Adopted Levels, Gammas

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

Q(β^-)=−1447 *15*; S(n)=6785 *syst*; S(p)=3948 *5*; Q(α)=6597.1 *10*   2021Wa16
ΔS(n)=100 (2021Wa16).
S(2n)=12806 SY *31*, S(2p)=9913 *5* (2021Wa16).

^{251}Es Levels

Cross Reference (XREF) Flags

A ^{251}Fm ε decay
B ^{255}Md α decay
C ^{250}Cf(α,t)

E(level)[a]	J$^\pi$	T$_{1/2}$	XREF	Comments
0[†]	3/2$^-$	33 h *1*	ABC	%α=0.5 *1*; %ε=99.5 *1* configuration=π3/2$^-$[521] (1978Ah02) T$_{1/2}$: From 1970Ah01. Other: 1.5 days (1956Ha80). %α: Deduced by evaluator from the observed ratio of α-decay to K x-rays I(α)/I(X$_K$)=0.008 *2* (1970Ah01) and K x-rays per electron capture I(X$_K$)/I(ε)=0.64 *5* (2005Ah09). J$^\pi$: Favored α decay to 3/2$^-$ ground state of ^{247}Bk (1979Ah03). Further evidence comes from population of the 3/2$^-$[521] band but not the 7/2$^+$[633] band in electron-capture decay to ^{251}Cf (1970Ah01). Spectroscopic factors measured in ^{250}Cf(α,t) support this assignment.
8.34[‡] *23*	(7/2)$^+$		AB	configuration=π7/2$^+$[633] J$^\pi$: log *ft*=6.75 from (9/2$^-$) ^{251}Fm limits J to 7/2, 9/2, 11/2; Nilsson model gives 7/2$^+$[633] as expected low−energy level. Positive parity based on known M1+E2 transition from 7/2$^-$[514] level.
31.70[†] *20*	5/2$^-$		ABC	
55.85[‡] *23*	(9/2)$^+$		AB	
76.1[†] *3*	7/2$^-$		ABC	
114.08[‡] *24*	(11/2$^+$)		A	
182.6[‡] *3*	(13/2$^+$)		A C	
263.0[‡] *4*	(15/2$^+$)		A	
411[#b] *2*	(1/2$^-$)		C	configuration=π1/2$^-$[521]
452[#b] *2*	(5/2$^-$)		C	
461.40[@] *22*	7/2$^-$		AB	configuration=7/2$^-$[514] J$^\pi$: Favored α decay from 7/2$^-$ ^{255}Md, E1 component of 405.6-keV γ to 9/2$^+$ state and M1 component of 429.7-keV γ to 5/2$^-$ state constrain spin to be 7/2$^-$.
523[@b] *2*	(9/2$^-$)		BC	
548[#b] *2*	(7/2$^-$)		C	
548[#b] *2*	(9/2$^-$)		C	
661[b] *3*	(1/2$^+$)		C	configuration=π1/2$^+$[400] J$^\pi$: Based on spectroscopic factor in ^{250}Cf(α,t).
777.94[c] *24*	(9/2)$^+$		A	configuration=π9/2$^+$[624] J$^\pi$: M1 γ to 7/2$^+$ state and M1+E2 γ to 11/2$^+$ state require 9/2$^+$.
889.10[&] *24*	(11/2)$^+$		A	configuration={π7/2$^+$[633]⊗2$^+$}11/2$^+$

Adopted Levels, Gammas (continued)

^{251}Es Levels (continued)

E(level)^a	J$^\pi$	XREF	Comments
			J$^\pi$: E2 γ to (7/2$^+$) and γ with M1 component to (13/2$^+$) require 11/2$^+$. Positive parity due to E2 decay to (7/2)$^+$ level.
942^{bc} 4	(13/2)$^+$	C	
957.52$^\&$ 24	(13/2)$^+$	A C	J$^\pi$: M1+E2 γ decays to 11/2$^+$, 13/2$^+$, and 15/2$^+$ requires 13/2$^+$. E2 to (9/2)$^+$ state requires positive parity.
1238.95 24	(11/2)$^+$	A	configuration={ν9/2$^-$[734]$\otimes\nu$1/2$^+$[620]$\otimes\pi$3/2$^-$[521]}11/2$^+$ J$^\pi$: M1 γ to 13/2$^+$ and E2 γ to 7/2$^+$ requires 11/2$^+$.
1264.94 24	(11/2)$^+$	A	Interpreted as a three-quasiparticle state, but a configuration could not be definitively assigned. See ^{251}Fm ε decay. J$^\pi$: M1 component of γ to 13/2$^+$ and E2 γ to 7/2$^+$ requires 11/2$^+$.
1301.4 3	(7/2$^+$,9/2,11/2)	A	J$^\pi$: γ rays to (9/2$^+$), (11/2$^+$) levels; log ft=7.6, log$f^{1u}t$=7.1 from (9/2$^-$) ^{251}Fm.
1307.1 3	(7/2$^+$,9/2,11/2$^+$)	A	J$^\pi$: γ rays to (7/2$^+$) and (11/2$^+$) levels.
1357.0 3	(7/2$^+$,9/2,11/2$^+$)	A	J$^\pi$: γ rays to (7/2$^+$) and (11/2$^+$) levels.

