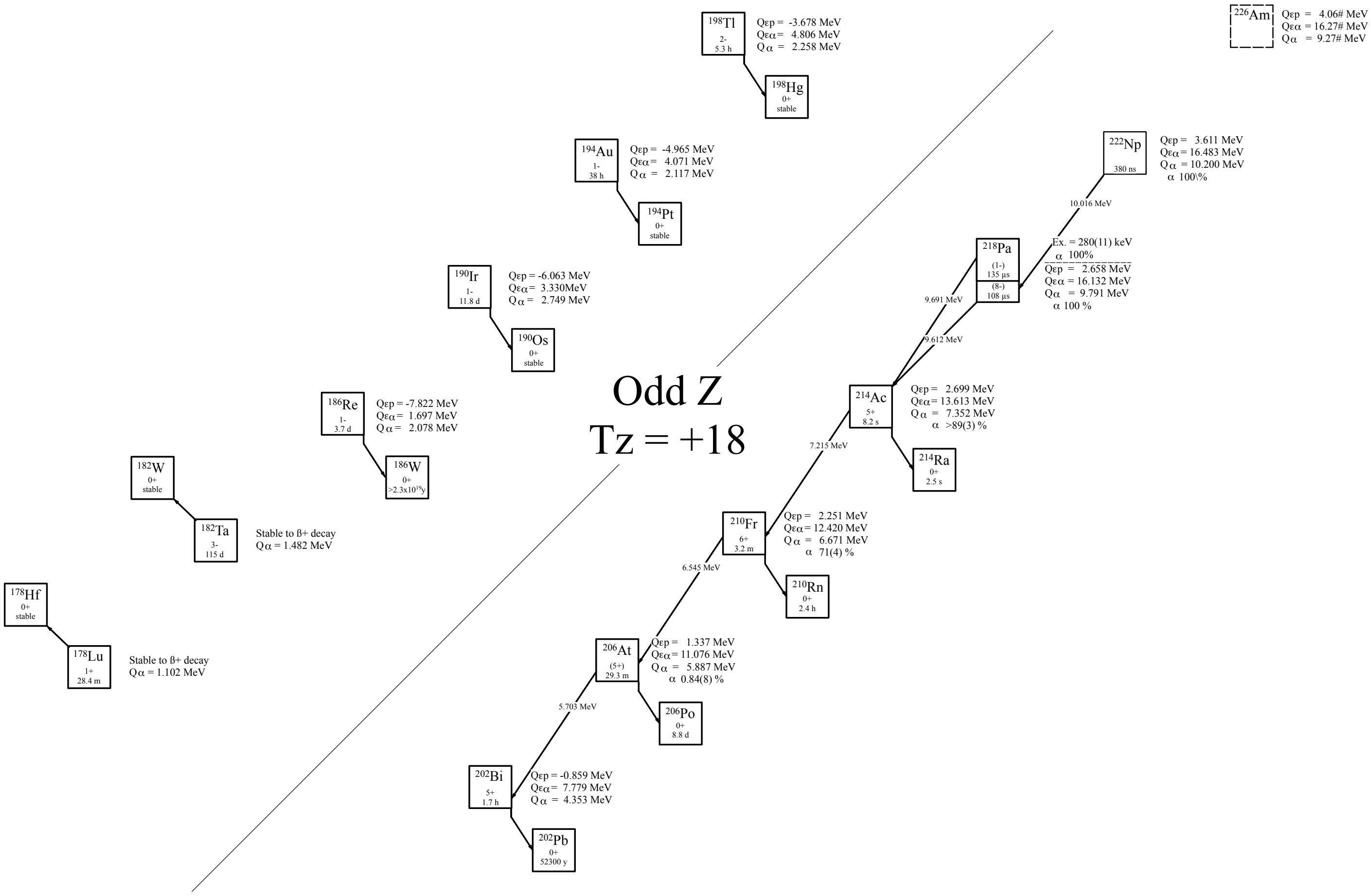

Fig. 1: Known experimental values for heavy particle emission of the odd-Z T_z= +18nuclei.

