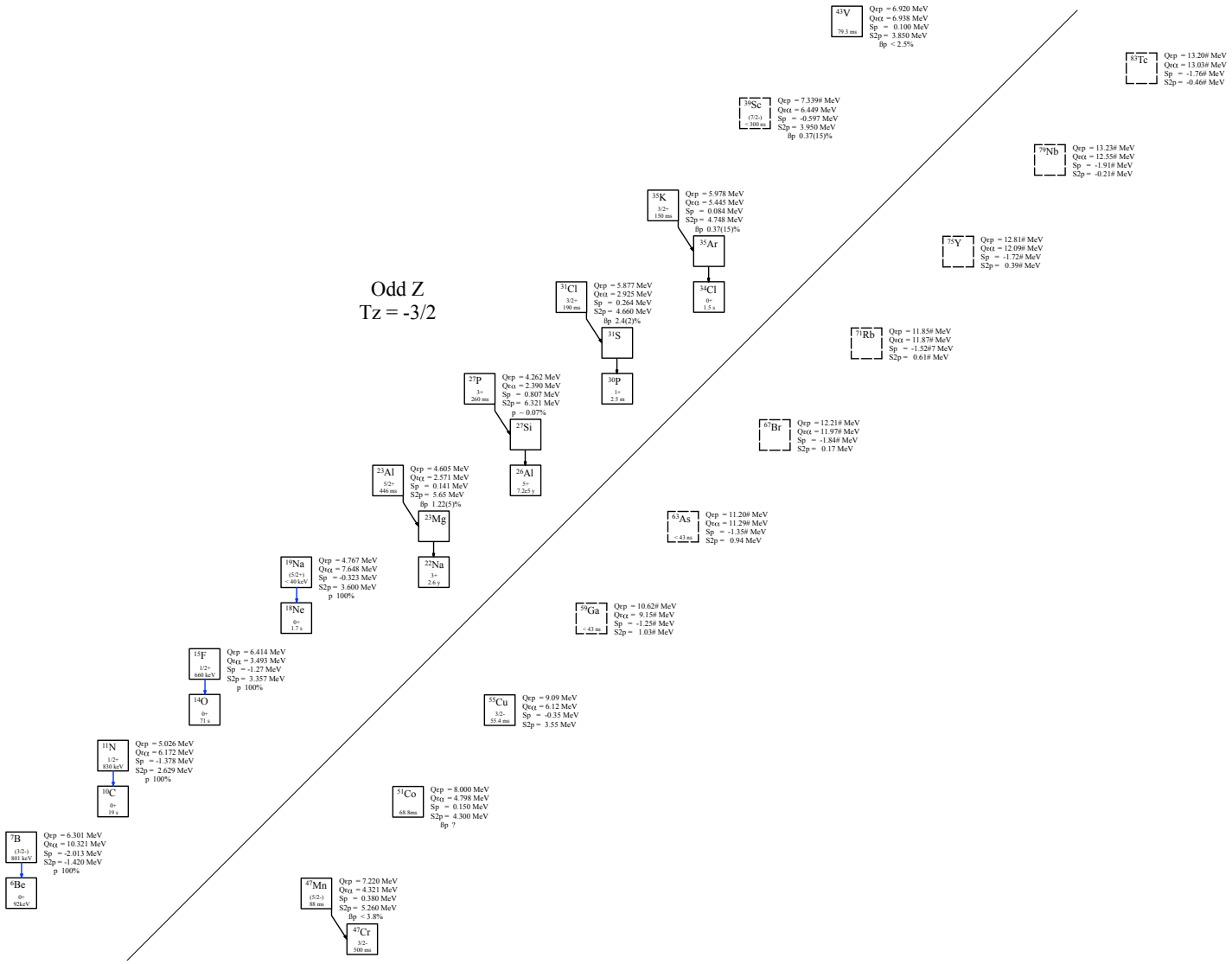

Fig. 1: Known experimental values for heavy particle emission of the odd-Z T_z= -3/2 nuclei.

