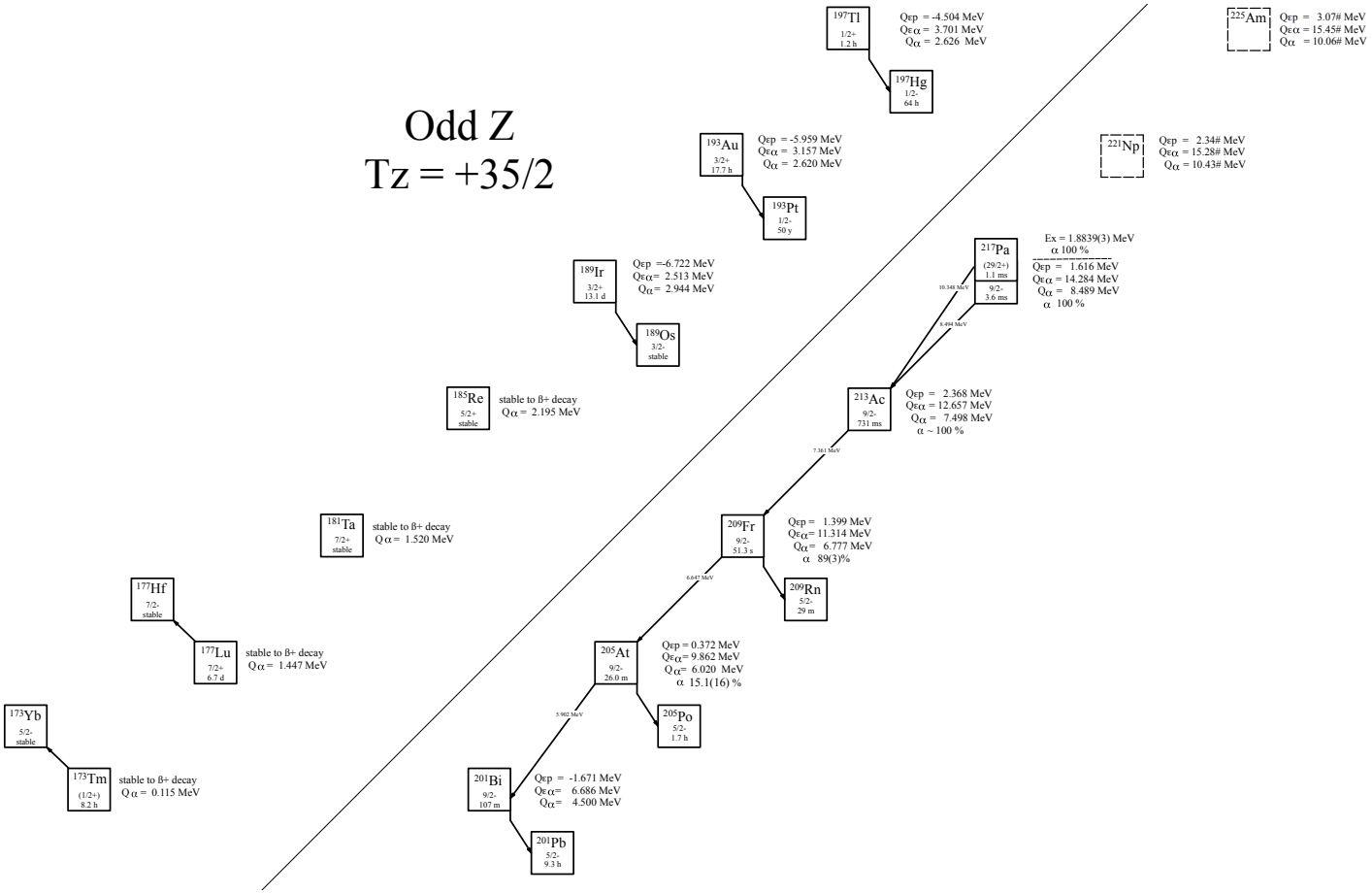

Fig. 1: Known experimental values for heavy particle emission of the odd-Z T_z= +35/2 nuclei.

