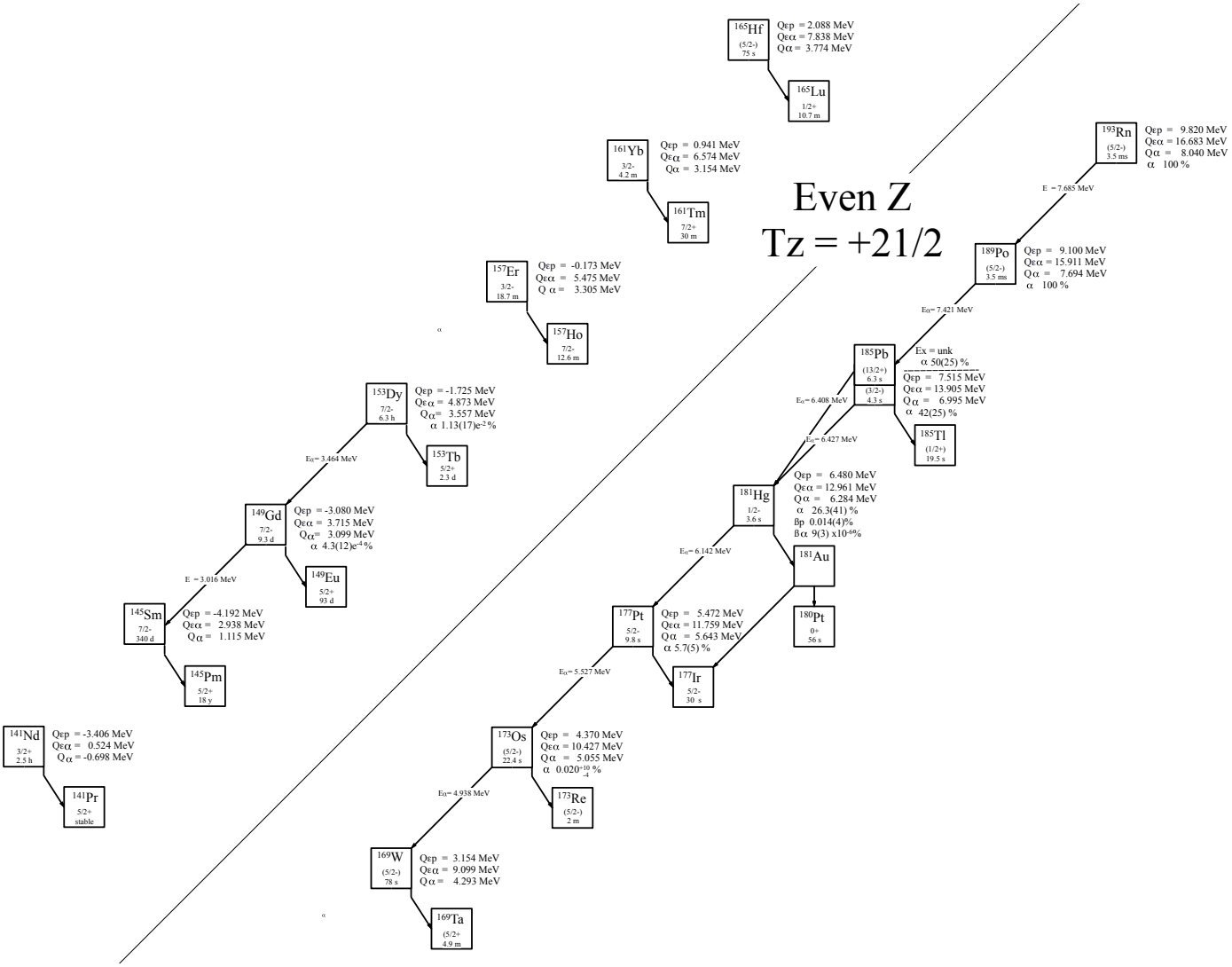

Fig. 1: Known experimental values for heavy particle emission of the even-Z T_z= +21/2 nuclei.

Last updated 3/28/23

Table 1
Observed and predicted β-delayed particle emission from the even-Z, T_z = +21/2 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein. J^π values for are taken from ENSDF.

