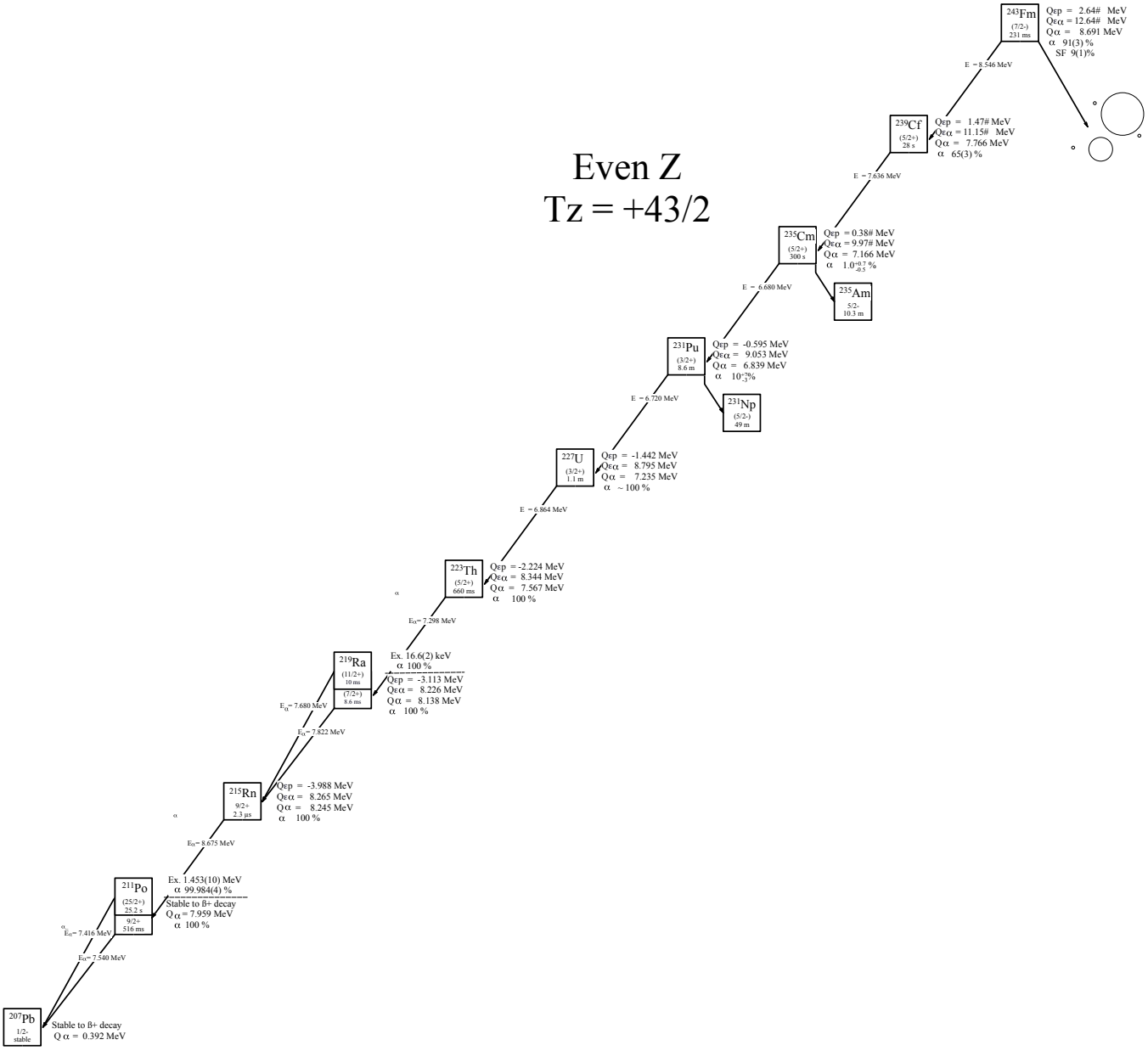

Fig. 1: Known experimental values for heavy particle emission of the even-Z T_z= +43/2 nuclei.

