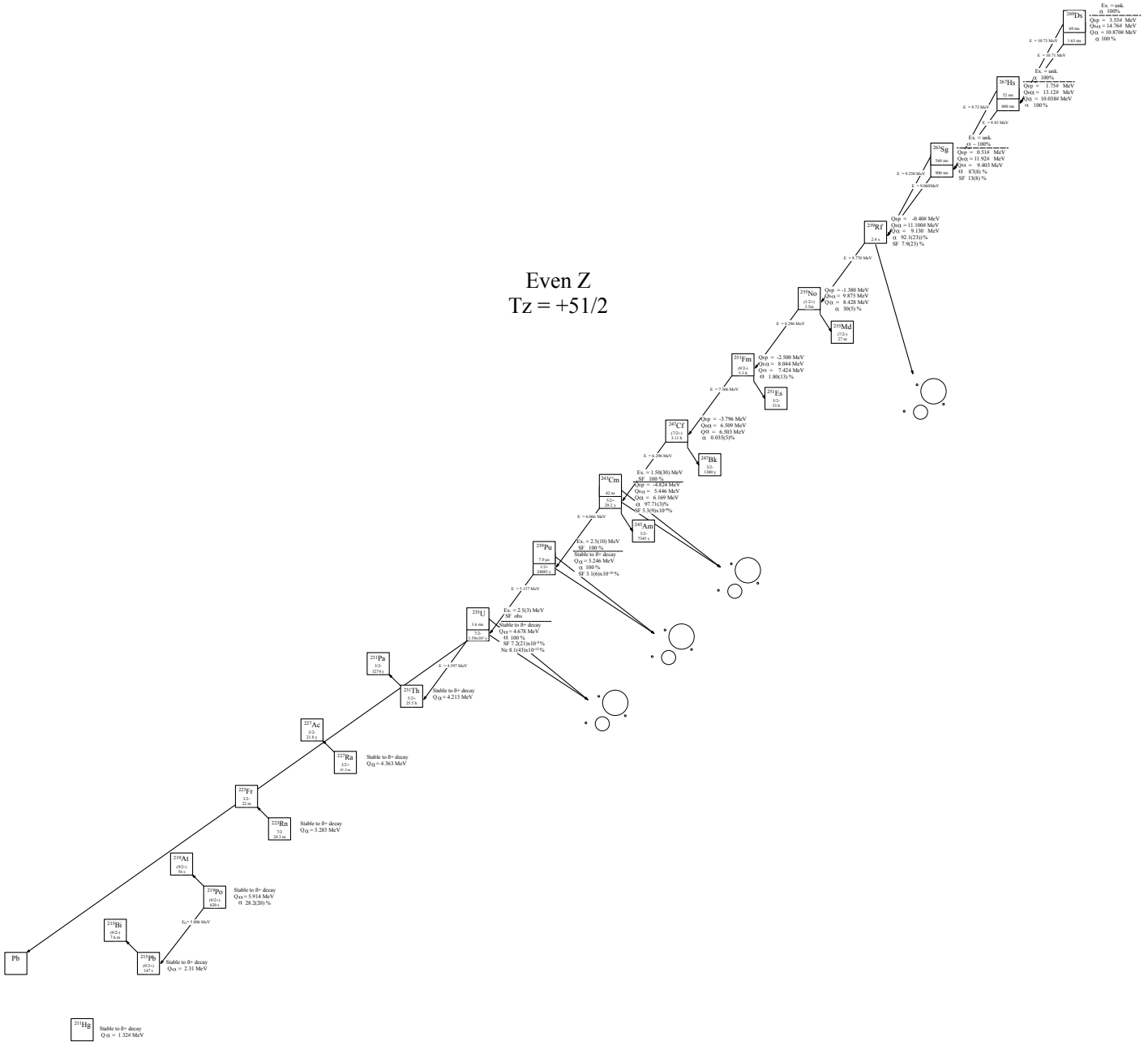

Fig. 1: Known experimental values for heavy particle emission of the even-Z T_z= +51/2 nuclei.

Last updated 12/29/24

Table 1
Observed and predicted β-delayed particle emission from the even-Z, T_z = +51/2 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein. J^π values for all nuclei are taken from ENSDF.

Nuclide	Ex.	J^π	$T_{1/2}$	Q_ε	Q_{β^-}	$Q_{\beta^- \alpha}$	Experimental
^{207}Pt*					6.50(50)#	7.99(57)#	[**2012Ku26**]
^{211}Hg*				26.4(81) s	5.69(21)#	8.01(36)#	[**2017Ca12**]
^{215}Pb*		$(9/2^+)$	147(12) s	-5.69(31)#	2.710(50)#	8.175(64)	[**2013De20**]
^{219}Po		$(9/2^+)$	620(59) s	-3.64(20)#	2.285(16)#	8.807(17)	[**2015Fi07**]
^{223}Rn*		7/2	24.3(3) m**	-3.038(16)	2.007(8)	7.749(9)	[**1992Ku03, 1986Bo35**]
^{227}Ra*		$3/2^+$	41.2(2) m	-2.505(6)	1.328(2)	6.550(3)	[**1953Bu63**]
^{231}Th*		$5/2^+$	25.52(10 h	-1.947(13)	0.392(2)	5.721(2)	[**1958Ca19**]
^{235}U		$7/2^-$	$7.04(1)\times10^8$ y	-1.370(14)	-0.124(1)	——	[**2004Sc03**]
^{235m}U	2.5(3)		3.6(18) ms	1.1(3)	2.4(3)	7.8(3)	[**2007Ob02**]
^{239}Pu		$1/2^+$	24085(13) y***	-0.773(1)	-0.802(2)	——	[**1975Al15, 1978Ja20, 1978Se12, 1978Pr07**]
^{239m}Pu	2.5(10)		7.0(4) μs$^{@}$	1.7(10)	1.7(10)	7.8(10)	[**1970Po01, 1972Wo07, 1977GoYZ, 1980Gu20**]
					$Q_{\varepsilon p}$	$Q_{\varepsilon\alpha}$	
^{243}Cm		$5/2^+$	29.20(14) y	0.007(2)	-4.824(1)	5.446(2)	[**1986Ti03, 1958Ch38**]
^{243m}Cm	1.50(30)		42(6) ns	0.151(30)	-3.32(30)	6.75(30)	[**1973Br04, 1972Wo07**]
^{247}Cf		$(7/2^+)$	3.11(3) h	0.620(15)	-3.796(14)	6.509(14)	[**1984Ah02**]
^{251}Fm		$(9/2^-)$	5.30(8) h	1.447(15)	-2.500(14)	8.044(15)	[**1973Ah02**]
^{255}No		$(1/2^+)$	3.52(18) m	1.970(015)	-1.380(14)	9.875(15)	[**2011As02**]
^{259}Rf			2.4(4) s$^{@@}$	2.52(10)#	-0.40(12)#	11.100(73)#	[**1973Dr10, 1981Be03, 1985So03**, [**1994Gr08, 2004Fo08, 2006Gr24**]
^{263}Sg			0.9(2) s	3.09(19)#	0.51(24)#	11.92(12)#	[**1974Gh04**
^{263m}Sg	x		560^{+160}_{-100} ms	3.09(19)#+x	0.51(24)#+x	11.92(12)#+x	[**2006Ni10**]
^{267}Hs$^{@@@}$			$0.80^{+3.80}_{-0.37}$ s	3.89(28)#	1.75(26)#	13.12(19)#	[**2004Mo40**]
^{267m}Hs$^{@@@}$	x		52^{+13}_{-8} ms	3.89(28)#+x	1.75(26)#+x	13.12(19)#+x	[**2004Mo40**]
^{271}Ds$^{@@@}$			$1.63^{+0.44}_{-0.29}$ ms	4.85(34)#	3.55(27)#	14.76(28)#	[**2015Mo25**]
^{271m}Ds$^{@@@}$	x		69^{+56}_{-21} ms	4.85(34)#+x	3.55(27)#+x	14.76(28)#+x	[**2015Mo25**]

* 100% β^- emitter.
** Weighted average of 25.3(4) m [1992Ku03] and 23.2(4) m [1986Bo35].
*** Weighted average of 24060(16) y [1975Al15], 24131(16) y [1978Ja20], 24101(20) y [1978Se12], 24089(13) y and 24019(21) [1978Pr07].
$^{@}$ Weighted average of 8(1) μs [1970Po01], 8.1(8) μs [1972Wo07], 7.5(10) μs [1977GoYZ], and 6.5(4) μs [1980Gu20].
$^{@@}$ Weighted average of 3.2(8) s [1973Dr10], 3.0(1.3) s [1981Be03], 3.4(17) s [1985So03],$1.7^{+0.8}_{-0.5}$ s [1994Gr08], $2.2^{+17}_{-0.8}$ s [2004Fo08] and $1.9^{+1.3}_{-0.5}$ s [2006Gr24].
$^{@@@}$ Unclear which is the ground state.

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the even-Z, T_z = +51/2 nuclei. Unless otherwise stated, all S and Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	S_p	Q_α	BR_α	BR_{SF}	$BR_{cluster}$	type	Experimental
^{207}Pt		0.71(57)#					
^{211}Hg	10.36(45)#	1.32(45)#					
^{215}Pb	9.41(20)#	2.31(21)					
^{219}Po	7.824(31)	5.914(5)	28.2(20)%				[**2015Fi07**]
^{223}Rn	7.852(18)	5.283(18)					
^{227}Ra	7.632(7)	4.363(8)					
^{231}Th	7.312(16)	4.213(2)					
^{235}U	6.709(4)	4.678(1)	100%	$7.2(21)\times10^{-9}$%	$8.06(432)\times10^{-12}$%	Ne*	**2005Ga36, 2004Da24, 1991Bo20, 1981Vo02, 1975Va11**, 2020FoZZ, 2018Ma03, 2017Le03, 2006Al28, 2005Ga36, 2004Sc03, 1999Yu01, 1997Tr17, 1989Tr11, 1986BaYK, 1986He12, 1984He12, 1983Ba77, 1983Ol01, 1982Va04, 1982VaZP, 1981VaZV, 1977Ba72, 1974De19, 1974GrZA, 1974Te03, 1973GrYU, 1971Cl03, 1971Ja07, 1971KrZH, 1966Al23, 1966Ba58, 1966Ga03, 1966Ga27, 1965De06, 1965Wh05, 1964Sc27, 1962De15, 1960Ba44, 1960Vo07, 1958Fi10, 1957Cl16, 1957Wu39, 1955St04, 1953Fr37, 1952Fl20, 1952Se67, 1951Gh22, 1951Sa30, 1944ChZX, 1940Fl02]
^{235m}U	4.2(3)	7.2(3)		obs			[**2007Ob02**]
^{239}Pu	6.1553(4)	5.2455(2)	100%	$3.1(6)\times10^{-10}$%			[**2000Ho27, 1993Ga28, 1976GuZN, 1968Ba25, 1966Ah02**, 2020Yo01, 2016Di11, 1992Bl13, 1986LoZT, 1985Dr09, 1984Iw02, 1982He02, 1981AhZV, 1980RyZX, 1979Ce04, 1978Ja20, 1978Lu10, 1978Ma45, 1978Pr07, 1978Se12, 1977Ja08, 1977MeYY, 1977VaYQ, 1977VaZW, 1976BaZZ, 1975Al15, 1971GuZY, 1970Cl11, 1968Cl02, 1966He11, 1965Ho04, 1965Tr03, 1963Ba09, 1963Le17, 1963Bj03, 1962Ba52, 1962Le11, 1961Dz05, 1959Do64, 1959Ma25, 1957No15, 1955Go57, 1953AsZZ, 1952As28, 1952Se67, 1950Ro09, 1949GaZZ, 1949SeZY, 1949SeZX, 1948Cr12, 1948Je02, 1945RoZZ]
^{239m}Pu	3.7(10)	7.7(10)		≈100%			[**1980Gu20, 1977GoYZ, 1973Na03, 1972Wo07**, 1974Be52, 1974BeYO, 1973Na35, 1972GaZW, 1971Ta17, 1969Me11, 1969VaZX]
^{243}Cm	5.575(1)	6.169(1)	99.71(3)%	$5.3(9)\times10^{-9}$			[**1987Po19, 1966Ba07, 1963Dz07, 1958Ch38, 1957As70**, 1989Ho24, 1986Ti03, 1976BaZZ, 1971Bb10, 1970BaZZ, 1970By01, 1969Ba57, 1963Le07, 1962Iv01, 1953As14, 1953AsZZ, 1951Hu39]
^{243m}Cm	4.08(30)	7.67(30)		100%			[**1973Br04, 1972Wo07**, 1974GaZD, 1971Re11, 1970Po01]
^{247}Cf	5.146(62)	6.503(14)	0.035(5)%				[**1984Ah02**]
^{251}Fm	4.56(10)#	7.424(1)	1.80(13)%				[**1978Ah02, 1973Ah02**, 1973AhZZ, 1967Ch17, 1957Am47]
^{255}No	3.93(10)#	8.428(3)	30(5)%				[**2011As02**, 2015Mo25, 2007AsZU, 2006AsZY, 2006Gr24, 2006He20, 2006Ni10, 2005HeZU, 2004Fo08, 2004Mo27, 2004Mo40, 2004Mo43, 1976SiZS, 1971BeYR, 1971BeZZ, 1970Es02, 1970GhZY, 1968Fl08, 1967Dr02, 1967Gh01]
^{259}Rf	3.70(13)#	9.130(71)#	92.1(23)%	7.9(23)%**			[**1981Be03, 1985So03**, 2015Mo25, 2006Gr24, 2006Ni10, 2004Fo08, 1994Gr08, 1983SoZZ, 1976GhZX, 1976GhZV, 1976GhZW, 1974DiZI, 1973Dr10, 1973DrZZ, 1970GhZY, 1970Og05]
^{263}Sg	3.35(17)#	9.403(61)#	87(8)%	13(8)%			[**2006Ni10, 2006Gr24**, 2015Mo25, 2010Ni14, 1997Ho03, 1997Ho13, 1996LaZY, 1994Gr08, 1976GhZV, 1976GhZW]
^{263m}Sg	3.35(17)#-x	9.403(61)#+x	≈ 100%				[**2006Ni10**, 2015Mo25, 2010Ni14, 2004Fo08, 1997Ho03, 1997Ho13, 1996LaZY]
^{267}Hs	2.74(19)#	10.038(13)#	100%				[**2015Mo15, 2004Mo40**, 2011Ho10, 2010Ni14, 2004Fo08, 2004Mo14, 2004Mo27, 2004Mo43, 2003Gi05, 2003MoZT, 1998Ho13, 1997Ho03, 1997Ho13, 1995La20. 1995LaZX, 1995Og02, 1994HoZQ]
^{267m}Hs	2.74(19)#-x	10.038(13)#+x	100%				[**2015Mo15, 2004Mo40**, 2011Ho10, 2004Mo14, 2004Mo27, 2004Mo43, 2003MoZT, 1998Ho13 1997Ho03]
^{271}Ds	2.05(21)#	10.870(18)#	100%				[**2015Mo15, 2004Mo40**, 2011Ho10, 2004Fo08, 2004Mo14, 2004Mo27, 2004Mo43, 2003Gi05, 2003MoZT, 1998Ho13 1997Ho03, 1997Ho13, 1995Og02, 1994HoZQ]
^{271m}Ds	2.05(21)#-x	10.870(18)#+x	100%				[**2015Mo15, 2012Zh04, 2004Mo40**, 2011Ho10, 2004Mo14, 2004Mo27, 2004Mo43, 2003MoZT, 1998Ho13]

