^{207}Pb(^{48}Ca,2nγ) 2009He23

History

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

2009He23: E=219 MeV; measured Eγ, Iγ, $\gamma\gamma$, ce, (recoil)ce coin and half-lives using the JUROGAM gamma-ray spectrometer coupled to the RITU gas filled separator and GREAT focal-plane detection system at the accelerator laboratory of the University of Jyvaskyla.

2007Lo11: E=242 MeV. Measured two isomers in ^{253}No from (evaporation residues)(γ and ce) coincidence measurements. The ^{48}Ca beam was provided by the U400 cyclotron of the FLNR, JINR, Dubna facility. The evaporation residues were separated by VASSILISSA separator and implanted into the GABRIELA detection system. The γ were detected by seven Ge detectors. Measured Eγ, Iγ, x rays, ce and half-lives of the isomers by timing correlations between the evaporation residues and γ rays and conversion electrons.

2005Re14: E=219 MeV. Measured Eγ, Iγ, $\gamma\gamma$, fragment-γ coin with Gammasphere and the fragment mass analyzer.

2003KhZY:: Measured γ with Gammasphere and the fragment mass analyzer.

^{253}No Levels

E(level)	J$^\pi$	T$_{1/2}$	Comments
0[†]	(9/2$^-$)	1.56 min *2*	T$_{1/2}$: measured by 2009He23 from recoil of 11,400 nuclei followed by ^{253}No α decay.
62?[‡]	(11/2$^-$)		
132?[†]	(13/2$^-$)		
167 *3*	5/2$^+$	31.1 μs *21*	E(level),J$^\pi$: from 2007Lo11. T$_{1/2}$: measured by 2007Lo11, 28 μs *3* (2009He23), 22.7 μs *5* (2011An13). Configuration=5/2[622]. Population of the isomer in reaction=16% *1*.
0+x		0.97 ms *21*	T$_{1/2}$: From 2007Lo11. Perhaps the same as 0.706 ms *24* isomer reported in 2011Lo06 No spectroscopic information is available due to problems in clean and efficient tagging on the decay of this isomer. Possibly a high-K isomer with configuration= K^π=25/2$^+$, π9/2[624]$\otimes\pi$7/2[514]$\otimes\nu$9/2[734] or K^π=23/2$^-$, ν9/2[734]$\otimes\nu$7/2[624]$\otimes\nu$7/2[613] or K^π=21/2$^-$, ν9/2[734]$\otimes\nu$5/2[622]$\otimes\nu$7/2[613].
218[‡]	(15/2$^-$)		
316[†]	(17/2$^-$)		
426[‡]	(19/2$^-$)		
550[†]	(21/2$^-$)		
685[‡]	(23/2$^-$)		
833[†]	(25/2$^-$)		
993[‡]	(27/2$^-$)		
1164[†]	(29/2$^-$)		
1345[‡]	(31/2$^-$)		
1540[†]	(33/2$^-$)		
1743[‡]	(35/2$^-$)		
1961[†]	(37/2$^-$)		
2183[‡]	(39/2$^-$)		
2422[†]	(41/2$^-$)		
2664[‡]	(43/2$^-$)		
2924[†]	(45/2$^-$)		
3183?[‡]	(47/2$^-$)		
3465?[†]	(49/2$^-$)		

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^{207}Pb(^{48}Ca,2nγ) 2009He23 (continued)

^{253}No Levels (continued)

† Band(A): ν9/2[734], α=+1/2.
‡ Band(a): ν9/2[734], α=−1/2.