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Table 1
Observed and predicted β-delayed particle emission from the even-Z, T_z = +43/2 nuclei. J^π values for ^{204}Tl and ^{208}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	$Q_{\varepsilon p}$	$Q_{\varepsilon\alpha}$	BR_{β_F}	Experimental
^{207}Pb		$1/2^-$	stable	-1.418(5)	——	——			
^{211}Po		$9/2^+$	516(3) ms	-0.573(5)	——	——	[**1974Ba29**]		
^{211m}Po	1.453(10)	$(25/2^+)$	25.2(5) s	0.880(11)	-3.540(10)	7.630(12)	[**1974Ba29**]		
^{215}Rn		$9/2^+$	2.3(1) μs	0.088(9)	-3.988(6)	8.265(8)	[**1970Va13**]		
^{219}Ra		$(7/2)^+$	8.6(17) ms*	0.777(10)	-3.113(7)	8.226(10)	[**2018Sa45**]		
^{219m}Ra	0.0166(2)**	$(11/2)^+$	10(3) ms	0.793(10)	-3.096(7)	8.243(10)	[**2018Sa45**]		
^{223}Th		$(5/2^+)$	660(10) ms	1.560(10)	-2.224(9)	8.344(11)	[**1970Va13**]		
^{227}U		$(3/2^+)$	1.1(1) m	2.215(11)	-1.442(10)	8.795(11)	[**1969Ha32**]		
^{231}Pu		$(3/2^+)$	8.6(5) m	2.680(60)	-0.595(22)	9.053(23)	[**1999La14**]		
^{235}Cm		$(5/2^+)$	300^{+250}_{-100} s	3.39(12)#	0.38(10)#	9.97(12)#	[**2020Kh10**]		
^{239}Cf		$(5/2^+)$	28(2) s	3.95(24)#	1.47(12)#	11.15(13)#	[**2020Kh10**]		
^{243}Fm		$(7/2^-)$	231(9) ms	4.57(25)#	2.64(13)#	12.64(24)#	[**2020Kh10**		

* Weighted average of 10(3) ms and 8(2) ms [2018Sa45].
** [2021Si21].

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the even-Z, T_z = +43/2 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	BR_{SF}	Experimental
^{207}Pb	7.488(1)	14.742(4)	0.392(1)			
^{211}Po	4.930(1)	9.396(1)	7.595(1)	100%		[**2001Ch66, 1969Go23**, 2000ChZU, 2000ChZX, 2000OgZR, 1989Ku08, 1989KuZE, 1988KuZR, 1985La17, 1982Bo14, 1978Ya04, 1975Ja04, 1974Ba29, 1970Va13, 1969Ha32, 1968GuZX, 1963Uh01, 1962Pe15, 1958To25, 1955Mo68, 1954Je11, 1954Sp32, 1954Wi26, 1953AsZZ, 1952Me13]
^{211m}Po	3.477(10)	7.943(10)	9.048(10)	99.984(4)%		[**1989Ku08, 1962Pe15**, 1989KuZE, 1988KuZR, 1982Bo14, 1974Ba29, 1954Je11, 1954Sp32]
^{215}Rn	5.079(7)	9.093(7)	8.839(6)	100%		[**1970Va13**, 2018Sa45, 1970VaZZ, 1969Ha32, 1952Me13]
^{219}Ra	. 4.955(8)	8.843(8)	8.138(3)	100%		[**1994Sh02**, 2018Sa45, 1993AnZS, 1989An13, 1987El02, 1970Va13, 1970VaZZ, 1969Ha32, 1952Me13
^{219m}Ra	4.937(8)	8.826(8)	8.155(3)	100%		[**2018Sa45**]
^{223}Th	4.525(9)	8.156(9)	7.567(4)	100%		[**1992Li09**, 1990An19, 1990AnZQ, 1989An13, 1989AnZL, 1988AnZS, 1987El02, 1970Va13, 1970VaZZ, 1969Ha32, 1952Me13]
^{227}U	4.278(14)	7.843(10)	7.235(3)	$\approx$ 100%		[**2015Ka24**, 1991Ho05, 1990JoZU, 1986BuZP, 1970Va13, 1969Ha32, 1952Me13]
^{231}Pu	4.217(59)	7.480(23)	6.839(20)	10^{+7}_{-3}%		[**1999La14**, 2007KhZQ]
^{235}Cm	3.74(19)#	6.62(12)#	7.116(14)*	$1.0^{+0.7}_{-0.5}$%		[**2020Kh10, 2007KhZQ**
^{239}Cf	3.30(28)#	5.62(14)#	7.766(8)**	65(3)%		[**2020Kh10**, 1981Mu12]
^{243}Fm	2.77(29)#	4.59(21)#	8.691(8)***	91(3)%	9(1)%	[**2020Kh10**, 2008Kh10, 1981Mu12]