† Band(A): π3/2$^-$[521].

‡ Band(B): π7/2$^+$[633].

$^\#$ Band(C): π1/2$^-$[521].

$^@$ Band(D): π7/2$^-$[514].

$^\&$ Band(E): {π7/2$^+$[633]$\otimes$2$^+$}11/2$^+$ γ-vibrational band.

^{a} Determined by least-squares fit to the γ-ray energies, and assuming that the 5/2$^-$ member of the π3/2$^-$[521] band decays to the ground state by a 31.7 2 keV transition (c.f. ^{251}Fm ε decay), unless otherwise noted.

^{b} From ^{250}Cf(α,t).

^{c} Band(F): π9/2$^+$[624].

Adopted Levels, Gammas (continued)

$\gamma(^{251}\text{Es})$

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	$\delta^\dagger$	$\alpha^\ddagger$	Comments
55.85	$(9/2)^+$	47.48 *6*	100	8.34	$(7/2)^+$	M1+E2	0.243 +25−27	125 *9*	α(L)=92 *7*; α(M)=24.1 *18*; α(N)=6.7 *5*; α(O)=1.73 *13*; α(P)=0.311 *20*; α(Q)=0.01213 *20*
461.40	$7/2^-$	385.3 *2*	2.1 *2*	76.1	$7/2^-$	(M1+E2)		0.54 *40*	α(K)=0.39 *34*; α(L)=0.107 *48*; α(M)=0.027 *11*; α(N)=0.0076 *30*; α(O)=0.00197 *81* α(P)=3.7×10⁻⁴ *17*; α(Q)=1.7×10⁻⁵ *14*
		405.55 *9*	68.2 *34*	55.85	$(9/2)^+$	E1+M2	0.179 *9*	0.091 *7*	α(K)=0.066 *5*; α(L)=0.0187 *15*; α(M)=0.0048 *4*; α(N)=0.00136 *11*; α(O)=0.00035 *3* α(P)=6.7×10⁻⁵ *6*; α(Q)=3.5×10⁻⁶ *3* E_γ: Weighted average of 405.6 *1* keV (1978Ah02), 405.5 *3* keV (2000Ah02), and 405.2 *3* keV (2005He27).
		429.7 *1*	5.7 *5*	31.70	$5/2^-$	(M1+E2)		0.40 *30*	α(K)=0.29 *25*; α(L)=0.078 *38*; α(M)=0.0196 *86*; α(N)=0.0055 *24*; α(O)=0.00142 *64* α(P)=2.7×10⁻⁴ *13*; α(Q)=1.3×10⁻⁵ *10*
		453.06 *9*	100	8.34	$(7/2)^+$	E1+M2	0.236 +17−18	0.100 *12*	α(K)=0.072 *8*; α(L)=0.0204 *25*; α(M)=0.0053 *7*; α(N)=0.00147 *18*; α(O)=0.00039 *5* α(P)=7.3×10⁻⁵ *9*; α(Q)=3.9×10⁻⁶ *5* E_γ: Weighted average of 453.1 *1* keV (1978Ah02), 453.0 *3* keV (2000Ah02), and 452.8 *3* keV (2005He27).
777.94	$(9/2)^+$	664.0 *3*	4.3 *8*	114.08	$(11/2^+)$	(M1+E2)		0.125 *88*	α(K)=0.095 *72*; α(L)=0.023 *13*; α(M)=0.0056 *30*; α(N)=0.00157 *82*; α(O)=4.1×10⁻⁴ *22* α(P)=7.8×10⁻⁵ *43*; α(Q)=4.0×10⁻⁶ *29*
		722.1 *2*	21 *2*	55.85	$(9/2)^+$	M1+E2	0.50 +28−35	0.142 *25*	α(K)=0.110 *21*; α(L)=0.024 *4*; α(M)=0.0059 *9*; α(N)=0.00163 *24*; α(O)=0.00043 *7* α(P)=8.2×10⁻⁵ *13*; α(Q)=4.6×10⁻⁶ *9*
		769.6 *1*	100	8.34	$(7/2)^+$	M1		0.1429	α(K)=0.1117 *16*; α(L)=0.0234 *4*; α(M)=0.00573 *8*; α(N)=0.001592 *23*; α(O)=0.000417 *6* α(P)=8.07×10⁻⁵ *12*; α(Q)=4.60×10⁻⁶ *7*
889.10	$(11/2)^+$	706.3 *2*	1.1 *1*	182.6	$(13/2^+)$	(M1+E2)		0.106 *74*	α(K)=0.081 *60*; α(L)=0.019 *11*; α(M)=0.0047 *25*; α(N)=0.00132 *69*; α(O)=3.4×10⁻⁴ *19* α(P)=6.6×10⁻⁵ *37*; α(Q)=3.4×10⁻⁶ *25*
		775.0 *1*	≈3.9	114.08	$(11/2^+)$	(M1+E2)		0.084 *57*	α(K)=0.064 *46*; α(L)=0.0148 *82*; α(M)=0.0037 *20*; α(N)=1.02×10⁻³ *54*; α(O)=2.7×10⁻⁴ *15* α(P)=5.1×10⁻⁵ *29*; α(Q)=2.7×10⁻⁶ *19*
		833.3 *1*	29 *2*	55.85	$(9/2)^+$	M1+E2	2.21 +40−28	0.039 *4*	α(K)=0.028 *4*; α(L)=0.0078 *6*; α(M)=0.00197 *14*; α(N)=0.00055 *4*; α(O)=0.000142 *10* α(P)=2.66×10⁻⁵ *20*; α(Q)=1.21×10⁻⁶ *13*
		880.8 *1*	100	8.34	$(7/2)^+$	E2		0.0209	α(K)=0.01447 *21*; α(L)=0.00476 *7*; α(M)=0.001231 *18*; α(N)=0.000344 *5*; α(O)=8.86×10⁻⁵ *13* α(P)=1.627×10⁻⁵ *23*; α(Q)=6.28×10⁻⁷ *9*
957.52	$(13/2)^+$	694.5 *3*	12 *2*	263.0	$(15/2^+)$	(M1+E2)		0.111 *78*	α(K)=0.084 *63*; α(L)=0.020 *11*; α(M)=0.0050 *26*;

