^{232}Th(^{136}Xe,Xγ) 1999Co02,1997Co08

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 112, 1115 (2011)	31-Oct-2010

Additional information 1.
E=833 MeV, multi-particle transfer reaction. Measured Eγ, Iγ, $\gamma\gamma\gamma$ using GAMMASPHERE array of 73 HPGe detectors.

^{220}Rn Levels

E(level)†	Jπ	E(level)†	Jπ	E(level)†	Jπ	E(level)†	Jπ
0.0‡	0^+	874.1‡ *4*	(6^+)	2034.1‡ *7*	(12^+)	3325.5‡ *11*	(18^+)
241.19‡ *15*	2^+	1128.4# *5*	(7^-)	2227.3# *9*	(13^-)	3510.0# *13*	(19^-)
533.89‡ *25*	4^+	1244.5‡ *4*	(8^+)	2452.9‡ *9*	(14^+)	3764.1‡ *12*	(20^+)
645.48# *10*	1^-	1462.3# *6*	(9^-)	2638.5# *10*	(15^-)	3961.7?# *12*	(21^-)
663.4# *7*	3^-	1631.3‡ *5*	(10^+)	2887.2‡ *10*	(16^+)		
852.2# *5*	(5^-)	1834.2# *8*	(11^-)	3068.8# *12*	(17^-)		

† Deduced by evaluators from least-squares fit to γ-ray energies.
‡ Band(A): g.s. rotational band.
# Band(B): octupole vibrational band.

γ(^{220}Rn)

E_γ†‡	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	α@	$I_{(\gamma+ce)}$	Comments
188.8 *5*	13 *4*	852.2	(5^-)	663.4	3^-	E2	0.644 *11*	22 *7*	ce(K)/(γ+ce)=0.1125 *17*; ce(L)/(γ+ce)=0.206 *4*; ce(M)/(γ+ce)=0.0552 *11*; ce(N+)/(γ+ce)=0.0176 *4* ce(N)/(γ+ce)=0.0144 *3*; ce(O)/(γ+ce)=0.00292 *6*; ce(P)/(γ+ce)=0.000335 *7*
217.9 *5*	10 *3*	1462.3	(9^-)	1244.5	(8^+)	E1	0.0701 *11*	11 *3*	ce(K)/(γ+ce)=0.0527 *8*; ce(L)/(γ+ce)=0.00977 *15*; ce(M)/(γ+ce)=0.00232 *4*; ce(N+)/(γ+ce)=0.000743 *12* ce(N)/(γ+ce)=0.000598 *9*; ce(O)/(γ+ce)=0.0001273 *20*; ce(P)/(γ+ce)=1.72×10^{-5} *3*
241.1 *2*	100 *20*	241.19	2^+	0.0	0^+	E2	0.275	128 *26*	ce(K)/(γ+ce)=0.0868 *12*; ce(L)/(γ+ce)=0.0955 *13*; ce(M)/(γ+ce)=0.0253 *4*; ce(N+)/(γ+ce)=0.00811 *12* ce(N)/(γ+ce)=0.00660 *10*; ce(O)/(γ+ce)=0.001350 *20*; ce(P)/(γ+ce)=0.0001580 *24*
254.3 *5*	17 *4*	1128.4	(7^-)	874.1	(6^+)	E1	0.0487	18 *4*	ce(K)/(γ+ce)=0.0375 *6*; ce(L)/(γ+ce)=0.00680 *10*; ce(M)/(γ+ce)=0.001613 *24*; ce(N+)/(γ+ce)=0.000518 *8* ce(N)/(γ+ce)=0.000417 *7*; ce(O)/(γ+ce)=8.89×10^{-5} *14*; ce(P)/(γ+ce)=1.215×10^{-5} *18*
276.2 *5*	41 *8*	1128.4	(7^-)	852.2	(5^-)	E2	0.178 *3*	48 *9*	ce(K)/(γ+ce)=0.0700 *10*;