* Unclear which isotope of Ne [1991Bo20].
** Weighted average of 6.3(37)% [1981Be03] and 9(3)% [1985So03].

Table 3
direct α emission from ^{219}Po*, J^{π} = (9/2$^+$), $T_{1/2}$ = 620(59) s, BR_{α} = 28.2(20)%.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(abs)	J_f^{π}	$E_{daughter}$(^{215}Pb)	coincident γ-rays (keV)	R_0 (fm)	HF
5.914(5)	5.806(5)	28.2(20)%	(9/2$^+$)	0.0	——	1.5434(12)	1.78(24)

* All values from [2015Fi07].

Table 4
direct α emission from ^{235}U, J^{π} = 7/2$^-$, $T_{1/2}$ = 7.04(1)$\times 10^8$ y*, BR_{α} = 100%.

E_{α}(c.m.)	E_{α}(lab)**	I_{α}(rel)	I_{α}(abs)**	J_f^{π}@	$E_{daughter}$(^{231}Th)@	coincident γ-rays (keV)@	R_0 (fm)	HF
4.045(5)	3.976(5)***	≈0.12%	≈0.07%***	(7/2$^-$)	0.6324	1.52410(58)	≈1.3	
4.112(5)	4.042(5)***	≈0.12% %	≈0.07%***		0.5658	1.52410(58)	≈4.9	
4.1513(4)	4.0806(4)***	0.04(2)%	0.026(12)%***	(11/2$^-$)	0.5302	19.5, 31.6, 42.0, 51.2, 54.3, 74.9, 96.1,109.2, 120.4, 142.4, 143.8, 144.5, 147.0, 150.9, 163.4, 185.7, 192.5, 202.1, 205.4, 291.7, 345.9, 387.8	1.52410(58)	27^{+24}_{-9}
4.224(2)	4.152(2)	0.52(2)%	0.298(13)%	9.2$^-$	0.4521	19.5, 31.6, 42.0, 51.2, 54.3, 74.9, 96.1, 109.2, 120.4, 143.8, 163.4, 185.7, 205.4, 215.3, 246.8, 266.5, 291.2, 356.0, 410.3	1.52410(58)	11.3(5)
4.2888(48)	4.2158(48)	13.9(1)%	8.02(6)%	7/2$^-$	0.3878	19.5, 31.6, 42.0, 51.2, 54.3, 74.9, 96.1,109.2, 120.4, 143.8, 144.5, 147.0, 150.9, 163.4, 185.7, 192.5, 202.1, 205.4, 291.7, 345.9, 387.8	1.52410(58)	1.45(2)
4.322(5)	4.248(5)***	0.12(1)%	0.07(1)%***	7/2$^+$	0.3515	42.0, 54.3, 96.1, 255.4, 309.6, 351.5	1.52410(58)	330^{+60}_{-40}
4.340(2)	4.266(2)	0.39(2)%	0.223(12)%	(13/2$^-$)	0.337	1.52410(58)	136(8)	
4.3571(24)	4.2829(24)	0.19(1)%	0.112(8)%	5/2$^+$	0.3171	42.0, 76.2, 95.7, 144.5, 221.4, 275.1, 317.1	1.52410(58)	394(29)
4.3979(6)	4.3230(6)	6.1(1)%	3.5(5)%	(11/2$^-$)	0.2776	19.5, 31.6, 41.1, 42.0, 51.2, 54.3, 72.7, 74.9, 96.1, 109.2, 115.5, 120.4, 143.8, 163.4, 182.1, 185.7, 205.4	1.52410(58)	26^{+5}_{-3}
4.4399(4)	4.3643(4)	34.5(2)%	19.94(11)%	9/2$^-$	0.23691	19.5, 31.6, 42.0, 51.2, 54.3, 74.9, 96.1, 109.2, 120.4, 143.8, 163.4, 185.7, 205.4	1.52410(58)	9.67(15)
4.4715(4)	4.3954(4)	100.0(3)%	57.79(19)%	(7/2$^-$)	0.2053	19.5, 42.0, 54.3, 96.1, 109.2, 143.8, 163.4, 185.7, 205.4	1.52410(58)	5.90(9)
4.4913(5)	4.4149(5)	5.3(1)%	3.09(5)%	5/2$^-$	0.1857	42.0, 143.8, 185.7	1.52410(58)	157(3)
4.516(2)	4.439(2)	0.40(2)%	0.230(12)%	11/2$^+$	0.1621	42.0, 120.4	1.52410(58)	$3.2(2)\times 10^3$
4.5805(7)	4.5025(7)	2.2(1)%	1.28(3)%	9/2$^+$	0.0961	42.0, 54.3, 96.1	1.52410(58)	$1.82(5)\times 10^3$
4.6349(4)	4.5560(4)	6.6(1)%	3.84(4)%	7/2$^+$	0.0419	42.0	1.52410(58)	$1.54(3)\times 10^3$
4.6770(4)	4.5974(4)	8.3(1)%	4.78(6)%	5/2$^+$	0.0	——	1.52410(58)	$2.50(5)\times 10^3$

* [2004Sc03].

** weighted average of [2005Ga36] and [2004Da24] except where noted. In addition to those listed, several α transitions were reported by [1966Ga03] (4.579, 4.559, 4.537, 4.552, 4.510, 4.478, 4.424, 4.368, 4.339, 4.184, 4.164, 4.131, 4.091, 3.945, 3.892, 3.825, and 3.769 MeV) and [1960Ba44] (4.578, 4.522, 4.426, 4.368 and 4.339). None of these lines were observed in [2005Ga36] or [2004Da24] despite having much more statistics.

*** [2004Da24].

@ [2022Si29].

Table 5
direct α emission from ^{239}Pu, J^{π} = 1/2^{+}, $T_{1/2}$ = 24085(13) y*, BR_{α} = 100%. (1 of 3)

E_{α}(c.m.)	E_{α}(lab)**	I_{α}(rel)	I_{α}(abs)**	J_f^{π}@@@	$E_{daughter}$(^{235}U)@@@	coincident γ-rays (keV)@@@	HF
4.1282(2)[b]	4.0591(2)	4.8(2)×10^{-8}	3.4(2)×10^{-8} [b]	(5/2^{-})	1.1162(1)	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 123.2, 129.3, 158.1, 171.4, 994.9, 986.9, 1102.9, 1115.6	25.3(15)
4.1870(4)[b]	4.1170(4)	1.81(4)×10^{-7}	1.28(7)×10^{-7} [b]		1.0574(3)	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 54.0, 69.0, 77.6, 89.6, 96.1, 116.3, 119.7, 129.3, 123.2, 143.4, 158.1, 171.4, 173.7, 179.2, 225.4, 832.5, 886.0, 927.8, 1005.7, 1057.3	22.5(13)
4.2518(4)[b]	4.1807(4)	5.1(2)×10^{-8}	3.6(2)×10^{-8} [b]	(5/2^{+})	0.9926(3)	13.0, 978.9, 992.6	293(17)
4.2760(2)[b]	4.2045(2)	8.95(14)×10^{-8}	6.3(1)×10^{-8} [b]	(3/2)$^{+}$	0.9684	13.0, 38.7, 51.6, 916.8, 955.4, 968.4	270(5)
4.3525(2)[b]	4.2797(2)	2.6(6)×10^{-7}	1.8(4)×10^{-7} [b]	5/2^{+}	0.8919	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 123.2, 129.3, 158.1, 171.4, 720.6, 762.6, 840.3, 879.2, 891.0	42(1)
4.3792(2)[b]	4.3059(2)	1.4(6)×10^{-7}	9.9(4)×10^{-8} [b]	3/2^{+}	0.8652	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 123.2, 129.3, 158.1, 171.4, 693.8, 735.9, 783.4, 813.5	1.26(5)×10^{3}
4.3991(2)[b]	4.3255(2)	4.6(7)×10^{-8}	3.2(5)×10^{-8} [b]	(7/2^{+})	0.8454	3.0, 30.0, 38.7, 51.6, 69.0, 763.6	$5.7^{+1.1}_{-0.8}$×10^{3}
4.4005(2)[b]	4.3269(2)	3.00(9)×10^{-7}	2.13(6)×10^{-7} [b]	(1/2)$^{+}$	0.8439	13.0, 30.0, 38.7, 47.6, 51.6, 69.0 77.6, 116.3, 129.3, 714.7, 843.8	1.83(3)×10^{3}
4.4232(2)[b]	4.3492(2)	3.74(9)×10^{-7}	2.64(6)×10^{-7} [b]	5/2^{+}	0.8212	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 54.0, 68.7, 69.0, 77.6, 89.6, 96.1, 98.8, 116.3, 119.7, 129.3, 123.2, 143.4, 158.1, 171.4, 173.7, 179.2, 225.4, 264.0, 341.5, 380.2, 393.1, 428.0, 596.0, 670.8, 769.6, 808.2, 821.3	1.08(3)×10^{3}
4.4387(2)[b]	4.3644(2)	1.24(6)×10^{-7}	8.8(4)×10^{-8} [b]	3/2^{-}	0.8057(1)	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 129.3, 123.2, 158.1, 171.4, 172.6, 255.4, 264.0, 297.5, 345.0, 341.5, 375.1, 378.8, 380.2, 393.1, 412.3, 413.7, 426.7, 633.2, 792.6, 805.7	4.3(2)×10^{3}
4.4649(2)[b]	4.3902(2)	8.6(3)×10^{-7}	6.1(2)×10^{-7} [b]	3/2^{+}	0.7795	13.0, 30.0, 38.7, 51.6, 69.0, 697.8 727.9, 766.5, 779.4	1.01(3)×10^{3}
4.4660(3)[b]	4.3913(3)	9.0(2)×10^{-7}	6.4(1)×10^{-7} [b]	(11/2)$^{-}$	0.7784(2)	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 57.8, 69.0, 77.6, 89.6, 103.1, 116.3, 119.7, 123.2, 129.3, 158.1, 171.4, 606.9, 674.4	1.01(2)×10^{3}
4.4751(2)[b]	4.4002(2)	3.23(6)×10^{-5}	2.29(4)×10^{-5} [b]	1/2^{+}	0.7693(1)	13.0, 30.0, 38.7, 47.6, 51.6, 69.0 77.6, 116.3, 129.3, 640.0, 756.4, 769.2	35.8(7)
4.4942(2)[b]	4.4190(2)	4.6(3)×10^{-7}	3.2(2)×10^{-7} [b]	(9/2^{-})	0.7502	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 68.7, 69.0, 77.6, 89.6, 98.8, 116.3, 119.7, 129.3, 123.2, 158.1, 171.4	3.3(2)×10^{3}
4.5242(2)[b]	4.4485(2)	2.62(8)×10^{-6}	1.86(5)×10^{-6} [b]	(9/2)$^{-}$	0.7202	46.2, 57.8, 103.1, 617.1, 674.1	$1.0^{+0.4}_{-0.2}$×10^{3}
4.5406(2)[b]	4.4646(2)	1.56(2)×10^{-5}	1.11(1)×10^{-5} [b]	3/2^{-}	0.7038	13.0, 38.7, 51.6, 652.1, 690.8, 703.6	219(2)