Adopted Levels, Gammas (continued)

γ(^{251}Es) (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	$\delta^\dagger$	$\alpha^\ddagger$	Comments
									α(N)=0.00138 73; α(O)=3.6×10^{-4} 19 α(P)=6.9×10^{-5} 38; α(Q)=3.5×10^{-6} 26
957.52	(13/2)$^+$	775.0 1	≈32	182.6	(13/2$^+$)	(M1+E2)		0.084 57	α(K)=0.064 46; α(L)=0.0148 82; α(M)=0.0037 20; α(N)=1.02×10^{-3} 54; α(O)=2.7×10^{-4} 15 α(P)=5.1×10^{-5} 29; α(Q)=2.7×10^{-6} 19
		843.4 1	92 8	114.08	(11/2$^+$)	M1+E2	0.72 $+22-20$	0.081 12	α(K)=0.063 10; α(L)=0.0138 17; α(M)=0.0034 4; α(N)=0.00095 11; α(O)=0.00025 3 α(P)=4.8×10^{-5} 6; α(Q)=2.6×10^{-6} 4
		901.6 1	100	55.85	(9/2)$^+$	E2		0.0200	α(K)=0.01392 20; α(L)=0.00449 7; α(M)=0.001158 17; α(N)=0.000323 5; α(O)=8.34×10^{-5} 12 α(P)=1.533×10^{-5} 22; α(Q)=6.00×10^{-7} 9
1238.95	(11/2)$^+$	281.4 1	8.6 6	957.52	(13/2)$^+$	M1		2.24	α(K)=1.741 25; α(L)=0.371 6; α(M)=0.0914 13; α(N)=0.0254 4; α(O)=0.00666 10 α(P)=0.001288 18; α(Q)=7.36×10^{-5} 11
		349.9 1	100	889.10	(11/2)$^+$	M1		1.223	α(K)=0.953 14; α(L)=0.202 3; α(M)=0.0498 7; α(N)=0.01384 20; α(O)=0.00363 5 α(P)=0.000702 10; α(Q)=4.00×10^{-5} 6
		461.0 1	11 1	777.94	(9/2)$^+$	(M1+E2)		0.33 25	α(K)=0.24 21; α(L)=0.063 32; α(M)=0.0160 73; α(N)=0.0044 21; α(O)=0.00116 54 α(P)=2.2×10^{-4} 11; α(Q)=1.05×10^{-5} 82
		1056.2 4	0.7 1	182.6	(13/2$^+$)	(M1+E2)		0.038 23	α(K)=0.029 19; α(L)=0.0065 35; α(M)=0.00160 83; α(N)=4.4×10^{-4} 23; α(O)=1.16×10^{-4} 61 α(P)=2.2×10^{-5} 12; α(Q)=1.20×10^{-6} 76
		1124.9 2	3.3 4	114.08	(11/2$^+$)	(M1+E2)		0.032 19	α(K)=0.025 16; α(L)=0.0055 29; α(M)=0.00135 69; α(N)=3.8×10^{-4} 19; α(O)=9.8×10^{-5} 51 α(P)=1.89×10^{-5} 99; α(Q)=1.02×10^{-6} 63
		1183.0 2	8.8 6	55.85	(9/2)$^+$	(M1+E2)		0.028 17	α(K)=0.022 13; α(L)=0.0048 25; α(M)=0.00119 60; α(N)=3.3×10^{-4} 17; α(O)=8.6×10^{-5} 44 α(P)=1.65×10^{-5} 86; α(Q)=9.0×10^{-7} 54
		1230.6 2	16 1	8.34	(7/2)$^+$	E2		0.01111	α(K)=0.00823 12; α(L)=0.00214 3; α(M)=0.000539 8; α(N)=0.0001502 21; α(O)=3.89×10^{-5} 6 α(P)=7.29×10^{-6} 11; α(Q)=3.34×10^{-7} 5
1264.94	(11/2)$^+$	307.4 1	9.7 8	957.52	(13/2)$^+$	(M1+E2)		1.01 74	α(K)=0.72 65; α(L)=0.214 77; α(M)=0.055 17; α(N)=0.0153 46; α(O)=0.0040 13 α(P)=7.3×10^{-4} 28; α(Q)=3.2×10^{-5} 26
		375.8 1	100	889.10	(11/2)$^+$	M1		1.005	α(K)=0.783 11; α(L)=0.1661 24; α(M)=0.0408 6; α(N)=0.01136 16; α(O)=0.00297 5 α(P)=0.000575 8; α(Q)=3.28×10^{-5} 5
		487.1 2	3.0 5	777.94	(9/2)$^+$	(M1+E2)		0.28 21	α(K)=0.21 18; α(L)=0.054 28; α(M)=0.0136 64; α(N)=0.0038

Adopted Levels, Gammas (continued)