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Table 1
Observed and predicted β-delayed particle emission from the odd-Z, T_z = +18 nuclei. J^{π} values for ^{178}Lu, ^{182}Ta, ^{186}Re, ^{190}Ir, ^{194}Au, ^{198}Tl and ^{202}Bi are taken from ENSDF. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	J^{π}	Ex.	$T_{1/2}$	Q_{ε}	$Q_{\varepsilon p}$	$Q_{\varepsilon\alpha}$	Experimental
^{178}Lu*		$1^{(+)}$	28.4(2) m	-0.661(7)	—	—	[**1973Or03**]
^{182}Ta*		3^-	114.740(24) d	-0.381(6)	—	—	[**1973Vi13**]
^{186}Re		1^-	3.7186(5) d	0.581(1)	-7.822(14)	1.697(6)	[**2004Sc04**]
^{190}Ir		4^-	11.78(10) d	1.954(1)	-6.063(8)	3.330(2)	[**1975Ba35**]
^{194}Au		1^-	38.02(10) h	2.548(2)	-4.965(2)	4.071(2)	[**1992Si02**]
^{198}Tl		2^-	5.3(5) h	3.426(8)	-3.678(8)	4.806(8)	[**1954Mi16**]
^{202}Bi		5^+	1.71(2) h***	5.190(15)	-0.859(20)	7.779(14)	[**1970DaZM, 1966KaZY**]
^{206}At		(5^+)	29.3(4) m	5.749(14)	1.337(14)	11.076(14)	[**1977Li16**]
^{210}Fr		6^+	3.18(6) m	6.261(14)	2.251(14)	12.420(14)	[**2005Ku06**]
^{214}Ac		5^+	8.2(2) s	6.341(15)	2.699(14)	13.613(14)	[**1968Va04**]
^{218}Pa		(8^-)	108(5) μs@	6.283(21)	2.658(21)	16.132(19)	[**2020Zh01, 2000He17**]
^{218m}Pa	0.080(11)	(1^-)	135^{+62}_{-32} μs	6.363(24)	2.738(24)	16.212(22)	[**2020Zh01**]
^{222}Np			380^{+260}_{-110} ns	7.000(60)	3.611(71)	16.483(39)	[**2020Ma27**
^{226}Am				7.34(36)#	4.06(31)#	16.27(30)#	

* 100 β^- emitter.
** 92.5(1)% β^-, 7.5(1)% ε emitter.
*** Weighted average of 1.67(2) h [1966KaZY] and 1.79(3) h [1970DaZM].
@ Weighted average of 107(5) μs [2020Zh01] and 113(10) μs [2000He17].

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the odd-Z, T_z = +18 nuclei. Unless otherwise stated, all S and Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	S_p	S_{2p}	Q_{α}	BR_{α}	Experimental
^{178}Lu	6.640(2)	15.55(10)	1.102(45)		
^{182}Ta	6.317(2)	14.332(71)	1.482(3)		
^{186}Re	5.828(1)	13.666(26)	2.078(2)		
^{190}Ir	5.056(1)	12.315(1)	2.749(1)		
^{194}Au	5.021(2)	11.954(2)	2.117(2)		
^{198}Tl	4.277(8)	10.968(8)	2.258(8)		
^{202}Bi	2.769(20)	8.282(15)	4.353(16)		
^{206}At	2.207(17)	6.371(16)	5.887(5)	0.87(8)%*	[**1981Va27, 1981Va29, 1977VaZT, 1961La02**, 1970DaZM, 1969Ba69, 1969BaZM, 1968Go12, 1964Th07, 1963Ho18, 1961Fo04]
^{210}Fr	1.691(17)	5.452(16)	6.671(5)	71(4)%	[**2005Ku06**, 2022Ha06, 2014Ma66, 2000RuZZ, 1972KeYY, 1971ReZE, 1967Va20, 1964Gr04, 1961Gr42]
^{214}Ac	1.201(17)	4.629(16)	7.352(2)	89(3)%	[**2004Ku24, 1968Va04**, 2000He17, 1961Gr42]
^{218}Pa	0.845(21)	4.078(20)	9.791(12)	100%	[**2020Zh01, 2000He17, 1996An21, 1979Sc09**, 1995AnZY, 1995NiZS, 1978ReZZ]
^{218m}Pa	0.765(24)	3.998(23)	9.871(16)	100%	[**2020Zh01**]
^{222}Np	0.534(82)	3.582(41)	10.200(34)	100%	[**2020Ma27**
^{226}Am	0.62(42)#	3.64(30)#	9.27(30)#		