* Weighted average of 24060(16) y [1975Al15], 24131(16) y [1978Ja20], 24101(20) y [1978Se12], 24089(13) y and 24019(21) [1978Pr07].
** Values from[1993Ga28], except where noted.
*** Value from [1980RyZX], adjusted by -0.11 keV as recommended by [1991Ry01].
@ Value from [1968Ba25], adjusted by +1.0 keV as recommended by [1991Ry01].
@@ [1966Ah02].
@@@ [2014Br18].
[a] R_0 (fm) = 1.51188(12).
[b] Deduced from γ energies [1976GuZN] and Q_{α} = 5244.43(14) keV, using the levels and transitions from [2014Br18]. Conversion electron strength and strength from unobserved γ's (in [1976GuZN]) decaying from a given level are taken into account.

Table 6
direct α emission from ^{239}Pu, J^{π} = 1/2$^+$, $T_{1/2}$ = 24085(13) y*, BR_{α} = 100%. (2 of 3)

E_{α}(c.m.)	E_{α}(lab)**	I_{α}(rel)	I_{α}(abs)**	J_f^{π}@@@	$E_{daughter}$(^{235}U)@@@	coincident γ-rays (keV)@@@	HF
4.5433(2)[b]	4.4673(2)	9.6(2)×10^{-6}	6.8(1)×10^{-6} [b]	(7/2)$^-$	0.7011	13.0, 30.0, 38.7, 46.2, 51.6, 57.8, 68.7, 69.0, 98.8, 103.1, 550.5, 598.0, 619.2, 649.3, 654.9, 701.0	376(6)
4.5735(2)[b]	4.4970(2)	6.6(8)×10^{-7}	4.7(5)×10^{-7} [b]	(7/2)$^-$	0.6709	46.2, 624.8, 671.0	$9.3^{+1.1}_{-0.9}\times10^3$
4.5799(2)[b]	4.5033(2)	8.66(8)×10^{-6}	6.13(6)×10^{-6} [b]	(5/2)$^-$	0.6645	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 129.3, 123.2, 158.1, 171.4, 493.0, 582.9, 612.8, 618.3, 664.6	800(8)
4.5854(2)[b]	4.5087(2)	3.70(4)×10^{-5}	2.62(3)×10^{-5} [b]	1/2$^-$	0.659.0	13.0, 30.0, 38.7, 47.6, 51.6, 69.0 77.6, 116.3, 129.3, 264.0, 265.7, 341.5, 380.2, 393.1, 645.9, 658.9	206(3)
4.6066(2)[b]	4.5295(2)	4.56(4)×10^{-6}	3.23(3)×10^{-6} [b]	3/2$^-$	0.6378	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 129.3, 123.2, 158.1, 171.4, 211.1, 244.6, 255.4, 264.0, 297.5, 341.5, 345.0, 375.1, 380.2, 393.1, 413.7, 426.7, 586.3, 624.8, 637.8	2429(24)
4.6362(2)[b]	4.5586(2)	1.7(1)×10^{-5}	1.17(7)×10^{-5} [b]	11/2$^+$	0.6082	13.0, 30.0, 38.7, 51.6, 68.7, 69.0, 115.3, 411.2, 457.6, 526.4	1.1(1)×10^3
4.709(3)	4.630(3)@@	1.0(3)×10^{-3}%	7(2)×10^{-4}%	9/2$^+$	0.5332	13.0, 30.0, 38.7, 51.6, 65.7, 68.7, 69.0, 98.1, 115.3, 119.0, 188.2, 242.1, 244.9, 307.9, 336.1, 361.9, 382.8, 430.1, 451.5, 481.7, 487.1	68^{+27}_{-15}
4.7339(2)[b]	4.6547(2)	1.29(7)×10^{-6}	9.1(5)×10^{-7} [b]	(9/2$^+$)	0.5105	46.2, 57.8, 103.1, 406.8, 463.9	7.7(4)×10^4
4.769(3)	4.689(3)@@	7(3)×10^{-4}%	5(2)×10^{-4}%	7/2$^+$	0.4738	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 54.0, 68.7, 69.0, 77.6, 89.6, 96.1, 98.8, 116.3, 119.7, 123.2, 129.3, 143.4, 158.1, 171.4, 173.7, 179.2, 225.4, 249.0, 302.9, 323.8, 341.0, 392.5, 422.6, 428.4, 461.3, 473.9	260^{+170}_{-70}
4.7988(2)[b]	4.7185(2)	7.2(1)×10^{-5}%	5.11(8)×10^{-5}% [b]	7/2$^+$	0.4456	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 129.3, 123.2, 158.1, 171.4, 274.4, 336.4, 399.5, 445.7	4.0(1)×10^3
4.807(9)	4.727(9)	7.2(11)×10^{-3}%	5.1(8)×10^{-3}%	5/2$^+$	0.4267	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 129.3, 123.2, 158.1, 171.4, 255.4, 297.5, 345.0, 375.1, 413.7, 426.7	55^{+10}_{-8}
4.830(5)	4.749(5)@@	≈8×10^{-4}%	≈6×10^{-4}%	9/2$^+$	0.4148	13.0, 30.0, 38.7, 51.6, 65.7, 69.0, 115.3, 119.0, 123.6, 188.2, 189.4, 218.0, 244.9, 311.8, 368.6	≈570
4.851(9)	4.770(9)	2.1(8)×10^{-3}%	1.5(6)×10^{-3}%	3/2$^+$	0.3932	13.0, 30.0, 38.7, 47.6, 51.6, 69.0 77.6, 116.3, 129.3, 264.0, 341.5, 380.2, 393.1	320^{+220}_{-90}
4.877(9)	4.795(9)	1.7(8)×10^{-3}%	1.2(6)×10^{-3}%	7/2$^+$	0.3670	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 54.0, 69.0, 77.6, 89.6, 96.1, 116.3, 119.7, 129.3, 123.2, 143.4, 141.7, 158.1, 171.4, 173.7, 179.2, 195.7, 225.4, 237.8, 285.3, 320.9, 354.0, 367.1	600^{+60}_{-20}
4.910(9)	4.828(9)	03.4(10)×10^{-3}%	2.4(7)×10^{-3}%	5/2$^+$	0.3328	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 129.3, 123.2, 158.1, 161.5, 171.4, 203.6, 281.2, 319.7, 332.8	530^{+220}_{-120}

* Weighted average of 24060(16) y [1975Al15], 24131(16) y [1978Ja20], 24101(20) y [1978Se12], 24089(13) y and 24019(21) [1978Pr07].
** Values from[1993Ga28], except where noted.
*** Value from [1980RyZX], adjusted by -0.11 keV as recommended by [1991Ry01].
@ Value from [1968Ba25], adjusted by +1.0 keV as recommended by [1991Ry01].
@@ [1966Ah02].
@@@ [2014Br18].
[a] R_0 (fm) = 1.51188(12).
[b] Deduced from γ energies [1976GuZN] and Q_{α} = 5244.43(14) keV, using the levels and transitions from [2014Br18]. Conversion electron strength and strength from unobserved γ's (in [1976GuZN]) decaying from a given level are taken into account.

Table 7
direct α emission from ^{239}Pu, J^{π} = 1/2^{+}, $T_{1/2}$ = 24085(13) y*, BR_{α} = 100%. (3 of 3)

E_{α}(c.m.)	E_{α}(lab)**	I_{α}(rel)	I_{α}(abs)**	J_f^{π}@@@	$E_{daughter}$(^{235}U)@@@	coincident γ-rays (keV)@@@	HF
4.950(9)	4.867(9)	2.7(10)$\times10^{-3}$%	1.9(7)$\times10^{-3}$%	13/2^{+}	0.2946	13.0, 30.0, 38.7, 51.6, 68.7, 69.0, 97.6, 98.8, 115.3, 144.2	$1.2^{+0.7}_{-0.3}\times10^{3}$
4.995(9)	4.911(9)	3.4(13)$\times10^{-3}$%	2.4(9)$\times10^{-3}$%	15/2^{-}	0.2500	3.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 57.8, 69.0, 77.6, 78.8, 89.6, 103.1, 116.3, 116.3, 119.7, 129.3, 123.2, 146.3, 158.1, 171.4	$1.9^{+1.2}_{-0.5}\times10^{3}$
5.018(9)	4.934(9)	8.5(14)$\times10^{-3}$%	6(1)$\times10^{-3}$%	9/2^{+}	0.2254	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 54.0, 69.0, 77.6, 89.6, 96.1, 116.3, 119.7, 129.3, 123.2, 143.4, 158.1, 171.4, 173.7, 179.2, 225.4	$1.14^{+0.23}_{-0.16}\times10^{3}$
5.046(9)	4.962(9)	0.010(1)%	7(1)$\times10^{-3}$%%	11/2^{+}	0.1971	13.0, 30.0, 38.7, 51.6, 69.0, 115.3	$1.5^{+3}_{-2}\times10^{3}$
5.074(9)	4.989(9)	0.018(3)%	0.013(2)%	7/2^{+}	0.1714	13.0, 30.0, 38.7, 41.9, 46.2, 47.6, 51.6, 69.0, 77.6, 89.6, 116.3, 119.7, 123.2, 129.3, 158.1, 171.4	1.2(2)$\times10^{3}$
5.094(9)	5.009(9)	0.024(3)%	0.017(2)%	9/2^{+}	0.1504	13.0, 30.0, 38.7, 51.6, 68.7, 69.0 98.8	$1.25^{+0.17}_{-0133}\times10^{3}$
5.117(9)	5.031(9)	0.013(42%	9.4(3)$\times10^{-3}$%	5/2^{+}	0.1293	13.0, 30.0, 38.7, 47.6, 51.6, 69.0 77.6, 116.3, 129.3	3.1(1)$\times10^{3}$
5.141(9)	5.055(9)	0.066(18)%	0.047(13)%	11/2^{-}	0.1039	46.2, 57.8, 103.1	910^{+350}_{-200}
5.162(9)	5.076(9)	0.11(1)%	0.078(8)%	7/2^{+}	0.0817	13.0, 30.0, 38.7, 51.6, 69.0	760^{+90}_{-70}
5.1927(8)	5.1058(8)@	16.87(10)%	11.94(7)%	5/2^{+}	0.0517	13.0, 38.7, 51.6	7.68(5)
5.2319(8)	5.1443(8)@	24.18(20)%	17.11(14)%	3/2^{+}	0.0130	13.0	9.40(8)
5.24436(14)	5.15659(14)***	100.0(2)%	70.77(14)%	1/2^{+}	0.000076		2.74(1)

* Weighted average of 24060(16) y [1975Al15], 24131(16) y [1978Ja20], 24101(20) y [1978Se12], 24089(13) y and 24019(21) [1978Pr07].
** Values from[1993Ga28], except where noted.
*** Value from [1980RyZX], adjusted by -0.11 keV as recommended by [1991Ry01].
@ Value from [1968Ba25], adjusted by +1.0 keV as recommended by [1991Ry01].
@@ [1966Ah02].
@@@ [2014Br18].
[a] R_0 (fm) = 1.51188(12).
[b] Deduced from γ energies [1976GuZN] and Q_{α} = 5244.43(14) keV, using the levels and transitions from [2014Br18]. Conversion electron strength and strength from unobserved γ's (in [1976GuZN]) decaying from a given level are taken into account.