$\gamma(^{251}\mathrm{Es})$ (continued)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	$\alpha^\ddagger$	Comments
								18; $\alpha(\mathrm{O})=9.8\times10^{-4}$ 47
								$\alpha(\mathrm{P})=1.86\times10^{-4}$ 96; $\alpha(\mathrm{Q})=9.1\times10^{-6}$ 70
1264.94	$(11/2)^+$	1151.0 2	4.1 5	114.08	$(11/2^+)$	(M1+E2)	0.030 18	$\alpha(\mathrm{K})=0.023$ 15; $\alpha(\mathrm{L})=0.0052$ 27; $\alpha(\mathrm{M})=0.00127$ 65; $\alpha(\mathrm{N})=3.5\times10^{-4}$
								18; $\alpha(\mathrm{O})=9.3\times10^{-5}$ 47
								$\alpha(\mathrm{P})=1.78\times10^{-5}$ 93; $\alpha(\mathrm{Q})=9.6\times10^{-7}$ 59
		1209.1 2	9.5 8	55.85	$(9/2)^+$	(M1+E2)	0.027 16	$\alpha(\mathrm{K})=0.021$ 13; $\alpha(\mathrm{L})=0.0045$ 23; $\alpha(\mathrm{M})=0.00112$ 56; $\alpha(\mathrm{N})=3.1\times10^{-4}$
								16; $\alpha(\mathrm{O})=8.1\times10^{-5}$ 41
								$\alpha(\mathrm{P})=1.56\times10^{-5}$ 81; $\alpha(\mathrm{Q})=8.5\times10^{-7}$ 51