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^{232}Th(^{136}Xe,Xγ) 1999Co02,1997Co08 (continued)

γ(^{220}Rn) (continued)

E_γ[†‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[@]	$I_{(\gamma+ce)}$	Comments
									ce(L)/(γ+ce)=0.0600 *9*; ce(M)/(γ+ce)=0.01583 *25*; ce(N+)/(γ+ce)=0.00507 *8* ce(N)/(γ+ce)=0.00412 *7*; ce(O)/(γ+ce)=0.000847 *14*; ce(P)/(γ+ce)=0.0001006 *16*
292.7 *2*	94 *9*	533.89	4^+	241.19	2^+	E2	0.1487	108 *10*	ce(K)/(γ+ce)=0.0633 *9*; ce(L)/(γ+ce)=0.0491 *7*; ce(M)/(γ+ce)=0.01292 *19*; ce(N+)/(γ+ce)=0.00414 *6* ce(N)/(γ+ce)=0.00336 *5*; ce(O)/(γ+ce)=0.000692 *10*; ce(P)/(γ+ce)=8.27×10^{-5} *12*
318.3 *5*	53 *8*	852.2	(5^-)	533.89	4^+	E1	0.0291	55 *8*	ce(K)/(γ+ce)=0.0229 *4*; ce(L)/(γ+ce)=0.00405 *6*; ce(M)/(γ+ce)=0.000958 *14*; ce(N+)/(γ+ce)=0.000308 *5* ce(N)/(γ+ce)=0.000248 *4*; ce(O)/(γ+ce)=5.31×10^{-5} *8*; ce(P)/(γ+ce)=7.34×10^{-6} *11*
333.9 *5*	72 *11*	1462.3	(9^-)	1128.4	(7^-)	E2	0.1008	79 *12*	ce(K)/(γ+ce)=0.0497 *7*; ce(L)/(γ+ce)=0.0312 *5*; ce(M)/(γ+ce)=0.00814 *13*; ce(N+)/(γ+ce)=0.00261 *4* ce(N)/(γ+ce)=0.00212 *4*; ce(O)/(γ+ce)=0.000438 *7*; ce(P)/(γ+ce)=5.32×10^{-5} *8*
340.2 *2*	84 *8*	874.1	(6^+)	533.89	4^+	E2	0.0956	92 *9*	ce(K)/(γ+ce)=0.0480 *7*; ce(L)/(γ+ce)=0.0292 *4*; ce(M)/(γ+ce)=0.00762 *11*; ce(N+)/(γ+ce)=0.00245 *4* ce(N)/(γ+ce)=0.00199 *3*; ce(O)/(γ+ce)=0.000410 *6*; ce(P)/(γ+ce)=5.00×10^{-5} *8*
370.4 *2*	78 *19*	1244.5	(8^+)	874.1	(6^+)	E2	0.0755	85 *20*	ce(K)/(γ+ce)=0.0408 *6*; ce(L)/(γ+ce)=0.0219 *3*; ce(M)/(γ+ce)=0.00568 *8*; ce(N+)/(γ+ce)=0.00183 *3* ce(N)/(γ+ce)=0.001480 *21*; ce(O)/(γ+ce)=0.000307 *5*; ce(P)/(γ+ce)=3.78×10^{-5} *6*
371.9 *5*	70 *12*	1834.2	(11^-)	1462.3	(9^-)	E2	0.0746	75 *13*	ce(K)/(γ+ce)=0.0404 *6*; ce(L)/(γ+ce)=0.0216 *4*; ce(M)/(γ+ce)=0.00561 *9*; ce(N+)/(γ+ce)=0.00180 *3* ce(N)/(γ+ce)=0.001460 *22*; ce(O)/(γ+ce)=0.000303 *5*; ce(P)/(γ+ce)=3.73×10^{-5} *6*
386.8 *2*	71 *12*	1631.3	(10^+)	1244.5	(8^+)	E2	0.0671	76 *13*	ce(K)/(γ+ce)=0.0375 *5*; ce(L)/(γ+ce)=0.0190 *3*; ce(M)/(γ+ce)=0.00490 *7*; ce(N+)/(γ+ce)=0.001575 *23* ce(N)/(γ+ce)=0.001277 *18*; ce(O)/(γ+ce)=0.000265 *4*; ce(P)/(γ+ce)=3.29×10^{-5} *5*
393.1 *5*	66 *8*	2227.3	(13^-)	1834.2	(11^-)	E2	0.0643	70 *9*	ce(K)/(γ+ce)=0.0363 *5*;