Table 8
direct α emission from ^{243}Cm, J^{π} = 5/2$^+$, $T_{1/2}$ = 29.20(14) y*, BR_{α} = 99.97(3)%.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(rel)	I_{α}(abs)	J^{π}_f	$E_{daughter}$(^{239}Pu)	coincident γ-rays (keV)$^{@@}$	HF^a
5.355(3)	5.267(3)***	0.002%	0.0015%***		0.813(3)		60
5.405(3)	5.316(3)***	0.001%	0.001%***		0.763(3)		180
5.412(3)	5.323(3)***	0.004%	0.003%***		0.756(3)		67
5.421(3)	5.332(3)***	0.004%	0.003%***		0.747(3)		76
5.615(3)	5.523(3)***	0.003%	0.002%***		0.552(3)		1.6×10^3
5.625(3)	5.532(3)***	0.008%	0.006%***		0.543(3)		610
5.630(3)	5.537(3)***	0.003%	0.002%***		0.538(3)		2.0×10^3
5.661(3)	5.568(3)***	0.010%	0.007%***	(5/2$^-$)	0.5056(2)$^{@@}$	49.4, 57.3, 67.8, 430.0, 448.3, 505.6	850
5.668(3)	5.575(3)***	0.010%	0.007%***		0.499(3)		930
5.675(3)	5.582(3)***	≈0.012%	≈0.009%***	3/2$^-$	0.4921(3)$^{@@}$	49.4, 57.3, 434.7, 484.3, 492.3	≈790
5.681(3)	5.587(3)***	≈0.027%	≈0.02%	(11/2$^-$)	0.487(3)		≈380
5.687(2)	5.593(2)$^{@}$	0.041(10)%	0.03(1)%$^{@}$		0.481(3)		270^{+140}_{-70}
5.703(3)	5.609(3)***	0.014%	0.01%***		0.465(3)		1.0×10^3
5.706(3)	5.612(3)***	≈0.055%	≈0.04%***	(11/2$^+$)	0.462(3)		≈260
5.716(3)	5.622(3)***	0.082%	0.06%***		0.452(3)		200
5.780(2)	5.685(2)$^{@@}$	2.25(28)%	1.65(20)%$^{@}$	9/2$^+$	0.3874$^{@@}$	44.7, 49.4, 57.3, 67.8, 88.1, 102.0, 106.5, 166.3, 209.8, 228.1, 254.4, 272.9, 277.6, 322.3, 285.5, 311.7	$16.5^{+2.4}_{-1.9}$
5.8382(9)	5.7421(9)	16.80(97)%	12.3(6)%	7/2$^+$	0.3301$^{@@}$	44.7, 49.4, 57.3, 67.8, 88.1, 106.5, 166.3, 209.8, 228.1, 254.4, 272.9, 277.6, 322.3, 285.5	4.53(24)
5.8820(9)	5.7852(9)	100.0(44)%	73.2(23)%	5/2$^+$	0.2855$^{@@}$	49.4, 57.3, 67.8, 209.8, 228.1, 277.6, 285.5	1.32(4)
6.0921(15)	5.9918(15)	7.79(37)%	5.7(2)%	7/2$^+$	0.0757$^{@@}$	67.8	209(8)
6.158	6.057	6.83%	5%	3/2$^+$	0.0078$^{@@}$		570
6.1677(17)	6.0662(17)	2.05(28)%	1.5(2)%	1/2$^+$	0.00	——	$1.9^{+3.1}_{-2.4}\times10^3$

* [1986Ti03].
** [1958Ch38].
*** From [1966Ba07], E_{α}(lab) is adjusted by +0.4 keV as recommended by [1991Ry01].
$^{@}$ Weighted average of values from [1963Dz07] (adjusted by -1.5 keV [1991Ry01]) and [1966Ba07] (adjusted by +0.4 keV [1991Ry01]). I_{α}(abs) taken from [1963Dz07].
$^{@@}$ [2014Br13].
$^{@@@}$ Recommended by [1991Ry01] based on the adjusted values of [1957As70], [1963Dz07] and [19Ba07].
^{a} R_0 (fm) = 1.499719(73).

Table 9
direct α emission from ^{247}Cf*, J^{π} = (7/2$^+$), $T_{1/2}$ = 3.11(3) h, BR_{α} = 0.035(5)%.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(rel)	I_{α}(abs)	J^{π}_f	$E_{daughter}$(^{243}Cm)	coincident γ-rays (keV)	R_0 (fm)	HF
6.341(6)	6.238(6)	5(1)%	5(1)%				1.4903(17)	16^{+5}_{-3}
6.400(5)	6.296(5)	100%	95(3)%				1.4903(17)	$1.56^{+0.31}_{-0.24}$

* All values from [1984Ah02].

Table 10
direct α emission from ^{251}Fm*, J^{π} = (7/2$^+$), $T_{1/2}$ = 5.30(8) h, BR_{α} = 1.80(13)%**.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(rel)	I_{α}(abs)	J^{π}_f	$E_{daughter}$(^{247}Cf)	coincident γ-rays (keV)	R_0 (fm)	HF
6.687(3)	6.58(3)	0.30(5)%	$4.7(8)\times10^{-3}$%	(9/2$^-$)	0.738	55.0, 683	1.4730(28)	39^{+9}_{-7}
6.747(3)	6.639(3)	0.64(7)%	0.010(1)%	(7/2$^-$+)	0.678	55.0, 623.0, 678.0	1.4730(28)	34^{+6}_{-5}
6.790(4)	6.682(4)	0.08(3)%	$1.3(5)\times10^{-3}$%	(13/2$^+$)	0.634		1.4730(28)	430^{+340}_{-140}
6.830(3)	6.721(3)	0.51(5)%	$7.9(9)\times10^{-3}$%	(13/2$^-$)	0.594		1.4730(28)	103^{+18}_{-15}
6.873(3)	6.763(3)	0.44(7)%	$6.68(12)\times10^{-3}$%	(11/2$^+$)	0.552	55.0, 496	1.4730(28)	180^{+50}_{-30}
6.893(2)	6.783(2)	5.52(24)%	0.086(7)%	(11/2$^-$)	0.5320	55.0, 67.1, 122.1, 331.0, 410.0, 477.0	1.4730(28)	17.7(21)
6.945(2)	6.834(2)	100%	1.6(1)%	(9/2$^-$)	0.4804	55.0, 67.1, 122.1, 358.3, 425.4, 480.4	1.4730(28)	1.63(18)
6.998(2)	6.886(2)	1.95(12)%	0.031(3)%	(7/2$^+$)	0.4272	55.0, 372.2	1.4730(28)	141(17)
7.041(2)	6.929(2)	2.07(12)%	0.0320(3)%	(5/2$^+$)	0.383	383.2	1.4730(28)	205(24)
7.222(5)	7.107(5)	≈0.06	$\approx9\times10^{-4}$%	(13/2$^+$)	0.202		1.4730(28)	$\approx4.2\times10^4$
7.301(3)	7.185(3)	0.33(3)%	$5.2(7)\times10^{-3}$%	(11/2$^+$)	0.1221	55.0, 67.1, 122.1	1.4730(28)	$1.5^{+0.3}_{-0.2}\times10^4$
7.369(3)	7.252(3)	1.07(9)%	0.017(2)%	(9/2$^+$)	0.0550	55.0	1.4730(28)	$8.6^{+1.4}_{-1.1}\times10^3$
7.424(3)	7.306(3)	1.7(2)%	0.027(3)%	(7/2$^+$)	0.0	——	1.4730(28)	$8.7(11)\times10^3$

* All values from [1973Ah02], except where noted.
** [1978Ah02].

Table 11
direct α emission from ^{255}No*, J^{π} = (1/2$^+$), $T_{1/2}$ = 3.52(18) m, BR_{α} = 30(5)%.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(rel)	I_{α}(abs)	J^{π}_f	$E_{daughter}$(^{251}Fm)	coincident γ-rays (keV)	R_0 (fm)	HF
7.825(5)	7.702(5)	9(2)%	0.81(22)%	(5/2$^+$)	0.604(4)		1.4717(26)	18^{+9}_{-5}
7.849(6)	7.726(6)	9.1(29)%	0.81(29)%	(3/2$^+$)	0.579(5)		1.4717(26)	22^{+14}_{-7}
7.871(3)	7.748(3)	62(5)%	5.5(10)%	(1/2$^+$)	0.5887	163.3, 166.7, 191.9, 195.3, 200.1, 358.5	1.4717(26)	$3.0^{+0.9}_{-0.6}$
7.967(4)	7.842(4)	14.4(22)%	1.29(29)%	(5/2$^+$)	0.461(3)		1.4717(26)	37^{+10}_{-8}
8.035(3)	7.909(3)	56(4)%	5.1(9)%	(3/2$^+$)	0.3954	191.9, 195.3, 200.1	1.4717(26)	16^{+5}_{-3}
8.129(4)	8.001(4)	22.8(26)%	2.04(41)%	(9/2$^+$)	0.301(3)		1.4717(26)	84^{+28}_{-19}
8.185(4)	8.057(4)	34.7(31)%	3.11(59)%	(7/2$^+$)	0.243(3)		1.4717(26)	87^{+27}_{-19}
8.229(3)	8.100(3)	100(5)%	9.0(16)%	(5/2$^+$)	0.2001	200.1	1.4717(26)	42^{+12}_{-9}
8.364(4)	8.233(4)	23.1(26)%	2.07(42)%	(11/2$^-$)	0.0639	63.9	1.4717(26)	520^{+170}_{-110}
8.428(6)	8.296(6)	4.0(12)%	0.36(12)%	(9/2$^-$)	0.0	——	1.4717(26)	$4.9^{+3.0}_{-1.5}\times10^3$

* All values from [2011As02].

Table 12
direct α emission from ^{259}Rf*, J^{π} = (1/2$^+$), $T_{1/2}$ = 2.4(4) s**, BR_{α} = 92.1(23)%***.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(rel)	I_{α}(abs)	J^{π}_f	$E_{daughter}$(^{255}No)	coincident γ-rays (keV)	R_0 (fm)	HF
8.908(10)	8.770(10)	100%	55%		x + 101 keV		1.481(16)	3.1
9.009(10)	8.870(10)	67%	37%		x		1.481(16)	9

* All values from [1981Be03], except where noted.
** Weighted average of 3.2(8) s [1973Dr10], 3.0(1.3) s [1981Be03], 3.4(17) s [1985So03],$1.7^{+0.8}_{-0.5}$ s [1994Gr08], $2.2^{+17}_{-0.8}$ s [2004Fo08] and $1.9^{+1.3}_{-0.5}$ s [2006Gr24].
*** Weighted average of 6.3(37)% [1981Be03] and 9(3)% [1985So03] for BR_{SF}. α-decay is expected to be the rest of the decay strength.

Table 13
direct α emission from ^{263}Sg*, $T_{1/2}$ = 0.9(2) s, BR_{α} = 87(8)%**.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(abs)	J^{π}_f	$E_{daughter}$(^{259}Rf)	coincident γ-rays (keV)	R_0 (fm)	HF
9.200(40)	9.060(40)					1.466(30)	$0.9^{+1.0}_{-0.5}$

* All values from [1974Gh04], except where noted.
** [2006Gr24].

Table 14
direct α emission from ^{263m}Sg*, Ex. = unk., $T_{1/2} = 560^{+160}_{-100}$ ms, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{259}Rf)	coincident γ-rays (keV)	R_0 (fm)	HF
9.393	9.250					1.466(30)	1.7

* All values from [2006Ni10].

Table 15
direct α emission from ^{267}Hs*, $T_{1/2} = 0.80^{+3.80}_{-0.37}$ s, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{263}Sg)	coincident γ-rays (keV)	R_0 (fm)	HF
10.00	9.85					1.470(30)	28

* All values from [2004Mo40].

Table 16
direct α emission from ^{267m}Hs*, Ex. = unk., $T_{1/2} = 52^{+13}_{-8}$ ms, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{263}Sg)	coincident γ-rays (keV)	R_0 (fm)	HF
9.88	9.73					1.470(30)	0.9

* All values from [2004Mo40].