Last updated 12/5/23

Table 1
Observed and predicted β-delayed particle emission from the odd-Z, T_z = +35/2 nuclei. J^π values for ^{173}Tm, ^{177}Lu, ^{181}Ta, ^{185}Re, ^{189}Ir, ^{193}Au, ^{197}Tl and ^{201}Bi are taken from ENSDF. 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
^{173}Tm*		(1/2$^+$)	8.24(8) h	-2.60(20)#	——	——	[**1963Or01**]
^{177}Lu*		7/2$^+$	6.7479(7) d	-1.398(1)	——	——	[**1990Ab02**]
^{181}Ta		7/2$^+$	stable	-1.036(2)	——	——	
^{185}Re		5/2$^+$	stable	-0.431(1)	——	——	
^{189}Ir		3/2$^+$	13.1(1) d**	0.537(13)	-6.722(13)	2.513(13)	[**1975Ba35, 1964Le07, 1963Gr22**]
^{193}Au		3/2$^+$	17.65(15) h	1.075(9)	-5.858(9)	3.157(9)	[**1968Sv01**]
^{197}Tl		1/2$^+$	2.84(4) h	2.186(14)	-4.504(14)	3.701(14)	[**1961Ju05**]
^{201}Bi		9/2$^-$	107.4(21) m***	3.842(18)	-1.671(13)	6.686(13)	[**1970DaZM, 1956St05**]
^{205}At		9/2$^-$	26.0(5) m$^@$	4.537(16)	0.372(15)	9.862(18)	[**1970DaZM, 1968Go12, 1961La02**]
^{209}Fr		9/2$^-$	51.3(8) s	5.159(15)	1.399(15)	11.314(15)	[**1996Xu02**]
^{213}Ac		9/2$^-$	731(17) ms	5.795(15)	2.368(15)	12.657(15)	[**2000He17**]
^{217}Pa		9/2$^-$	3.6(2) ms$^{@@}$	4.849(16)	1.616(16)	14.284(16)	[**2002He29, 1996An21**]
^{217m}Pa	1.8839(3)	29/2$^+$	1.08(3) ms	6.733(16)	3.500(16)	16.168(16)	[**2002He29**]
^{221}Np				5.39(21)#	2.34(20)#	15.28(20)#	
^{225}Am				6.09(50)#	3.07(40)#	15.45(41)#	

* 100% β^- emitter.
** Weighted average of 13.1(1) d [1975Ba35], 13.3(1) d [1964Le07] and 13.2(2) d [1963Gr22].
*** Weighted average of 106.2(24) m [1970DaZM] and 111(4) m [1956St05].
$^@$ Weighted average of 27.2(6) m [1970DaZM], 25.0(5) m [1968Go12] and 26.2(5) m [1961La02].
$^{@@}$ Weighted average of 3.8(2) ms [2002He29] and 3.4(2) ms [1996An21].

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the odd-Z, T_z = +35/2 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
^{173}Tm	7.062(6)	16.32(60)#	0.115(21)		
^{177}Lu	6.182(1)	14.651(50)	1.447(5)		
^{181}Ta	5.949(2)	13.958(5)	1.520(2)		
^{185}Re	5.403(1)	13.103(2)	2.195(2)		
^{189}Ir	4.601(13)	11.811(138)	2.944(13)		
^{193}Au	4.405(9)	11.274(9)	2.620(15)		
^{197}Tl	3.817(14)	10.365(14)	2.626(16)		
^{201}Bi	2.467(16)	7.948(30)	4.500(6)		
^{205}At	1.932(16)	6.038(18)	6.020(2)	15.1(16)%*	[**1974Ho27, 1968Go12, 1961La02**, 1970DaZM, 1963Ho18, 1963Uh01, 1961Fo04, 1954Bu67, 1951Ba14]
^{209}Fr	1.416(15)	5.133(17)	6.777(4)	89(3)%	[**1974Ho27, 1967Va20**, 1964Gr04, 1964Gr04]
^{213}Ac	0.949(16)	4.297(17)	7.498(4)	≈ 100%	[**200He17, 1968Va04**, 1961Gr42]
^{217}Pa	0.533(17)	3.554(18)	8.489(4)	100%	[**2002He29**, 2008DoZZ, 2002HeZV, 1998Ik01, 1998MiZW, 1996An21, 1996AnZY, 1995NiZS, 1978ReZZ, 1977ScZC, 1968Va18]
^{217m}Pa	-1.351(17)	1.670(18)	10.373(4)	100%	[**2002He29**, 2008DoZZ, 2002HeZV, 1998Ik01, 1998MiZW, 1996An21, 1996AnZY, 1995NiZS, 1978ReZZ]
^{221}Np	0.39(22)#	3.25(21)#	10.43(20)#		
^{225}Am	0.18(50)#	2.85(41)#	10.06(45)#		

* Weighted average of 10(2)% [1974Ho27] and 18.4(16)% [1961La02].
** Not measured, inferred from half-life.

