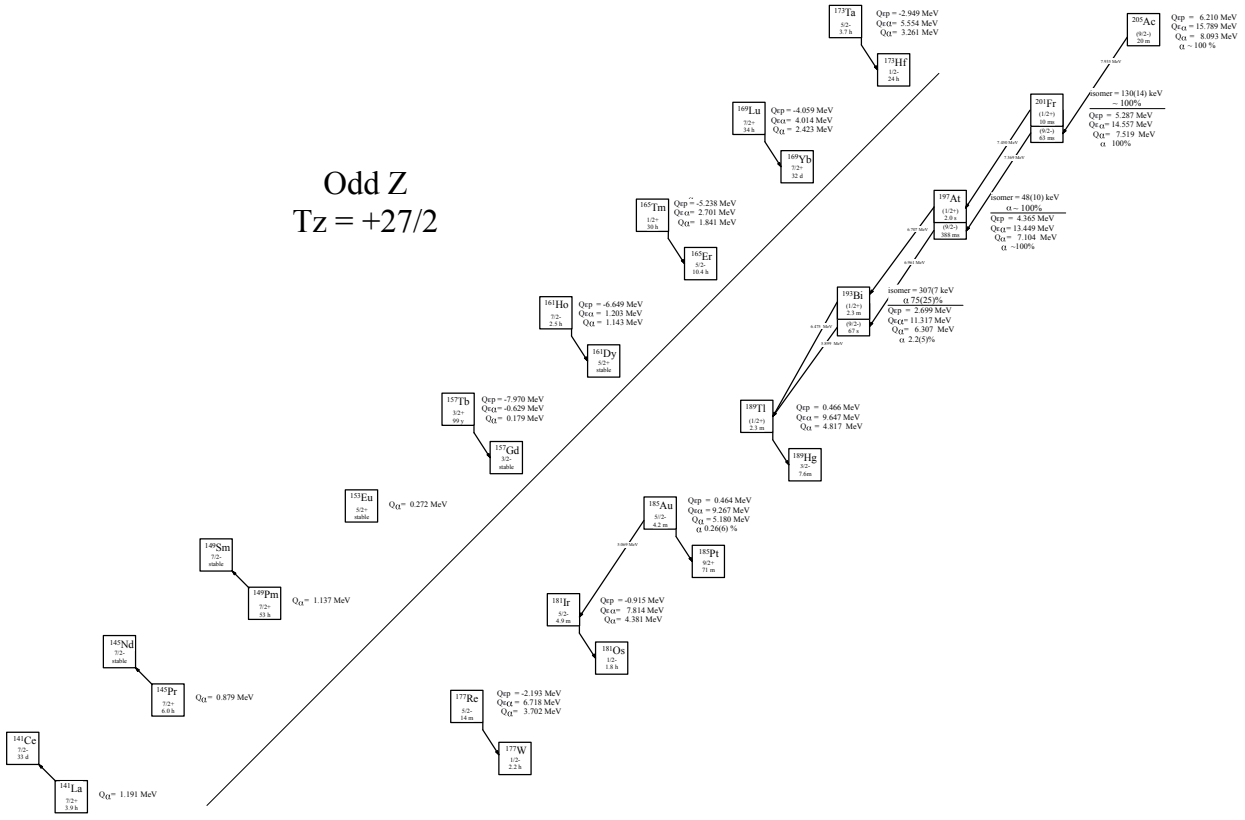

Fig. 1: Known experimental values for heavy particle emission of the odd-Z T_z= +27/2 nuclei.

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Table 1
Observed and predicted β-delayed particle emission from the odd-Z, T_z = +27/2 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	Ex	J^π	$T_{1/2}$	Q$_\varepsilon$	$Q_{\varepsilon p}$	$Q_{\varepsilon \alpha}$	Experimental
^{141}La*		$7/2^+$	3.92(3) h	-3.197(7)	——	——	[**1981Ge04**]
^{145}Pr*		$7/2^+$	5.984(10) h	-2.560(30)	——	——	[**1980Ge11**]
^{149}Pm*		$7/2^+$	53.09(9) h	-1.689(3)	——	——	[**1960Bu06**]
^{153}Eu		$5/2^+$	stable	stable	——	——	
^{157}Tb		$3/2^+$	99(10) y	0.060	-7.970(3)	-0.629(1)	[**1983Be42**]
^{161}Ho		$7/2^-$	2.48(5) h	0.859(2)	-6.649(2)	1.203(2)	[**1965Ab04**]
^{165}Tm		$1/2^+$	30.06(5) h	1.591(2)	-5.238(2)	2.701(2)	[**1970Ka23**]
^{169}Lu		$7/2^+$	34.06(5) h	2.293(3)	-4.059(3)	4.014(3)	[**1970Ka23**]
^{173}Ta		$5/2^-$	3.65(5) h	3.020(40)	-2.949(28)	5.554(28)	[**1963Sa14**]
^{177}Re		$5/2^-$	14(1) m	3.430(40)	-2.193(42)	6.718(40)	[**1970Go20**]
^{181}Ir		$5/2^-$	4.90(15) m	4.087(26)	-0.915(22)	7.814(28)	[**1978La04**]
^{185}Au		$5/2^-$	4.2(1) m	4.830(26)	0.464(28)	9.267(25)	[**1995Bi01**]
^{189}Tl		$(1/2^+)$	2.3(2) m	5.010(30)	0.466(9)	9.647(27)	[**1976Ha25**]
^{193}Bi		$(9/2^-)$	67(3) s**	6.345(13)	2.699(33)	11.317(32)	[**1985Co06, 1972Ga27**]
^{193m}Bi	0.307(7)	$(1/2^+)$	3.4(2) s***	6.652(15)	3.006(34)	11.624(33)	[**1985Co06, 1972Ga27**]
^{197}At		$(9/2^-)$	388(6) ms	7.038(13)	4.365(26)	13.449(13)	[**1999Sm07**]
^{197m}At	0.048(10)	$(1/2^+)$	2.0(2) s	7.086(16)	4.413(28)	13.497(16)	[**1999Sm07**]
^{201}Fr		$(9/2^-)$	63(3) ms$^@$	7.696(14)	5.287(26)	14.557(13)	[**2014Ka23, 2005De01, 2005Uu02**]
^{201m}Fr	0.130(14)	$(1/2^+)$	10^{+12}_{-3} ms$^{@@}$	7.826(20)	5.417(30)	14.687(19)	[**2014Ka23, 2005Uu02**]
^{205}Ac		$(9/2^-)$	20^{+97}_{-9} ms	8.300(60)	6.210(64)	15.789(60)	[**2014Zh03**]