Table 17
direct α emission from ^{271}Ds*, $T_{1/2} = 1.63^{+0.44}_{-0.29}$ ms, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{267}Hs)	coincident γ-rays (keV)	R_0 (fm)	HF
10.87	10.71						

* All values from [2015Mo25].

Table 18
direct α emission from ^{271m}Ds*, Ex. = unk., $T_{1/2} = 69^{+56}_{-21}$ ms, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J^π_f	$E_{daughter}$(^{267}Hs)	coincident γ-rays (keV)	R_0 (fm)	HF
10.06	9.91	13%	7%					
10.61	10.45	63%	36%					
10.89	10.73	100%	57%					

* All values from [2015Mo25]. I_α is based on the 14 events reported therein.

References used in the Tables

[1] **1940Fl02** G. N. Flerov, K. A. Petrzhak, J. Phys. (Moscow). (U.S.S.R.) **3**, 275 (1940).

[2] **1944ChZX**O. Chamberlain, G. W. Farwell, E. Segre, LA-86 (1944).

[3] **1945RoZZ** J. E. Roberts, A. C. Wahl, LA-446 (1945).

[4] **1948Cr12** T. E. Cranshaw, J. A. Harvey, Can. J. Research **26**A, 243 (1948). https://doi.org/10.1139/cjr48a-022

[5] **1948Je02** W. P. Jesse, H. Forstat, Phys. Rev. **73**, 926 (1948).

[6] **1949GaZZ** C. S. Garner, N. A. Bonner, G. T. Seaborg, The Transuranium Elements: Research Papers, Book 1, Vol. **14**B, paper 1. 10, G. T. Seaborg ed. , p. 84 (1949).

[7] **1949SeZX** G. T. Seaborg, E. M. McMillan, J. W. Kennedy, A. C. Wahl, The Transuranium Elements: Research Papers, Book 1, Vol. **14**B, paper 1. 1a, G. T. Seaborg ed., p. 3 (1949).

[8] **1949SeZY** G. T. Seaborg, E. M. McMillan, J. W. Kennedy, A. C. Wahl, The Transuranium Elements: Research Papers, Book 1, Vol. **14**B, paper 1. 1a, G. T. Seaborg ed., p. 1 (1949).

[9] **1950Ro09**S. Rosenblum, M. Valadares, B. Goldschmidt, Compt. Rend. **230**, 638 (1950).

[10] **1951Gh22**A. Ghiorso, Phys. Rev. **82**, 979 (1951).

[11] **1951Hu39** E. K. Hulet, S. G. Thompson, A. Ghiorso, K. Street, Jr., Phys. Rev. **84**, 366 (1951). https://doi.org/10.1103/PhysRev.84.366.2

[12] **1951Sa30** G. J. Sayag, Compt. Rend. 232, 2091 (1951).

[13] **1952Fl20** E. H. Fleming, Jr. , A. Ghiorso, B. B. Cunningham, Phys. Rev. **88**, 642 (1952). https://doi.org/10.1103/PhysRev.88.642

[14] **1952Se67** E. Segre, Phys. Rev. **86**, 21 (1952). https://doi.org/10.1103/PhysRev.86.21

[15] **1953As14** F. Asaro, S. G. Thompson, I. Perlman, Phys. Rev. **92**, 694 (1953). https://doi.org/10.1103/PhysRev.92.694

[16] **1953AsZZ** F. Asaro, Thesis, Univ. California (1953); UCRL-2180 (1953).

[17] **1953Bu63** J. P. Butler, J. S. Adam, Phys. Rev. **91**, 1219 (1953).

[18] **1953Fr37**M. S. Freedman, A. H. Jaffey, F. Wagner, Jr. , J. May, Phys. Rev. **89**, 302 (1953).

[19] **1955Go57** L. L. Goldin, G. I. Novikova, E. F. Tretyakov, Conf. Acad. Sci. USSR Peaceful Uses of Atomic Energy, Session Div. Phys. Math. Sci. , Moscow, p. 226 (1955); Consultants Bureau Transl. p. 167 (1956).

[20] **1955St04** F. S. Stephens, Jr., Thesis, Univ. California (1955); UCRL-2970 (1955).

[21] **1957Am47** S. Amiel, A. Chetham-Strode, Jr. , G. R. Choppin, A. Ghiorso, B. G. Harvey, L. W. Holm, S. G. Thompson, Phys. Rev. **106**, 553 (1957). https://doi.org/10.1103/PhysRev.106.553

[22] **1957As70**F. Asaro, S. G. Thompson, F. S. Stephens, Jr., I. Perlman, Bull. Am. Phys. Soc. **2**, No. 8, 393 R1 (1957).

[23] **1957Cl16**F. L. Clark, H. J. Spencer-Palmer, R. N. Woodward, J. S. African Chem. Inst. **10**, 62 (1957).

[24] **1957No15**G. I. Novikova, L. N. Kondratev, Y. P. Sobolev, L. L. Goldin, Zhur. Eksptl. i Teoret. Fiz. **32**, 1018 (1957).; Soviet Phys. JETP **5**, 832 (1957).

[25] **1957Wu39** E. Wurger, K. P. Meyer, P. Huber, Helv. Phys. Acta **30**, 157 (1957).

[26] **1958Ca19** M. J. Cabell, Can. J. Phys. **36**, 989 (1958). https://doi.org/10.1139/p58-107

[27] **1958Ch38** G. R. Choppin, S. G. Thompson, J. Inorg. Nucl. Chem. **7**, 197 (1958). https://doi.org/10.1016/0022-1902(58).80069-X

[28] **1958Fi10** I. I. Filimonov, B. V. Pshenichnikov, Zhur. Eksptl. I. Teoret. Fiz. **35**, 548 (1958).; Soviet Phys. JETP 8, 378 (1959).

[29] **1959Do64**Y. P. Dokuchaev, Atomnaya Energ. **6**, 74 (1959).; J. Nuclear Energy 11A, 195 (1960).; Soviet J. At. Energy **6**, 41 (1960). https://doi.org/10.1007/BF01471930

[30] **1959Ma25**T. L. Markin, J. Inorg. Nucl. Chem. **9**, 320 (1959). https://doi.org/10.1016/0022-1902(59).80238-4

[31] **1960Ba44** S. A. Baranov, A. G. Zelenkov, V. M. Kulakov, Izvest. Akad. Nauk SSSR, Ser. Fiz. **24**, 1035 (1960).; Columbia Tech. Transl. **24**, 1045 (1961).

[32] **1960Vo07** A. A. Vorobev, A. P. Komar, V. A. Korolev, Izvest. Akad. Nauk SSSR, Ser. Fiz. **24**, 1092 (1960).; Columbia Tech. Transl. 24, 1099 (1961).

[33] **1961Dz05** B. S. Dzhelepov, R. B. Ivanov, V. G. Nedovesov, Zhur. Eksptl. i Teoret. Fiz. 41, 1725 (1961).; Soviet Phys. JETP 14, 1227 (1962).

[34] **1962Ba52**S. A. Baranov, V. M. Kulakov, S. N. Belenkii, Zhur. Eksptl. i Teoret. Fiz. **43**, 1135 (1962).; Soviet Phys. JETP 16, 801 (1963).

[35] **1962De15** A. J. Deruytter, J. A. Moore, I. G. Schroder, Cu(Pnpl). - 219, p. 11 (1962).

[36] **1962Ja10** J. F. W. Jansen, S. Hultberg, P. F. A. Goudsmit, A. H. Wapstra, Nuclear Phys. **38**, 121 (1962). https://doi.org/10.1016/0029-5582(62)91022-2

[37] **1962Le11** C. F. Leang, Compt. Rend. **255**, 3155 (1962).

[38] **1963Ba09** S. A. Baranov, V. M. Kulakov, S. N. Belenky, Nucl. Phys. **41**, 95 (1963). https://doi.org/10.1016/0029-5582(63).90483-8

[39] **1963Bj03** S. Bjornholm, C. M. Lederer, F. Asaro, I. Perlman, Phys. Rev. **130**, 2000 (1963). https://doi.org/10.1103/PhysRev.130.2000

[40] **1963Dz07** B. S. Dzhelepov, R. B. Ivanov, V. G. Nedovesov, V. P. Chechev, Zh. Eksperim. i Teor. Fiz. **45**, 1360 (1963); Soviet

Phys. JETP **18**, 937 (1964).

[41] **1963Le07** J. Lerner, J. Inorg. Nucl. Chem. **25**, 749 (1963). https://doi.org/10.1016/0022-1902(63).80357-7

[42] **1963Le17** C. M. Lederer, Thesis, Univ. California (1963); UCRL-11028 (1963).

[43] **1964Sc27** R. P. Schuman, IDO-17042, p. 11 (1964).

[44] **1965De06** A. J. Deruytter, I. G. Schroder, J. A. Moore, Nucl. Sci. Eng. **21**, 325 (1965). https://doi.org/10.13182/NSE65-A20036

[45] **1965Ho04** F. Horsch, Z. Physik **183**, 352 (1965). https://doi.org/10.1007/BF01380764

[46] **1965Ti03** E. Tielsch, Phys. Letters **17**, 273 (1965). https://doi.org/10.1016/0031-9163(65)90528-7

[47] **1965Wh05** P. H. White, G. J. Wall, F. R. Pontet, J. Nucl. Energy A/B**19**, 33 (1965). https://doi.org/10.1016/0368-3230(65).90086-8

[48] **1966Ah02** I. Ahmad, Thesis, Univ. California (1966).; UCRL-16888 (1966).

[49] **1966Al23** B. M. Aleksandrov, A. S. Krivokhatskii, L. Z. Malkin, K. A. Petrzhak, At. Energ. **20**, 315 (1966).; Sov. At. Energy **20**, 352 (1966).

[50] **1966Ba07** S. A. Baranov, Y. F. Rodionov, V. M. Kulakov, V. M. Shatinskii, Yadern. Fiz. **4**, 1108 (1966); Soviet J. Nucl. Phys. **4**, 798 (1967).

[51] **1966Ba58** P. O. Banks, L. T. Silver, J. Geophys. Res. **71**, 4037 (1966). https://doi.org/10.1029/JZ071i016p04037

[52] **1966Ga03** R. Gaeta, M. A. Vigon, Nucl. Phys. **76**, 353(1966). https://doi.org/10.1016/0029-5582(66).90029-0

[53] **1966Ga27** R. Gaeta, Anales Real Soc. Espan. Fis. Quim. (Madrid). **62**A, 27 (1966).

[54] **1966He11** R. L. Heath, J. E. Cline, IDO-17188 (June 1966).

[55] **1967Gh01** A. Ghiorso, T. Sikkeland, M. J. Nurmia, Phys. Rev. Letters **18**, 401 (1967). https://doi.org/10.1103/PhysRevLett.18.401

[56] **1968Ba25** S. A. Baranov, V. M. Kulakov, V. M. Shatinskii, Yadern. Fiz. **7**, 727 (1968).; Soviet J. Nucl. Phys. **7**, 442 (1968).

[57] **1967Ch17** J. Chwaszczewska, K. A. Gavrilov, W. Kusch, M. Szymczak, Phys. Letters **25**B, 331 (1967). https://doi.org/10.1016/0370-2693(67).90085-8

[58] **1967Dr02** V. A. Druin, G. N. Akapev, A. G. Demin, Y. V. Lobanov, B. V. Fefilov, G. N. Flerov, L. P. Chelnokov, At. Energ. USSR **22**, 127 (1967).; Soviet J. At. Energy **22**, 135 (1967).

[59] **1968Cl02** J. E. Cline, Nucl. Phys. A**106**, 481 (1968). https://doi.org/10.1016/0375-9474(68).90512-5

[60] **1968Fl08** G. N. Flerov, G. N. Akapev, A. G. Demin, V. A. Druin, Y. V. Lobanov, B. V. Fefilov, Yadern. Fiz. **7**, 977 (1968).; Soviet J. Nucl. Phys. 7, 588 (1968).

[61] **1969Ba57** S. A. Baranov, V. M. Shatinskii, V. M. Kulakov, Yadern. Fiz. **10**, 1110 (1969); Soviet J. Nucl. Phys. **10**, 632 (1970).

[62] **1969Me11** V. Metag, R. Repnow, P. Von Brentano, J. D. Fox, Z. Physik **226**, 1 (1969). https://doi.org/10.1007/BF01392778

[63] **1969VaZX** R. Vandenbosch, K. L. Wolf, Proc. Symp. Phys. Chem. Fission, 2nd, Vienna, Intern. At. En. Agency, Vienna, p. 439 (1969).; IAEA-SM-122/110 (1969).

