Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja, E. A. Mccutchan	NDS 121, 695 (2014)	30-Sep-2013

Q(β^-)=−7.5 *17*; S(n)=6364.9 *14*; S(p)=4831.2 *16*; Q(α)=5438.8 *10* 2012Wa38
S(2n)=11902.5 *14*; S(2p)=1.166×10^4 *7* (2012Wa38).

Theoretical and Systematic studies:

2013Ta07: Partial $T_{1/2}$ for cluster decay of ^{243}Am using semi-empirical model.
2012Ni16: α decay $T_{1/2}$ for transitions from ground state to favored rotational bands using Multicluster Channel Model.
2012Ro34: $T_{1/2}$ and fission barriers with a generalized liquid drop model.
2012Pr13: Maxwellian-averaged cross sections and their uncertainties.
2012Sa05: Partial $T_{1/2}$, α-branching ratio to individual residual states using CPPMDN (Coulomb and proximity potential model for deformed nuclei).
2012Ta10: Partial $T_{1/2}$, Q-values, branching ratios using a semi-empirical with the one-parameter model dependence on cluster radius.
2011He12: Compilation of $T_{1/2}$, J^π, and energy for long lived isomers for Z≥82.
2011Zh36: Systematic analysis and calculated partial half life of α decay to members of favored band. Accurate expressions are proposed for the evaluation of partial half-lives of these transitions based on microscopic quantum tunneling theory.
2010Ni02: Systematic analysis calculations of $T_{1/2}$ and relative intensities of α decay within the generalized density-dependent cluster model.
2009Mo18: Qε-values and fission barriers in the daughter nuclides using the macroscopic-microscopic finite-range liquid-drop model.
2007Oh07,2007Ro08,2004Ro01,1985Lo17: Spontaneous fission $T_{1/2}$.
2003De17: Alpha-decay anisotropy.
2001YaZU,1992Gr16,1990Bh02,1987Gu03,1984Ku05,1984Oh09,1981Re06, 1980Ku14,1980Bj02,1976Ga11,1974Ba73,1974Ga41,1973Br04,1972We09: Fission-barrier parameters.
2000CaZU: Cross-sections for ^{242}Am(n,γ) and ^{242}Am(n,F) for E(n)<20 MeV.
1985Po12: Studied decay by heavy-ion emission and partial half-life for this mode.
1994Pi12,1984Ni04: Ternary fission with light particle emission.
1988Io05: Probability of pion decay relative to spontaneous fission.
1982Be59: Level densities.
1980Ka41: Hindrance factors for unhindered alpha transitions.
1980Bo10: Studied effects of nuclear deformation on the electron states and conversion coefficients.
1977Ra15: Q values.
1974Ba18, 1973Ra06, 1972El21: μ values.
1976Ch22, 1971Ko31: Single-particle level energies.
1971Vo13: Penetration matrix element for the 84-keV E1 transition.
1970Bo27: The M1 transition probabilities in the ground-state band.
Other Experimental studies:
2008PaZR: ^{242}Am(n,f): Preliminary measurement on a 47 μg target using the Los Alamos Science Center, DANCE detector array (Detector for Advanced Neutron Capture Experiments). Fission tagging detector reduces gamma rays associated with the (n,f). (n,γ) data are barely visible over the background after subtracting gamma rays associated with fission.
2008BrZW: Cross section obtained for thermal capture and fission cross sections using the post-irradiation mass spectrometry analysis for ^{242m}Am(n,γ) and the fission chamber measurements for ^{242m}Am(n,f). Measurements were performed at the High Flux Reactor of Laue Langevin Institut in Grenoble, France.
2003An18: The cross-sections for ^{242}Am(n,γ), E=5-100 keV were analyzed.
2001Fi15,1999Bo08: The cross-section for ^{242}Am(thermal n,γ) was measured. See also 1972Ih01 for measured effective cross-sections.
1997Li27,1996Li22: The hyperfine and nuclear quadrupole interactions were studied by optical spectral hole-burning technique.
1993Oh03: The excitation function and mass yields for proton induced fission with E(p)=10 *16*16 MeV incident energy were measured, and asymmetric fission-barrier height was deduced.