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^{232}Th(^{136}Xe,Xγ) 1999Co02,1997Co08 (continued)

$\gamma(^{220}Rn)$ (continued)

E_γ[†‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[@]	$I_{(\gamma+ce)}$	Comments
									ce(L)/(γ+ce)=0.0180 *3*; ce(M)/(γ+ce)=0.00464 *7*; ce(N+)/(γ+ce)=0.001492 *22* ce(N)/(γ+ce)=0.001209 *18*; ce(O)/(γ+ce)=0.000251 *4*; ce(P)/(γ+ce)=3.12×10^{-5} *5*
402.8 *5*	52 *12*	2034.1	(12$^+$)	1631.3	(10$^+$)	E2	0.0603	55 *13*	ce(K)/(γ+ce)=0.0347 *5*; ce(L)/(γ+ce)=0.01657 *24*; ce(M)/(γ+ce)=0.00428 *7*; ce(N+)/(γ+ce)=0.001374 *21* ce(N)/(γ+ce)=0.001114 *17*; ce(O)/(γ+ce)=0.000232 *4*; ce(P)/(γ+ce)=2.89×10^{-5} *5*
404.2 *2*		645.48	1$^-$	241.19	2$^+$				E_γ: From Adopted Gammas.
411.2 *5*	51 *10*	2638.5	(15$^-$)	2227.3	(13$^-$)	E2	0.0572	54 *11*	ce(K)/(γ+ce)=0.0333 *5*; ce(L)/(γ+ce)=0.01549 *23*; ce(M)/(γ+ce)=0.00399 *6*; ce(N+)/(γ+ce)=0.001283 *19* ce(N)/(γ+ce)=0.001039 *16*; ce(O)/(γ+ce)=0.000216 *4*; ce(P)/(γ+ce)=2.71×10^{-5} *4*
418.8 *5*	44 *11*	2452.9	(14$^+$)	2034.1	(12$^+$)	E2	0.0545	46 *12*	ce(K)/(γ+ce)=0.0321 *5*; ce(L)/(γ+ce)=0.01459 *21*; ce(M)/(γ+ce)=0.00376 *6*; ce(N+)/(γ+ce)=0.001207 *18* ce(N)/(γ+ce)=0.000978 *15*; ce(O)/(γ+ce)=0.000204 *3*; ce(P)/(γ+ce)=2.55×10^{-5} *4*
422.3[&] *5*		663.4	3$^-$	241.19	2$^+$				
430.3 *5*	26 *10*	3068.8	(17$^-$)	2638.5	(15$^-$)	E2	0.0509	27 *11*	ce(K)/(γ+ce)=0.0305 *5*; ce(L)/(γ+ce)=0.01337 *20*; ce(M)/(γ+ce)=0.00343 *5*; ce(N+)/(γ+ce)=0.001104 *16* ce(N)/(γ+ce)=0.000894 *13*; ce(O)/(γ+ce)=0.000186 *3*; ce(P)/(γ+ce)=2.35×10^{-5} *4*
434.3 *5*	36 *12*	2887.2	(16$^+$)	2452.9	(14$^+$)	E2	0.0497	38 *13*	ce(K)/(γ+ce)=0.0300 *5*; ce(L)/(γ+ce)=0.01298 *19*; ce(M)/(γ+ce)=0.00333 *5*; ce(N+)/(γ+ce)=0.001071 *16* ce(N)/(γ+ce)=0.000867 *13*; ce(O)/(γ+ce)=0.000181 *3*; ce(P)/(γ+ce)=2.28×10^{-5} *4*
438.3 *5*		3325.5	(18$^+$)	2887.2	(16$^+$)				
438.6 *5*		3764.1	(20$^+$)	3325.5	(18$^+$)				
441.2 *5*	20 *13*	3510.0	(19$^-$)	3068.8	(17$^-$)	E2	0.0478	21 *14*	ce(K)/(γ+ce)=0.0291 *4*; ce(L)/(γ+ce)=0.01234 *18*; ce(M)/(γ+ce)=0.00316 *5*; ce(N+)/(γ+ce)=0.001018 *15* ce(N)/(γ+ce)=0.000824 *12*; ce(O)/(γ+ce)=0.0001720 *25*; ce(P)/(γ+ce)=2.17×10^{-5} *4*
451.7[&] *5*		3961.7?	(21$^-$)	3510.0	(19$^-$)				
645.5 *1*		645.48	1$^-$	0.0	0$^+$				E_γ: From Adopted Gammas.

