^{255}No α decay 2006He20,2011As03,2018Re07

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. Morse	NDS 189,111 (2023)	23-Sep-2022

Parent: ^{255}No: E=0; J^π=(1/2$^+$); $T_{1/2}$=3.52 min *18*; Q(α)=8428 *3*; %α decay=30 *5*

^{255}No-J^π: From 1970Es02,2006He20,2011As03.

^{255}No-$T_{1/2}$,%α decay: From 2011As03. Shorter half-life values of 185 s *20* (1967Gh01) and 200 s *10* (1970Es02) are not adopted due to potential contamination by other nobelium isotopes.

^{255}No-Q(α): From 2021Wa16.

2018Re07: ^{255}No produced in the following two reactions: ^{208}Pb(^{48}Ca,n)^{255}No, E=220 MeV; ^{209}Bi(^{48}Ca,2n)^{255}Lr, E=214 MeV, the latter followed by ε decay to ^{255}No. Residues separated using SHELLS and GABRIELA spectrometer. GABRIELA consisted of a 100×100 mm^2 double-sided silicon strip detector (DSSD) with 128×128 strips at the focal plane, surrounded by a box of eight DSSDs, a clover Ge detector and four Compton-suppressed coaxial HPGe detectors. Measured Eγ, Iγ, Eα, ce, x rays, $\alpha\gamma$-coin, α(ce)-coin, and isomer half-life by ce(t). Deduced levels, conversion coefficients, mixing ratio, and multipolarity. Two separate experiments are described, one in 2004+2005 and the second in 2016. Comparison with theoretical calculations based on beyond mean-field approach with QRPA and Gogny D1M parametrization.

2011As03: ^{255}No produced by the ^{248}Cm(^{12}C,5n) reaction with E(^{12}C)=77 MeV from the 20-MeV tandem accelerator at Japan Atomic Energy Agency (JAEA). Reaction products were thermalized in He gas and deposited onto a polyethylene terephthalate. Two Si PIN photodiode detectors for detecting α-particles (6 for α fine structure measurements) and two Ge detectors behind the Si detectors for detecting γ rays. Measured Eγ, Iγ, $\alpha\gamma$-coin, $\alpha\gamma\gamma$-coin, α fine structure. Deduced levels, J, π, $T_{1/2}$.

2006He20: ^{255}No produced in the following reactions: ^{208}Pb(^{48}Ca,n) E=4.45 MeV/nucleon; ^{238}U(^{22}Ne,5n) E=5.2 MeV/nucleon; ^{209}Bi(^{48}Ca,2n)^{255}Lr E=4.55 MeV/nucleon, followed by ε decay to ^{255}No. Residues separated by SHIP velocity filter and implanted into PIPS (stop) detector at GSI facility. Measured α, γ, $\gamma\gamma$ coin, $\alpha\gamma$ coin. Alpha particles measured with a PIPS detector, γ rays measured with a 'Clover' detector consisting of four Ge crystals. Prompt and delayed $\alpha\gamma$, $\alpha\gamma\gamma$ coincidence. Main contaminant: ^{254}No.

Other references: 1967Gh01,1970Es02,1971Di03.

^{251}Fm Levels

E(level)[&]	J^{π}[b]	$T_{1/2}$[c]	Comments
0[†]	(9/2$^-$)		configuration=ν9/2$^-$[734] (2011As03)
63.9[†] *8*	(11/2$^-$)		
200.07[‡] *10*	(5/2$^+$)	22.9 μs *9*	configuration=ν5/2$^+$[622] (2011As03) $T_{1/2}$: Weighted average of 21 μs *3* (2006He20), 21.1 μs *19* (2011As03), and 23.7 μs *11* (2018Re07). Other: 1971Di03 reports a lifetime of 15.2 μs 23.
243[‡a] *3*	(7/2$^+$)		
301[‡a] *3*	(9/2$^+$)		
353.8 *3*	(7/2$^+$)		configuration=ν7/2$^+$[624] (2011As03)
391.97[#] *16*	(1/2$^+$)	22 ns *3*	configuration=ν1/2$^+$[631] (2011As03)
395.27[#] *22*	(3/2$^+$)	<16 ns	
461[#a] *3*	(5/2$^+$)		
558.57[@] *17*	(1/2$^+$)	<8 ns	configuration=ν1/2$^+$[620] (2011As03)
579[@a] *5*	(3/2$^+$)		
604[@a] *4*	(5/2$^+$)		