* Deduced from α energy, 7.28(10)# in [2021Wa16].
** Deduced from α energy, 7.763(63) in [2021Wa16].
*** Deduced from α energy, 8.689(51) in [2021Wa16].

Table 3
direct α emission from ^{211}Po, $J^\pi = 9/2^+$, $T_{1/2}$ = 516(3) ms*, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(rel)[@]	I_α(abs)	J^π_f	$E_{daughter}$(^{207}Pb)[@@]	coincident γ-rays[@@]	R_0 (fm)	HF
5.961	5.848**	$8.1(10) \times 10^{-4}$%	$8.1(10) \times 10^{-4}$%**	$13/2^+$	1.6333	0.5697, 1.0637	1.46528(11)	$10.3^{+1.6}_{-1.3}$
6.6970(25)	6.5700(25)***	0.59(1)%	0.58(1)%	$3/2^-$	0.8978	0.8978	1.46528(11)	16.10(34)
7.0250(25)	6.8920(25)***	0.61(1)%	0.60(1)%	$5/2^-$	0.5697	0.5697	1.46528(11)	244(5)
7.594(3)	7.450(3)***	100	98.82(1)%	$1/2^-$	0.0	——	1.46528(11)	112(3)

* [1974Ba29].
** [2001Ch66].
*** [1969Go23].
[@] [1978Ya04].
[@@] [2011Ko04].

Table 4
direct α emission from ^{211m}Po, Ex. = 1.453(10) MeV, $J^\pi = (25/2^+)$, $T_{1/2}$ = 25.2(5) s*, BR_α =99.984(4)%**.

E_α(c.m.)	E_α(lab)***	I_α(rel)[@]	I_α(abs)	J^π_f	$E_{daughter}$(^{207}Pb)[@@]	coincident γ-rays[@@]	R_0 (fm)	HF
7.416(15)	7.275(15)	100%	91%	$13/2^+$	1.6333	0.5697, 1.0637	1.46528(11)	$1.60(16) \times 10^3$
8.149(15)	7.995(15)	1.82(3)%	1.66(3)%	$3/2^-$	0.8978	0.8978	1.46528(11)	$1.36(4) \times 10^7$
8.465(15)	8.305(15)	0.27(2)%	0.25(2)%	$5/2^-$	0.5697	0.5697	1.46528(11)	$6.8(6) \times 10^8$
9.046(10)	8.875(10)	7.74(15)%	7.04(14)%	$1/2^-$	0.0	——	1.46528(11)	$6.1(4) \times 10^8$

* [1974Ba29].
** [1989Ku08].
*** Values taken from [1962Pe15], adjusted by +5 keV in [1991Ry01].
[@] [1962Pe15].
[@@] [2011Ko04].

Table 5
direct α emission from ^{215}Rn*, $J^\pi = 9/2^+$, $T_{1/2}$ = 2.3(1) μs, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{211}Po)	coincident γ-rays	R_0 (fm)	HF
8.839(8)	8.675(8)	100%	$9/2^+$	0.0	——	1.5499(42)	1.69(18)

* Al values from [1970Va13], unless noted otherwise.