* A value of 0.88(8)% was reported in [1961La02]. This value was deduced using an α branching ratio of 5(1)% [1955Mo08] for the decay of ^{206}Po. [1981Va27] report a value of 0.70(14)% for the α branching of ^{206}At, using using an α branching ratio of 5.2(4)% [1971Go35] for the decay of ^{206}Po. Adjusting the value of [1961La02] using the ^{206}Po α branching ratio of [1971Go35] results in a value of 0.92(8)%. The weighted average of 0.70(14)% and 0.92(8)% is adopted here. In addition, note that [1967Le08] list an α branching ratio of 5.45% for ^{206}Po with no uncertainty reported.

Table 3
direct α emission from ^{206}At, Ex. = 2.045(9) MeV, J_i^π = (5$^+$), $T_{1/2}$ = 29.3(4) m**, BR_α = 0.87(8)%***.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^{π} @	$E_{daughter}$(^{202}Bi)	coincident γ-rays @	R_0 (fm) @@	HF
5.816(2)	5.703(2)	100%	0.83(8)%	(5$^+$)	0.072(4)		1.4690(56)	2.0^{+4}_{-3}
5.848(3)	5.734(3)	1.2(3)%	9.6(28) × 10^{-3}%	(4$^+$)	0.041(5)	.041	1.4690(56)	240^{+110}_{-70}
5.881(3)	5.767(3)	2.4(4)%	0.020(4)%	(7$^+$)	0.007(5)		1.4690(56)	170^{+50}_{-40}
5.888(4)	5.774(4)	0.9(3)%	7.8(27) × 10^{-3}%	5$^+$	0.0	—–	1.4690(56)	460^{+260}_{-140}

* All values from [1981Va27], except where noted.
** [1977Li16].
*** A value of 0.88(8)% was reported in [1961La02]. This value was deduced using an α branching ratio of 5(1)% [1955Mo08] for the decay of ^{206}Po. [1981Va27] report a value of 0.70(14)% for the α branching of ^{206}At, using using an α branching ratio of 5.2(4)% [1971Go35] for the decay of ^{206}Po. Adjusting the value of [1961La02] using the ^{206}Po α branching ratio of [1971Go35] results in a value of 0.92(8)%. The weighted average of 0.70(14)% and 0.92(8)% is adopted here. In addition, note that [1967Le08] list an α branching ratio of 5.45% for ^{206}Po with no uncertainty reported.
@ [2008Zh05].
@@ Interpolated between 1.4625(22) fm (^{204}Po) and 1.4755(52) fm (^{208}Rn).

Table 4
direct α emission from ^{210}Fr, J_i^π = 6$^+$, $T_{1/2}$ = 3.18(6) m*, BR_α = 71(4)%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{206}Ra)	coincident γ-rays	R_0 (fm)***	HF
6.015(5)**	5.900(5)**	>0.010(5)%	>0.0071(36)%		0.6573(2)**	0.6263(3)**, 0.6515(3)**	1.4737(61)	$<32^{+34}_{-12}$
6.231(7)	6.112(7)	>0.0017(9)%	>0.0012(6)%		0.4442(5)	0.442(5)	1.4737(61)	<1.8(3) × 10^3
6.333(4)	6.212(4)	>0.022(3)%	>0.016(2)%		0.3404(1)	0.3404(1)	1.4737(61)	$<380^{+100}_{-80}$
6.348(5)**	6.227(5)**	>0.010(2)%	>0.0071(15)%		0.3223(1)**	0.3223(1)**	1.4737(61)	$<1.0^{+0.3}_{-0.2} \times 10^3$
6.471(5)**	6.348(5)**	>0.0041(13)%	>0.0029(9)%		0.2009(5)**	0.1953(2)**	1.4737(61)	$<1.1^{+0.6}_{-0.3} \times 10^4$
6.524(4)	6.400(4)	>0.034(7)%	>0.024(5)%		0.1480(1)	0.1169(3)**, 0.1480(1)	1.4737(61)	$<1.6^{+0.5}_{-0.4} \times 10^3$
6.533(4)**	6.409(4)**	>0.014(4)%	>0.010(3)%		0.1376(3)**	0.1065(2)**, 0.1376(3)**	1.4737(61)	$<4.3^{+2.0}_{-1.2} \times 10^3$
6.545(4)	6.420(4)	>0.030(5)%	>0.021(4)%		0.1263(1)	0.1207(3)**, 0.1263(1)	1.4737(61)	$<2.2^{+0.6}_{-0.5} \times 10^3$
6.672(5)	6.545(5)	100%	70.9(40)%	(5$^+$)	0.0	—–	1.4737(61)	$2.13^{+0.35}_{-0.31}$