Adopted Levels, Gammas (continued)

1986Al04: ^{243}Am(γ,F); E(γ)=11.5 MeV: induced fission yields were measured; neutron and fission widths were deduced.
1981Wa05: Delayed neutron yields in ^{242}Am(n,fission) were measured.
1981Be15: Neutron-induced fission cross sections relative to ^{235}U were measured with E(n)=0.2 *30*30 MeV neutrons.
1978Al33: ^{243}Am(γ,F); E(γ)=100-1000 MeV: cross sections were measured and fissionability deduced.
α: Additional information 1.

^{243}Am Levels

Cross Reference (XREF) Flags

A	^{247}Bk α decay	D	^{242}Pu(^{3}He,d),(α,t)
B	^{243}Pu β^- decay	E	^{243}Cm ε decay
C	Coulomb excitation		

E(level)†	J$^\pi$‡	$T_{1/2}$	XREF	Comments
0.0#	5/2⁻	7364 y *22*	ABCDE	%α=100; %SF=3.7×10^{-9} *9* Q=+2.86 *3*; μ=+1.503 *14* J$^\pi$: spin measured from study of hyperfine structure of atomic spectral lines (1954Co19); parity is from Nilsson orbital assignment which is from agreement of measured μ with the calculated value. μ(^{243}Am)=+1.503 *14* was obtained by 1990Iz01 from μ(^{241}Am)/μ(^{243}Am)=1.052 *7* and μ(^{241}Am)=+1.58 *1* (1990Iz01); hyperfine structure and isotope shift measurements by LASER spectroscopy. Compiled by 2011StZZ. Others: +1.61 *4* (1966Ar04, 1956Ma31). Q(^{243}Am)=+2.86 *3* from Q(^{241}Am)/Q(^{243}Am)=1.10 *2* and Q(^{241}Am)=+3.14 *5*, measured by 1990Iz01. Compiled by 2011StZZ. Others: +4.2 *13* (1956Ma31). $T_{1/2}$: $T_{1/2}$= 7357 y *23* was determined from relative activity method using a value of $T_{1/2}$(^{241}Am)=432.2 y *7* by 2007Ag02. Using the adopted $T_{1/2}$(^{241}Am)=432.6 y *6* from 2005Ma88, evaluators have recalculated $T_{1/2}$(^{243}Am)=7364 y *22*. Others: 7370 y *40* (1968Br22), 7380 y *17* (1974Po17) , 7360 y *42* (1980Ag05, 1986Ag01). Earlier measurements: 1953Di27, 1954As05, 1957Bu49, 1958Wa69, 1959Ba22, 1960Be10. $T_{1/2}$(SF)=2.0×10^{14} y *5* (1966Gv01). Other measurement: 3.3×10^{13} y *3* (1966Al23). Measurement of 1966Gv01 was recommended by 1989Ho24. For a compilation and $T_{1/2}$(SF) systematics, see 1997Ro12. %α/%SF=2.66×10^{10} *50* was measured by 2002Sa53. This ratio yields %SF=3.8×10^{-9} *7* which agrees well with the adopted branching of %SF=3.7×10^{-9} *9*, obtained from $T_{1/2}$(total)=7364 y *22* and $T_{1/2}$(SF)=2.0×10^{14} y *5*.
42.20# *22*	7/2⁻	≈40 ps	ABC	J$^\pi$: 42.2γ is M1+E2; energy fit to the band. $T_{1/2}$: from B(E2)=6.89 *10* in Coulomb Excitation and δ≈0.28.
84.00@ *16*	5/2⁺	2.34 ns *7*	AB D	Q=4.1 *12*; μ=+2.9 *2* μ value by Mossbauer spectroscopy (1986Sa10). Compiled by 2011StZZ. Q value by Mossbauer spectroscopy (1989Ra17). Compiled by 2011StZZ. J$^\pi$: 84.0γ to 5/2⁻ is E1. $T_{1/2}$: From delayed β^- −84 keV γ coincidence measurement (1969Fr01) in ^{243}Pu β-decay. The resonance of the 84.0γ was observed, and from the measured isomeric shift, Δ<r^2>/ <r^2>=−9×10^{-4} *3* was calculated by 1969Ka17.
96.4# *4*	9/2⁻		B D	J$^\pi$: level is Coulomb excited; γ′s to 5/2⁻, 7/2⁻ states; energy fit to the band; (^{3}He,d), (α,t) reaction data.
109.22@ *17*	7/2⁺		AB	J$^\pi$: γ′s to 5/2⁻, 7/2⁻ states; Alaga rule.
143.39@ *24*	(9/2⁺)		AB D	J$^\pi$: γ′s to 7/2± states; (^{3}He,d) and (α,t) reaction data.
162.3# *10*	11/2⁻		C	J$^\pi$: Level is Coulomb excited; energy fit to the band.