Table 6
direct α emission from ^{219}Ra, $J^\pi = (7/2)^+$, $T_{1/2}$ = 8.6(17) ms**, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J^π_f	$E_{daughter}$(^{215}Rn)	coincident γ-rays	R_0 (fm)	HF
7.330(5)	7.196(5)	3.2%	2.0%	$7/2^+$	0.806	0.2140, 0.3160, 0.490, 0.5920, 0.8052	1.5597(35)	3.5
7.822(3)	7.679(3)	100%	62%	$11/2^+$	0.316	0.316	1.5597(35)	4.4
7.846(10)	7.703(10)	2.3%	1.4%	$(11/2)^-$	0.2906	0.2906	1.5597(35)	230
7.925(10)	7.780(10)	≈0.8%	≈0.5%		0.2140	0.2140	1.5597(35)	$\approx 1.1 \times 10^3$
8.138(3)	7.989(3)	55%	34%	$9/2^+$	0.0	——	1.5597(35)	70

* All values from [1994Sh02], except where noted.
** Weighted average of 10(3) ms and 8(2) ms [2018Sa45].

Table 7
direct α emission from ^{219}Ra*, Ex. = 0.0166(2)**, $J^\pi = (11/2)^+$, $T_{1/2}$ = 10(3) ms, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{215}Rn)	coincident γ-rays	R_0 (fm)	HF
7.823(20)	7.680(20)	100%	$11/2^+$	0.316	0.316	1.5597(35)	3.6(11)

* All values from [2018Sa45], except where noted.
** [2021Si21].

Table 8
direct α emission from ^{223}Th*, $J^\pi = (5/2)^+$, $T_{1/2}$ = 660(10) ms**, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{219}Ra)	coincident γ-rays	R_0 (fm)	HF
7.052	6.928	0.7%	0.4%		0.5155(10)	0.0972(1), 0.1138(1), 0.4017(10)	1.5478(22)	18
7.098	6.973	1.1%	0.6%		0.4707(7)	0.0382(3), 0.0972(1), 0.1138(1), 0.3188(7), 0.3569(7)	1.5478(22)	18
7.124	6.998	2.7%	1.5%		0.4450(5)	0.0382(3), 0.088, 0.0972(1), 0.2930(5), 0.3050(5), 0.3313(5)	1.5478(22)	8.9
7.146	7.020	0.5%	0.3%		0.4217(12)	0.4217(12)	1.5478(22)	54
7.163	7.037	3.4%	1.9%		0.4047(2)	0.0382(3), 0.088, 0.0972(1), 0.1520(1), 0.2528(2), 0.2647(2), 0.353	1.5478(22)	9.9
7.245	7.117	1.3%	0.7%		0.3206(7)	0.0382(3), 0.0972(1), 0.1520(1), 0.1688(5), 0.2680(10), 0.3206(8)	1.5478(22)	54
7.417	7.286	47.7%	26.4%	$(7/2^+)$	0.1520(3)	0.0382(3), 0.0972(1), 0.1520(1)	1.5478(22)	5.6
7.429	7.298	100%	55.3%	$(9/2^+)$	0.1400(3)	0.0520(3), 0.088, 0.1400(3)	1.5478(22)	2.9
7.454	7.323	23.9%	13.2%	$(5/2^+)$	0.1138(1)	0.1138(1)	1.5478(22)	35
7.565	7.432	1.8%	≈1%	$7/2^+$	0.0	—	1.5478(22)	≈480

* All values from [1992Li09], except where noted. Uncertainties were not given for α energies and intensities.
** [1970Va13].