* All values from [2005Ku06].
** Tentatively assigned.
*** Interpolated between 1.4755(52) fm (^{208}Rn) and 1.4718(31) fm (^{212}Ra).

Table 5
direct α emission from ^{214}Ac*, J_i^π = 5$^+$, $T_{1/2}$ = 8.2(2) s**, BR_α = 89(3)%**.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{210}Fr)	coincident γ-rays	R_0 (fm) @	HF
6.601(15)	6.478(15)	> 0.0043(15)%	>0.0020(7)%		0.7537(7)	0.7537(7)	1.4707(34)	$<270^{+1460}_{-80}$
6.639(15)	6.515(15)	> 0.0041(15)%	>0.0020(7)%		0.7134(7)	0.7134(7)	1.4707(34)	$<390^{+230}_{-110}$
6.732(7)	6.606(7)	>0.0122(24)%	>0.0059(12)%		0.6225(2)	0.6225(2)	1.4707(34)	$<310^{+90}_{-60}$
6.752(7)	6.626(7)	>0.0087(22)%	>0.0042(11)%		0.6014(2)	0.6014(2)	1.4707(34)	$<530^{+210}_{-130}$
6.829(5)	6.701(5)	0.26(4)%	0.125(18)%		0.5259(1)	0.2814(1), 0.3166(2), 0.3301(1), 0.3867(2), 0.4630(2), 0.5259(1)	1.4707(34)	35^{+8}_{-6}
6.912(7)	6.783(7)	>0.028(8)%	>0.013(4)%		0.4442(2)	0.4442(2)	1.4707(34)	$<680^{+280}_{-170}$
6.992(6)	6.861(6)	>0.167(4)%	>0.080(18)%		0.3639(2)	0.1546(1), 0.2247(1), 0.3639(2)	1.4707(34)	$<230^{+80}_{-50}$
7.009(5)	6.878(5)	>0.24(9)%	>0.116(18)%		0.3464(1)	0.3464(1)	1.4707(34)	$<180^{+40}_{-30}$
7.010(6)	6.879(6)	>0.057(15)%	>0.027(7)%		0.3395(1)	0.3395(1)	1.4707(34)	$<810^{+310}_{-190}$
7.020(6)	6.889(6)	>0.100(19)%	>0.048(9)%		0.3330(1)	0.3330(1)	1.4707(34)	$<500^{+140}_{-100}$
7.111(5)	6.978(5)	2.04(56)%	0.98(27)%		0.2442(1)	0.1814(1), 0.2442(1)	1.4707(34)	52^{+22}_{-13}
7131(7)***	6998(7)***	>0.074(37)%***	>0.036(18)%		0.2551(2)***	0.1625(1)***, 0.2551(2)***	1.4707(34)	$<1.7^{+1.8}_{-0.6} \times 10^3$
7.145(5)	7.011(5)	>0.81(8)%	>0.39(4)%		0.2090(1)	0.14640(1), 0.2090(1)	1.4707(34)	$<176^{+29}_{-24}$
7.157(5)	7.023(5)	>0.65(10)%	>0.312(5)%		0.1955(1)	0.1331(1), 0.1955(1)	1.4707(34)	$<250^{+60}_{-40}$
7.216(4)	7.081(4)	77.8(45)%	37.4(22)%		0.1390(1)	0.0763(1), 0.1390(1)	1.4707(34)	3.3(4)
7.289(6)	7.153(6)	?	?		0.0626(1)	0.0626(1)	1.4707(34)	
7.352(3)	7.215(3)	100(5)%	48(2)%		0.0	—–	1.4707(34)	7.9(8)