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^{232}Th(^{136}Xe,Xγ) 1999Co02,1997Co08 (continued)

$\gamma(^{220}Rn)$ (continued)

† From 1999Co02, unless otherwise specified. Others: 2000BuZY, 1998Bu17, 1997Co14.
‡ Uncertainties ΔE=0.5 keV have been assigned by the evaluators, unless otherwise specified.
# From γ-ray angular distributions $\gamma(\theta)$.
@ 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.

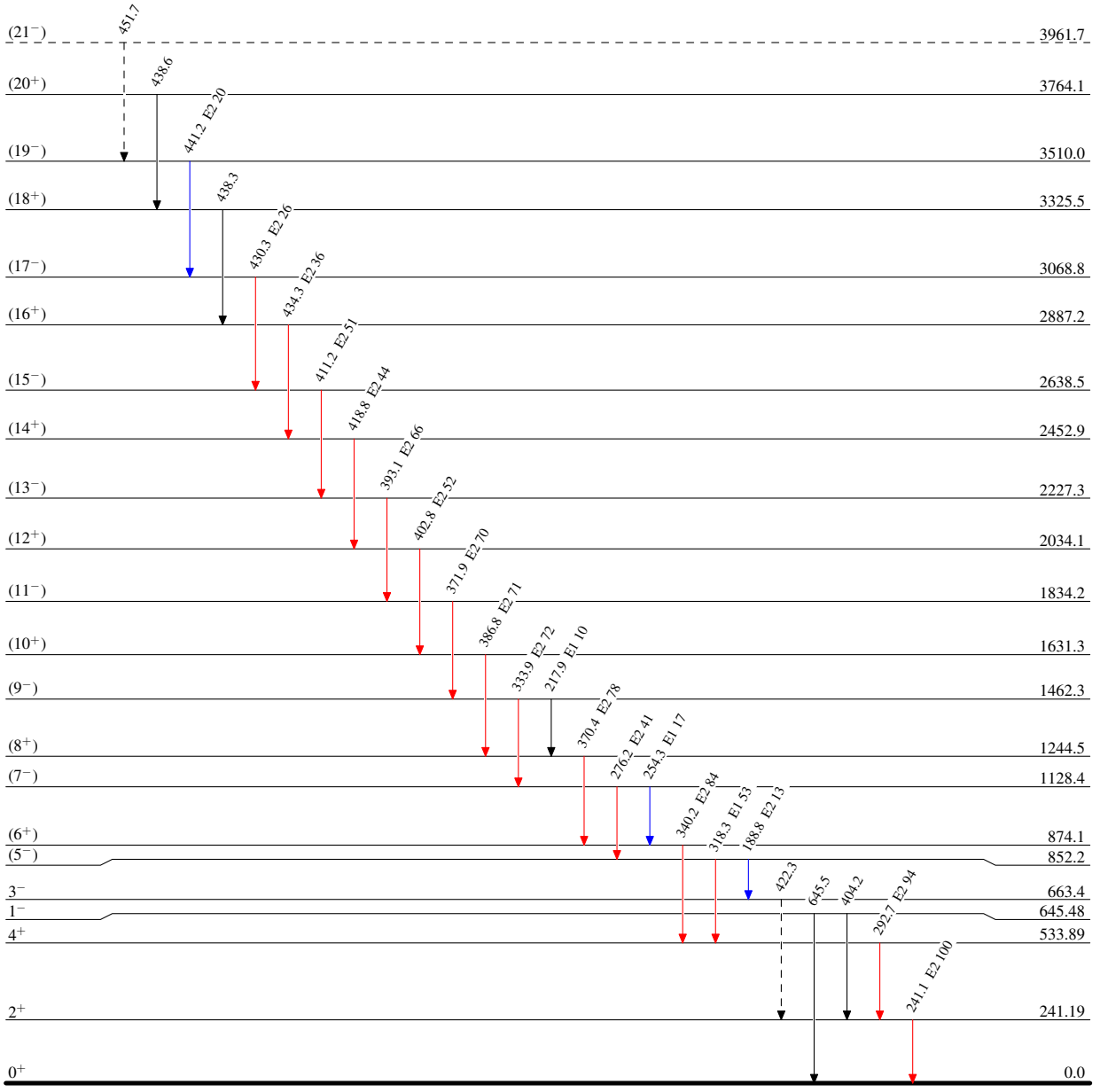
^{232}Th(^{136}Xe,Xγ) 1999Co02,1997Co08

Level Scheme

Intensities: Relative I_γ

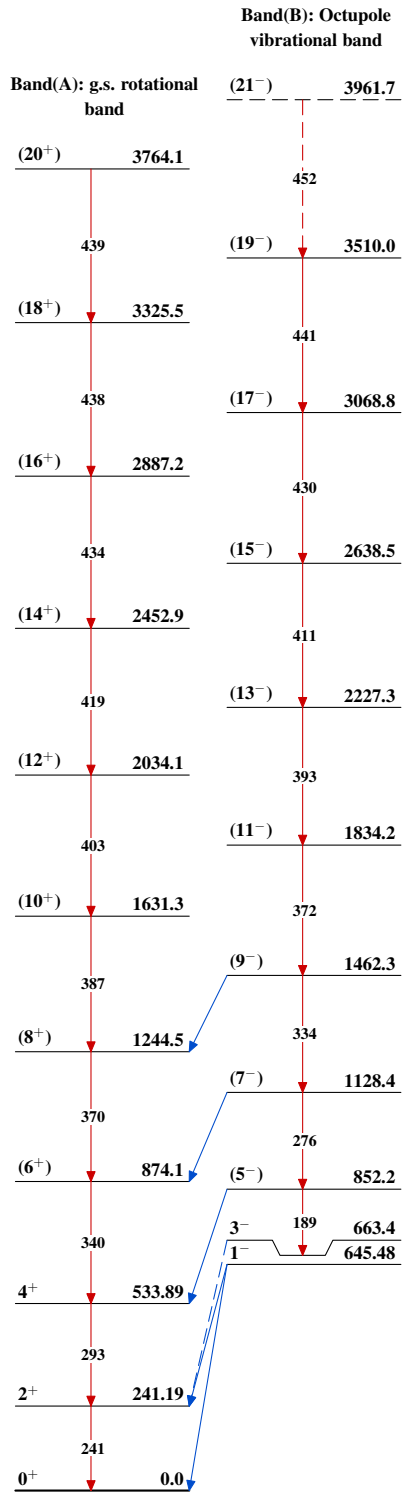
Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{220}_{86}Rn_{134}$

^{232}Th(^{136}Xe,Xγ) 1999Co02,1997Co08



$^{220}_{86}Rn_{134}$