^{253}No IT decay (706 μs) 2011Lo06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 114, 1041 (2013)	1-Mar-2012

Parent: ^{253}No: E=0+z; $T_{1/2}$=706 μs *24*; %IT decay=?

From ^{207}Pb(^{48}Ca,2nγ).

Beam: ^{48}Ca with an average mid-target bombarding energy of 220 MeV. Target: 350μg/cm^2 and 680 μg/cm^2, 96.2% enriched in ^{207}Pb, with 1.5μg/cm^2 Ti backing. The evaporation residues were separated by VASSILISSA separator and implanted into the GABRIELA detection system at the focal plane of the separator. GABRIELA consisted of four micro-channel plates to detect the secondary electrons emitted due to the passage of separated evaporation residues through thin mylar foil, 48×48 strip Double-sided silicon-strip detector to provide energy and time information of the implanted evaporation residues, 32-strip silicon detectors for the detection of internal conversion electrons and escape α particles and a ring of six Compton suppressed EUROGAM Phase-I Ge detectors placed around the focal plane and one unsuppressed Ge detector, placed in a collinear geometry with respect to the beam line to detect the γ-rays. Measured: Eγ, Iγ, x rays, ce, (x-ray)ce coin, $T_{1/2}$. Deduced: ^{253}No energy levels, mult, J^π.

The x rays from the decay of 0.706 ms isomeric state: $K_{\alpha 2}$=120.2 *5* (I=19 *4*), $K_{\alpha 1}$=127 *5* (I=26 *5*), $K_{\beta 1,\beta 3}$=142.7 *5* (I=13 *3*), $K_{\beta 2,\beta 4,\beta 5}$=147.9 *5* (I=4.7 *14*). Intensities were measured relative to 100 for 801.8γ.

Existence of a 0.7-ms isomer is confirmed through recoil-decay tagging method, although, the energy of this isomer is not determined.

^{253}No Levels

E(level)[a]	J^π[†]	$T_{1/2}$	Comments
0.0[‡]	9/2$^-$		Configuration=ν9/2[734].
64.0[#] *8*	(11/2$^-$)		
139.0[‡] *8*	(13/2$^-$)		
167.0 *10*	5/2$^+$	31.1 μs *21*	J^π,$T_{1/2}$: from 2007Lo11. Configuration=ν5/2[622] (2007Lo11).
226.1[#] *9*	(15/2$^-$)		
324.5[‡] *10*	(17/2$^-$)		
434.3[#] *11*	(19/2$^-$)		
557.6[‡] *12*	(21/2$^-$)		
692.9[#] *13*	(23/2$^-$)		
940.6[@] *9*	(15/2$^-$)		
1028.8[&] *10*	(17/2$^-$)		
1128.1[@] *10*	(19/2$^-$)		
1238.2[&] *10*	(21/2$^-$)		
1358.2[@] *12*	(23/2$^-$)		
0+x	(19/2$^+$)	706 μs *24*	Additional information 1. $T_{1/2}$: from (ER)(α) correlated events and mult-component fitting procedure of the decay curve (2011Lo06). This half-life may be correspond to one isomer or a composit of two isomers, since half-life of 792 μs *43* is obtained from L-x rays and 209.5γ, whereas 641 μs *23* is obtained from other γ rays. 2011Lo06 measured $T_{1/2}$=0.706 ms *24* from the time correlation between the implantation and the α-decay of ^{253}No g.s. for the new isomeric level(s). Authors stated that this $T_{1/2}$ can be assigned either to J^π=(19/2$^+$) at 0+x keV or J^π=(25/2$^+$) at 0+y keV isomeric states but more data are needed to establish the complete level scheme, and to give a definite assignment. Possibly a high-K isomer with configuration= π9/2[624]⊗π1/2[521]⊗ν9/2[734]. E(level): this isomer may correspond to either of the two states expected at 19/2$^+$ and 25/2$^+$.
0+y	(25/2$^+$)	?	Additional information 2. Possibly a high-K isomer with configuration= π9/2[624]⊗π7/2[514]⊗ν9/2[734].

