^{258}Md α decay (51.50 d) 1993Mo18

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 156, 1 (2019)	31-Jan-2019

Parent: ^{258}Md: E=0.0; J^π=(8$^-$); $T_{1/2}$=51.50 d *29*; Q(α)=7271.3 *19*; %α decay=100.0

^{258}Md-J^π,$T_{1/2}$: From ^{258}Md Adopted Levels in the ENSDF database (August 2017 update). Proposed configuration=π7/2[514]+ν9/2[615], K^π=8$^-$.

^{258}Md-Q(α): From 2017Wa10.

^{258}Md-%α decay: %α=100 for ^{258}Md α decay.

1993Mo18: measured Eα, Iα, Eγ, Iγ, $\alpha\gamma$-coin.

2007Sa02: theoretical structure analysis based on particle plus rotor model and Gallagher-Moszkowski rules, assigned J^π and bands.

^{254}Es Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0[#]	(7$^+$)	275.7 d *5*	$T_{1/2}$: from Adopted Levels.
80.1[#] *1*	(8$^+$)		J^π: large lower limit for HF is consistent with 8$^+$ member of g.s. rotational band, however, other possibilities are not excluded.
171.1[#] *1*	(9$^+$)		J^π: large lower limit for HF is consistent with 9$^+$ member of g.s. rotational band. Note that there is a large non-physical negative transition intensity balance at the 171-keV level.
214.7? *2*			J^π: 6$^-$ bandhead (1993Mo18) with configuration=π3/2[521]$\otimes\nu$9/2[615], but 2007Sa02 analysis did not support this assignment, as the calculated energy for the bandhead for this configuration is above 350 keV.
289.9? *3*	(7$^+$)		J^π: 1993Mo18 suggested 7$^-$ member of K^π=6$^-$ band.
376.8 *1*	(8$^+$)		The gamma decay of this level is not fully known. J^π: 8$^-$ member of 6$^-$ band (1993Mo18), but 8$^+$ in the theoretical analysis by 2007Sa02 with configuration=π7/2[633]$\otimes\nu$9/2[615].
403.8 *3*	(7$^-$)		The gamma decay of this level is largely unknown. J^π: (7$^-$,8$^-$) (1993Mo18); 7$^-$ in the theoretical analysis by 2007Sa02 with configuration=π7/2[514]$\otimes\nu$7/2[613].
447.9 *1*	(8$^-$)		
469.2 *2*			J^π: 9$^-$ member of 6$^-$ band (1993Mo18).

[†] From least-squares fit to Eγ values.

[‡] From Adopted Levels. Assignments proposed by 1993Mo18 are given under comments. Also assignments proposed in the theoretical analysis by 2007Sa02 are considered.

[#] Band(A): K^π=(7$^+$) band. Configuration=π7/2[633]$\otimes\nu$7/2[613] (1993Mo18).

α radiations

Eα[†]	E(level)	Iα[†@]	HF[#]	Comments
6697 *2*	469.2	3.4 *14*	32 *14*	Relative Iα=0.052 *21* (1993Mo18).
6718 *2*	447.9	65.8 *13*	2.1 *1*	Relative Iα=1.000 *19* (1993Mo18).
6763 *4*	403.8	20.8 *12*	10.2 *7*	Relative Iα=0.316 *18* (1993Mo18).
6788 *2*	376.8	9.9 *10*	28 *3*	Relative Iα=0.151 *15* (1993Mo18).
6990[&] *2*	171.1	≤0.20[‡]	≥1.0×10^4	Relative Iα<0.003 (1993Mo18).
7080[&] *2*	80.1	≤0.20[‡]	≥2.5×10^4	Relative Iα=0.003 (1993Mo18).
7159[&] *2*	0.0	≤0.20[‡]	≥5.3×10^4	Relative Iα<0.003 (1993Mo18).

[†] From 1993Mo18. Iα values have been normalized here such that summed Iα=100, excluding those for Eα≥6800 where only upper limits were given. Other measurements: 1980Ho04, 1970Fi12, 1968Hu06. Possible additional α groups: 6800-6980 keV,

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^{258}Md α decay (51.50 d) 1993Mo18 (continued)

α radiations (continued)

Iα≤5.4; 7000-7040 keV, Iα≤1.0; 7090-7140 keV, Iα≤0.20. The relative intensities listed in 1993Mo18 are ≤0.082, ≤0.015 and ≤0.003, respectively.