[†] Band(A): ν9/2$^-$[734].
[‡] Band(B): ν5/2$^+$[622].
[#] Band(C): ν1/2$^+$[631].
[@] Band(D): ν1/2$^+$[620].
[&] From least-squares fit to γ-ray energies, unless otherwise noted.
[a] From 2011As03, based on α-decay energies.

Continued on next page (footnotes at end of table)

^{255}No α decay 2006He20,2011As03,2018Re07 (continued)

^{251}Fm Levels (continued)

[b] From Adopted Levels.
[c] From 2011As03, unless otherwise noted.

α radiations

Eα[†]	E(level)	Iα[†#]	HF[‡]
7702 *5*	604	9.0 *20*	5.4 *16*
7726 *6*	579	9.1 *29*	6.6 *24*
7748 *3*	558.57	62 *5*	1.15 *22*
7842 *4*	461	14.4 *22*	11 *3*
7909 *3*	395.27	56 *4*	4.8 *10*
8001 *4*	301	22.8 *26*	25 *6*
8057 *4*	243	34.7 *31*	26 *6*
8100 *3*	200.07	100 *5*	12.6 *23*
8233 *4*	63.9	23.1 *26*	155 *33*
8296 *6*	0	4.0 *12*	1.45×10^3 *51*

[†] From Table II of 2011As03. Note that Fig. 3 of this reference indicates the possibility of an unobserved α decay to the 354-keV level, which would explain the observed γ decay. The evaluator has followed the authors of this study and not adopted this α decay.
[‡] The nuclear radius parameter $r_0(^{251}Fm)$=1.4717 *26* is deduced from interpolation (or unweighted average) of radius parameters of the adjacent even-even nuclides (2020Si16).
[#] For absolute intensity per 100 decays, multiply by 0.089 *15*.

γ(^{251}Fm)

E_γ[†]	I_γ[‡@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α[#]	Comments
(3.4)		395.27	(3/2$^+$)	391.97	(1/2$^+$)	[M1]		1.599×10^4	α(N)=1.211×10^4 *17*; α(O)=3.22×10^3 *5*; α(P)=625 *9*; α(Q)=35.5 *5*
63.9 *8*	1.4 *9*	63.9	(11/2$^-$)	0	(9/2$^-$)	M1		38.7 *16*	α(exp)=48 *31* (2011As03) α(L)=28.9 *12*; α(M)=7.2 *3*; α(N)=2.00 *8*; α(O)=0.528 *22*; α(P)=0.103 *5*; α(Q)=0.00579 *24* Mult.: Based on measured internal conversion coefficient in 2011As03.
163.3 *2*	8.4 *22*	558.57	(1/2$^+$)	395.27	(3/2$^+$)	M1		11.30	α(exp)>5.5 (2011As03) α(K)=8.74 *13*; α(L)=1.91 *3*; α(M)=0.473 *7*; α(N)=0.1320 *19*; α(O)=0.0349 *5* α(P)=0.00677 *10*; α(Q)=0.000379 *6* Mult.: Based on internal conversion coefficient from 2011As03. E_γ: Weighted average of 163.3 keV *4* (2006He20) and 163.3 keV *2* (2011As03).
166.7 *2*	3.9 *15*	558.57	(1/2$^+$)	391.97	(1/2$^+$)	M1		10.66	α(K)exp>7 (2006He20) α(K)=8.25 *12*; α(L)=1.80 *3*; α(M)=0.446 *7*; α(N)=0.1245 *18*; α(O)=0.0329 *5* α(P)=0.00638 *10*; α(Q)=0.000357 *6* E_γ: Weighted average of 166.8 keV *4* (2006He20) and 166.7 keV *2* (2011As03). Mult.: Based on internal conversion coefficient from 2006He20.
191.95 *14*	100 *12*	391.97	(1/2$^+$)	200.07	(5/2$^+$)	E2		1.567	α(exp)=2.36 *35* (2018Re07); α(K)exp=0.76 *18* (2018Re07) α(L)exp=1.16 *16* (2018Re07); α(M)exp=0.55 *10* (2018Re07) α(K)=0.1385 *20*; α(L)=1.027 *15*; α(M)=0.293 *5*; α(N)=0.0833 *12*; α(O)=0.0211 *3* α(P)=0.00346 *5*; α(Q)=2.49×10^{-5} *4* Mult.: Based on internal conversion coefficients from 2018Re07. E_γ: Weighted average of 192.1 keV *3* (2006He20) and 191.91 keV *16* (2011As03).
195.2 *3*	12.9 *30*	395.27	(3/2$^+$)	200.07	(5/2$^+$)	M1		6.83	α(K)exp=8.2 *29* (2011As03) α(K)=5.29 *8*; α(L)=1.152 *17*; α(M)=0.284 *5*; α(N)=0.0794 *12*; α(O)=0.0210 *3* α(P)=0.00407 *6*; α(Q)=0.000228 *4* Mult.: Based on internal conversion coefficient from 2011As03. E_γ: Weighted average of 194.5 keV *5* (2006He20) and 195.3 keV *2* (2011As03).