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Adopted Levels, Gammas (continued)

^{243}Am Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$	XREF	Comments
189.4[@] *6*	(11/2$^+$)		AB	J^{π}: band member.
238[#] *1*	13/2$^-$		C	J^{π}: level is Coulomb excited; energy fit to the band.
244[@] *2*	(13/2$^+$)		D	J^{π}: (^{3}He,d) and (α,t) reaction data.
265[&] *10*	3/2$^-$		A D	J^{π}: (M1+E2) γ to 5/2$^-$ level; (^{3}He,d) and (α,t) reaction data; α hindrance factor=1.14 in 3/2$^-$ ^{247}Bk decay.
300[&] *2*	(5/2$^-$)		A D	J^{π}: (^{3}He,d) and (α,t) reaction data.
345[&] *1*	(7/2$^-$)		A D	J^{π}: (^{3}He,d) and (α,t) reaction data.
383 *2*			D	
407.1 *5*			B	
423 *5*			D	
445 *3*			D	
465.64[a] *18*	7/2$^+$		B D	XREF: D(?). J^{π}: 381.7γ to 5/2$^+$ state is M1; 356.4γ to 7/2$^+$ is (M1+E2); 322.2γ to (9/2$^+$) level.
466[&] *5*	(11/2$^-$)		D	J^{π}: (^{3}He,d) reaction data.
532.4[a] *3*	(9/2$^+$)		B D	J^{π}: γ's to 5/2$^+$, (11/2$^+$) states; (^{3}He,d) and (α,t) reaction data.
586 *5*			D	
704[a] *2*	(13/2$^+$)		D	J^{π}: (^{3}He,d) and (α,t) reaction data.
724 *4*			D	
933 *4*			D	
977 *3*	(9/2$^-$)		D	J^{π}: 9/2$^-$,7/2[514] configuration is suggested by 1970El07 from (^{3}He,d) and (α,t) reaction data.
1053 *3*			D	
1123 *3*			D	
1174 *3*			D	
1222 *3*			D	
2.3×10^3 *2*		5.5 μs *5*		%SF≤100 E(level): recommended by 1980Bj02. Second minimum of the fission barrier was calculated: E=1.80 MeV (1972We09), 2.10 MeV *20* (1973Br04), 2.0 MeV (1987Gu03), 1.80 MeV (1990Bh02). $T_{1/2}$: weighted average of: 6.5 μs *10* (1970Po01), 5.2 μs *5* (1972Wo07), and 6 μs *3* (1973Na35). Other: 1973Br04. Only SF decay was observed. Search by 1976Be55 for conversion electrons of 267-keV γ transition from the 3/2$^-$ state in ^{243}Am to the ground state yielded negative results. Assignment: ^{243}Am(d,pn) excit (1970Po01,1971Br39); ^{244}Pu(p,2n) excit (1972Wo07); ^{242}Pu(t,2n) excit (1972Br35). From comparison of their experimental and calculated excitation function for ^{243}Am(γ,γ') reaction, 1971Ga39 deduced that this shape isomer was populated predominantly from levels lying above the fission barrier. Cross-sections for populating the isomer via ^{243}Am(n,n') reaction were measured by 1971Ga35. See 1980Bj02 for an extensive review of spontaneously fissioning isomers. See also 1977VaYN. Experimental searches for α and γ decays from spontaneously fissioning isomers were reviewed by 1992Ma34.

† From least square fit of adopted γ energies and levels observed in Coulomb excitation and (^{3}He,d), (α,t) reactions.

‡ Assignments derived from (^{3}He,d), (α,t) reactions are based on comparison of experimental and theoretical spectroscopic factors, and on (α,t)/(^{3}He,d) cross-section ratios which were used to obtain information on the L values.

Band(A): 5/2[523] band member. α=6.0.

@ Band(B): 5/2[642] band member. Abnormal value of band parameter, α=3.9, suggests strong Coriolis coupling. See 1969Fr01 for

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Adopted Levels, Gammas (continued)

^{243}Am Levels (continued)

calculated level energies including Coriolis interactions among the 5/2[642], 7/2[633], and 9/2[624] orbits.

[&] Band(C): 3/2[521] band member. α=6.7.