$\gamma(^{253}No)$

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α‡	Comments
62#		62?	(11/2$^-$)	0	(9/2$^-$)			
70#		132?	(13/2$^-$)	62?	(11/2$^-$)			
86#		218	(15/2$^-$)	132?	(13/2$^-$)	M1	20.1	α(L)=15.02 *21*; α(M)=3.73 *6*; α(N+..)=1.391 *20* α(N)=1.051 *15*; α(O)=0.282 *4*; α(P)=0.0550 *8*; α(Q)=0.00296 *5* I_γ: under Pb K-x rays.
98	30 *8*	316	(17/2$^-$)	218	(15/2$^-$)	M1	13.78	α(L)=10.28 *15*; α(M)=2.55 *4*; α(N+..)=0.952 *14* α(N)=0.719 *10*; α(O)=0.193 *3*; α(P)=0.0376 *6*; α(Q)=0.00202 *3*
110	28 *9*	426	(19/2$^-$)	316	(17/2$^-$)	M1	9.86	α(L)=7.35 *11*; α(M)=1.83 *3*; α(N+..)=0.681 *10* α(N)=0.514 *8*; α(O)=0.1382 *20*; α(P)=0.0269 *4*; α(Q)=0.001446 *21*
123.5		550	(21/2$^-$)	426	(19/2$^-$)	M1	7.06	α(L)=5.27 *8*; α(M)=1.308 *19*; α(N+..)=0.487 *7* α(N)=0.368 *6*; α(O)=0.0989 *14*; α(P)=0.0193 *3*; α(Q)=0.001034 *15* I_γ: under No K-x rays.
132#		132?	(13/2$^-$)	0	(9/2$^-$)			
135.5	20 *11*	685	(23/2$^-$)	550	(21/2$^-$)	M1	5.41	α(L)=4.03 *6*; α(M)=1.002 *14*; α(N+..)=0.373 *6* α(N)=0.282 *4*; α(O)=0.0757 *11*; α(P)=0.01474 *21*; α(Q)=0.000791 *11*
147.5		833	(25/2$^-$)	685	(23/2$^-$)	M1	4.24	α(L)=3.16 *5*; α(M)=0.785 *11*; α(N+..)=0.292 *4* α(N)=0.221 *3*; α(O)=0.0593 *9*; α(P)=0.01155 *17*; α(Q)=0.000619 *9* I_γ: under No K-x rays.
156	17 *5*	218	(15/2$^-$)	62?	(11/2$^-$)	E2	4.33	α(K)=0.1077 *15*; α(L)=3.02 *5*; α(M)=0.875 *13*; α(N+..)=0.326 *5* α(N)=0.251 *4*; α(O)=0.0648 *9*; α(P)=0.01048 *15*; α(Q)=6.02×10^{-5} *9*
160	18 *5*	993	(27/2$^-$)	833	(25/2$^-$)	M1	14.42	α(K)=11.06 *16*; α(L)=2.51 *4*; α(M)=0.622 *9*; α(N+..)=0.232 *4* α(N)=0.1751 *25*; α(O)=0.0470 *7*; α(P)=0.00915 *13*; α(Q)=0.000490 *7*
167 *3*	5 *3*	167	5/2$^+$	0	(9/2$^-$)	M2	52 *4*	α(K)=28.8 *17*; α(L)=16.4 *13*; α(M)=4.6 *4*; α(N+..)=1.76 *14* α(N)=1.33 *11*; α(O)=0.36 *3*; α(P)=0.067 *6*; α(Q)=0.00326 *25* B(M2)(W.u.)=0.0036 *5* E_γ,I_γ: from 2007Lo11. Mult.: from α(K)exp/(α(L+...)exp)=1.3 *2*, α(L)exp/(α(M+...)exp)=2.8 *5* (2007Lo11). E_γ: form 2007Lo11. α: from BrIcc code.
171	23 *5*	1164	(29/2$^-$)	993	(27/2$^-$)	M1	11.97	α(K)=9.19 *13*; α(L)=2.07 *3*; α(M)=0.514 *8*; α(N+..)=0.192 *3* α(N)=0.1448 *21*; α(O)=0.0389 *6*; α(P)=0.00756 *11*; α(Q)=0.000405 *6*
181.5	14 *4*	1345	(31/2$^-$)	1164	(29/2$^-$)	M1	10.11	α(K)=7.77 *11*; α(L)=1.748 *25*; α(M)=0.434 *6*; α(N+..)=0.1617 *23* α(N)=0.1221 *17*; α(O)=0.0328 *5*; α(P)=0.00638 *9*; α(Q)=0.000341 *5*

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^{207}Pb(^{48}Ca,2nγ) 2009He23 (continued)