Nuclide	Ex	J^π	$T_{1/2}$	Q_ε	$Q_{\varepsilon p}$	$BR_{\beta p}$	$Q_{\varepsilon\alpha}$	$BR_{\beta\alpha}$	Experimental
^{141}Nd		$3/2^+$	2.54(5) h	1.823(3)	-3.406(3)		0.524(4)		[**1961Ra06**]
^{145}Sm		$7/2^-$	340(3) d	0.616(3)	-4.192(1)		2.938(2)		[**1959Br65**]
^{149}Gd		$7/2^-$	9.25(10) d	1.314(4)	-3.080(3)		3.715(4)		[**1968Ch30**]
^{153}Dy		$7/2^-$	6.29(10) h	2.170(2)	-1.725(4)		4.873(6)		[**1970Ch09**]
^{157}Er		$3/2^-$	18.65(10) m	3.420(30)	-0.173(27)		5.475(27)		[**1984GrZL**]
^{161}Yb		$3/2^-$	4.2(2) m	4.060(30)	0.941(29)		6.574(28)		[**1974Ad10**]
^{165}Hf		$(5/2^-)$	75(3) s	4.810(40)	2.088(32)		7.838(40)		[**1981LiZM**]
^{169}W		$(5/2^-)$	78(6) s*	5.370(30)	3.154(32)		9.099(31)		[**1990Me12, 1992HeZV**]
^{173}Os		$(5/2^-)$	22.4(9) s	6.120(30)	4.370(32)		10.427(32)		[**1995Hi02**]
^{177}Pt		$5/2^-$	9.8(4) s	6.677(25)	5.472(19)		11.759(32)		[**1993Me13**]
^{181}Hg		$1/2^-$	3.6(1) s	7.210(25)	6.480(18)	0.014(4)%	12.961(25)	$9(3)\times10^{-6}$%	[**1979Ho10, 1975Ho02, 1971Ho07**, 1970HoZZ]
^{185}Pb		$(3/2^-)$	4.3(2) s	8.217(26)	7.515(19)		13.905(26)		[**2002An15**]
^{185m}Pb	x	$(13/2^+)$	6.3(4) s	8.217(26)+x	7.515(19)+x		13.905(26)+x		[**2002An15**]
^{189}Po		$(5/2^-)$	3.5(5) ms	8.640(30)	9.100(24)		15.911(30)		[**2005Va04**]
^{193}Rn			1.15(27) ms	9.110(30)	9.820(27)		16.683(33)		[**2006An36**, 2006AnZT]

* Weighted average of 76(6) s [1990Me12] and 80(6) s [1992HeZV].

Table 2
Particle separation, Q-values, and measured values for direct particle emission of the even-Z, T_z = +21/2 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	Experimental
^{141}Nd	6.794(7)	11.812(4)	-0.698(3)	——	
^{145}Sm	6.524(3)	11.227(1)	1.115(3)		
^{149}Gd	6.119(10)	10.439(3)	3.099(3)	$4.3(12)\times10^{-4}$%	[**1967Go32, 1966Wi12, 1965Si06**, 1965Ma48]
^{153}Dy	5.715(40)	9.532(5)	3.557(5)*	0.0113(17)%	[**1974To07, 1967Go32**, 1978AfZZ, 1974PeZS, 1974ToZN, 1974ToZQ, 1965Ma51, 1964Ma19, 1960Ma47, 1960To05, 1958To27]
^{157}Er	5.164(47)	8.836(28)	3.305(27)		
^{161}Yb	4.822(36)	7.851(16)	3.154(31)		
^{165}Hf	4.282(40)	6.920(32)	3.774(32)		
^{169}W	3.813(32)	6.028(32)	4.293(32)		
^{173}Os	3.160(39)	4.930(32)	5.055(6)	$0.020^{+0.010}_{-0.004}$%	[**1995Hi02, 1971Bo06**, 1973Be67, 1971BoZK]
^{177}Pt	2.777(17)	3.843(19)	5.643(3)	5.7(5)%	[**1979Ha10**, 2004GoZZ, 1992MeZW, 1992Bo04, 1982HeZM, 1973BoXL, 1970Ha18, 1966Si08]
^{181}Hg	2.324(16)	2.971(17)	6.284(4)	26.3(41)%**	[**1979Ha10**, 1996Pa01, 1992BoZO, 1990SaZU, 1986Ke03, 1984ScZQ, 1982HeZM, 1970Ha18, 1969NaZT, 1969NaZU]
^{185}Pb	1.947(19)	2.314(18)	6.695(5)	42(25)%***	[**2005Va04, 2002An15**, 1984ScZQ, 1982HeZM, 1980Sc09, 1975Ca06, 1974CaYE]
^{185m}Pb	1.947(19)-x	2.314(18)-x	6.695(5)+x	50(25)%	[**2002Va15**, 2005Va04, 1975Ca06, 1974CaYE
^{189}Po	1.516(25)	1.013(23)	7.694(15)	$\approx$ 100%$^@$	[**2005Va04**, 2000AnZZ, 1999An52]
^{193}Rn	1.172(38)	0.466(26)	8.040(12)	100%$^@$	[**2006An36**, 2006AnZT]