[a] Band(D): 7/2[633] band member. α=7.4. See 1969Fr01 for discussion on Coriolis coupling with the 5/2[622] and 9/2[624] bands.

$\gamma(^{243}Am)$

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ	α	Comments
42.20	7/2⁻	42.2 *5*	100	0.0	5/2⁻	M1+E2	≈0.28	≈149	α(L)≈110; α(M)≈28.9; α(N)≈7.9 α(O)≈1.94; α(P)≈0.336; α(Q)≈0.0116 B(E2)(W.u.)≈570; B(M1)(W.u.)≈0.045
84.00	5/2⁺	41.8 *2*	3.3 *3*	42.20	7/2⁻	[E1]		1.33 *3*	α(L)=0.991 *19*; α(M)=0.252 *5*; α(N)=0.0675 *13* α(O)=0.0157 *3*; α(P)=0.00231 *5* α(Q)=6.32×10^{-5} *11* B(E1)(W.u.)=2.6×10^{-5} *3*
		84.0 *2*	100	0.0	5/2⁻	E1		0.214 *4*	α(L)=0.1605 *25*; α(M)=0.0397 *6*; α(N)=0.01072 *17* α(O)=0.00257 *4*; α(P)=0.000422 *7* α(Q)=1.494×10^{-5} *23* B(E1)(W.u.)=9.7×10^{-5} *3*
96.4	9/2⁻	54 *1*	≤100	42.20	7/2⁻	[M1+E2]		1.8×10^2 *15*	α(L)=1.3×10^2 *11*; α(M)=4.E1 3; α(N)=10 *9* α(O)=2.4 *20*; α(P)=0.4 *3*; α(Q)=0.0037 *22*
		96.4 *4*	60 *10*	0.0	5/2⁻	(E2)		20.4 *5*	α(L)=14.8 *4*; α(M)=4.15 *10*; α(N)=1.15 *3* α(O)=0.274 *7*; α(P)=0.0438 *11*; α(Q)=0.000152 *4*
109.22	7/2⁺	(25.2 *3*)		84.00	5/2⁺				E_γ: γ not observed. Eγ is from level scheme in ^{243}Pu β^- decay.
		67 *1*	100 *50*	42.20	7/2⁻	[E1]		0.386 *17*	α(L)=0.290 *13*; α(M)=0.072 *3*; α(N)=0.0194 *9* α(O)=0.00463 *20*; α(P)=0.00074 *3* α(Q)=2.41×10^{-5} *9*
		109.2 *2*	70 *7*	0.0	5/2⁻	[E1]		0.1083	α(L)=0.0813 *12*; α(M)=0.0200 *3*; α(N)=0.00541 *8* α(O)=0.001310 *20*; α(P)=0.000221 *4* α(Q)=8.52×10^{-6} *13*
143.39	(9/2⁺)	≈34		109.22	7/2⁺				
		101.3		42.20	7/2⁻				E_γ: γ was obscured by Kα_2 x-ray in the ^{243}Pu β- decay. Energy is from level scheme. Authors (1969Ho10) report excess value of the observed IKα_2 x-ray/ IKα1− x-ray to be 101 γ intensity.
265	3/2⁻	265 *10*	100	0.0	5/2⁻	(M1+E2)		1.1 *8*	α(K)=0.8 *7*; α(L)=0.23 *7*; α(M)=0.060 *15*; α(N)=0.016 *4* α(O)=0.0041 *11*; α(P)=0.00074 *23* α(Q)=3.E−5 *3* E_γ,I_γ: From ^{247}Bk α decay.

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Adopted Levels, Gammas (continued)

γ(^{243}Am) (continued)