* All values from [2004Ku24], except where noted.
** [1968Va04], the I_α value is reported as a lower limit.
*** Tentatively assigned.
@ Interpolated between 1.4718(31) fm (^{2128}Ra) and 1.4695(14) ^{216}Th

Table 6
direct α emission from ^{218}Pa, J_i^π = (8$^-$), $T_{1/2}$ = 108(5) μs*, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{214}Ac)	coincident γ-rays	R_0 (fm)@	HF
9.712(8)	9.534(8)**	40(3)%**	29(2)%	(4$^+$)	0.092	0.092	1.495(21)	220^{+130}_{-80}
9.792(8)	9.612(8)***	100%	71(4)%	(5$^+$)	0.0	—	1.495(21)	150^{+180}_{-50}

* Weighted average of 107(5) μs [2020Zh01] and 113(10) μs [2000He17].
** Weighted average of 9.524(16) MeV; 26(2)% [2020Zh01], 9.544(15) MeV; 35(5)% [2000He17], 9.530(15) MeV; 31(4)% [1996An21] and 9.535(15) MeV; 35(10)% [1979Sc09].
*** Weighted average of 9.610(14) MeV; 74(5)% [2020Zh01], 9.616(15) MeV; 65(7)% [2000He17], 9.610(15) MeV; 69(4)% [1996An21] and 9.614(15) MeV; 365(10)% [1979Sc09].
@ Interpolated between 1.4695(14) fm ^{216}Th and 1.521(15) fm ^{220}U.

Table 7
direct α emission from ^{218m}Pa*, Ex. = 80(11) keV, J_i^π = (1$^-$), $T_{1/2}$ = 135^{+62}_{-32} μs, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{214}Ac)	coincident γ-rays	R_0 (fm)***	HF
9.775(21)	9.596(21)**			(4$^+$)	0.092	0.092	1.495(21)	
9.872(15)	9.691(15)***	100%	≈100%	(5$^+$)	0.0	—	1.495(21)	200^{+140}_{-120}

* All values from [2020Zh01].
** Tentatively assigned.
*** Interpolated between 1.4695(14) fm ^{216}Th and 1.521(15) fm ^{220}U.

Table 8
direct α emission from ^{222}Np*, $T_{1/2}$ = 380^{+260}_{-110} ns, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{218}Pa)	coincident γ-rays	R_0 (fm)**	HF
10.200(33)	10.016(33)	100%	29(2)%	(8$^-$)	0.0	—	1.503(50)	$0.9^{+1.8}_{-0.7}$

* All values from [2020Ma27].
** Interpolated between 1.521(15) fm ^{220}U and 1.484(48) fm ^{224}Pu,

References used in the Tables

[1] **1954Mi16** M. C. Michel, D. H. Templeton, Phys. Rev. **93**, 1422 (1954). https://doi.org/10.1103/PhysRev.93.1422

[2] **1961Fo04** W. Forsling, T. Alvager, L. W. Holm, O. Melin, J. Uhler, B. Astrom, Ark. Fys. **19**, 83 (1961).

[3] **1961Gr42** R. D. Griffioen, R. D. Macfarlane, UCRL-10023, p. 47 (1961).

[4] **1961La02** R. M. Latimer, G. E. Gordon, T. D. Thomas, J. Inorg. Nuclear Chem. **17**, 1 (1961). https://doi.org/10.1016/0022-1902(61)80177-2

[5] **1963Ho18** R. W. Hoff, F. Asaro, I. Perlman, J. Inorg. Nucl. Chem. **25**, 1303 (1963). https://doi.org/10.1016/0022-1902(63)80400-5

[6] **1964Gr04** R. D. Griffioen, R. D. Macfarlane, Phys. Rev. **133**, B1373 (1964). https://doi.org/10.1103/PhysRev.133.B1373

[7] **1964Th07** P. E. Thoresen, F. Asaro, I. Perlman, J. Inorg. Nucl. Chem. **26**, 1341 (1964).