γ(^{253}No) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[‡]	Comments
184	22 *5*	316	(17/2$^-$)	132?	(13/2$^-$)	E2	2.19	α(K)=0.1304 *19*; α(L)=1.473 *21*; α(M)=0.425 *6*; α(N+..)=0.1585 *23* α(N)=0.1219 *17*; α(O)=0.0315 *5*; α(P)=0.00513 *8*; α(Q)=3.50×10^{-5} *5*
195	12 *4*	1540	(33/2$^-$)	1345	(31/2$^-$)	M1	8.26	α(K)=6.35 *9*; α(L)=1.426 *20*; α(M)=0.354 *5*; α(N+..)=0.1318 *19* α(N)=0.0996 *14*; α(O)=0.0267 *4*; α(P)=0.00520 *8*; α(Q)=0.000278 *4*
203	22 *5*	1743	(35/2$^-$)	1540	(33/2$^-$)	M1	7.38	α(K)=5.67 *8*; α(L)=1.272 *18*; α(M)=0.316 *5*; α(N+..)=0.1176 *17* α(N)=0.0888 *13*; α(O)=0.0239 *4*; α(P)=0.00464 *7*; α(Q)=0.000248 *4*
208	28 *5*	426	(19/2$^-$)	218	(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*
218		1961	(37/2$^-$)	1743	(35/2$^-$)	M1	6.03	α(K)=4.64 *7*; α(L)=1.040 *15*; α(M)=0.258 *4*; α(N+..)=0.0961 *14* α(N)=0.0726 *11*; α(O)=0.0195 *3*; α(P)=0.00379 *6*; α(Q)=0.000202 *3*
222	10 *4*	2183	(39/2$^-$)	1961	(37/2$^-$)	M1	5.73	α(K)=4.41 *7*; α(L)=0.988 *14*; α(M)=0.245 *4*; α(N+..)=0.0912 *13* α(N)=0.0689 *10*; α(O)=0.0185 *3*; α(P)=0.00360 *5*; α(Q)=0.000192 *3*
233.5	66 *7*	550	(21/2$^-$)	316	(17/2$^-$)	E2	0.869	α(K)=0.1169 *17*; α(L)=0.540 *8*; α(M)=0.1546 *22*; α(N+..)=0.0577 *8* α(N)=0.0443 *7*; α(O)=0.01147 *16*; α(P)=0.00190 *3*; α(Q)=1.697×10^{-5} *24*
239[†#]		2422	(41/2$^-$)	2183	(39/2$^-$)	M1	4.66	α(K)=3.58 *5*; α(L)=0.802 *12*; α(M)=0.199 *3*; α(N+..)=0.0741 *11* α(N)=0.0560 *8*; α(O)=0.01503 *21*; α(P)=0.00292 *4*; α(Q)=0.0001559 *22*
242	11 *4*	2664	(43/2$^-$)	2422	(41/2$^-$)	M1	4.50	α(K)=3.46 *5*; α(L)=0.774 *11*; α(M)=0.192 *3*; α(N+..)=0.0715 *10* α(N)=0.0540 *8*; α(O)=0.01451 *21*; α(P)=0.00282 *4*; α(Q)=0.0001505 *21*
259	100 *20*	685	(23/2$^-$)	426	(19/2$^-$)	E2	0.598	α(K)=0.1052 *15*; α(L)=0.354 *5*; α(M)=0.1010 *15*; α(N+..)=0.0377 *6* α(N)=0.0289 *4*; α(O)=0.00750 *11*; α(P)=0.001247 *18*; α(Q)=1.264×10^{-5} *18*
259[†#]		3183?	(47/2$^-$)	2924	(45/2$^-$)	M1	3.72	α(K)=2.86 *4*; α(L)=0.640 *9*; α(M)=0.1586 *23*; α(N+..)=0.0591 *9* α(N)=0.0446 *7*; α(O)=0.01198 *17*; α(P)=0.00233 *4*; α(Q)=0.0001242 *18*
260[†#]		2924	(45/2$^-$)	2664	(43/2$^-$)	M1	3.68	α(K)=2.83 *4*; α(L)=0.633 *9*; α(M)=0.1569 *22*; α(N+..)=0.0584 *9* α(N)=0.0441 *7*; α(O)=0.01185 *17*; α(P)=0.00230 *4*; α(Q)=0.0001229 *18*
282[†#]		3465?	(49/2$^-$)	3183?	(47/2$^-$)	M1	2.93	α(K)=2.26 *4*; α(L)=0.504 *7*; α(M)=0.1249 *18*; α(N+..)=0.0465 *7* α(N)=0.0351 *5*; α(O)=0.00943 *14*; α(P)=0.00183 *3*; α(Q)=9.77×10^{-5} *14*
283	139 *24*	833	(25/2$^-$)	550	(21/2$^-$)	E2	0.440	α(K)=0.0947 *14*; α(L)=0.249 *4*; α(M)=0.0707 *10*; α(N+..)=0.0264 *4* α(N)=0.0202 *3*; α(O)=0.00525 *8*; α(P)=0.000878 *13*; α(Q)=9.92×10^{-6} *14*