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^{253}No IT decay (706 μs) 2011Lo06 (continued)

^{253}No Levels (continued)

† From 2011Lo06, unless otherwise stated.
‡ Band(A): 9/2[734], g.s. band,α+1/2.
# Band(a): 9/2[734], g.s. band,α-1/2.
@ Band(B): $K^{\pi}=15/2^{-}$ band,α=−1/2. Configuration=π7/2[514]⊗π1/2[521]⊗ν9/2[734]; from the anology to neighboring ^{254}No.
& Band(b): $K^{\pi}=15/2^{-}$ band,α=+1/2. Configuration=π7/2[514]⊗π1/2[521]⊗ν9/2[734]; from the anology to neighboring ^{254}No.
a From least-squares fit to Eγ assuming ΔEγ=1 keV.

γ(^{253}No)

E_γ †	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	α&	Comments
64‡		64.0	(11/2⁻)	0.0	9/2⁻	M1	47.7	α(L)=35.5 *5*; α(M)=8.85 *13*; α(N+..)=3.30 *5* α(N)=2.49 *4*; α(O)=0.669 *10*; α(P)=0.1303 *19*; α(Q)=0.00704 *10*
75‡		139.0	(13/2⁻)	64.0	(11/2⁻)	M1	30.0	α(L)=22.4 *4*; α(M)=5.56 *8*; α(N+..)=2.07 *3* α(N)=1.566 *22*; α(O)=0.421 *6*; α(P)=0.0819 *12*; α(Q)=0.00442 *7*
87‡		226.1	(15/2⁻)	139.0	(13/2⁻)	(M1)@	19.5	α(L)=14.52 *21*; α(M)=3.61 *5*; α(N+..)=1.345 *19* α(N)=1.016 *15*; α(O)=0.273 *4*; α(P)=0.0532 *8*; α(Q)=0.00286 *4*
87.7 *5*	5.9 *18*	1028.8	(17/2⁻)	940.6	(15/2⁻)	M1(+E2)	39 *20*	α(L)=28 *14*; α(M)=8 *5*; α(N+..)=2.9 *16* α(N)=2.2 *13*; α(O)=0.6 *4*; α(P)=0.10 *5*; α(Q)=0.0017 *12* I_γ: contribution from Pb x rays removed.
98.6 *6*	7.2 *17*	1128.1	(19/2⁻)	1028.8	(17/2⁻)	M1(+E2)	24 *11*	α(L)=17 *7*; α(M)=4.8 *23*; α(N+..)=1.8 *9* α(N)=1.4 *7*; α(O)=0.35 *17*; α(P)=0.060 *23*; α(Q)=0.0012 *9*
99		324.5	(17/2⁻)	226.1	(15/2⁻)	(M1)@	13.38	α(L)=9.98 *14*; α(M)=2.48 *4*; α(N+..)=0.924 *13* α(N)=0.698 *10*; α(O)=0.187 *3*; α(P)=0.0365 *6*; α(Q)=0.00196 *3*
110‡		434.3	(19/2⁻)	324.5	(17/2⁻)			
110.0 *5*	8.0 *18*	1238.2	(21/2⁻)	1128.1	(19/2⁻)	M1(+E2)	15 *6*	α(L)=11 *4*; α(M)=3.0 *12*; α(N+..)=1.1 *5* α(N)=0.9 *4*; α(O)=0.23 *9*; α(P)=0.038 *12*; α(Q)=0.0008 *7*
120‡		1358.2	(23/2⁻)	1238.2	(21/2⁻)			
123‡		557.6	(21/2⁻)	434.3	(19/2⁻)			
135‡		692.9	(23/2⁻)	557.6	(21/2⁻)			
139‡		139.0	(13/2⁻)	0.0	9/2⁻	(E2)	7.05	α(L)=5.05 *7*; α(M)=1.462 *21*; α(N+..)=0.546 *8* α(N)=0.420 *6*; α(O)=0.1083 *16*; α(P)=0.01742 *25*; α(Q)=8.97×10^{-5} *13*
x155 *1*	3.4 *12*							
162‡		226.1	(15/2⁻)	64.0	(11/2⁻)	(E2)	3.69	α(K)=0.1170 *17*; α(L)=2.56 *4*; α(M)=0.740 *11*; α(N+..)=0.276 *4* α(N)=0.213 *3*; α(O)=0.0549 *8*; α(P)=0.00889 *13*; α(Q)=5.31×10^{-5} *8*
167		167.0	5/2⁺	0.0	9/2⁻	M2	51.6	α(K)=28.8 *4*; α(L)=16.45 *23*; α(M)=4.61 *7*; α(N+..)=1.760 *25* α(N)=1.333 *19*; α(O)=0.357 *5*; α(P)=0.0668 *10*; α(Q)=0.00326 *5* B(M2)(W.u.)=0.0036 *3* Mult.: from α(K)exp/ (α(L)exp+α(M)exp+α(N+...)exp)=1.3 *2*, α(L)exp/(α(M)exp+α(N+...)exp)=2.8 *5* (2007Lo11).

