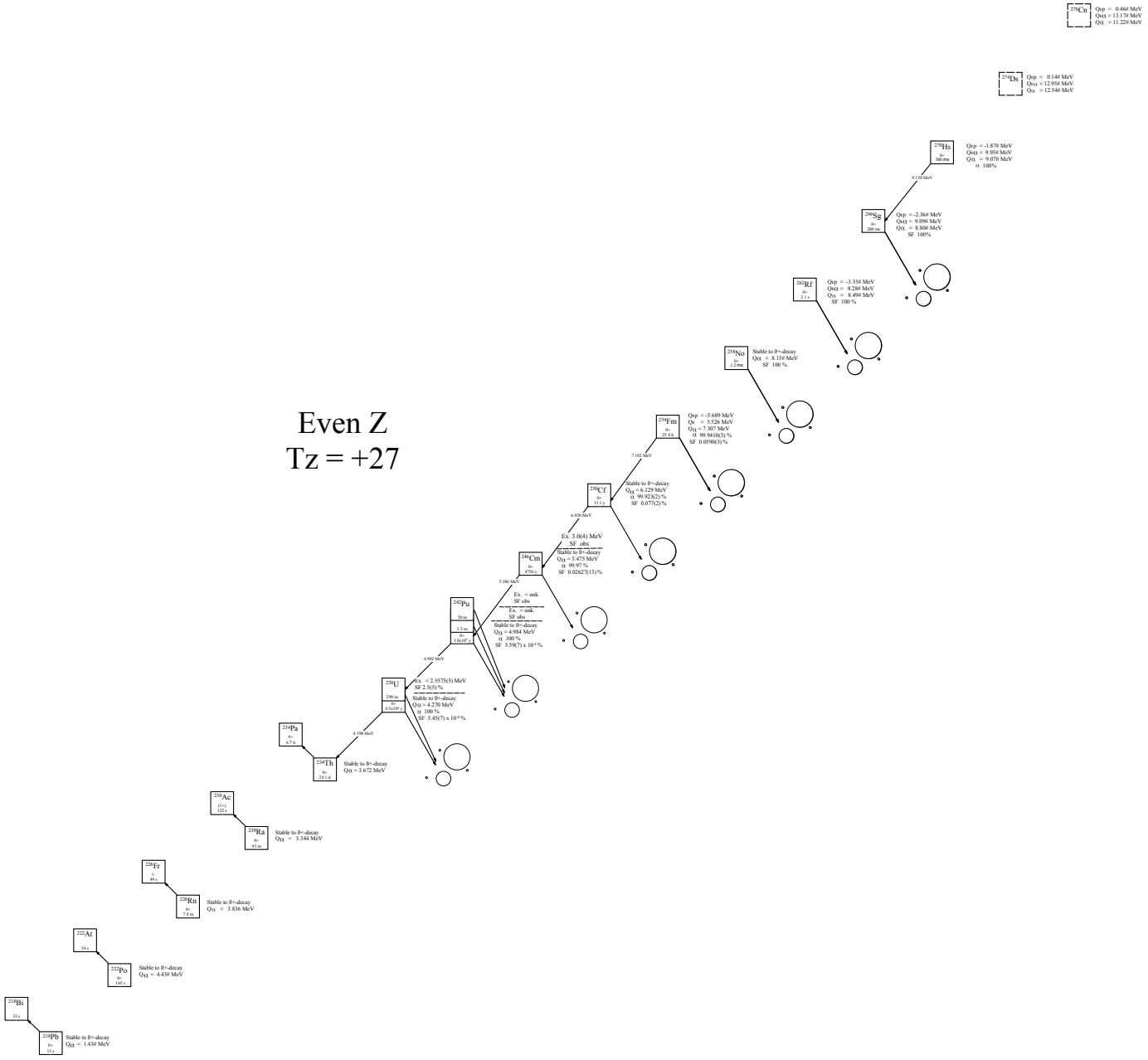

Fig. 1: Known experimental values for heavy particle emission of the even-Z T_z= +27 nuclei.