Table 9
direct α emission from ^{227}U*, $J^\pi = (3/2)^+$, $T_{1/2}$ = 1.1(1) m**, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(rel)[@]	I_α(abs)	J_f^π	$E_{daughter}$(^{223}Th)	coincident γ-rays	R_0 (fm)	HF
6.746(7)	6.627(7)	2(2)%	1(1)%	$(3/2^+, 5/2^+, 7/2^+)$	0.4888(6)	0.0513, 0.4374, 0.4888	1.5316(43)	5^{+54}_{-3}
6.839(8)	6.718(8)	12(3)%	5(1)%	$(1/2^+, 3/2^+, 5/2^+)$	0.3955(7)	0.0513, 0.0850, 0.1492, 0.2471, 0.2589, 0.3104, 0.3955	1.5316(43)	$2.6^{+1.0}_{-0.7}$
6.864(4)	6.743(4)	14(3)%	6(1)%	$(1/2^+, 9/2^+)$	0.3702(3)	0.3702	1.5316(43)	$2.7^{+0.9}_{-0.7}$
6.924(4)	6.802(4)	40(10)%	17(3)%	$(5/2^+)$	0.3104(3)	0.0513, 0.2589, 0.3104	1.5316(43)	$1.7^{+0.6}_{-0.4}$
6.987(3)	6.864(3)	100(17)%	42(7)%	$(3/2^+)$	0.2471(3)	0.2471	1.5316(43)	$1.2^{+0.4}_{-0.3}$
7.026(5)	6.902(5)	48(12)%	20(4)%	$(7/2^+)$	0.2089(5)	0.0513, 0.1574, 0.2089	1.5316(43)	$3.5^{+1.3}_{-0.9}$
7.183(3)	7.056(3)	10(10)%	4(4)%	$(7/2^+)$	0.0515(4)	0.0513	1.5316(43)	69(9)
7.234(3)	7.107(3)	14(10)%	6(4)%	$(5/2^+)$	0.0	—	1.5316(43)	70^{+160}_{-30}

* All values from [2015Ka24], except where noted.
** [1969Ha32].

Table 10
direct α emission from ^{231}Pu*, $J^\pi = (3/2)^+$, $T_{1/2}$ = 8.6(5) m, $BR_\alpha = 10^{+7}_{-3}\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{227}U)	coincident γ-rays	R_0 (fm)	HF
6.838(30)	6.720(30)	$10^{+7}_{-3}\%$	$(3/2^+)$	0.0	—	1.512(28)	$1.1^{+2.9}_{-0.6}$

* All values from [1999La14].

Table 11
direct α emission from ^{235}Cm, $J^\pi = (5/2)^+$*, $T_{1/2} = 300^{+250}_{-100}$ s*, $BR_\alpha = 1.0^{+0.7}_{-0.5}\%$*.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{231}Pu)	coincident γ-rays	R_0 (fm)	HF
6.796(14)	6.680(14)**	100%	≈0.7%*	$(5/2^+)$	0.320(20)		1.505(16)	≈0.8
7.116(14)	6.995(14)***	≈ 40%	≈0.3%*	$(3/2^+)$	0.0	—	1.505(16)	≈40

* [2020Kh10].
** Weighted average of 6.690(20) MeV [2020Kh10] and 6.670(20) MeV [2007KhZQ].
*** Weighted average of 7.010(20) MeV [2020Kh10] and 6.980(20) MeV [2007KhZQ].

Table 12
direct α emission from ^{239}Cf*, J^{π} = $(5/2)^{+}$, $T_{1/2}$ = 28(2) s, BR_{α} = 65(3)%.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(abs)	J^{π}_{f}	$E_{daughter}$(^{235}Cm)	coincident γ-rays	R_0 (fm)	HF
7.766(8)	7.636(8)	65(3)%	$(5/2)^{+}$	0.0	——	1.504(21)	$0.8^{+0.5}_{-0.3}$

* All values taken from [2020Kh10].

Table 13
direct α emission from ^{243}Fm*, J^{π} = $(7/2)^{-}$, $T_{1/2}$ = 231(9) ms, BR_{α} = 91(3)%.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(abs)	J^{π}_{f}	$E_{daughter}$(^{239}Cf)	coincident γ-rays	R_0 (fm)	HF
8.691(8)	8.546(8)	65(3)%	$(5/2)^{+}$	0.0	——	1.511(39)	$1.1^{+1.7}_{-0.37}$

* All values taken from [2020Kh10], except where noted.

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