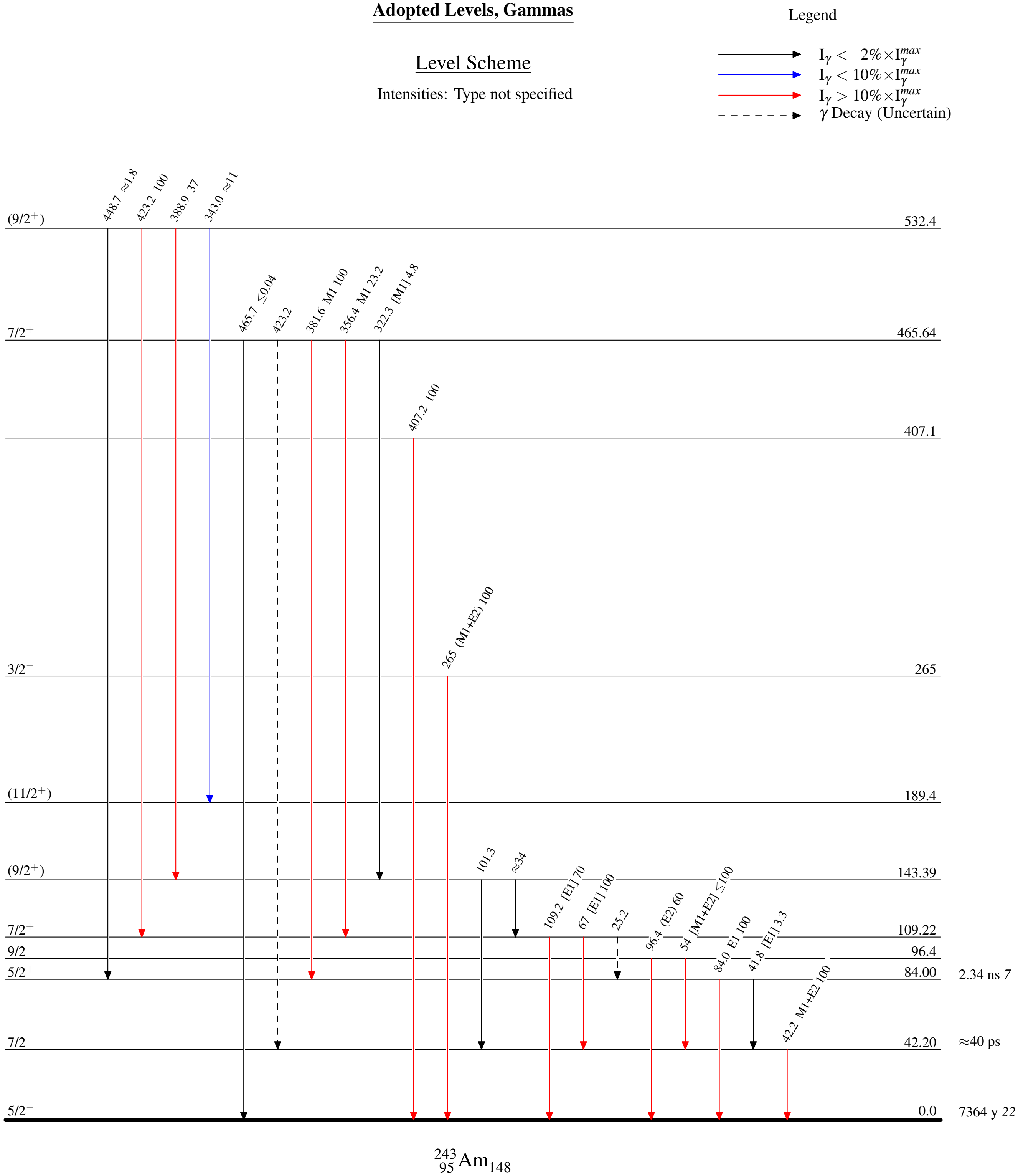
E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α	Comments
407.1		407.2 *5*	100	0.0	5/2⁻			
465.64	7/2⁺	322.3 *2*	4.8 *4*	143.39	(9/2⁺)	[M1]	1.071	α(K)=0.845 *12*; α(L)=0.1699 *24*; α(M)=0.0414 *6*; α(N)=0.01131 *16* α(O)=0.00285 *4*; α(P)=0.000544 *8*; α(Q)=3.45×10^{-5} *5*
		356.4 *2*	23.2 *12*	109.22	7/2⁺	M1	0.812	α(K)=0.641 *9*; α(L)=0.1286 *19*; α(M)=0.0313 *5*; α(N)=0.00856 *12* α(O)=0.00215 *3*; α(P)=0.000412 *6*; α(Q)=2.61×10^{-5} *4*
		381.6 *2*	100 *4*	84.00	5/2⁺	M1	0.674	α(K)=0.532 *8*; α(L)=0.1066 *15*; α(M)=0.0259 *4*; α(N)=0.00709 *10* α(O)=0.00178 *3*; α(P)=0.000341 *5*; α(Q)=2.16×10^{-5} *3*
		423.2#@ *2*		42.20	7/2⁻			
		465.7 *5*	≤0.04	0.0	5/2⁻			
532.4	(9/2⁺)	343.0 *5*	≈11	189.4	(11/2⁺)			
		388.9 *3*	37 *7*	143.39	(9/2⁺)			
		423.2# *3*	100 *11*	109.22	7/2⁺			
		448.7 *5*	≈1.8	84.00	5/2⁺			

† From ^{243}Pu β^- decay, unless otherwise noted.
‡ From ^{243}Pu β^- and ^{247}Bk α decays.
# Multiply placed.
@ Placement of transition in the level scheme is uncertain.