Last updated 3/17/23

Table 1
Observed and predicted β-delayed particle emission from the odd-Z, T_z = -3/2 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	J^π	$T_{1/2}$	Q_ε	$Q_{\varepsilon p}$	$BR_{\beta p}$	$Q_{\varepsilon 2p}$	$Q_{\varepsilon 3p}$	$Q_{\varepsilon \alpha}$	Experimental
^{7}B	$(3/2^-)$	801(20) keV	11.908(25)	6.301(25)		1.868(32)	-19.51(21)	10.321(25)	[**2011Ch32**]
^{11}N	$1/2^+$	830(30) keV	13.716(5)	5.026(5)		-1.561(5)	-18.447(5)	6.172(5)	[**2006Ca05**, 2000Ma62, 1996Ax01]
^{15}F	$1/2^+$	660(20) keV	13.711(14)	6.414(14)		-1.136(14)	-18.669(14)	3.493(14)	[**2010Mu12**, 2006AcZY]
^{19}Na	$(5/2^+)$	<40 keV	11.177(11)	4.767(11)		-0.840(11)	-14.622(11)	7.648(11)	[**2010Mu12**, 2006AcZY]
^{23}Al	$5/2^+$	446(6) ms*	12.2217(3)	4.6405(4)	1.22(5)%	-2.0981(3)	-15.1014(3)	2.5711(4)	[**2011Sa15, 2011Ki26, 2006Ia03**, 2015Su15, 2014Ka01, 2000Pe28, 1995Ti08, 1972Go03, 1971GoZH]
^{27}P	$(5/2)^+$	260(80) ms	11.725(9)	4.262(9)	≈0.07%	-2.044(9)	-14.108(9)	2.390(9)	[**1996Og01,1985Ay02**, 1983Ay02]
^{31}Cl	$3/2^+$	190(1) ms	12.008(3)	5.877(3)	2.4(2)%	0.282(3)	-11.705(3)	2.925(3)	[**2022Bu14, 2011SaZM**, 2018Be12, 2016Sa60, 2014Ka01, 2006Ka11, 1996Og01, 1985Ay02, 1983Ay02, 1982Ay01]
^{35}K	$3/2^+$	150(25) ms	11.8744(9)	5.9782(5)	0.37(15)%	0.8349(5)	-8735(1)	5.445(1)	[**1980Ew02**]
^{39}Sc	(7/2-)	<300ns	13.110(24)	7.339(24)#		2.197(24)	-6.521(40)	6.449(24)	[**1994Bl10**]
^{43}V		79.3(24) ms	11.400(40)	6.920(40)	<2.5%***	2.640(40)	-6.251(40)	6.938(40)	[**2007Do17**]
^{47}Mn	$(5/2^-)$	88.0(13) ms	12.000(30)	7.220(30)	>1.7%	1.862(30)	-6.621(30)	4.321(31)	[**1996Fa09**]
^{51}Co		68.8(19) ms	12.850(50)	8.000(50)	<3.8%***	3.414(50)	-4.729(50)	4.798(50)	[**2007Do17**]
^{55}Cu	$3/2^-$	55.4(18) ms	13.70(16)	9.09(16)	?[@]	4.73(16)	-2.80(16)	6.12(16)	[**2017GoZT**, 2013Tr09, 2007Do17]
^{59}Ga		<43 ns	13.46(17)#	10.62(17)#		7.75(17)#	0.41(17)#	9.15(17)#	[**2005St29**]
^{63}As	$(3/2^-)$	< 43 ns	13.420(20)#	11.20(20)#		8.27(20)#	2.98(20)#	11.29(20)#	[**2005St29**]
^{67}Br			14.05(31)#	12.21(30)#		9.37(30)#	4.44(30)#	11.97(30)#	
^{71}Rb			14.04(42)#	11.85(40)#		9.57(40)#	4.74(40)#	11.87(41)#	
^{75}Y			14.80(37)#	12.81(30)#		10.15(30)#	5.38(30)#	12.09(33)#	
^{79}Nb			15.12(58)#	13.23(58)#		11.58(50)#	6.96(50)#	12.55(55)#	
^{83}Tc			15.02(64)#	13.20(58)#		11.62(51)#	7.96(50)#	13.03(58)#	

* [2006Ia03].
** [2011SaZM].
*** Not observed.
[@] Reported as 15.0(43)% in [2007Do17], but [2013Tr09] and [2017GoZT] report no observation of delayed protons despite having much higher statistics.

Table 2
Particle emission from the odd-Z, T_z = -3/2 nuclei. Unless otherwise stated, all Q-values and separation energies are taken from [2021Wa16] or deduced from values therein.