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Table 1
Observed and predicted β-delayed particle emission from the even-Z, T_z = +27 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein. J^π values are taken from ENSDF.

Nuclide	Ex.	J^π	$T_{1/2}$	Q_ε	Q_{β^-}	$Q_{\beta^-\alpha}$	Experimental
^{218}Pb*		0^+	13(7) s	-8.08(50)#	2.41(30)#	6.92(36)#	[**2016Ca25**]
^{222}Po*		0^+	145^{+694}_{-66} s	-6.46(30)#	1.530(40)	7.029(48)	[**2010Ch15**]
^{226}Rn*		0^+	7.4(1) m	-5.91(30)#	1.227(12)	5.549(19)	[**1986Bo35**]
^{230}Ra*		0^+	93(2) m	-4.970(12)	0.678(19)	4.750(12)	[**1978Gi07**]
^{234}Th(UX$_1$)*		0^+	24.101(25) d	-4.228(14)	0.274(3)	4.530(16)	[**1948Kn23**]
					$Q_{\varepsilon p}$	$Q_{\varepsilon\alpha}$	
^{238}U(U$_1$)		0^+	$4.4683(24)\times10^9$ y	-3.586(16)	—	—	[**1971Ja07**]
^{238m}U	2.5575(5)	0^+	298(18) ns	-1.028(16)	—	—	[**1992St05**]
^{242}Pu		0^+	$3.77(7)\times10^5$ y**	-2.70(20)	—	—	[**1976Bu23, 1976Os05, 1969Be06**]
^{242m1}Pu	x		3.5(6) ns	-2.70(20)+x	—	—	[**1974MeYP**]
^{242m2}Pu	y		50(30) ns	-2.70(20)+y	—	—	[**1969La14**, 1970Po01]
^{246}Cm		0^+	4756(20) y***	-2.377(18)#	—	—	[**2007Ko01, 1977Po20, 1971Ma32, 1971Mc19, 1969Me01**]
^{250}Cf		0^+	13.08(9) y	-1.782(3)	—	—	[**1969Me01**]
^{254}Fm		0^+	194.4(1) m	0.653(12)	-5.689(4)	5.526(3)	[**1967Fi03**]
^{258}No		0^+	1.2(2) ms	-0.21(10)#	—	—	[**1989Hu09**]
^{262}Rf		0^+	2.1(2) s	0.29(30)#	-3.35(30)#	8.28(22)#	[**1996La11**]
^{266}Sg		0^+	$0.28^{+0.19}_{-0.08}$ s	0.88(37)#	-2.36(44)#	9.09(32)#	[**2013Og03**]
^{270}Hs		0^+	$7.6^{+4.9}_{-2.2}$ s	0.88(39)#	-1.87(44)#	9.95(38)#	[**2013Og03**]
^{274}Ds				1.95(54)#	0.14(54)#	12.54(49)#	
^{278}Cn				2.32(59)#	0.46(59)#	13.17(58)#	

* 100% β^- emitter.
** Weighted average of $3.702(14)\times10^5$ y [1976Bu23], $3.763(9)\times10^5$ y [1976Os05] and $3.869(164)\times10^5$ y [1969Be06].
*** Weighted average of 4706(40) y [2007Ko01], 4852(76) y [1977Po20], 4820(20) y [1971Ma32], 4655(40) y [1971Mc19] and 4718(22) y 1969Me01].