[8] **1966KaZY** P. Karol, C. Stearns, CU-1019-51, p. 8 (1966)

[9] **1967Va20** K. Valli, E. K. Hyde, W. Treytl, J. Inorg. Nucl. Chem. **29**, 2503 (1967). https://doi.org/10.1016/0022-1902(67)80176-3

[10] **1968Go12** N. A. Golovkov, R. B. Ivanov, Y. V. Norseev, So Ki Kvan, V. A. Khalkin, V. G. Chumin, Contrib. Intern. Conf. Nucl. Struct. , Dubna, p. 54 (1968).

[11] **1968Va04** K. Valli, W. J. Treytl, E. K. Hyde, Phys. Rev. **167**, 1094 (1968). https://doi.org/10.1103/PhysRev.167.1094

[12] **1969Ba69** G. Bastin, Centre Spectrometrie Nucl. Spectrometrie Masse, Ann. 1968-69, Centre Natl. Recherche Sci. , Orsay, p. 3 (1969).

[13] **1969BaZM** G. Bastin, NP-18837, p. 3 (1969).

[14] **1970DaZM** J. M. Dairiki, Thesis, Univ. California (1970); UCRL-20412 (1970).

[15] **1971ReZE** J. -L. Reyss, Thesis, Univ. Paris (1971); FRNC-TH-124 (1971).

[16] **1972KeYY** T. Kempisty, A. Korman, T. Morek, L. K. Peker, Z. Haratym, S. Chojnacki, JINR-P6-6725 (1972).

[17] **1973Or03** C. J. Orth, W. R. Daniels, D. C. Hoffman, F. O. Lawrence, Phys. Rev. C**8**, 718 (1973). https://doi.org/10.1103/PhysRevC.8.718

[18] **1973Vi13** C. J. Visser, J. H. M. Karsten, F. J. Haasbroek, P. G. Marais, Agrochemophysica **5**, 15 (1973).

[19] **1975Ba35** B. P. Bayhurst, J. S. Gilmore, R. J. Prestwood, J. B. Wilhelmy, N. Jarmie, B. H. Erkkila, R. A. Hardekopf, Phys. Rev. C**12**, 451 (1975). https://doi.org/10.1103/PhysRevC.12.451

[20] **1977Li16** E. W. A. Lingeman, Phys. Scr. **15**, 205 (1977). https://doi.org/10.1088/0031-8949/15/3/008

[21] **1977VaZT** V. M. Vakhtel, L. Vasharosh, N. A. Golovkov, R. B. Ivanov, Y. Y. Lobanov, A. F. Novgorodov, Y. V. Norseev, V. G. Chumin, Program and Theses, Proc. 27th Ann. Conf. Nucl. Spectrosc. Struct. At. Nuclei, Tashkent, p. 117 (1977).

[22] **1978ReZZ** W. Reisdorf, GSI-M-2-78 (1978).

[23] **1979Sc09** K. -H. Schmidt, W. Faust, G. Munzenberg, H. -G. Clerc, W. Lang, K. Pielenz, D. Vermeulen, H. Wohlfarth, H. Ewald, K. Guttner, Nucl. Phys. A**318**, 253 (1979). https://doi.org/10.1016/0375-9474(79)90482-2

[24] **1981Va27** V. M. Vakhtel, N. A. Golvkov, R. B. Ivanov, M. A. Mikhailova, A. F. Novgorodov, Yu. V. Norseev, V. G. Chumin, Yu. V. Yushkevich, Izv. Akad. Nauk SSSR, Ser. Fiz. **45**, 1861 (1981).

[25] **1981Va29** V. M. Vakhtel, N. A. Golovkov, R. B. Ivanov, M. A. Mikhailova, V. G. Chumin, Izv. Akad. Nauk SSSR, Ser. Fiz. **45**, 1966 (1981).

[26] **1992Si02** B. Singh, H. W. Taylor, Appl. Radiat. Isot. **43**, 647 (1992).

[27] **1995AnZY** A. N. Andreev, D. D. Bogdanov, A. V. Eremin, A. P. Kabachenko, O. N. Malyshev, G. M. Ter-Akopyan, V. I. Chepigin, Program and Thesis, Proc. 45th Ann. Conf. Nucl. Spectrosc. Struct. At. Nuclei, St. Petersburg, p. 109 (1995).

