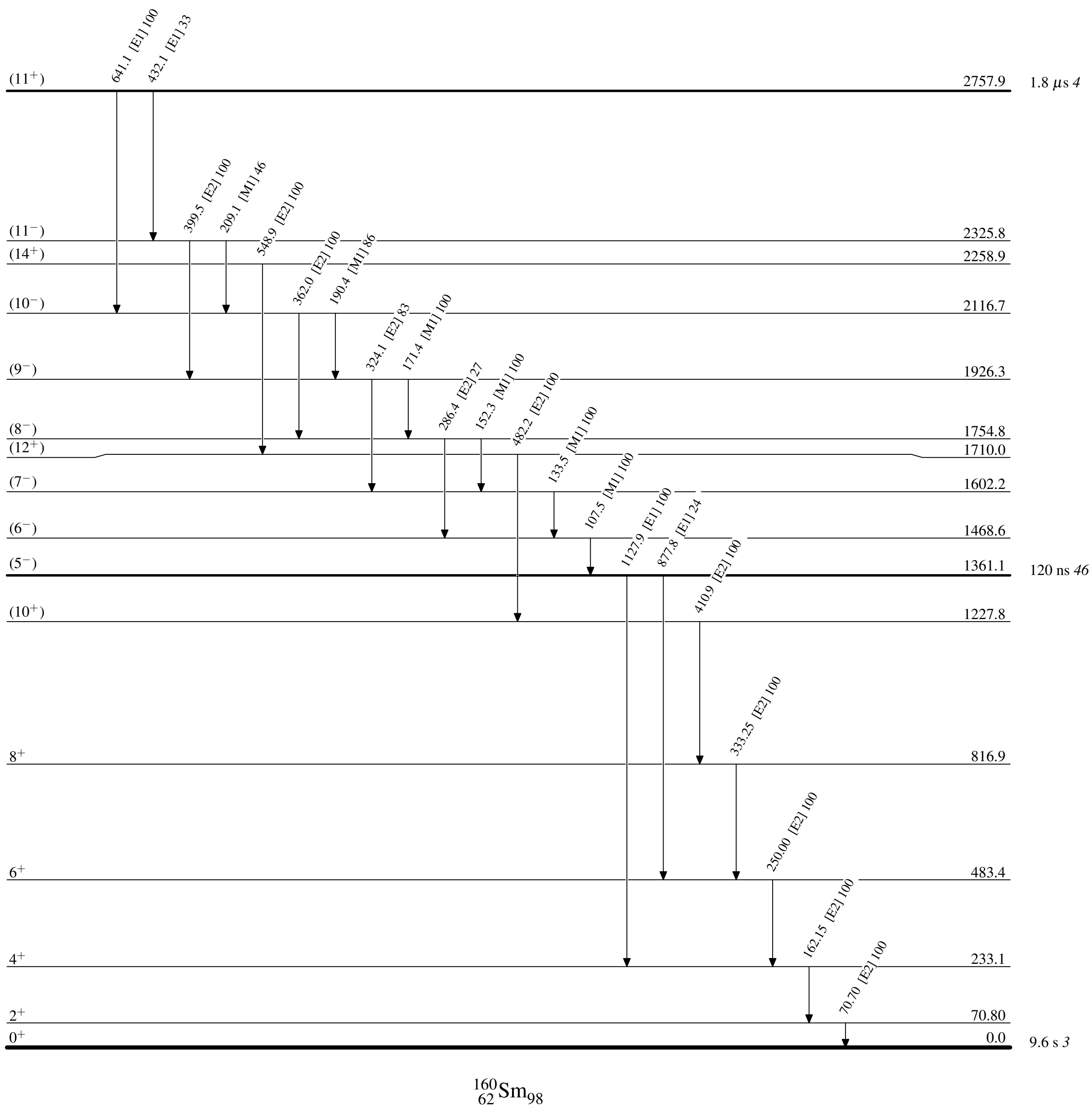
‡ 2016Pa01 (^{160}Sm IT decay) did very tentative estimates of multipolaties from the intensity balances through the levels and the decay patterns only (no directly measured electron conversion coefficients and γ-ray angular correlations were performed). Although 2016Pa01 list no explicit multipolarities they were tacitly figured into the J^π assignments.

Additional information 2.

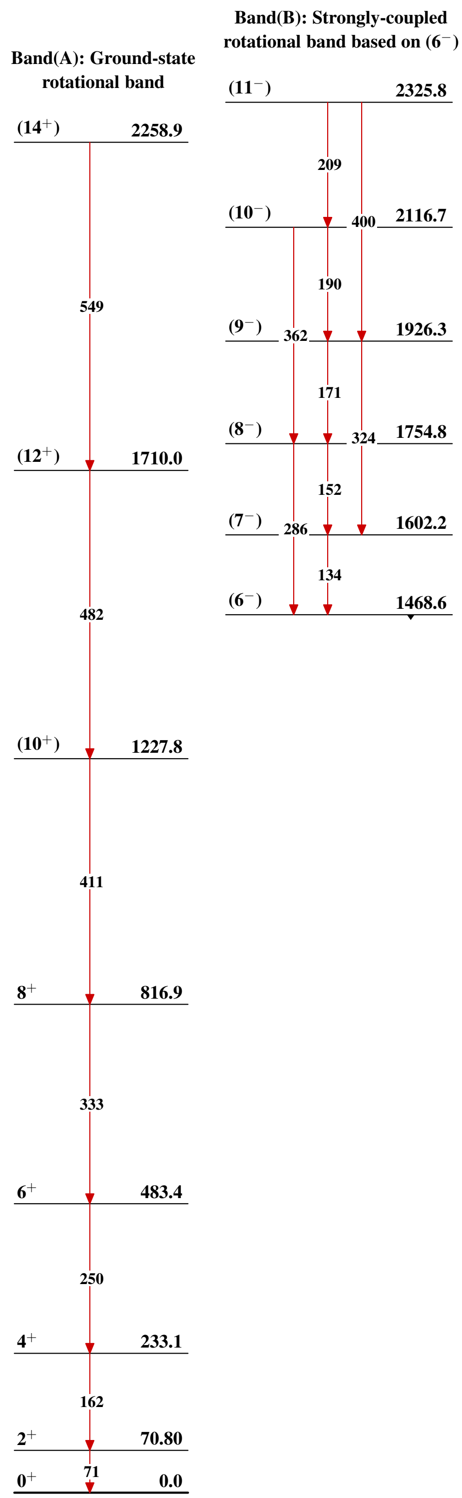
Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{160}_{62}Sm_{98}$