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^{207}Pb(^{48}Ca,2nγ) 2009He23 (continued)

γ(^{253}No) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[‡]	Comments
307.5	89 *27*	993	(27/2$^-$)	685	(23/2$^-$)	E2	0.335	α(K)=0.0851 *12*; α(L)=0.180 *3*; α(M)=0.0509 *8*; α(N+..)=0.0190 *3* α(N)=0.01457 *21*; α(O)=0.00379 *6*; α(P)=0.000637 *9*; α(Q)=7.96×10^{-6} *12*
331	77 *17*	1164	(29/2$^-$)	833	(25/2$^-$)	E2	0.265	α(K)=0.0769 *11*; α(L)=0.1358 *19*; α(M)=0.0383 *6*; α(N+..)=0.01429 *20* α(N)=0.01095 *16*; α(O)=0.00285 *4*; α(P)=0.000482 *7*; α(Q)=6.59×10^{-6} *10*
352.5	58 *8*	1345	(31/2$^-$)	993	(27/2$^-$)	E2	0.219	α(K)=0.0704 *10*; α(L)=0.1073 *15*; α(M)=0.0302 *5*; α(N+..)=0.01125 *16* α(N)=0.00862 *12*; α(O)=0.00224 *4*; α(P)=0.000382 *6*; α(Q)=5.62×10^{-6} *8*
376.5	66 *8*	1540	(33/2$^-$)	1164	(29/2$^-$)	E2	0.181	α(K)=0.0639 *9*; α(L)=0.0843 *12*; α(M)=0.0236 *4*; α(N+..)=0.00880 *13* α(N)=0.00674 *10*; α(O)=0.001757 *25*; α(P)=0.000300 *5*; α(Q)=4.78×10^{-6} *7*
398	57 *16*	1743	(35/2$^-$)	1345	(31/2$^-$)	E2	0.1544	α(K)=0.0589 *9*; α(L)=0.0691 *10*; α(M)=0.0193 *3*; α(N+..)=0.00719 *10* α(N)=0.00550 *8*; α(O)=0.001435 *20*; α(P)=0.000246 *4*; α(Q)=4.19×10^{-6} *6*
421	33 *5*	1961	(37/2$^-$)	1540	(33/2$^-$)	E2	0.1324	α(K)=0.0541 *8*; α(L)=0.0567 *8*; α(M)=0.01575 *22*; α(N+..)=0.00587 *9* α(N)=0.00449 *7*; α(O)=0.001173 *17*; α(P)=0.000202 *3*; α(Q)=3.67×10^{-6} *6*
440	24 *4*	2183	(39/2$^-$)	1743	(35/2$^-$)	E2	0.1177	α(K)=0.0506 *7*; α(L)=0.0486 *7*; α(M)=0.01348 *19*; α(N+..)=0.00503 *7* α(N)=0.00384 *6*; α(O)=0.001004 *14*; α(P)=0.0001739 *25*; α(Q)=3.31×10^{-6} *5*
461	26 *5*	2422	(41/2$^-$)	1961	(37/2$^-$)	E2	0.1043	α(K)=0.0471 *7*; α(L)=0.0415 *6*; α(M)=0.01146 *16*; α(N+..)=0.00427 *6* α(N)=0.00327 *5*; α(O)=0.000854 *12*; α(P)=0.0001485 *21*; α(Q)=2.98×10^{-6} *5*
481	25 *5*	2664	(43/2$^-$)	2183	(39/2$^-$)	E2	0.0937	α(K)=0.0441 *7*; α(L)=0.0360 *5*; α(M)=0.00991 *14*; α(N+..)=0.00369 *6* α(N)=0.00282 *4*; α(O)=0.000739 *11*; α(P)=0.0001290 *18*; α(Q)=2.70×10^{-6} *4*
502	20 *5*	2924	(45/2$^-$)	2422	(41/2$^-$)	E2	0.0843	α(K)=0.0413 *6*; α(L)=0.0313 *5*; α(M)=0.00858 *12*; α(N+..)=0.00320 *5* α(N)=0.00244 *4*; α(O)=0.000640 *9*; α(P)=0.0001121 *16*; α(Q)=2.46×10^{-6} *4*
519[#]	20 *5*	3183?	(47/2$^-$)	2664	(43/2$^-$)	E2	0.0778	α(K)=0.0392 *6*; α(L)=0.0281 *4*; α(M)=0.00768 *11*; α(N+..)=0.00286 *4* α(N)=0.00219 *3*; α(O)=0.000573 *8*; α(P)=0.0001007 *14*; α(Q)=2.28×10^{-6} *4*
541[#]	12 *4*	3465?	(49/2$^-$)	2924	(45/2$^-$)	E2	0.0705	α(K)=0.0367 *6*; α(L)=0.0246 *4*; α(M)=0.00671 *10*; α(N+..)=0.00250 *4* α(N)=0.00191 *3*; α(O)=0.000501 *7*; α(P)=8.82×10^{-5} *13*; α(Q)=2.09×10^{-6} *3*