[64] **1970BaZZ** S. A. Baranov, V. M. Shatinskii, V. M. Kulakov, Program and Theses, Proc. 20th Ann. Conf. Nucl. Spectrosc. Struct. At. Nuclei, Pt. 1, Leningrad, p. 169 (1970).

[65] **1970By01**J. Byrne, R. J. D. Beattie, S. Benda, I. Collingwood, J. Phys. B **3**, 1166 (1970).

[66] **1970Cl11** J. E. Cline, IN-1448 (1970).

[67] **1970Es02**P. Eskola, K. Eskola, M. Nurmia, A. Ghiorso, Phys. Rev. C**2**, 1058 (1970). https://doi.org/10.1103/PhysRevC.2.1058

[68] **1970GhZY** A. Ghiorso, Proc. Robert A. Welch Foundation Conf. On Chem. Research, W. O. Milligan, Ed. , Houston, Texas (1969)., Vol. XIII, p. 107 (1970).

[69] **1970Og05**Y. T. Oganesyan, Y. V. Lobanov, S. P. Tretyakova, Y. A. Lazarev, I. V. Kolesov, K. A. Gavrilov, V. M. Plotko, Y. V. Poluboyarinov, At. Energ. USSR **28**, 393 (1970).; Soviet J. At. Energy **28**, 502 (1970).

[70] **1970Po01** S. M. Polikanov, G. Sletten, Nucl. Phys. A**151**, 656 (1970). https://doi.org/10.1016/0375-9474(70)90403-3

[71] **1971Bb10** S. A. Baranov, V. M. Shatinskii, V. M. Kulakov, Yad. Fiz. **14**, 1101 (1971); Sov. J. Nucl. Phys. **14**, 614 (1972).

[72] **1971BeYR**C. E. Bemis, Jr. , D. C. Hensley, P. F. Dittner, C. D. Goodman, R. J. Silva, ORNL-4706, p. 62 (1971).

[73] **1971BeZZ** C. E. Bemis, CONF Dubna(Heavy Ion Physics).

[74] **1971Cl03** J. E. Cline, IN-1448 Rev. (1971).

[75] **1971GuZY**R. Gunnink, R. J. Morrow, UCRL-51087 (1971).

[76] **1971Ja07**A. H. Jaffey, K. F. Flynn, L. E. Glendenin, W. C. Bentley, A. M. Essling, Phys. Rev. C**4**, 1889 (1971). https://doi.org/10.1103/PhysRevC.4.1889

[77] **1971KrZH**L. A. Kroger, C. W. Reich, J. E. Cline, ANCR-1016, p. 75 (1971).

[78] **1971Re11** R. Repnow, V. Metag, P. von Brentano, Z. Phys. **243**, 418 (1971). https://doi.org/10.1007/BF01396616

[79] **1971Ta17** B. Tamain, B. Pfeiffer, H. Wollnik, E. Konecny,Nucl. Phys. A**173**, 465 (1971). https://doi.org/10.1016/0375-9474(71).90964-X

[80] **1972GaZW** L. Galloway, J. L. Fowler, J. A. Harvey, C. H. Johnson, REPT ORNL-4743, P39, 6/7/72.

[81] **1972Wo07** K. L. Wolf, J. P. Unik, Phys. Lett. **38**B, 405 (1972). https://doi.org/10.1016/0370-2693(72)90167-0

[82] **1973Ah02**I. Ahmad, J. Milsted, R. K. Sjoblom, J. Lerner, P. R. Fields, Phys. Rev. C**8**, 737 (1973). https://doi.org/10.1103/PhysRevC.8.737

[83] **1973AhZZ** I. Ahmad, J. Milsted, R. K. Sjoblom, J. Lerner, P. R. Field, JOUR BAPSA **18** 702 JK15.

[84] **1973Br04**H. C. Britt, M. Bolsterli, J. R. Nix, J. L. Norton, Phys. Rev. C**7**, 801 (1973). https://doi.org/10.1103/PhysRevC.7.801

[85] **1973Dr10**V. B. Druin, Y. V. Lobanov, D. M. Nadkarni, Y. P. Kharitonov, Y. S. Korotkin, S. P. Tretyakova, V. I. Krashonkin, At. Energ. **35**, 279 (1973).; Sov. At. Energy **35**, 946 (1974).

[86] **1973DrZZ** V. B. Druin, Y. V. Lobanov, D. M. Nadkarni, Y. P. Kharitonov, Y. S. Korotkin, S. P. Tretyakova, V. I. Krashonkin, JOUR BAPSA **18** 592 DE12

[87] **1973GrYU** A. Grutter, H. R. von Gruten, V. Herrnberger,B. Hahn, U. Mosser, H. W. Reist, G. Sletten, REPT EANDC(OR).-133L P13.

[88] **1973Na03**M. N. Namboodiri, F. H. Ruddy, J. M. Alexander, Phys. Rev. C**7**, 1222 (1973). https://doi.org/10.1103/PhysRevC.7.1222

[89] **1973Na35**T. Nagy, Magy. Fiz. Foly. **21**, 555 (1973).

[90] **1974Be52**C. E. Bemis, Jr. , F. Plasil, R. L. Ferguson, E. E. Gross, A. Zucker, Phys. Rev. C**10**, 1590 (1974). https://doi.org/10.1103/PhysRevC.10.1590

[91] **1974BeYO**C. E. Bemis, Jr. R. L. Ferguson, F. Plasil, E. E. Gross, A. Zucker, ORNL-4937, p. 26 (1974).

[92] **1974De19**A. J. Deruytter, G. Wegener-Penning, Phys. Rev. C**10**, 383 (1974). https://doi.org/10.1103/PhysRevC.10.383

[93] **1974DiZI**P. F. Dittner, F. Plasil, C. E. Bemis, Jr. , F. Pleasonton, R. L. Ferguson, D. C. Hensley, ORNL-4976, p. 39 (1974).

[94] **1974Gh04**A. Ghiorso, J. M. Nitschke, J. R. Alonso, C. T. Alonso, M. Nurmia, G. T. Seaborg, E. K. Hulet, R. W. Lougheed, Phys. Rev. Lett. **33**, 1490 (1974). https://doi.org/10.1103/PhysRevLett.33.1490

[95] **1974GrZA**A. Grutter, H. R. von Gunten, V. Herrnberger, B. Hahn, U. Moser, H. W. Reist, G. Sletten, Proc. Symp. Phys. Chem. of Fission, 3rd, Rochester, N. Y. (1973)., Int. At. En. Agency, Vienna, Vol. 1, p. 305 (1974).

[96] **1974GaZD**D. Galeriu, M. Marinescu, D. Poenaru, I. Vilcov, N. Vilcov, Y. P. Gangrsky, P. Z. Hien, N. C. Khan, Proc. Symp. Phys. Chem. Fission, 3rd, Rochester, N. Y. (1973)., Int. At. En. Agency, Vienna, Vol. 1, p. 297 (1974).

[97] **1974Te03**W. Teoh, R. D. Connor, R. H. Betts, Nucl. Phys. A**228**, 432 (1974). https://doi.org/10.1016/0375-9474(74).90613-7

[98] **1975Al15**B. M. Aleksandrov, V. T. Antsiferov, L. S. Bulyanitsa, A. M. Geidelman, Y. S. Egorov, L. M. Krizhanskii, A. A. Lipovskii, V. G. Nedovesov, L. D. Preobrazhenskaya, L. A. Razumovskii, V. M. Smirnov, Y. V. Kholnov, Y. L. Chereshkevich, V. I. Sharalapov, G. E. Shchukin, K. I. Yakovlev, G. M. Yanchilenko, Izv. Akad. Nauk SSSR, Ser. Fiz. **39**, 482 (1975).; Bull. Acad. Sci. USSR, Phys. Ser. **39**, No. 3, 20 (1975).

[99] **1975Va11**E. Vano, R. Gaeta, L. Gonzalez, C. F. Liang, Nucl. Phys. A**251**, 225 (1975). https://doi.org/10.1016/0375-9474(75).90067-6

[100] **1976BaZZ**S. A. Baranov, A. G. Zelenkov, V. M. Kulakov, Proc. Advisory Group Meeting on Transactinium Nucl. Data, Karlsruhe, Vol. III, p. 249 (1976).; IAEA-186 (1976).

[101] **1976GhZV**A. Ghiorso, E. K. Hulet, J. M. Nitschke, J. R. Alonso, R. W. Lougheed, C. T. Alonso, M. Nurmia, G. T. Seaborg, Proc. 4th Intern. Transplutonium Element Symp. , Baden Baden, 1975, W. Muller, R. Lindner, Eds. , p. 323 (1976).

[102] **1976GhZW**A. Ghiorso, E. K. Hulet, J. M. Nitschke, J. R. Alonso, R. W. Lougheed, C. T. Alonso, M. Nurmia, G. T. Seaborg, REPT CERN-76-13, P548.

[103] **1976GhZX**A. Ghiorso, E. K. Hulet, J. M. Nitschke, J. R. Alonso, R. W. Lougheed, C. T. Alonso, M. Nurmia, G. T. Seaborg, Proc. 4th Intern. Transplutonium Element Symp. , Baden Baden, 1975, W. Muller, R. Lindner, Eds. , p. 323 (1976).

[104] **1976GuZN**R. Gunnink, J. E. Evans, A. L. Prindle, UCRL-52139 (1976).

[105] **1976SiZS** R. J. Silva, C. E. Bemis, Jr. , P. F. Dittner, D. C. Hensley, ORNL-5137, p. 70 (1976).

[106] **1977Ba72** S. A. Baranov, V. M. Shatinskii, A. G. Zelenkov, V. A. Pchelin, Yad. Fiz. **26**, 921 (1977).; Sov. J. Nucl. Phys. 26, 486 (1977).

[107] **1977GoYZ**U. Goerlach, D. Habs, M. Just, V. Metag, E. Mosler, J. Pedersen, J. Schukraft, P. Singer, H. J. Specht, G. Ulfert, C. O. Wene, Max-Planck Institut fur Keinphysik (Heidelberg)., Jahresbericht 1977, p. 51 (1977).

[108] **1977Ja08**A. H. Jaffey, H. Diamond, W. C. Bentley, K. F. Flynn, D. J. Rokop, A. M. Essling, J. Williams, Phys. Rev. C**16**, 354 (1977). https://doi.org/10.1103/PhysRevC.16.354

[109] **1977MeYY** J. W. Meadows, ANL-NDM-38 (1977).

[110] **1977VaYQ** R. Vaninbroukx, REPT NEANDC(E).-192U, Vol3, P57.

[111] **1977VaZW**V. I. Vakatov, H. Sodan, R. Kalpakchieva, Y. T. Oganesyan, Y. E. Penionzhkevich, V. N. Polyanskii, L. P. Chelnokov, JINR-P7-10123 (1977).

[112] **1978Ah02** I. Ahmad, R. K. Sjoblom, A. M. Friedman, S. W. Yates, Phys. Rev. C**17**, 2163 (1978). https://doi.org/10.1103/PhysRevC.17.2163

[113] **1978Ja20**A. H. Jaffey, H. Diamond, W. C. Bentley, K. F. Flynn, D. J. Rokop, A. M. Essling, J. Williams, Int. J. Appl. Radiat. Isotop. **29**, 505 (1978). https://doi.org/10.1016/0020-708X(78).90007-8

[114] **1978Lu10**L. L. Lucas, J. R. Noyce, B. M. Coursey, Int. J. Appl. Radiat. Isotop. **29**, 501 (1978). https://doi.org/10.1016/0020-708X(78).90006-6

[115] **1978Ma45**S. F. Marsh, R. M. Abernathey, R. J. Beckman, R. K. Zeigler, J. E. Rein, Int. J. Appl. Radiat. Isotop. **29**, 509 (1978). https://doi.org/10.1016/0020-708X(78).90008-X

[116] **1978Pr07**A. Prindle, J. Evans, R. Dupzyk, R. Nagle, R. Newbury, Int. J. Appl. Radiat. Isotop. **29**, 517 (1978). https://doi.org/10.1016/0020-708X(78).90009-1

[117] **1978Se12** P. W. Seabaugh, K. C. Jordan, Int. J. Appl. Radiat. Isotop. **29**, 489 (1978). https://doi.org/10.1016/0020-708X(78).90004-2

[118] **1979Ce04** A. Cesana, G. Sandrelli, V. Sangiust, M. Terrani, Energ. Nucl. (Milan). **26**, 526 (1979).