* From α energy, 3.559(4) in [2021Wa16].
** Sum of α intensities from [1979Ha10].
*** Weighted average of 50(25)% [2002AN15] and 34(25)% [2005Va04].
$^@$ Based on short Half-life.

Table 3
direct α emission from ^{149}Gd, $J^\pi = 7/2^-$, $T_{1/2}$ = 9.25(10) d*, $BR_\alpha = 4.3(12)\times10^{-4}$%**.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{145}Sm)	coincident γ-rays	R_0 (fm)	HF
3.099(5)	3.016(5)***	$4.3(12)\times10^{-4}$%**	$7/2^-$	0.0	——	1.5722(55)	$2.5^{+1.1}_{-0.7}$

* [1968Ch30].
** Weighted average of $4.0(12)\times10^{-4}$% [1966Wi12] and $4.6(15)\times10^{-4}$% [19665Si06].
*** 3.018(5) MeV in [1967Go32] (adjusted to 3.016(5) MeV in 1999Ry01).

Table 4
direct α emission from ^{153}Dy, $J^\pi = 7/2^-$, $T_{1/2}$ = 6.29(10) h*, BR_α = 0.0113(17)%**.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J^π_f	$E_{daughter}$(^{149}Gd)	coincident γ-rays	R_0 (fm)	HF
3.394(5)	3.305(5)***	0.09(7)%**	2.12e^{-6}%	$5/2^-$	0.165	0.165	1.560(21)	50^{+190}_{-30}
3.557(5)	3.464(5)***	100%**	0.01133(17)%**	0.0	$7/2^-$	——	1.560(21)	$0.9^{+0.5}_{-0.3}$

* [1970Ch09].
** [1974To07].
*** [1967Go32].

Table 5
direct α emission from ^{173}Os, $J^\pi = (5/2^-)$, $T_{1/2}$ = 22.4(9) s*, $BR_\alpha = 0.020^{+10}_{-4}$%**.

E_α(c.m.)	E_α(lab)	I_α(abs)	J^π_f	$E_{daughter}$(^{169}W)	coincident γ-rays	R_0 (fm)	HF
5.055(7)	4.938(7)*	0.01133(17)%**	$(5/2^-)$	0.0	——	1.562(24)	7^{+9}_{-4}

* [1995Hi02].
** [1971Bo06].

Table 6
direct α emission from ^{177}Pt*, $J^\pi = (5/2^-)$, $T_{1/2}$ = 9.8(4) s**, BR_α = 5.7(5)%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J^π_f	$E_{daughter}$(^{173}Os)	coincident γ-rays	R_0 (fm)	HF
5.561(10)	5.435(10)	13(2)%	0.65(5)%	$(7/2^-)$	0.0916(1)***	0.0916***	1.563(37)	$3.9^{+1.2}_{-0.9}$
5.655(6)	5.527(6)	100(8)%	5.0(4)%	$(5/2^-)$	0.0	——	1.563(37)	$1.41^{+0.29}_{-0.24}$

* All values from [1979Ho10], except where noted.
** [1993Me13].
*** [1991Ka05].