† Unresolved multiplet.
‡ 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.
# Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative I_γ

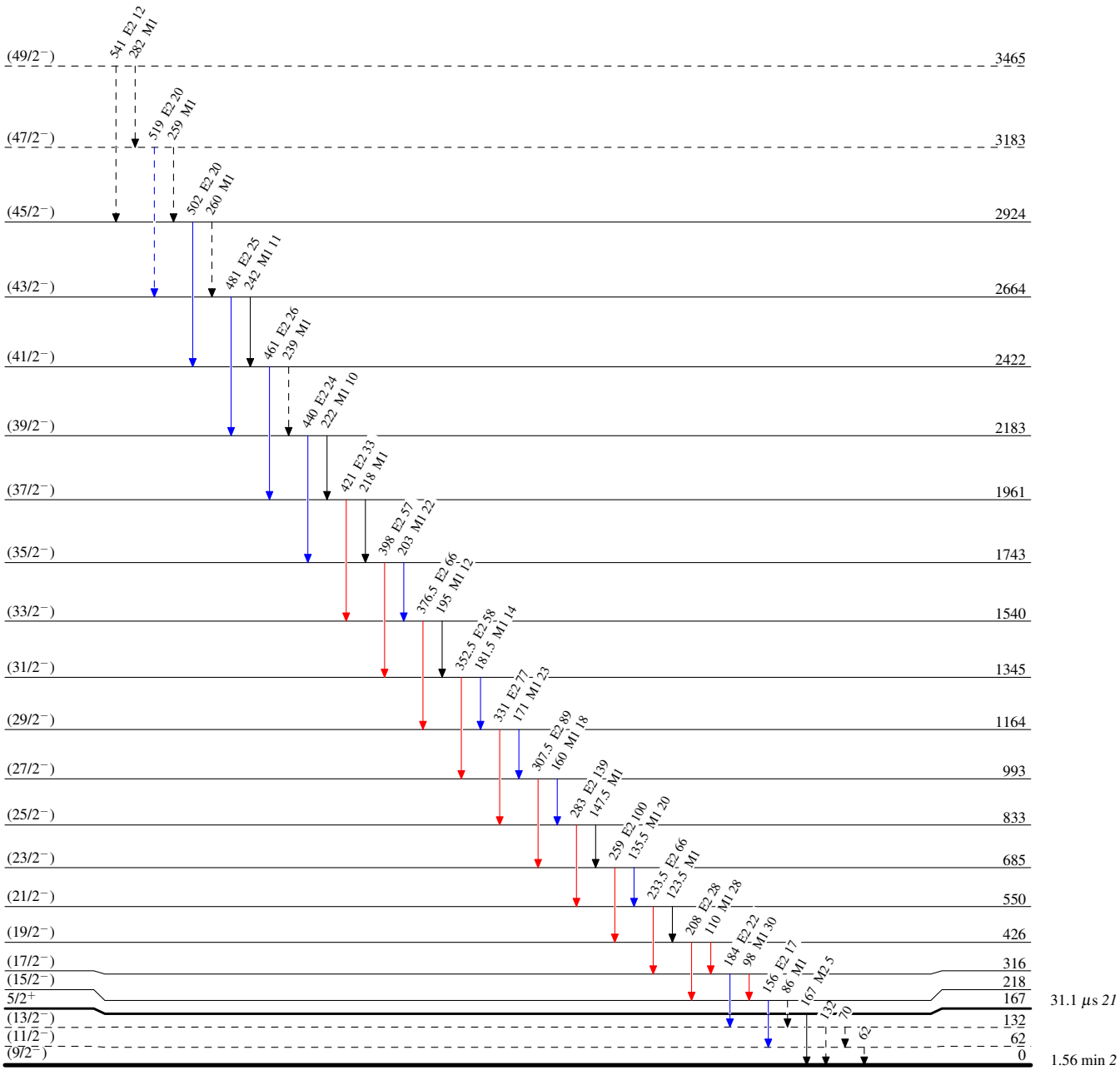
Legend

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