[119] **1980Gu20** W. Gunther, K. Huber, U. Kneissl, H. Krieger, H. Ries, H. Stroher, W. Wilke, H. J. Maier, Nucl. Phys. A350, 1 (1980). https://doi.org/10.1016/0375-9474(80).90385-1

[120] **1980RyZX** A. Rytz, Proc. Intern. Conf. Atomic Masses and Fundamental Constants, 6th, East Lansing (1979)., J. A. Nolen,Jr. , W. Benensen Eds. , Plenum Press, New York, p. 249 (1980).

[121] **1981AhZV** I. Ahmad, INDC(NDS).-126/NE, p. 28 (1981).

[122] **1981Be03** C. E. Bemis, Jr. , P. F. Dittner, R. L. Ferguson, D. C. Hensley, F. Plasil, F. Pleasonton, Phys. Rev. C23, 555 (1981). https://doi.org/10.1103/PhysRevC.23.555

[123] **1981VaZV**R. Vaninbroukx, B. Denecke, INDC(NDS).-126/NE, p. 13 (1981).

[124] **1981Vo02** H. R. von Gunten, A. Grutter, H. W. Reist, M. Baggenstos, Phys. Rev. C**23**, 1110 (1981). https://doi.org/10.1103/PhysRevC.23.1110

[125] **1982He02** R. G. Helmer, C. W. Reich, R. J. Gehrke, J. D. Baker, Int. J. Appl. Radiat. Isotop. 33, 23 (1982). https://doi.org/10.1016/0020-708X(82).90201-0

[126] **1982Va04** R. Vaninbroukx, B. Denecke, Nucl. Instrum. Methods 193, 191 (1982). https://doi.org/10.1016/0029-554X(82).90695-4

[127] **1982VaZP** R. Vaninbroukx, B. Denecke, NEANDC(E).-232U, Vol. III, p. 51 (1982).

[128] **1983Ba77** M. F. Banham, R. Jones, Int. J. Appl. Radiat. Isotop. **34**, 1225 (1983). https://doi.org/10.1016/0020-708X(83).90191-6

[129] **1983Ol01** D. G. Olson, Nucl. Instrum. Methods **206**, 313 (1983). https://doi.org/10.1016/0167-5087(83).91274-7

[130] **1983SoZZ** L. P. Somerville, Diss. Abst. Int. **43**B, 2607 (1983).

[131] **1984Ah02** I. Ahmad, J. L. Lerner, Nucl. Phys. A**413**, 423 (1984). https://doi.org/10.1016/0375-9474(84).90419-6

[132] **1984He12** R. G. Helmer, C. W. Reich, Int. J. Appl. Radiat. Isotop. **35**, 783 (1984). https://doi.org/10.1016/0020-708X(84).90087-5

[133] **1984Iw02** Y. Iwata, Y. Yoshizawa, T. Suzuki, S. Ichikawa, S. Okazaki, Int. J. Appl. Radiat. Isotop. **35**, 1 (1984). https://doi.org/10.1016/0020-708X(84).90122-4

[134] **1985Dr09** A. A. Druzhinin, V. N. Polynov, A. M. Korochkin, E. A. Nikitin, L. I. Lagutina, At. Energ. **59**, 68 (1985).; Sov. At. Energy 59, 628 (1985).

[135] **1985So03** L. P. Somerville, M. J. Nurmia, J. M. Nitschke, A. Ghiorso, E. K. Hulet, R. W. Lougheed, Phys. Rev. C **31**, 1801 (1985). https://doi.org/10.1103/PhysRevC.31.1801

[136] **1986BaYK** M. F. Banham, R. McCrohon, AERE-R-11353 (1986).

[137] **1986Bo35** M. J. G. Borge, D. G. Burke, F. Calaprice, O. C. Jonsson, G. Lovhoiden, R. A. Naumann, K. Nybo, G. Nyman, H. L. Ravn, T. F. Thorsteinsen, and the ISOLDE collaboration, Z. Phys. A**325**, 429 (1986).

[138] **1986He12** R. G. Helmer, C. W. Reich, Nucl. Instrum. Methods Phys. Res. A**242**, 475 (1986). https://doi.org/10.1016/0168-9002(86)90449-3

[139] **1986LoZT** A. Lorenz, IAEA Tech. Rept. Ser., No. 261 (1986).

[140] **1986Ti03** G. A. Timofeev, V. V. Kalygin, P. A. Privalova, At. Energ. **60**, 286 (1986).; Sov. At. Energy 60, 341 (1986).

[141] **1987Po19**V. N. Polynov, A. A. Druzhinin, A. M. Korochkin, E. A. Nikitin, V. A. Bochkarev, V. N. Vyachin, V. G. Lapin, M. Yu. Maksimov, At. Energ. **62**, 277 (1987).; Sov. At. Energy 62, 336 (1987).

[142] **1989Ho24** N. E. Holden, Pure Appl. Chem. **61**, 1483 (1989).

[143] **1989Tr11** S. P. Tretyakova, Yu. S. Zamyatnin, V. N. Kovantsev, Yu. S. Korotkin, V. L. Mikheev, G. A. Timofeev, Z. Phys. A**333**, 349 (1989). https://doi.org/10.1007/BF01299687

[144] **1991Bo20** R. Bonetti, C. Chiesa, A. Guglielmetti, C. Migliorino, A. Cesana, M. Terrani, P. B. Price, Phys. Rev. C**44**, 888 (1991). https://doi.org/10.1103/PhysRevC.44.888

[145] **1991Ry01** A Rytz, At Data NuclData Tables **47**, 205 (1991). https://doi.org/10.1016/0092-640X(91)90002-L

[146] **1992Bl13** C. J. Bland, J. Truffy, Appl. Radiat. Isot. **43**, 1241 (1992). https://doi.org/10.1016/0883-2889(92).90201-O

[147] **1992Ku03** W. Kurcewicz, G. Lovhoiden, T. F. Thorsteinsen, M. J. G. Borge, D. G. Burke, M. Cronqvist, H. Gabelmann, H. Gietz, P. Hill, N. Kaffrell, R. A. Naumann, K. Nybo, G. Nyman, J. Rogowski, and the ISOLDE Collaboration, Nucl. Phys. A**539**, 451 (1992). https://doi.org/10.1016/0375-9474(92).90287-T

[148] **1993Ga28** E. Garcia-Torano, M. L. Acena, G. Bortels, D. Mouchel, Nucl. Instrum. Methods Phys. Res. A**334**, 477 (1993). https://doi.org/10.1016/0168-9002(93).90811-U

[149] **1994Gr08** K. E. Gregorich, M. R. Lane, M. F. Mohar, D. M. Lee, C. D. Kacher, E. R. Sylwester, D. C. Hoffman, Phys. Rev. Lett. **72**, 1423 (1994). https://doi.org/10.1103/PhysRevLett.72.1423

[150] **1994HoZQ** S. Hofmann, GSI Nachrichten 11-94 (1994).

[151] **1995La20** Yu. A. Lazarev, Yu. V. Lobanov, Yu. Ts. Oganessian, Yu. S. Tsyganov, V. K. Utyonkov, F. Sh. Abdullin, S. Iliev, A. N. Polyakov, J. Rigol, I. V. Shirokovsky, V. G. Subbotin, A. M. Sukhov, G. V. Buklanov, B. N. Gikal, V. B. Kutner, A. N. Mezentsev, I. M. Sedykh, D. V. Vakatov, R. W. Lougheed, J. F. Wild, K. J. Moody, E. K. Hulet, Phys. Rev. Lett. **75**, 1903 (1995). https://doi.org/10.1103/PhysRevLett.75.1903

[152] **1995LaZX** Yu. A. Lazarev, Yu. V. Lobanov, Yu. Ts. Oganessian, Yu. S. Tsyganov, V. K. Utyonkov, F. Sh. Abdullin, S. Iliev, A. N. Polyakov, J. Rigol, I. V. Shirokovsky, V. G. Subbotin, A. M. Sukhov, G. V. Buklanov, B. N. Gikal, V. B. Kutner, A. N. Mezentsev, I. M. Sedykh, D. V. Vakatov, R. W. Lougheed, J. F. Wild, K. J. Moody, E. K. Hulet, JINR-E7-95-100 (1995).

[153] **1995Og02** Yu. Ts. Oganessian, Nucl. Phys. A**583**, 823c (1995). https://doi.org/10.1016/0375-9474(94).00766-G

[154] **1996LaZY** Yu. A. Lazarev, JINR-E7-96-82 (1996).

[155] **1997Ho03** S. Hofmann, Nucl. Phys. A616, 370c (1997). https://doi.org/10.1016/S0375-9474(97).00121-8

[156] **1997Ho13** S. Hofmann, Z. Phys. A**358**, 125 (1997). https://doi.org/10.1007/s002180050286

[157] **1997Tr17** S. P. Tretyakova, V. L. Mikheev, Nuovo Cim. **110**A, 1043 (1997). https://doi.org/10.1007/BF03035943

[158] **1998Ho13** S. Hofmann, Rep. Prog. Phys. **61**, 639 (1998). https://doi.org/10.1088/0034-4885/61/6/002

[159] **1999Yu01**H. Yuki, K. Nakazawa, T. Ohtsuki, J. Kasagi, T. Mitsugashira, J. Radioanal. Nucl. Chem. **239**, 151 (1999). https://doi.org/10.1007/BF02349547

[160] **2000Ho27** N. E. Holden, D. C. Hoffman, Pure Appl. Chem. **72**, 1525 (2000).; Erratum Pure Appl. Chem. 73, 1225 (2001). https://doi.org/10.1351/pac200072081525

[161] **2003Gi05** T. N. Ginter, K. E. Gregorich, W. Loveland, D. M. Lee, U. W. Kirbach, R. Sudowe, C. M. Folden III, J. B. Patin, N. Seward, P. A. Wilk, P. M. Zielinski, K. Aleklett, R. Eichler, H. Nitsche, D. C. Hoffman, Phys. Rev. C **67**, 064609 (2003).; Erratum Phys. Rev. C 68, 029901 (2003). https://doi.org/10.1103/PhysRevC.67.064609

[162] **2003MoZT** K. Morita, K. Morimoto, D. Kaji, T. Chihara, H. Haba, H. Hasebe, Y. Higurashi, E. Ideguchi, N. Iwasa, T. Kamigaito, R. Kanungo, T. Kato, K. Katori, M. Kidera, H. Koura, H. Kudo, T. Ohnishi, T. Suda, K. Sueki, I. Sugai, T. Suzuki, S. Takeuchi, F. Tokanai, K. Uchiyama, Y. Wakasaya, H. Xu, T. Yamaguchi, A. Yeremin, A. Yoneda, A. Yoshida, Y. L. Zhao, T. Zheng, I. Tanihata, Proc. Frontiers of Collective Motion, Aizu, Japan, November 2002, H. Sagawa and H. Iwasaki, eds., p. 140 (2003)

[163] **2004Da24** F. Dayras, N. Chauvin, Nucl. Instrum. Methods Phys. Res. A530, 391 (2004). https://doi.org/10.1016/j.nima.2004.006.130

[164] **2004Fo08** C. M. Folden III, K. E. Gregorich, Ch. E. Dullmann, H. Mahmud, G. K. Pang, J. M. Schwantes, R. Sudowe, P. M. Zielinski, H. Nitsche, D. C. Hoffman, Phys. Rev. Lett. **93**, 212702 (2004). https://doi.org/10.1103/PhysRevLett.93.212702

[165] **2004Mo14** K. Morita, K. Morimoto, D. Kaji, S. Goto, H. Haba, E. Ideguchi, R. Kanungo, K. Katori, H. Koura, H. Kudo, T. Ohnishi, A. Ozawa, J. C. Peter, T. Suda, K. Sueki, I. Tanihata, F. Tokanai, H. Xu, A. V. Yeremin, A. Yoneda, A. Yoshida, Y. -L. Zhao, T. Zheng, Nucl. Phys. A**734**, 101 (2004). https://doi.org/10.1016/j.nuclphysa.2004.01.019

[166] **2004Mo27** K. Morimoto, K. Morita, D. Kaji, S. Goto, H. Haba, E. Ideguchi, R. Kanungo, K. Katori, H. Koura, H. Kudo, T. Ohnishi, A. Ozawa, J. C. Peter, T. Suda, K. Sueki, I. Tanihata, F. Tokanai, H. Xu, A. V. Yeremin, A. Yoneda, A. Yoshida, T. -L. Zhao, T. Zheng, Nucl. Phys. A**738**, 129 (2004). https://doi.org/10.1016/j.nuclphysa.2004.04.021

[167] **2004Mo40** K. Morita, K. Morimoto, D. Kaji, H. Haba, E. Ideguchi, R. Kanungo, K. Katori, H. Koura, H. Kudo, T. Ohnishi, A. Ozawa, T. Suda, K. Sueki, I. Tanihata, H. Xu, A. V. Yeremin, A. Yoneda, A. Yoshida, Y. -L. Zhao, T. Zheng, Eur. Phys. J. A **21**, 257 (2004). https://doi.org/10.1140/epja/i2003-10205-1

[168] **2004Mo43** K. Morita, K. Morimoto, D. Kaji, Yu. L. Zhao, A. Yoshida, T. Suda, A. Yoneda, T. Ohnishi, H. Haba, E. Ideguchi, H. S. Xu, T. Zheng, H. Kudo, K. Sueki, K. Katori, I. Tanihata, Acta Phys. Hung. N. S. **19**, 53 (2004). https://doi.org/10.1556/APH.19.2004.1-2.8

[169] **2004Sc03** R. Schon, G. Winkler, W. Kutschera, Appl. Radiat. Isot. **60**, 263 (2004). https://doi.org/10.1016/j.apradiso.2003.11.027

[170] **2005Ga36** E. Garcia-Torano, M. T. Crespo, M. Roteta, G. Sibbens, S. Pomme, A. M. Sanchez, M. P. R. Montero, S. Woods, A. Pearce, Nucl. Instrum. Methods Phys. Res. A**550**, 581 (2005). https://doi.org/10.1016/j.nima.2005.05.059

[171] **2005HeZU** F. P. Hessberger, S. Hofmann, D. Ackermann, S. Antalic, I. Kojouharov, P. Kuusiniemi, R. Mann, K. Nishio, S. Saro, B. Streicher, B. Sulignano, M. Venhart, GSI 2005-1, p. 73 (2005).