‡ Since contributions from conversion-electron summing could not be estimated for these α groups, only upper limits were given by 1993Mo18.

$r_0(^{254}Es)$=1.49 *1* is used in deducing hindrance factors.

@ Absolute intensity per 100 decays.

& Existence of this branch is questionable.

γ(^{254}Es)

Iγ normalization: From summed transition intensity from 448 level normalized to Iα=65.8% *13*.

The decay scheme given here is basically that proposed by 1993Mo18, based on levels populated by α transitions and γ data. Exceptions are for J^π assignments, which in some cases are different from those in 1993Mo18. Evaluator considers the decay scheme as incomplete, since information about multipolarities and mixing ratios is generally missing. There is also a serious problem with a non-physical negative transition intensity balance at the 171-keV level.

Einsteinium x-ray energies and intensities (1993Mo18)

E(x-ray)	I(x-ray) relative to Iγ(367.8γ)=100			
112.4 *2*	2.2 *3*	Kα$_2$	x-ray	
117.9 *2*	3.6 *4*	Kα$_1$	x-ray	
133.4 *4*	1.3 *3*	Kβ$_1$	x-ray +Kβ$_3$	x-ray
136.8 *3*	0.7 *3*	Kβ$_2$	x-ray	

E_γ†	I_γ†@	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α&	Comments
x56.7 *2*	0.54 *13*								
71.1 *1*	8.0 *5*	447.9	(8$^-$)	376.8	(8$^+$)	(E1)		0.366	α(L)=0.273 *4*; α(M)=0.0686 *10* α(N)=0.0189 *3*; α(O)=0.00469 *7*; α(P)=0.000742 *11*; α(Q)=2.15×10^{-5} *3* Mult.: from intensity balance considerations at 447.9 and 376.8 levels, mult=E1 is more consistent than either M1 or E2.
80.1 *2*	2.43 *23*	80.1	(8$^+$)	0.0	(7$^+$)	(M1+E2)	1.25 *25*	49 *6*	α(L)=35 *4*; α(M)=9.9 *12*; α(N)=2.8 *4*; α(O)=0.70 *9*; α(P)=0.115 *13*; α(Q)=0.00127 *25* Mult.,δ: deduced by evaluator from transition intensity balance at 80.1 level.
86.9[a] *2*	0.56 *15*	376.8	(8$^+$)	289.9?	(7$^+$)	(M1+E2)		30 *17*	α(exp)=31 *16* α(L)=22 *12*; α(M)=6 *4*; α(N)=1.7 *10*; α(O)=0.44 *25* α(P)=0.07 *4*; α(Q)=0.0013 *9* Mult.: from α(exp), deduced by evaluator from intensity balance at 376.8 level.
91.0 *3*	0.30 *18*	171.1	(9$^+$)	80.1	(8$^+$)	[M1+E2]		25 *13*	α(L)=18.2 *89*; α(M)=5.0 *28* α(N)=1.42 *78*; α(O)=0.36 *19*; α(P)=0.060 *28*; α(Q)=0.00109 *79*
171.1 *2*	1.14 *37*	171.1	(9$^+$)	0.0	(7$^+$)	[E2]		2.30	α(K)=0.1482 *21*; α(L)=1.546 *23*; α(M)=0.441 *7*

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^{258}Md α decay (51.50 d) 1993Mo18 (continued)

γ(^{254}Es) (continued)