* 100% β^- emitter.
** Weighted average of 67(3) s [1985Co06] and 62.2(36) s [1972Ga27].
*** Weighted average of 3.2(2) s [1985Co06] and3.48(18) s [1972Ga27].
$^@$ Weighted average of 64(3) ms [2014Ka23], 67(3) ms [2005De01] and 53(4) ms [2005Uu02].
$^{@@}$ Weighted average of 8^{+12}_{-3} ms [2014Ka23],and 19^{+19}_{-6} ms [2005Uu02].

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the odd-Z, T_z = +27/2 nuclei. Unless otherwise stated, all S and Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	S$_p$	S$_{2p}$	Q$_\alpha$	BR$_\alpha$	Experimental
^{141}La	6.951(9)	16.807(5)	1.191(4)		
^{145}Pr	6.483(7)	16.032(10)	0.879(8)		
^{149}Pm	5.945(2)	15.198(16)	1.137(7)		
^{153}Eu	5.893(1)	14.559(5)	0.272(2)		
^{157}Tb	5.517(0)	13.523(1)	0.179(1)		
^{161}Ho	4.813(2)	12.242(2)	1.143(2)		
^{165}Tm	4.276(1)	11.130(2)	1.841(3)		
^{169}Lu	3.792(3)	10.117(3)	2.423(3)		
^{173}Ta	3.283(37)	9.146(28)	3.261(28)		
^{177}Re	2.917(40)	8.438(40)	3.702(40)		
^{181}Ir	2.396(17)	7.457(25)	4.381(28)		
^{185}Au	1.815(15)	6.234(25)	5.180(5)	0.26(6)%	[**1995Bi01**, 1993BiZY, 1991Bi04, 1970Ha18, 1968De01, 1968Si01, 1965Si07]
^{189}Tl	1.707(11)	6.165(24)	4.817(9)		
^{193}Bi	0.622(9)	4.180(11)	6.307(5)	2.2(5)%	[**2005De01, 1985Co06, 1972Ga27**, 2004DeZV, 1993An19, 1990AnZR, 1989AnZF, 1984Co13, 1982LeZN, 1978Va21, 1974Le02, 1970Ta14, 1967Tr06]
^{193m}Bi	0.315(11)	3.873(13)	6.614(9)	75(25)%	[**1993An19, 1985Co06, 1972Ga27**, 2005De01, 2004DeZV 1984Co13, 1982LeZN, 1978Va21, 1974Le02, 1970Ta14, 1967Tr06]
^{197}At	0.175(10)	2.908(10)	7.104(3)	$\approx$ 100%*	[**2014Ka23, 2005De01, 2005Uu02, 1999Sm07, 1996En01**, 2015We13, 2004DeZV, 1986Co12, 1985HuZY, 1967Tr04, 1967Tr06]
^{197m}At	0.127(14)	2.860(14)	7.152(10)	$\approx$ 100%*	[**2014Ka23, 2005De01, 1999Sm07**, 2004DeZV, 1986Co12, 1985HuZY]
^{201}Fr	-0.300(11)	2.166(11)	7.519(4)	$\approx$ 100%*	[**2014Ka23, 2005De01, 2005Uu02, 1996En01**, 2004DeZV,] 1980Ew03, 1979Ca16]
^{201m}Fr	-0.430(17)	2.036(18)	7.649(14)	100%*	[**2014Ka23, 2005Uu02**]
^{205}Ac	-0.757(60)	1.348(60)	8.093(59)	$\approx$ 100%*	[**2014Zh03**]

* Based on short half-life.