Table 7
direct α emission from ^{181}Hg*, $J^\pi = 1/2^-$, $T_{1/2}$ = 3.6(1) s, BR_α =26.3(41)%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J^π_f	$E_{daughter}$(^{173}Os)	coincident γ-rays	R_0 (fm)	HF
6.050(10)	5.916(10)	5.2(24)%	1.2(5)%	$(5/2^-)$	0.2398(4)	0.0809, 0.0924, 0.1474, 0.1587, 0.2398	1.5250(33)	64^{+28}_{-17}
6.072(10)	5.938(10)	7.0(21)%	1.6(4)%	$(3/2^-)$	0.2142(5)	0.2142	1.5250(33)	27^{+10}_{-7}
6.142(5)	6.006(5)	100(17)%	23(4)%	$(1/2^-)$	0.1474(4)	0.1474	1.5250(33)	$0.87^{+0.32}_{-0.21}$
6.208(10)	6.071(10)	1.7(4)%	0.39(7)%		0.0810(4)	0.0810	1.5250(33)	23^{+11}_{-6}
6.287(10)	6.148(10)	0.57(16)%	0.13(3)%	$(5/2^-)$	0.0	——	1.5250(33)	70^{+60}_{-20}

* All values from [1979Ho10], except where noted.
** Sum of α intensities from [1979Ha10].

Table 8
direct α emission from ^{185}Pb*, $J^\pi = (3/2^-)$, $T_{1/2}$ = 6.3(4) s, BR_α =42(25)%**.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J^π_f	$E_{daughter}$(^{173}Os)	coincident γ-rays	R_0 (fm)	HF
6.427(5)	6.288 (5)	100(4)%	24(14)%	$(3/2^-)$	0.269	0.269, 0.205	1.495(11)	$1.7^{+2.8}_{-0.8}$
6.629(5)	6.486 (5)	79(5)%	18(11)%	$(3/2^-)$	0.064		1.495(11)	13^{+22}_{-6}
6.693	6.548	<0.6%	<1.4%	$1/2^-$	0.0	——	1.495(11)	>700

* All values from [2002An15], except where noted.
** Weighted average of 50(250% [2002AN15] and 34(25)% [2005Va04].

Table 9
direct α emission from ^{185m}Pb*, Ex = unk, J^π = (13/2$^+$), $T_{1/2}$ = 4.3(2) s, BR_α =50(25)%.

E_α(c.m.)	E_α(lab)	I_α(abs)	J_f^π	$E_{daughter}$(^{173}Os)	coincident γ-rays	R_0 (fm)	HF
6.550(5)	6.408 (5)	50(25)%	(13/2$^+$)	x		1.495(11)	$1.7^{+1.9}_{-0.7}$

* All values from [2002An15].

Table 10
direct α emission from ^{189}Po*, J^π = (7/2$^-$), $T_{1/2}$ = 3.5(5) ms, BR_α =100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{173}Os)	coincident γ-rays	R_0 (fm)	HF
7.416(15)	7.259(15)	100(21)%	80(12)%	(5/2$^-$)	0.280	0.280	1.4991(51)	$0.18^{+0.07}_{-0.05}$**
7.467(20)	7.309(20)	15(7)%	12(5)%		0.226	0.226	1.4991(51)	$1.8^{+1.8}_{-0.7}$
7.695(20)	7.53(20)	10(8)%	8(6)%	(3/2$^-$)	0.0	——	1.4991(51)	14^{+49}_{-7}

* All values from [2005Va04].
** The reason for this unphysically low value is unknown.

Table 11
direct α emission from ^{193}Rn*, J^π = , $T_{1/2}$ = 1.15(27) ms, BR_α =100%.

E_α(c.m.)	E_α(lab)	I_α(rel)	I_α(abs)	J_f^π	$E_{daughter}$(^{173}Os)	coincident γ-rays	R_0 (fm)	HF
7.848(15)	7.685(15)	100(27)%	74(20)%		0.194	0.194	1.561(16)	$1.0^{+0.8}_{-0.5}$
8.042(20)	7.875(20)	35(19)%	26(12)%	(5/2$^-$)	0.0	——	1.561(16)	10^{+14}_{-6}

* All values from [20006An14].

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