E_γ[†]	I_γ[†@]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[&]	Comments
								α(N)=0.1246 *19*; α(O)=0.0313 *5*; α(P)=0.00509 *8*; α(Q)=3.22×10^{-5} *5*
189.1[#a] *2*	0.99 *39*	403.8	(7$^-$)	214.7?		[D,E2]	3.5 *34*	Mult.: [M1+E2] implied by J^π assignments in 1993Mo18. Placement of this transition based on energy sum of 189.1+214.7 gammas, also supported by nearly balance intensities of the two transitions in a cascade, however the ordering of the two transitions is not established.
205.7 *2*	1.21 *43*	376.8	(8$^+$)	171.1	(9$^+$)	[M1+E2]	3.2 *22*	α(K)=2.2 *21*; α(L)=0.80 *10*; α(M)=0.210 *12* α(N)=0.059 *3*; α(O)=0.0151 *10*; α(P)=0.0027 *4*; α(Q)=0.00010 *8* Mult.: [E1] implied by J^π assignments in 1993Mo18.
214.7[#a] *2*	1.16 *46*	214.7?		0.0	(7$^+$)	[D,E2]	2.5 *24*	Mult.: [E1] implied by J^π assignments in 1993Mo18. See comment for 189.1γ about placement of this transition.
276.8 *1*	20.2 *19*	447.9	(8$^-$)	171.1	(9$^+$)	(E1)[‡]	0.0556	α(K)=0.0430 *6*; α(L)=0.00941 *14*; α(M)=0.00231 *4* α(N)=0.000639 *9*; α(O)=0.0001642 *23*; α(P)=2.97×10^{-5} *5*; α(Q)=1.293×10^{-6} *19*
296.7 *2*	5.4 *9*	376.8	(8$^+$)	80.1	(8$^+$)	[M1+E2]	1.1 *9*	α(K)=0.8 *7*; α(L)=0.24 *9*; α(M)=0.052 *18* α(N)=0.017 *5*; α(O)=0.0044 *13*; α(P)=0.008 *3*; α(Q)=4×10^{-5} *3* Mult.: [E1] implied by J^π assignments in 1993Mo18.
298.1 *3*	1.89 *56*	469.2		171.1	(9$^+$)	[D,E2]	0.98 *93*	Mult.: [E1] implied by J^π assignments in 1993Mo18.
367.8 *1*	100.0 *69*	447.9	(8$^-$)	80.1	(8$^+$)	(E1)[‡]	0.0308	α(K)=0.0241 *4*; α(L)=0.00501 *7*; α(M)=0.001227 *18* α(N)=0.000339 *5*; α(O)=8.74×10^{-5} *13*; α(P)=1.605×10^{-5} *23*; α(Q)=7.47×10^{-7} *11*
376.8 *4*	1.72 *67*	376.8	(8$^+$)	0.0	(7$^+$)	[M1+E2]	0.6 *5*	α(K)=0.42 *35*; α(L)=0.11 *5*; α(M)=0.029 *12* α(N)=0.008 *4*; α(O)=0.0021 *9*; α(P)=0.00039 *18*; α(Q)=1.8×10^{-5} *15* Mult.: [E1] implied by J^π assignments in 1993Mo18.
389.1 *2*	4.0 *9*	469.2		80.1	(8$^+$)	[D,E2]	0.47 *44*	Mult.: [E1] implied by J^π assignments in 1993Mo18.
447.9 *1*	36.6 *38*	447.9	(8$^-$)	0.0	(7$^+$)	(E1)[‡]	0.0209	α(K)=0.01645 *23*; α(L)=0.00331 *5*; α(M)=0.000808 *12* α(N)=0.000223 *4*; α(O)=5.77×10^{-5} *8*; α(P)=1.069×10^{-5} *15*; α(Q)=5.18×10^{-7} *8*

[†] From 1993Mo18. Gammas were observed in coincidence with α.
[‡] From 1993Mo18, based on weakness of the observed intensity of K x-rays.
[#] The ordering of the 189.1-214.7 γ cascade is not established.
[@] For absolute intensity per 100 decays, multiply by 0.381 *21*.
[&] 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.

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^{258}Md α decay (51.50 d) 1993Mo18 (continued)