Table 3
direct α emission from ^{185}Au*, $J_i^\pi = 5/2^-$, $T_{1/2}$ = 4.2(1) m, BR_α = 0.26(6)%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{181}Ir)	coincident γ-rays**	R_0 (fm)	HF
4.680(10)	4.579(10)	0.03(1)%	$7.8(32)\times10^{-5}$%		0.501		1.521(22)	$3.0^{+2.8}_{-1.4}$
4.933(10)	4.826(10)	0.15(1)%	$3.9(9)\times10^{-4}$%	$(3/2^-, 5//2^-)$	0.243	0.112, 0.131, 0.243	1.521(22)	20^{+14}_{-9}
5.181(5)	5.069 5(5)	100(1)%	0.26(6)%	$(5/2^-)$	0.0	——	1.521(22)	0.7^{+4}_{-3}

* All values from 1005Bi01], except where noted.
** [2005Wu07].

Table 4
direct α emission from ^{193}Bi, $J_i^\pi = (9/2^-)$, $T_{1/2}$ = 67(3) s*, BR_α = 2.2(5)%**.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{189}Tl)	coincident γ-rays	R_0 (fm)	HF
6.024(5)	5.899(5)***	100%	0.021(5)%	$(9/2^-)$	0.281(7)		1.5059(63)	$2.9^{+1.1}_{-0.8}$
6.305(5)	6.174(5)***	4.4(5)%	$9.3(2)\times10^{-4}$%	$(1/2^+)$	0.0	——	1.5059(63)	1000^{+500}_{-300}

* Weighted average of 67(3) s [1985Co06] and 62.2(36) s [1972Ga27].
** [2005De01].
*** [1985Co06].

Table 5
direct α emission from ^{193m}Bi, Ex = 307(7) keV, $J_i^\pi = (1/2^+)$, $T_{1/2}$ = 3.4(2) s*, BR_α = 75(25)%**.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{189}Tl)	coincident γ-rays	R_0 (fm)	HF
6.612(5)	6.475(5)***	75(25)%**	$(1/2^+)$	0.0	——	1.5059(63)	$1.0^{+0.6}_{-0.3}$

* Weighted average of 3.2(2) s [1985Co06] and3.48(18) s [1972Ga27].
** [1993An19].
*** [1985Co06].

Table 6
direct α emission from ^{197}At, $J_i^\pi = (9/2^-)$, $T_{1/2}$ =388(6) ms*, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{193}Bi)	coincident γ-rays	R_0 (fm)	HF
7.105(3)	6.961(3)**	$\approx$ 100%	$(9/2^-)$	0.0	——	1.5291(28)	1.53(10)

* [1999Sm07].
** Weighted average of 6.963(5) MeV [2014Ka23], 6.963(4) MeV [2005De01], 6.959(6) MeV [2005Uu02], 6.960(5) [1999Sm07] and 6.956(5) MeV [1996En01].

Table 7
direct α emission from ^{197m}At*, Ex = 48(10) keV, $J_i^\pi = (1/2^+)$, $T_{1/2}$ = 2.0(2) s, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{193}Bi)	coincident γ-rays	R_0 (fm)	HF
6.846(5)	6.707(5)**	$\approx$ 100%	$(1/2^+)$	0.307(7)		1.5291(28)	0.93(12)

* All values from [1999Sm07].

Table 8
direct α emission from ^{201}Fr, $J_i^\pi = (9/2^-)$, $T_{1/2}$ =63(3) ms*, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{197}At)	coincident γ-rays	R_0 (fm)	HF
7.519(5)	7.369(5)**	$\approx$ 100%	$(9/2^-)$	0.0	——	1.547(12)	$1.7^{+0.5}_{-0.4}$

* Weighted average of 64(3) ms [2014Ka23], 67(3) ms [2005De01] and 53(4) ms [2005Uu02].
** Weighted average of 7.369(5) MeV [2014Ka23], 7.379(7) MeV [2005De01], 7.369(8) MeV [2005Uu02], and 7.361(7) MeV [1996En01].

Table 9
direct α emission from ^{201m}Fr, Ex = 130(14) keV, $J_i^\pi = (1/2^+)$, $T_{1/2} = 10^{+12}_{-3}$ ms*, $BR_\alpha = 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{197}At)	coincident γ-rays	R_0 (fm)	HF
7.601(8)	7.450(8)**	100%	$(1/2^+)$	0.048(10)		1.547(12)	$0.5^{+0.5}_{-0.2}$

* Weighted average of 8^{+12}_{-3} ms [2014Ka23],and 19^{+19}_{-6} ms [2005Uu02].
** Weighted average of 7.445(8) MeV [2014Ka23], and 7.454(8) MeV [2005Uu02].

Table 10
direct α emission from ^{205}Ac*, $J_i^\pi = (9/2^-)$, $T_{1/2} = 20^{+97}_{-9}$ ms, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{201}Fr)	coincident γ-rays	R_0 (fm)	HF
8.093(30)	7.935(30)	$\approx 100\%$	$(9/2^-)$	0.0	——	1.541(17)	6^{+6}_{-3}

* All values from [2014Zh03].

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