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the even-Z, T_z = +27 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}	Experimental
^{218}Pb	10.32(50)#	1.43(50)#			
^{222}Po	9.00(30)#	4.43(30)#			
^{226}Rn	8.84(30)#	3.836(41)			
^{230}Ra	8.441(11)	3.344(15)			
^{234}Th(UX_1)	7.984(13)	3.672(11)			
^{238}U(U_1)	7.509(13)	6.828(2)	100%	$5.45(7)\times10^{-5}$%*	[**2014Po02, 2000Ho27, 1961Ko11, 1960Vo05, 1957Ha08**, 2005Yo12, 2004Ab03, 2003Gu18, 2000Ga05, 1987Al28, 1985Iv01, 1984Ro21, 1984Va35, 1983Be66, 1982De22, 1980Po09, 1980PoZX, 1978Ka40, 1978Ri07, 1978ThZW, 1976Th12, 1975Wa37, 1972Ni19, 1971Kl14, 1971Le11, 1971Sa08, 1971Sw03, 1971Th17, 1970Ga27, 1968Ro15, 1968Ar14, 1967Is04, 1967Sp12, 1966Ra25, 1964Fl07, 1964Me14, 1960Sh19, 1960Vo05, 1960Yo07, 1959Ge30, 1959Ha04, 1959Ko58, 1959Ku81, 1959St45, 1957Bo98, 1957Cl16, 1952Za01, 1944ChZX, 1940Fl02, 1918So01, 1912Ge01]
^{238m}U	4.951(13)	4.270(2)		2.5(5)%	[**1992St05**, 1989Ma54, 1989Ma57, 1989MaZF, 1988Ma52, 1988MaZF, 1984Ka10, 1984Ka17, 1983Dr14, 1983Ka11, 1980Me15, 1977VoZU, 1977ArZZ, 1975Ru03, 1974WoZK, 1971Ta17, 1970Po01, 1970Re05, 1970Wo06, 1969La14]
^{242}Pu	6.89(10)	4.984(1)	100%	$5.59(7)\times10^{-4}$%	[**2013Sa65, 2011Be01, 1986Va33, 1968Ba25, 1956Hu96, 1956Ko67, 1953AsZZ**, 2018Be29, 2016Ob01, 1998Se17, 1998VeZW, 1997De11, 1997SeZW, 1988SeZY, 1982Al13, 1979Ag03, 1978MeZL, 1976Bu23, 1976Os05, 1973Dy01, 1973VoZB, 1972Sc01, 1970Du02, 1969Be06, 1968Bo54, 1968HaZX, 1967Ga20, 1963Ma50, 1961Dr04, 1956Bu64, 1956Cr69, 1956Me37, 1950Th54]
^{242m1}Pu	6.89(10)-x	4.984(1)+x		obs	[**1974MeYP**]
^{242m2}Pu	6.89(10)-y	4.984(1)+y		obs	[1969La14, 1970Po01]
^{246}Cm	6.572(2)	5.475(1)	99.97(27)%	0.02627(13)%**	[**2007Ko01, 1984Sh31, 1971Ma32, 1969Me01, 1966Ba07, 1963Be48, 1963Dz07**, 2008KoZP, 2008Ve05, 1981Gi02, 1977Po20, 1974UnZV, 1973Pl04, 1973PlZW, 1973St04, 1972Pr19, 1972Da34, 1971BeYS, 1971Mc19, 1970Th06, 1967Ch12, 1967Sc32, 1961Ca01, 1956Bu91, 1955Br02, 1954Fr19]
^{250}Cf	5.965(1)	6.129	99.923(2)%	0.077(2)%***	[**2007Ko01, 1986Ry04, 1971Bb10, 1965Me02, 1963Ph01**, 2010Ve03, 2010VeZZ, 2008KoZP, 1985Wi10, 1977Fl07, 1970Ba18, 1970BaZX, 1970BaZZ, 1969Ba57, 1969Me01, 1963Br35, 1963Le17, 1962Br45, 1962Ph02, 1957Ea01, 1955As42, 1954Gh24, 1954Ma98]
^{254}Fm	5.397(2)	7.307(1)	99.9410(3)%	0.0590(3)%	[**1984Ah02, 1967Fi03**, 1977Gi15, 1974UnZU, 1974UnZX, 1973Ha44, 1963Bj03, 1963Br35, 1963Le13, 1962Br45, 1956Ch81, 1956Jo09, 1955As08]
^{258}No	4.80(10)#	8.15(10)#		100%	[**1989Hu09**, 2009Pe09, 2002PeZW, 1986Hu01, 1969NuZZ]
^{262}Rf	4.45(30)#	8.49(20)#		100%	[**1996La11, 1994La22**, 2013Mu08, 1998Tu01, 1994LaZX, 1994Og04, 1985So03, 1978NiZW]
^{266}Sg	4.05(33)#	8.80(10)#		100%	[**2013Og03, 2008Dv02, 2006Dv01, 2003Tu05**, 2012Tu01, 2006Dv01, 2004Vo24, 2003Du27]
^{270}Hs	3.65(45)#	9.070(38)	$\approx$ 100%		[**2013Og03, 2008Dv02, 2006Dv01, 2003Tu05**, 2012Tu01, 2004Vo24, 2003Du27, 2002Du21]
^{274}Ds	2.87(58)#	11.66(30)#			
^{278}Cn	2.85(64)#	11.22(20)#			