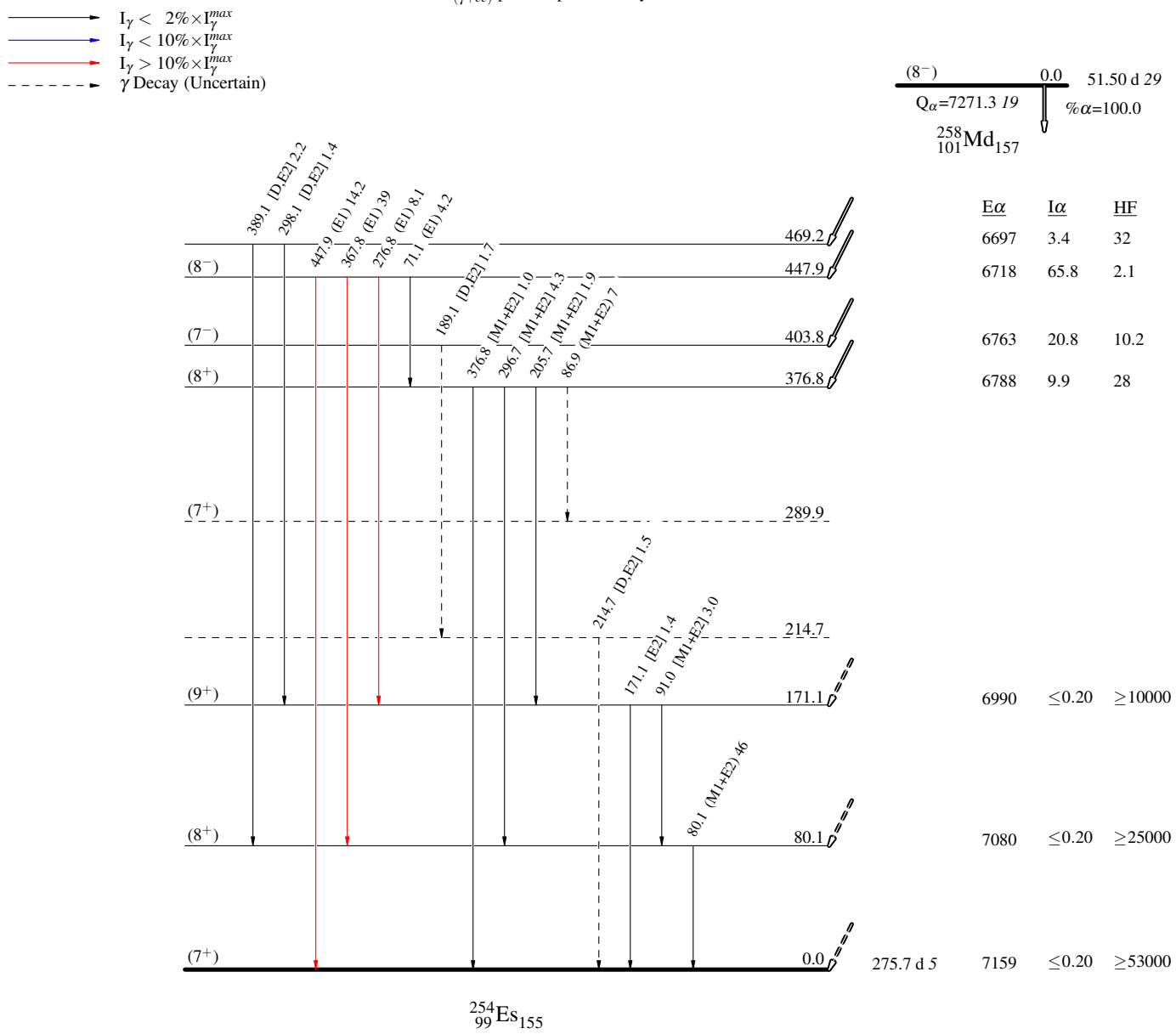
$\gamma(^{254}Es)$ (continued)

[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{258}Md α decay (51.50 d) 1993Mo18

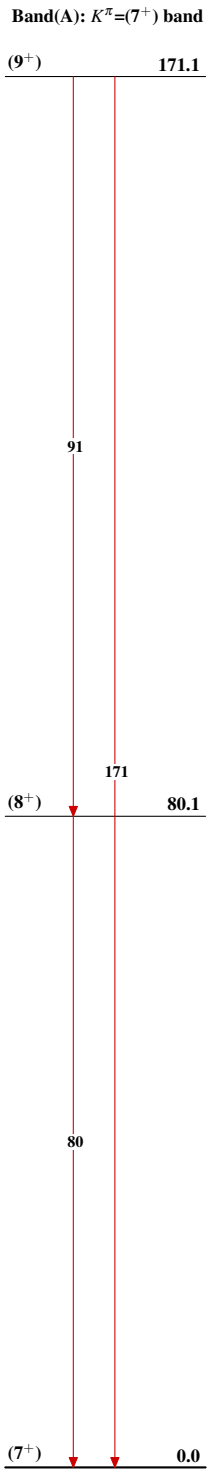
Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



Eα	Iα	HF
6697	3.4	32
6718	65.8	2.1
6763	20.8	10.2
6788	9.9	28
6990	≤0.20	≥10000
7080	≤0.20	≥25000
7159	≤0.20	≥53000

^{258}Md α decay (51.50 d) 1993Mo18



$^{254}_{99}Es_{155}$