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^{253}No IT decay (706 μs) 2011Lo06 (continued)

γ(^{253}No) (continued)

E_γ[†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[&]	Comments
185[‡]		324.5	(17/2⁻)	139.0	(13/2⁻)	(E2)[@]	2.14	α(K)=0.1306 *19*; α(L)=1.439 *21*; α(M)=0.415 *6*; α(N+..)=0.1548 *22* α(N)=0.1190 *17*; α(O)=0.0308 *5*; α(P)=0.00501 *7*; α(Q)=3.44×10^{-5} *5*
188.6 *8*	4.0 *13*	1128.1	(19/2⁻)	940.6	(15/2⁻)	E2	1.98 *5*	α(K)=0.1307 *19*; α(L)=1.32 *3*; α(M)=0.382 *9*; α(N+..)=0.142 *4* α(N)=0.110 *3*; α(O)=0.0283 *7*; α(P)=0.00462 *11*; α(Q)=3.24×10^{-5} *7*
208[‡]		434.3	(19/2⁻)	226.1	(15/2⁻)	(E2)[@]	1.346	α(K)=0.1272 *18*; α(L)=0.874 *13*; α(M)=0.251 *4*; α(N+..)=0.0937 *14* α(N)=0.0720 *10*; α(O)=0.0186 *3*; α(P)=0.00306 *5*; α(Q)=2.39×10^{-5} *4*
209.5 *3*	12 *3*	1238.2	(21/2⁻)	1028.8	(17/2⁻)	E2	1.309	α(K)=0.1267 *18*; α(L)=0.848 *13*; α(M)=0.244 *4*; α(N+..)=0.0909 *14* α(N)=0.0699 *11*; α(O)=0.0181 *3*; α(P)=0.00297 *5*; α(Q)=2.34×10^{-5} *4*
230[‡]		1358.2	(23/2⁻)	1128.1	(19/2⁻)			
233[‡]		557.6	(21/2⁻)	324.5	(17/2⁻)			
[x]254 *1*	3.7 *13*							
259[‡]		692.9	(23/2⁻)	434.3	(19/2⁻)			
[x]605.1 *5*	11 *3*							
[x]613.8 *5*	8 *2*					M1	0.344	α(K)=0.266 *4*; α(L)=0.0585 *9*; α(M)=0.01448 *21*; α(N+..)=0.00538 *8* α(N)=0.00407 *6*; α(O)=0.001092 *16*; α(P)=0.000212 *3*; α(Q)=1.127×10^{-5} *16*
[x]704.2 *5*	10 *3*					M1	0.237	α(K)=0.183 *3*; α(L)=0.0402 *6*; α(M)=0.00993 *14*; α(N+..)=0.00369 *6* α(N)=0.00279 *4*; α(O)=0.000749 *11*; α(P)=0.0001457 *21*; α(Q)=7.73×10^{-6} *11*
714.3 *5*	42 *8*	940.6	(15/2⁻)	226.1	(15/2⁻)	M1	0.228	α(K)=0.1762 *25*; α(L)=0.0386 *6*; α(M)=0.00955 *14*; α(N+..)=0.00355 *5* α(N)=0.00268 *4*; α(O)=0.000721 *11*; α(P)=0.0001401 *20*; α(Q)=7.44×10^{-6} *11*
[x]750 *1*	4.6 *19*							
[x]779.3 *4*	11 *3*							
801.8 *4*	100 *18*	940.6	(15/2⁻)	139.0	(13/2⁻)	M1	0.1664	α(K)=0.1287 *19*; α(L)=0.0282 *4*; α(M)=0.00696 *10*; α(N+..)=0.00259 *4* α(N)=0.00196 *3*; α(O)=0.000525 *8*; α(P)=0.0001021 *15*; α(Q)=5.42×10^{-6} *8* Mult.: from K (x-ray)ce coincidences.