[172] **2006Al28** F. S. Al-Saleh, Al-J. H. Al-Mukren, M. A. Farouk, Nucl. Instrum. Methods Phys. Res. A**568**, 734 (2006). https://doi.org/10.1016/j.nima.2006.06.052

[173] **2006AsZY** M. Asai, K. Tsukada, H. Haba, A. Toyoshima, T. Ishii, Y. Nagame, I. Nishinaka, T. Ichikawa, Y. Kojima, K. Sueki, JAEA-Review 2006-029, p. 41 (2006).

[174] **2006Gr24** K. E. Gregorich, J. M. Gates, Ch. E. Dullmann, R. Sudowe, S. L. Nelson, M. A. Garcia, I. Dragojevic, C. M. Folden III, S. H. Neumann, D. C. Hoffman, H. Nitsche, Phys. Rev. C **74**, 044611 (2006). https://doi.org/10.1103/PhysRevC.74 044611

[175] **2006He20** F. P. Hessberger, S. Hofmann, D. Ackermann, S. Antalic, B. Kindler, I. Kojouharov, P. Kuusiniemi, M. Leino, B. Lommel, R. Mann, K. Nishio, A. G. Popeko, B. Sulignano, S. Saro, B. Streicher, M. Venhart, A. V. Yeremin, Eur. Phys. J. A **29**, 165 (2006). https://doi.org/10.1140/epja/i2006-10083-y

[176] **2006Ni10** K. Nishio, S. Hofmann, F. P. Hessberger, D. Ackermann, S. Antalic, V. F. Comas, Z. Gan, S. Heinz, J. A. Heredia, H. Ikezoe, J. Khuyagbaatar, B. Kindler, I. Kojouharov, P. Kuusiniemi, B. Lommel, R. Mann, M. Mazzocco, S. Mitsuoka, Y. Nagame, T. Ohtsuki, A. G. Popeko, S. Saro, H. J. Schott, B. Sulignano, A. Svirikhin, K. Tsukada, K. Tsuruta, A. V. Yeremin, Eur. Phys. J. A **29**, 281 (2006). https://doi.org/10.1140/epja/i2006-10091-y

[177] **2007AsZU** M. Asai, K. Tsukada, Y. Ishii, A. Toyoshima, T. Ishii, I. Nishinaka, Y. Nagame, JAEA-Review 2007-046, p. 42 (2007).

[178] **2007Ob02** A. Oberstedt, S. Oberstedt, M. Gawrys, N. Kornilov, Phys. Rev. Lett. **99**, 042502 (2007). https://doi.org/10.1103/PhysRevLett.99.042502

[179] **2010Ni14** K. Nishio, S. Hofmann, F. P. Hessberger, D. Ackermann, S. Antalic, Y. Aritomo, V. F. Comas, Ch. E. Dullmann, A. Gorshkov, R. Graeger, K. Hagino, S. Heinz, J. A. Heredia, K. Hirose, H. Ikezoe, J. Khuyagbaatar, B. Kindler, I. Kojouharov, B. Lommel, R. Mann, S. Mitsuoka, Y. Nagame, I. Nishinaka, T. Ohtsuki, A. G. Popeko, S. Saro, M. Schadel, A. Turler, Y. Watanabe, A. Yakushev, A. V. Yeremin, Phys. Rev. C **82**, 024611 (2010). https://doi.org/10.1103/PhysRevC.82.024611

[180] **2011As02** A. Astier, M. Porquet,Phys. Rev. C **83**, 014311 (2011). https://doi.org/10.1103/PhysRevC.83.014311

[181] **2011Ho10** S. Hofmann, Radiochim. Acta **99**, 405 (2011). https://doi.org/10.1524/ract.2011.1854

[182] **2012Ku26** J. Kurcewicz, F. Farinon, H. Geissel, S. Pietri, C. Nociforo, A. Prochazka, H. Weick, J. S. Winfield, A. Estrade, P. R. P. Allegro, A. Bail, G. Belier, J. Benlliure, G. Benzoni, M. Bunce, M. Bowry, R. Caballero-Folch, I. Dillmann, A. Evdokimov, J. Gerl, A. Gottardo, E. Gregor, R. Janik, A. Kelic-Heil, R. Knobel, T. Kubo, Yu. A. Litvinov, E. Merchan, I. Mukha, F. Naqvi, M. Pfutzner, M. Pomorski, Zs. Podolyak, P. H. Regan, B. Riese, M. V. Ricciardi, C. Scheidenberger, B. Sitar, P. Spiller, J. Stadlmann, P. Strmen, B. Sun, I. Szarka, J. Taieb, S. Terashima, J. J. Valiente-Dobon, M. Winkler, Ph. Woods, Phys. Lett. B **717**, 371 (2012). https://doi.org/10.1016/j.physletb.2012.09.021

[183] **2012Zh04** Z. -Y. Zhang, Z. -G. Gan, L. Ma, M. -H. Huang, T. -H. Huang, X. -L. Wu, G. -B. Jia, G. -S. Li, L. Yu, Z. -Z. Ren, S. -G. Zhou, Y. -H. Zhang, X. -H. Zhou, H. -S. Xu, H. -Q. Zhang, G. -Q. Xiao, W. -L. Zhang, Chin. Phys. Lett. **29**, 012502 (2012). https://doi.org/10.1088/0256-307X/29/1/012502

[184] **2013De20** H. De Witte, S. Eeckhaudt, A. N. Andreyev, I. N. Borzov, J. Cederkall, A. De Smet, D. V. Fedorov, V. N. Fedoseyev, S. Franchoo, M. Gorska, H. Grawe, G. Huber, M. Huyse, Z. Janas, U. Koester, W. Kurcewicz, J. Kurpeta, A. Plochocki, K. Van de Vel, P. Van Duppen, L. Weissman, Phys. Rev. C **87**, 067303 (2013). https://doi.org/10.1103/PhysRevC.87.067303

[185] **2014Br18** E. Browne, J .K. Tuli, Nucl. Data Sheets **122**, 293 (2014). https://doi.org/10.1016/j.nds.2014.11.003

[186] **2015Fi07** D. A. Fink, T. E. Cocolios, A. N. Andreyev, S. Antalic, A. E. Barzakh, B. Bastin, D. V. Fedorov, V. N. Fedosseev, K. T. Flanagan, L. Ghys, A. Gottberg, M. Huyse, N. Imai, T. Kron, N. Lecesne, K. M. Lynch, B. A. Marsh, D. Pauwels, E. Rapisarda, S. D. Richter, R. E. Rossel, S. Rothe, M. D. Seliverstov, A. M. Sjodin, C. Van Beveren, P. Van Duppen, K. D. A. Wendt, Phys. Rev. X **5**, 011018 (2015). https://doi.org/10.1103/PhysRevX.5.011018

[187] **2015Mo15** M. Modarres, A. Tafrihi, Nucl. Phys. A**941**, 212 (2015). https://doi.org/10.1016/j.nuclphysa.2015.06.016

[188] **2015Mo25** K. Morita, Nucl. Phys. A**944**, 30 (2015). https://doi.org/10.1016/j.nuclphysa.2015.10.007

[189] **2016Di11** M. P. Dion, B. W. Miller, G. A. Warren, Nucl. Instrum. Methods Phys. Res. A**830**, 6 (2016). https://doi.org/10.1016/j.nima.2016.05.041

[190] **2017Ca12** R. Caballero-Folch, C. Domingo-Pardo, J. Agramunt, A. Algora, F. Ameil, Y. Ayyad, J. Benlliure, M. Bowry, F. Calvino, D. Cano-Ott, G. Cortes, T. Davinson, I. Dillmann, A. Estrade, A. Evdokimov, T. Faestermann, F. Farinon, D. Galaviz, A. R. Garcia, H. Geissel, W. Gelletly, R. Gernhauser, M. B. Gomez Hornillos, C. Guerrero, M. Heil, C. Hinke, R. Knobel, I. Kojouharov, J. Kurcewicz, N. Kurz, Yu. A. Litvinov, L. Maier, J. Marganiec, M. Marta, T. Martinez, F. Montes, I. Mukha, D. R. Napoli, C. Nociforo, C. Paradela, S. Pietri, Zs. Podolyak, A. Prochazka, S. Rice, A. Riego, B. Rubio, H. Schaffner, Ch. Scheidenberger, K. Smith, E. Sokol, K. Steiger, B. Sun, J. L. Tain, M. Takechi, D. Testov, H. Weick, E. Wilson, J. S. Winfield, R. Wood, P. J. Woods, A. Yeremin, Phys. Rev. C **95**, 064322 (2017). https://doi.org/10.1103/PhysRevC.95.064322

[191] **2017Le03** M. -C. Lepy, S. Pierre, R. Van Ammel, M. Marouli, Appl. Radiat. Isot. **126**, 150 (2017). https://doi.org/10.1016/j.apradiso.2016.12.045

[192] **2018Ma03**M. Marouli, G. Lutter, S. Pomme, R. Van Ammel, M. Hult, S. Richter, R. Eykens, V. Peyres, E. Garcia-Torano, P. Dryak, M. Mazanova, P. Carconi, Appl. Radiat. Isot. **132**, 72 (2018). https://doi.org/10.1016/j.apradiso.2017.10.049

[193] **2020FoZZ** D. Foligno, P. Leconte, O. Serot, B. Geslot, G. De Izarra, A. Chebboubi, A. Sardet, M. Diakaki, P. Tamagno, A. Billebaud, F. -R. Lecolley, T. Soldner, U. Koster, P. Mutti, A. Pepino, O. Meplan, G. Kessedjian, J. -L. Lecouey, L. Mathieu, N. Marie-Nourry, Proc. Intern. Conf. Nuclear Data for Science and Technology (ND2019)., Beijing, China, May 19-24, 2019, Z. Ge, et al. Eds. , p. 18006 (2020).;EPJ Web of Conf. Vol. **239** (2020). https://doi.org/10.1051/epjconf/202023918006

[194] **2020Yo01** M. D. Yoho, K. E. Koehler, D. T. Becker, D. A. Bennett, M. H. Carpenter, M. P. Croce, J. D. Gard, J. A. B. Mates, D. J. Mercer, N. J. Ortiz, D. R. Schmidt, C. M. Smith, D. S. Swetz, A. D. Tollefson, J. N. Ullom, L. R. Vale, A. L. Wessels, D. T. Vo, Nucl. Instrum. Methods Phys. Res. A**977**, 164307 (2020). https://doi.org/10.1016/j.nima.2020.164307

[195] **2021Wa16** M. Wang, W. J. Huang, F. G. Kondev, G. Audi, S. Naimi, Chin. Phys. C **45**, 030003 (2021). https://doi.org/10.1088/1674-1137/abddaf

[196] **2022Si29** B. Singh, J. K. Tuli, E. Browne, Nucl.Data Sheets 185, 560 (2022). https://doi.org/10.1016/j.nds.2022.10.002