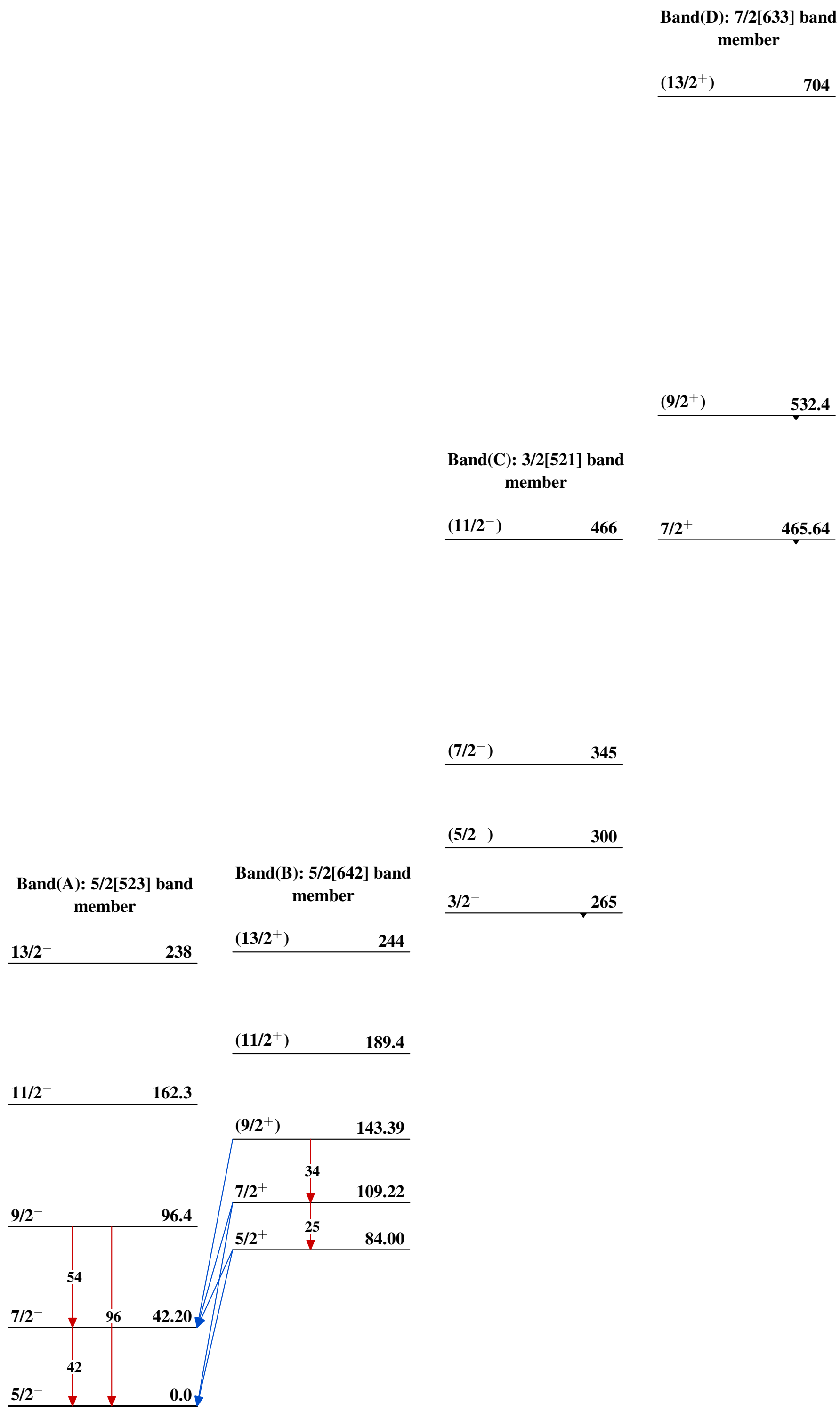
Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified



Adopted Levels, Gammas



$^{243}_{95}Am_{148}$