Table 3
direct α emission from ^{205}At, J_i^π = 9/2$^-$, T$_{1/2}$ = 26.0(5) m*, BR_α = 15.1(16)%**.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{201}Bi)	coincident γ-rays	R$_0$ (fm)]	HF
6.019(2)	5.902(2)***	15.1(16)%$^@$	9/2$^-$	0.0	——	1.4771(25)	$0.98^{+0.15}_{-0.13}$

* Weighted average of 27.2(6) m [1970DaZM], 25.0(5) m [1968Go12] and 26.2(5) m [1961La02].
** Weighted average of 10(2)% [1974Ho27] and 18.4(16)% [1961La02].
*** Weighted average of 5.901(5) MeV [1974Ho27], 5.903(2) MeV [1968Go12] and 5.896(4) MeV (adjusted to 5.899(4) MeV in [1991Ry01])[1974Ho27].
$^@$ Weighted average of 10(2)% [1974Ho27] and 18.4(16)% [1961La02].

Table 4
direct α emission from ^{209}Fr*, $J_i^\pi = 9/2^-$, $T_{1/2}$ = 51.3(8) s**, BR_α = 89(3)%.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{205}At)	coincident γ-rays	R_0 (fm)]	HF
6.777(5)	6.647(5)***	89(3)%@	$9/2^-$	0.0	——	1.4808(14)	1.30(14)

* All values from [1974Ho27], except where noted.
** [1996Xu02].
*** 6.646(5) MeV in [1974Ho27], modified to 6.647(5) MeV in [1991Ry01].

Table 5
direct α emission from ^{213}Ac*, $J_i^\pi = 9/2^-$, $T_{1/2}$ = 731(17) ms, $BR_\alpha = \approx 100\%$.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{209}Fr)	coincident γ-rays	R_0 (fm)]	HF
7.502(8)	7.361(8)**	$\approx 100\%$	$9/2^-$	0.0	——	1.4852(44)	1.29(15)

* All values from [2000He17], except where noted.

Table 6
direct α emission from ^{217}Pa*, $J_i^\pi = (9/2^-)$, $T_{1/2}$ = 3.6(2) ms**, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{213}Ac)	coincident γ-rays	R_0 (fm)]	HF
7.855(5)	7.710(5)	0.3(2)%	0.3(2)%	$(13/2^-)$	0.6343	0.6343(1)	1.4908(17)	7^{+15}_{-3}
7.873(5)	7.728(5)	0.3(2)%	0.3(2)%	$(13/2^-)$	0.6130	0.6125(8)	1.4908(17)	8^{+18}_{-4}
8.021(5)	7.873(5)	0.4(2)%	0.4(2)%		0.4665	0.4661(20)	1.4908(17)	17^{+20}_{-7}
8.494(5)	8.337(5)	100 (1)%	99(1)%	$(9/2^-)$	0.0	——	1.4908(17)	$1.67^{+0.32}_{-0.28}$

* All values from [2002He29], except where noted.
** Weighted average of 3.8(2) ms [2002He29] and 3.4(2) ms [1996An21].

Table 7
direct α emission from ^{217m}Pa*, Ex. = 1.8839(3) MeV, $J_i^\pi = (29/2^+)$, $T_{1/2}$ = 1.08(3) ms, BR_α = 100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{213}Ac)	coincident γ-rays	R_0 (fm)]	HF
8.462(5)	8.306(5)	15.3(29)% %	11(2)%	$(21/2^-)$	1.8842	0.450, 0.613, 0.821	1.4908(17)	$3.7^{+1.2}_{-0.9}$
9.712(5)	9.533(5)	8.3(15)%	6(1)%	$(13/2^-)$	0.6343	0.634	1.4908(17)	$1.00^{+0.29}_{-0.23}\times10^4$
9.731(5)	9.552(5)	12.5(15)%	9(1)%	$(13/2^-)$	0.613	0.613	1.4908(17)	$7.5^{+1.8}_{-1.5}\times10^3$
9.879(5)	9.697(5)	2.8(14)%	2(1)%		0.4665	0.466	1.4908(17)	$7^{+8}_{-3}\times10^4$
10.348(5)	10.157(5)	100(8)%	72(4)%	$(9/2^-)$	0.0	——	1.4908(17)	$1.9^{+0.4}_{-0.3}\times10^4$

* All values from [2002He29], except where noted.

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