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

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

γ Decay (Uncertain)



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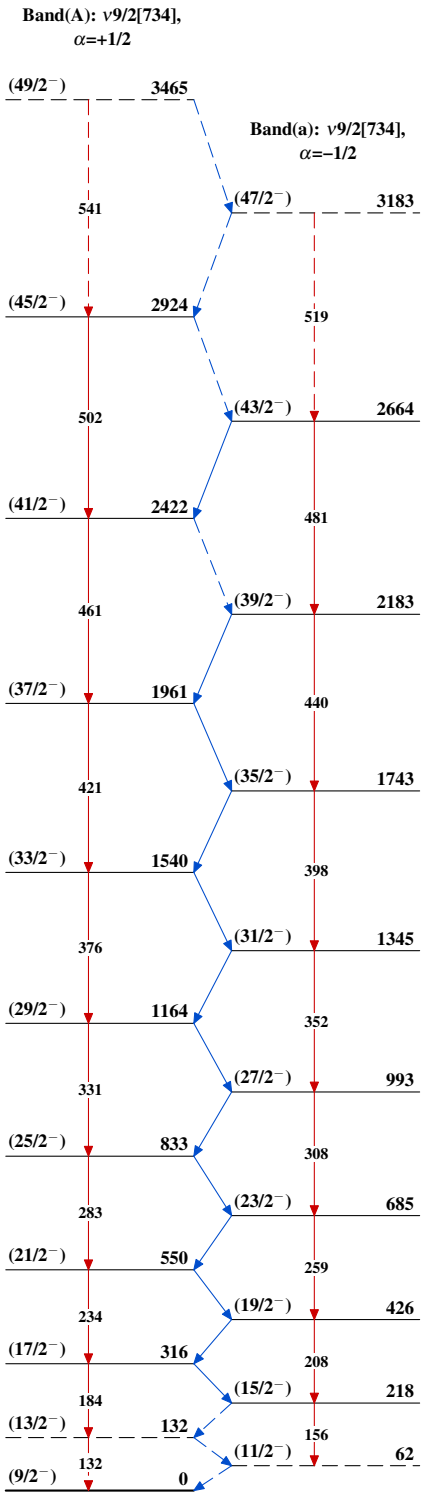

$^{253}_{102}No_{151}$