		1256.6 2	18 1	8.34	$(7/2)^+$	E2	0.01069	$\alpha(\mathrm{K})=0.00794$ 12; $\alpha(\mathrm{L})=0.00204$ 3; $\alpha(\mathrm{M})=0.000514$ 8;
								$\alpha(\mathrm{N})=0.0001431$ 20; $\alpha(\mathrm{O})=3.71\times10^{-5}$ 6
								$\alpha(\mathrm{P})=6.96\times10^{-6}$ 10; $\alpha(\mathrm{Q})=3.21\times10^{-7}$ 5
1301.4	$(7/2^+,9/2,11/2)$	1245.6 4	16 2	55.85	$(9/2)^+$			
		1293.0 3	100	8.34	$(7/2)^+$			
1307.1	$(7/2^+,9/2,11/2^+)$	1193.0 2	21 2	114.08	$(11/2^+)$			
		1251.2 2	45 4	55.85	$(9/2)^+$			
		1298.8 3	100	8.34	$(7/2)^+$			
1357.0	$(7/2^+,9/2,11/2^+)$	1242.8 4	52 5	114.08	$(11/2^+)$			
		1301.2 3	100 1	55.85	$(9/2)^+$			
		1348.6 3	33 3	8.34	$(7/2)^+$			

† If No value given it was assumed $\delta=1.00$ for E2/M1, $\delta=1.00$ for E3/M2 and $\delta=0.10$ for the other multipolarities.
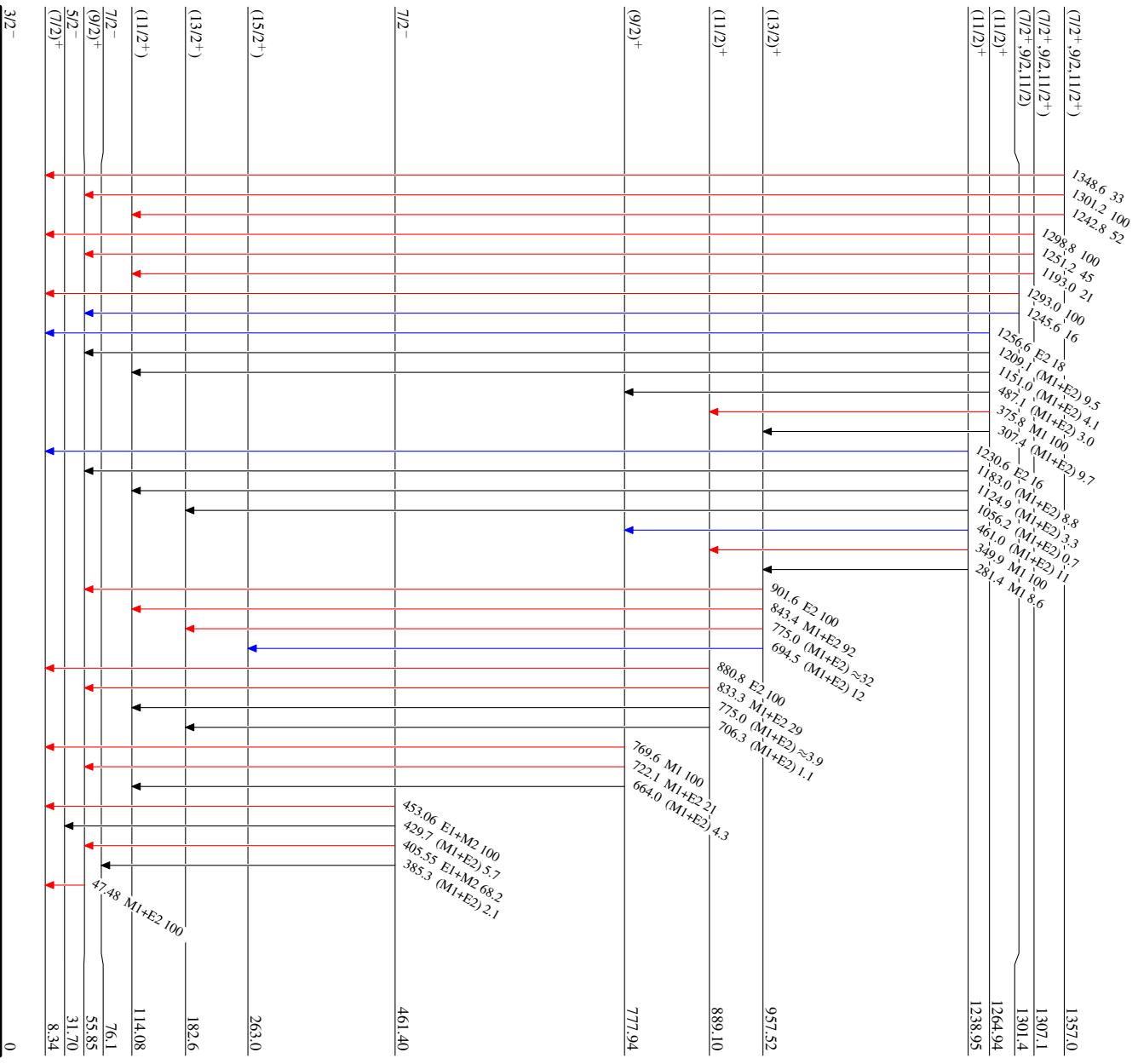‡ Additional information 1.