[†] From the decay of 706−μs isomeric state (2011Lo06) (normalized to 100 for 801.8γ), unless otherwise stated.
[‡] From figure 15 of 2011Lo06. ΔEγ=1 keV by the evaluators.
[#] Deduced from rotational model equation taking into account measured mult of several transitions in 2009He23, unless otherwise stated.
[@] From 2009He23.
[&] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[x] γ ray not placed in level scheme.

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Decay Scheme

Intensities: Relative I_γ

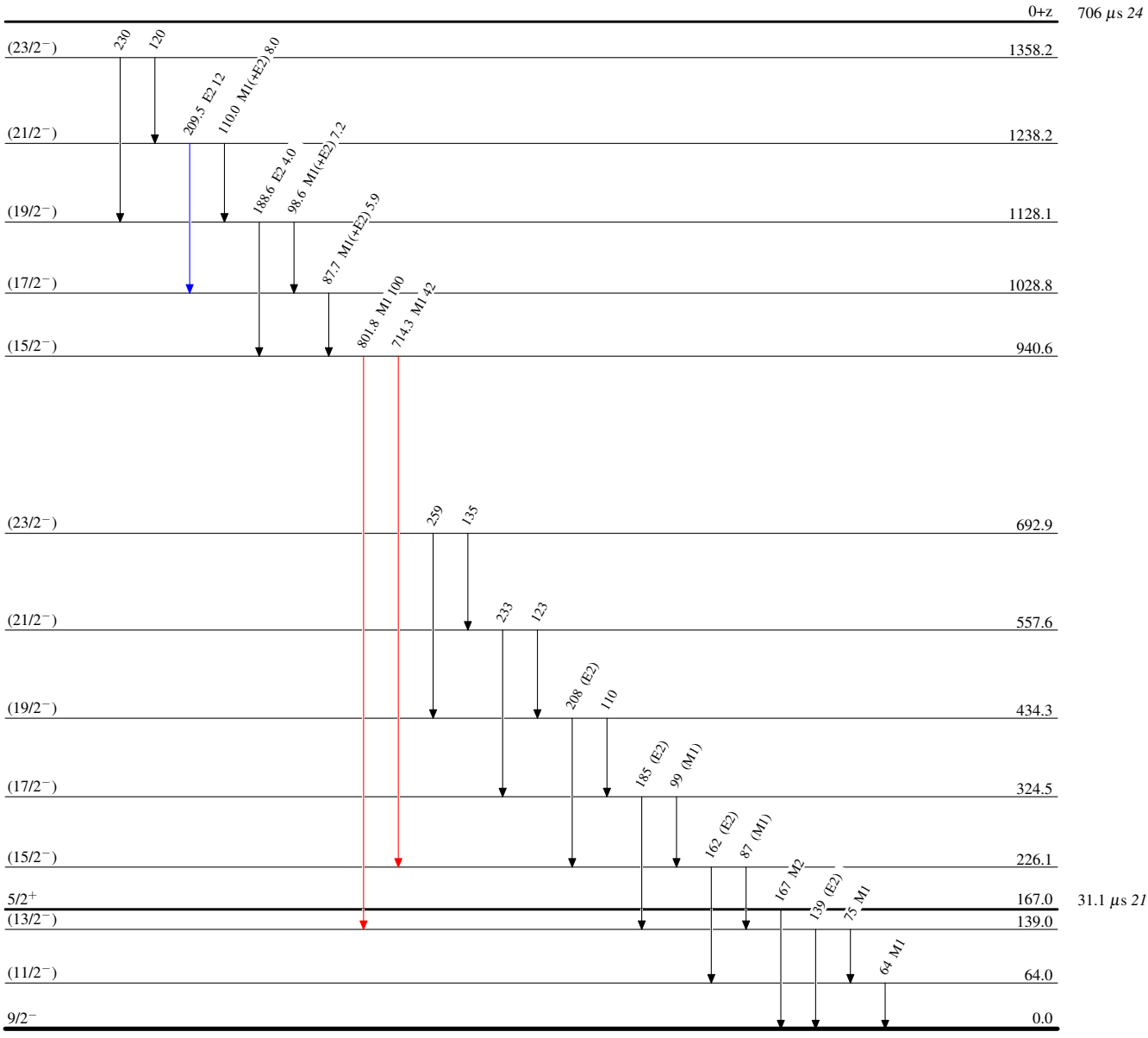
%IT=?