[28] **1995NiZS** V. Ninov, S. Hofmann, F. P. Hessberger, H. Folger, A. N. Andreev, A. V. Eremin, A. G. Popeko, S. Saro, Program and Thesis, Proc. 45th Ann. Conf. Nucl. Spectrosc. Struct. At. Nuclei, St. Petersburg, p. 108 (1995).

[29] **1996An21** A. N. Andreev, A. G. Popeko, A. V. Eremin, S. Hofmann, F. Hessberger, H. Folger, V. Ninov, S. Saro, Bull. Rus. Acad. Sci. Phys. **60**, 119 (1996).

[30] **2000He17** F. P. Hessberger, S. Hofmann, D. Ackermann, V. Ninov, M. Leino, S. Saro, A. Andreyev, A. Lavrentev, A. G. Popeko, A. V. Yeremin, Eur. Phys. J. A **8**, 521 (2000); Erratum Eur. Phys. J. A **9**, 433 (2000). https://doi.org/10.1007/s100500070075

[31] **2000RuZZ** M. Rupp, G. Langrock, N. Wiehl, H. O. Kling, M. Mendel, U. Tharun, J. V. Kratz, A. Turler, Univ Mainz, Institut fur Kernchemie, Ann. Rept. , A1 (2000).

[32] **2004Ku24** P. Kuusiniemi, F. P. Hessberger, D. Ackermann, S. Hofmann, I. Kojouharov, Eur. Phys. J. A **22**, 429 (2004). https://doi.org/10.1140/epja/i2004-10101-2

[33] **2004Sc04** H. Schrader, Appl. Radiat. Isot. —bf60, 317 (2004). https://doi.org/10.1016/j.apradiso.2003.11.039

[34] **2005Ku06** P. Kuusiniemi, F. P. Hessberger, D. Ackermann, S. Hofmann, I. Kojouharov, Eur. Phys. J. A **23**, 417 (2005). https://doi.org/10.1140/epja/i2004-10104-y

[35] **2008Zh05** S. Zhu, F. G. Kondev, Nucl.Data Sheets **109**, 699 (2008). https://doi.org/10.1016/j.nds.2008.02.002

[36] **2014Ma66** D. A. Mayorov, T. A. Werke, M. C. Alfonso, M. E. Bennett, C. M. Folden, Phys. Rev. C **90**, 024602 (2014). https://doi.org/10.1103/PhysRevC.90.024602

[37] **2020Ma27** L. Ma, Z. Y. Zhang, Z. G. Gan, X. H. Zhou, H. B. Yang, M. H. Huang, C. L. Yang, M. M. Zhang, Y. L. Tian, Y. S. Wang, H. B. Zhou, X. T. He, Y. C. Mao, W. Hua, L. M. Duan, W. X. Huang, Z. Liu, X. X. Xu, Z. Z. Ren, S. G. Zhou, H. S. Xu, Phys. Rev. Lett. **125**, 032502 (2020). https://doi.org/10.1103/PhysRevLett.125.032502

[38] **2020Zh01** M. M. Zhang, H. B. Yang, Z. G. Gan, Z. Y. Zhang, M. H. Huang, L. Ma, C. L. Yang, C. X. Yuan, Y. S. Wang, Y. L. Tian, H. B. Zhou, S. Huang, X. T. He, S. Y. Wang, W. Z. Xu, H. W. Li, X. X. Xu, J. G. Wang, H. R. Yang, L. M. Duan, W. Q. Yang, S. G. Zhou, Z. Z. Ren, X. H. Zhou, H. S. Xu, A. A. Voinov, Yu. S. Tsyganov, A. N. Polyakov, M. V. Shumeiko, Phys. Lett. B **800**, 135102 (2020). https://doi.org/10.1016/j.physletb.2019.135102

[39] **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

[40] **2022Ha06** T. Hayamizu, H. Haba, K. Nakamura, T. Aoki, H. Nagahama, K. S. Tanaka, N. Ozawa, M. Ohtsuka, Y. Sakemi,

Few-Body Systems **63**, 11 (2022). https://doi.org/10.1007/s00601-021-01710-4