* Evaluated value from [2000Ho27], based on previous measurements.
** Deduced from a weighted average of $T_{1/2}$(SF) = $1.85(2)\times10^7$ y [1971Ma32] and $T_{1/2}$(SF) = $1.80(1)\times10^7$ y [1969Me01].
*** Deduced from a weighted average of α/SF =1260(40) [1965Me02] and α/SF =1330(45) [1963Ph01].

Table 3
direct α emission from ^{238}U, $J^\pi = 0^+$, $T_{1/2} = 4.4683(24)\times10^9$ y*, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)[@]	J_f^π	$E_{daughter}$(^{234}Th)[@@]	coincident γ-rays (keV)[@@]	R_0 (fm)	HF
4.107(5)	4.038(5)**	0.088(1)%	0.068(10)%	4^+	0.163	49.6, 113.5	1.5350(17)	45^{+8}_{-6}
4.222(5)	4.151(5)***	29.8(1)%	22.92(10)%	2^+	0.496	49.6	1.5350(17)	1.258(6)
4.270(3)	4.198(3)***	100%	77.01(10)%	0^+	0.0	——	1.5350(17)	1.0018(14)

* [1971Ja07].
** Deduced from E_α to the ground state and E_{level}.
*** Recommended by [1991Ry01], based on the adjusted values of [1961Ko11], [1960Vo05] and [1957Ha08].
[@] [2014Po02].
[@@] [2007Br04].

Table 4
direct α emission from ^{242}Pu, $J^\pi = 0^+$, $T_{1/2} = 3.77(7)\times10^5$ y*, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)[@]	J_f^π	$E_{daughter}$(^{238}U)[@@]	coincident γ-rays (keV)[@@]	R_0 (fm)	HF
4.6773(14)**	4.6000(14)	$8.37(26)\times10^{-4}$%	$6.40(20)\times10^{-4}$%	6^+	0.30741(4)	44.9, 103.5, 159.0	1.51448(75)	810(30)
4.8812(14)**	4.8005(14)	0.0388(13)%	0.0297(10)%	4^+	0.1484(4)	44.9, 103.5	1.51448(75)	247(10)
4.9397(15)	4.8581(15)***	30.74(16)%	23.51(12)%	2^+	0.044915(13)	44.9	1.51448(75)	1.634(32)
4.9847(14)	4.9023(14)***	100%	76.46(12)%	0^+	0.0	——	1.51448(75)	1.014(19)

* Weighted average of $3.702(14)\times10^5$ y [1976Bu23], $3.763(9)\times10^5$ y [1976Os05] and $3.869(164)\times10^5$ y [1969Be06].
** Deduced from E_α to the ground state and E_{level}.
*** Recommended by [1991Ry01], based on the adjusted values of [1968Ba25], [1956Hu96], [1956Ko67] and [1953AsZZ].
[@] Weighted average of values from [2011Be01] and [1986Va33].
[@@] [2011Be01].