$^{251}_{100}$Fm$_{151}$-3

$\gamma(^{251}$Fm) (continued)

E_γ †	I_γ ‡@	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ	α #	Comments
200.07 *10*	31 *5*	200.07	(5/2$^+$)	0	(9/2$^-$)	M2+E3	0.76 *+20−19*	20.9 *10*	α(exp)=21.2 *75* (2018Re07); α(K)exp=8.8 *31* (2018Re07); α(L)exp=8.0 *16* (2018Re07) α(K)=9.3 *18*; α(L)=8.3 *6*; α(M)=2.41 *19*; α(N)=0.69 *6*; α(O)=0.179 *14*; α(P)=0.0315 *19* α(Q)=0.00095 *13* Mult.: Based on measured internal conversion coefficients in 2018Re07. Note that α_K measured in this reference agrees with α_K=8.3 *29* in 2006He20 but disagrees with α_K(exp)=16.7 *27* reported by 2011As03. E_γ: Weighted average of 199.9 keV *3* (2006He20) and 200.09 keV *11* (2011As03). δ: From 2018Re07.
353.8 *3*	4.0 *18*	353.8	(7/2$^+$)	0	(9/2$^-$)	(E1)		0.0342	α(K)=0.0266 *4*; α(L)=0.00567 *8*; α(M)=0.001391 *20*; α(N)=0.000386 *6*; α(O)=0.0001003 *15* α(P)=1.84×10^{-5} *3*; α(Q)=8.24×10^{-7} *12* Mult.: From 2006He20. E_γ: Weighted average of 353.8 keV *4* (2006He20) and 354.0 keV *7* (2011As03).
358.4 *2*	24 *5*	558.57	(1/2$^+$)	200.07	(5/2$^+$)	E2		0.181	α(K)=0.0651 *10*; α(L)=0.0843 *12*; α(M)=0.0235 *4*; α(N)=0.00664 *10*; α(O)=0.001698 *24* α(P)=0.000290 *4*; α(Q)=4.57×10^{-6} *7* E_γ: Weighted average of 358.3 keV *3* (2006He20) and 358.5 keV *2* (2011As03). Mult.: Based on spin-parities of initial and final states (2006He20) and non-observation of associated conversion electrons in 2018Re07.