From ENSDF

Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified

Legend

$\mathrm{I}_\gamma < 2\% \times \mathrm{I}_\gamma^{max}$

$\mathrm{I}_\gamma < 10\% \times \mathrm{I}_\gamma^{max}$

$\mathrm{I}_\gamma > 10\% \times \mathrm{I}_\gamma^{max}$

$(7/2^+,9/2,11/2^+)$

$(7/2^-,9/2,11/2^+)$
$(7/2^+,9/2,11/2)$

$(11/2)^+$
$(11/2)^+$

$(9/2)^+$

$(11/2)^+$

$(13/2)^+$

$(15/2^+)$

$7/2^-$

$(9/2)^+$

$(11/2)^+$
$(13/2)^+$
$7/2^-$
$(9/2)^+$
$7/2^-$
$5/2^-$
$(7/2)^+$

$3/2^-$

1348.6 33
1301.2 100
1242.8 52

1298.8 100
1251.2 45
1193.0 21

1293.0 100
1245.6 16

1256.6 E2 18
1209.1 (M1+E2) 9.5
1151.0 (M1+E2) 4.1
487.1 (M1+E2) 3.0
375.8 M1 100
307.4 (M1+E2) 9.7

1230.6 E2 16
1183.0 (M1+E2) 8.8
1124.9 (M1+E2) 3.3
1056.2 (M1+E2) 0.7
461.0 (M1+E2) 11
349.9 M1 100
281.4 M1 8.6

901.6 E2 100
843.4 M1+E2 92
775.0 (M1+E2) ≈32
694.5 (M1+E2) 12

880.8 E2 100
833.3 M1+E2 29
775.0 (M1+E2) ≈3.9
706.3 (M1+E2) 1.1

769.6 M1 100
722.1 M1+E2 21
664.0 (M1+E2) 4.3

453.06 E1+M2 100
429.7 (M1+E2) 5.7
405.55 E1+M2 68.2
385.3 (M1+E2) 2.1

47.48 M1+E2 100

1238.95
1264.94
1301.4
1307.1
1357.0

777.94

889.10

957.52

461.40

263.0

182.6

114.08
76.1
55.85
31.70
8.34

0   33 h l

Adopted Levels, Gammas

Band(E): $\{\pi 7/2^+[633]\otimes 2^+\}1$
$1/2^+$ γ-vibrational
band

Band(F): $\pi 9/2^+[624]$

(13/2)$^+$ 957.52

(13/2)$^+$ 942

(11/2)$^+$ 889.10

(9/2)$^+$ 777.94

Band(C): $\pi 1/2^-[521]$

(9/2$^-$)   548

Band(D): $\pi 7/2^-[514]$

(9/2$^-$)   523

(5/2$^-$)   452

7/2$^-$ 461.40

(1/2$^-$)   411

Band(B): $\pi 7/2^+[633]$

(15/2$^+$)   263.0

(13/2$^+$)   182.6

(11/2$^+$)   114.08

Band(A): $\pi 3/2^-[521]$

7/2$^-$ 76.1

(9/2)$^+$ 55.85

5/2$^-$ 31.70

47

(7/2)$^+$ 8.34

3/2$^-$ 0

$^{251}_{99}$Es$_{152}$