Table 5
direct α emission from ^{246}Cm, $J^\pi = 0^+$, $T_{1/2} = 4756(20)$ y*, $BR_\alpha = 99.97(27)\%^{@}$.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)**	J_f^π	$E_{daughter}$(^{242}Pu)	coincident γ-rays (keV)	R_0 (fm)	HF
5.329(3)**	5.242(3)	0.025(3)%	0.020(2)%	4^+	0.1473	44.5, 102.8	1.49412(62)	500^{+50}_{-50}
5.4310(9)	5.3427(9)***	26.43(51)%	20.9(4)%	2^+	0.0445	44.5	1.49412(62)	2.06(4)
5.4747(9)	5.3857(9)***	100%	79.08(22)%	0^+	0.0	——	1.49412(62)	1.006(6)

* Weighted average of 4706(40) y [2007Ko01], 4852(76) y [1977Po20], 4820(20) y [1971Ma32], 4655(40) y [1971Mc19] and 4718(22) y 1969Me01].
** [2007Ko01].
*** Recommended by [1991Ry01], based on the adjusted values of [1984Sh31], [1966Ba07], [1963Be48] and [1963Dz07].
[@] Deduced from a weighted average of $T_{1/2}$(SF) = $1.85(2)\times10^7$ y [1971Ma32] and $T_{1/2}$(SF) = $1.80(1)\times10^7$ y [1969Me01].

Table 6
direct α emission from ^{250}Cf, $J^\pi = 0^+$, $T_{1/2} = 13.08(9)$ y*, $BR_\alpha = 99.923(2)\%$**.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)***	J_f^π	$E_{daughter}$(^{246}Cm)[@@]	coincident γ-rays (keV)[@@]	R_0 (fm)	HF
5.835(3)	5.742(3)***	0.008(2)%	0.007(2)%	6^+	0.2950	42.9, 99.2, 153.0	1.48260(30)	320^{+130}_{-70}
5.987(3)	5.891(3)***	0.343(18)%	0.283(15)%	4^+	0.1420	2.9, 99.2	1.48260(30)	52.9(28)
6.0863(6)	5.9889(6)[@]	20.71(16)%	17.11(13)%	2^+	0.0429	42.942.9	1.48260(30)	2.896(30)
6.12827(20)	6.03022(20)[@]	100%	82.6(1)%	0^+	0.0	——	1.48260(30)	0.998(7)

* [1969Me01].
** Deduced from a weighted average of α/SF =1260(40) [1965Me02] and α/SF =1330(45) [1963Ph01].
*** [2007Ko01].
[@] Recommended by [1991Ry01], based on the adjusted values of [1971Bb10], and [1986Ry06].
[@@] [2024Ne07].

Table 7
direct α emission from ^{254}Fm, $J^{\pi} = 0^+$, $T_{1/2}$ = 194.4(1) m*, BR_{α} = 99.9410(3)%*.

E_{α}(c.m.)	E_{α}(lab)**	I_{α}(rel)	I_{α}(abs)**	J_f^{π}	$E_{daughter}$(^{250}Cf)	coincident γ-rays (keV)	R_0 (fm)	HF
7.008(3)	6.898(3)	0.0078(9)%	0.0066(8)%	6^+	0.2962	42.7, 141.9, 296.2	1.48871(75)	780^{+110}_{-90}
7.163(2)	7.050(2)	0.96(7)%	0.82(6)%	4^+	0.1419	42.7, 141.9	1.48871(75)	27.6(20)
7.254(2)	7.140(2)	16.7(4)%	14.2(3)%	2^+	0.0427	42.7	1.48871(75)	4.03(9)
7.307(2)	7.192(2)	100%	85.0(5)%	0^+	0.0	—	1.48871(75)	0.996(6)

* [1967Fi03].
** [1984Ah02].

Table 8
direct α emission from ^{270}Hs*, $J^{\pi} = 0^+$, $T_{1/2} = 7.6^{+4.9}_{-2.2}$ s, $BR_{\alpha} = \approx 100\%$**.

E_{α}(c.m.)	E_{α}(lab)	I_{α}(abs)	J_f^{π}	$E_{daughter}$(^{266}Sg)	coincident γ-rays (keV)	R_0 (fm)	HF
9.288(80)	9.150(80)	$\approx$ 100%	0^+	0.0	—	1.471(27)	$3.4\ ^{2.2}_{-1.0}$***

* All values from [2013Og03].
** Only α emission has been observed. [2013Og03] also observed events consistent with SF from heavy nuclei. They report an upper limit for SF as 50%.

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