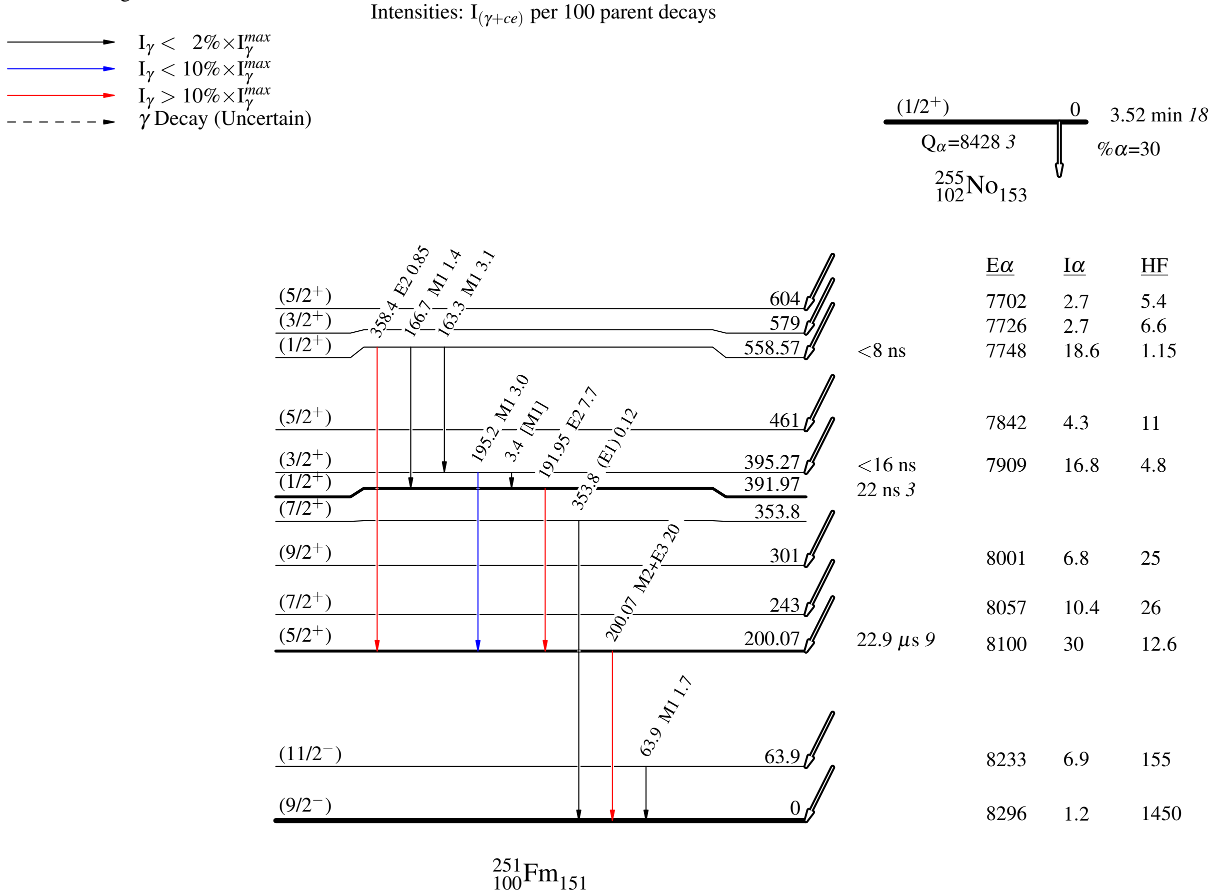
† From 2011As03, unless otherwise noted.
‡ From 2011As03, which also gives an absolute γ-ray intensity normalization of 0.1 γ rays per α decay.
# Additional information 1.
@ For absolute intensity per 100 decays, multiply by 0.030 *5*.