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



$^{253}_{102}No_{151}$

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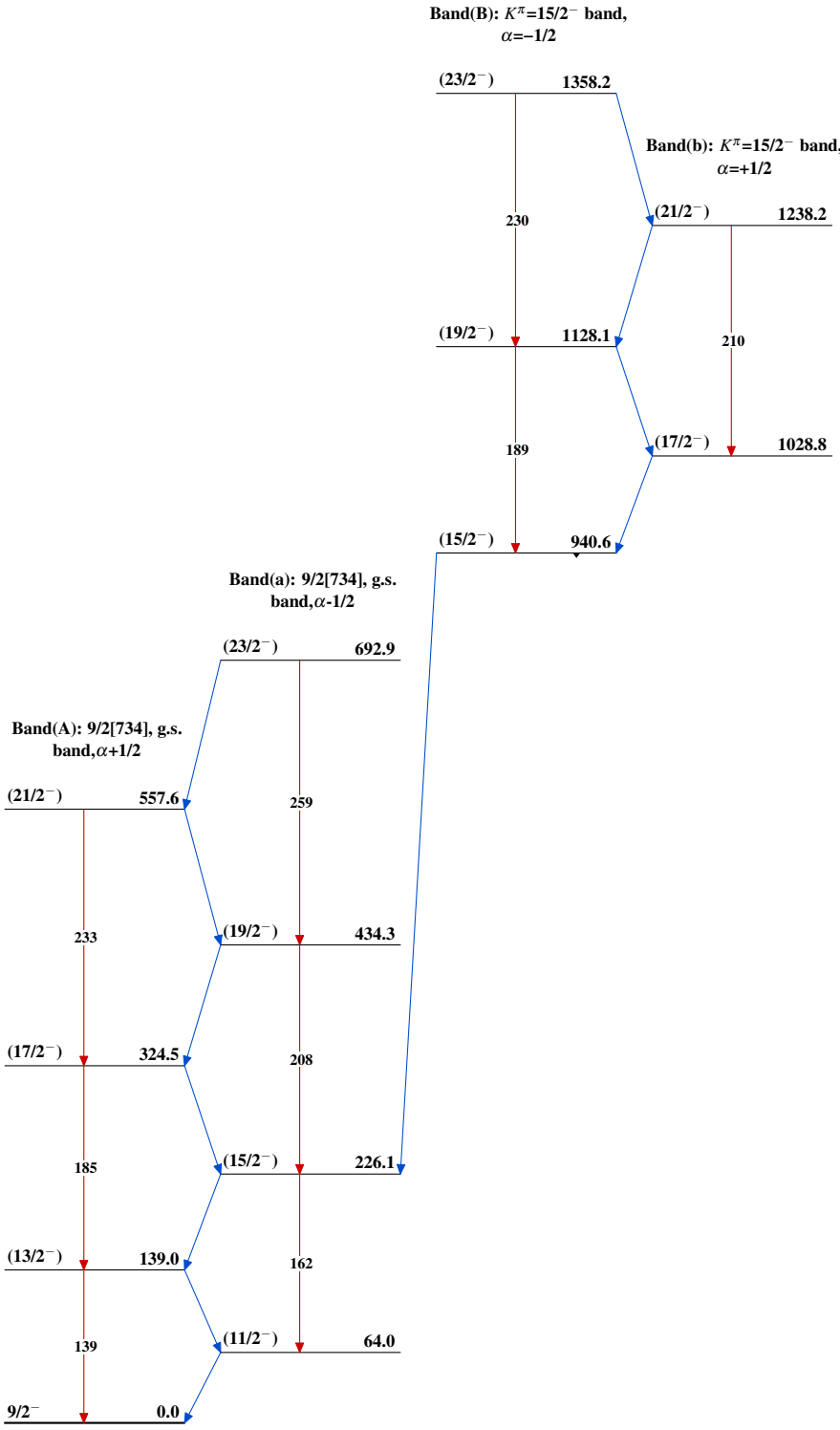

$^{253}_{102}No_{151}$