$^{251}_{100}Fm_{151}$-4

^{255}No α decay 2006He20,2011As03,2018Re07

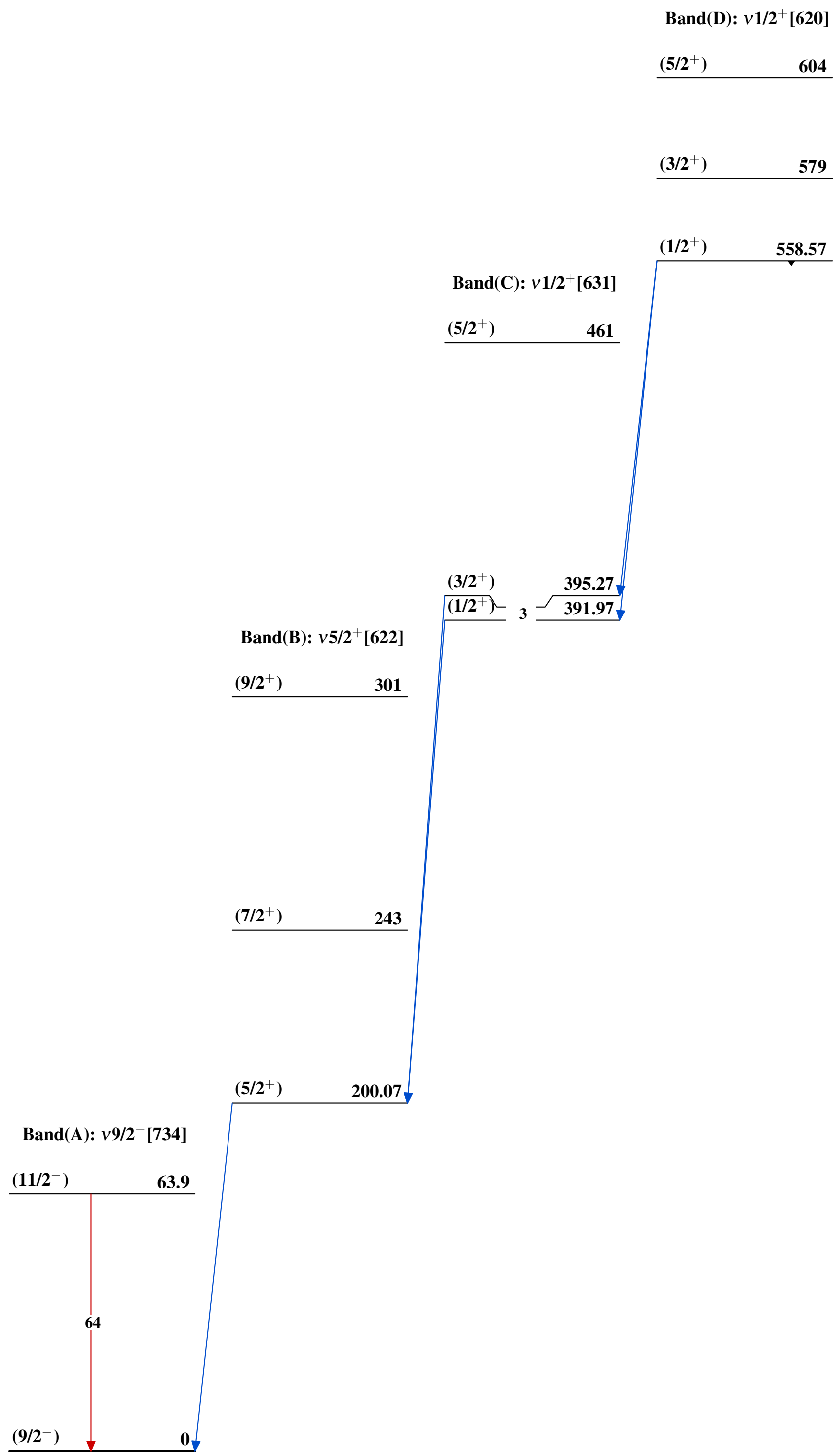
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



Eα	Iα	HF
7702	2.7	5.4
7726	2.7	6.6
7748	18.6	1.15
7842	4.3	11
7909	16.8	4.8
8001	6.8	25
8057	10.4	26
8100	30	12.6
8233	6.9	155
8296	1.2	1450

^{255}No α decay 2006He20,2011As03,2018Re07



$^{251}_{100}Fm_{151}$