Nuclide	S_p	BR_{1p}	S_{2p}	Q_α	experimental
^{7}B	-2.013(26)	100%	-1.420(60)	-3.42(200)#	[**2011Ch32**]
^{11}N	-1.378(5)	100%	2.629(5)	-5.736(26)	[**2006Ca05**,1996Ax01, 2000Ma62]
^{15}F	-1.27(14)	100%	3.357(14)	-10.224(15)	[**2010Mu12**, 2006AcZY]
^{19}Na	-0.323(11)	100%	3.600(11)	-6.062(18)	[**2010Mu12**, 2006AcZY]
^{23}Al	0.1409(4)	——	5.6450(3)	-8.606(11))	
^{27}P	0.807(9)	——	6.321(9)	-9.832(9)	
^{31}Cl	0.264(3)	——	4.660(3)	-8.800(10)	
^{35}K	0.0836(5)	——	4.7475(6)	-6.563(3)	
^{39}Sc	-0.597(24)		3.950(24)	-5.425(24)	
^{43}V	0.100(40)	——	3.850(40)	-6.170(50)	
^{47}Mn	0.380(30)	——	5.260(30)	-7.070(50)	
^{51}Co	0.150(50)	——	4.300(50)	-7.200(60)	
^{55}Cu	-0.35(16)		3.55(16)	-6.72(16)	
^{59}Ga	-1.25(18)#		1.03(17)#	-4.55(23)#	
^{63}As	-1.35(24)#		0.94(20)#	-2.17(26)#	
^{67}Br	-1.84(36)#		0.17(31)#	-1.45(36)#	
^{71}Rb	-1.52(45)#		0.61(40)#	-2.19(50)#	
^{75}Y	-1.72(32)#		0.39(30)#	-1.96(50)#	
^{79}Nb	-1.91(64)#		-0.21(54)#	-2.26(58)#	
^{83}Tc	-1.76(64)#		-0.46(64)#	-2.09(71)#	

Table 3
β-p emission from ^{23}Al*, $T_{1/2}$ = 446(6) ms[@@], $BR_{\beta p}$ = 1.22(5)%**.

E_p	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{23}Mg)***	$E_{daughter}$(^{22}Na)	coincident γ-rays
0.206(11)	32(6)	0.14(3)	7.787(11)	0	——
0.267(9)	42(8)	0.18(4)	7.848(9)	0	——
0.337(14)	8(2)	0.03(1)	7.918(14)	0	——
0.443(14)	4(2)	0.02(1)	8.025(14)	0	——
0.579(8)	65(2)	0.28(1)	8.160(8)	0	——
0.866(8)	100	0.41(1)	8.447(8)	0	——
1.204(8)	0.04(1)	0.02(1)	8.785(8)	0	——
1.338(9)	6(1)	0.02(1)	8.919(9)	0	——
1.419(10)	4(1)	0.02(1)	9.000(10)	0	——
1.520(5)*	0.7(2)	0.0032(6)	9.101(5)	0	
1.561(9)		0.03(1)	9.142(9)	0	——
1.729(25)	4(1)	0.02(1)	9.310(25)	0	——
1.843(9)	11(1)	0.05(1)	9.424(9)	0	——
1.887(5)[@]		0.0084(6)[@]	9.468(5)	0	——
2.023(5)[@]		0.0025(3)[@]	9.604(5)[@]	0	——
2.100(7)[@]		0.0008(2)[@]	9.682(7)[@]	0	——

* Values are taken from [2011Sa15], except where noted.
** From [2011Sa15]. Others: 0.46(23)% [2000Pe28], ≈1.1% [1995Ti08].
*** Energy calculated from proton energies and S_p (^{23}Mg) = 7581.25(14) keV [2021Wa16].
[@] [2011Ki26].
[@@] [2006Ia03].

Table 4
β-p emission from ^{27}P*, $T_{1/2}$ = 260(80) ms[@], $BR_{\beta p}$ = ≈0.07%.

E_p	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{27}Si) **	$E_{daughter}$(^{26}Al)***	coincident γ-rays
0.484(3)	9(2)	≈0.0063(14)	8.176(3)	0.2283	100% β^+
0.636(2)	97(3)	≈0.034(1)	8.327(2)	0.2283	100% β^+
0.759(2)	100	≈0.035	8.451(2)	0.2283	100% β^+
1.376(4)	7(2)	≈0.0025(7)	9.068(30)	0.2283	100% β^+

* All values taken from [1996Og01] except where noted.
** Energy calculated from proton energies and S_p (^{27}Si) = 7463.34(13) keV [2021Wa16].
*** Values from adopted levels in ENSDF [2016Ba18].
[@] [1985Ay02]

Table 5
β-p emission from ^{31}Cl*, $T_{1/2}$ = 190(1) ms, $BR_{\beta p}$ = 2.4(2)%.

E_p	I_p(rel)%	I_p(abs)%	$E_{emitter}$ (^{31}Cl)	$E_{daughter}$(^{30}P)	coincident γ-rays
0.260 ***	$0.063^{+9}_{-0.7}$	$8.3^{+1.2}_{-0.9}\times10^{-4}$	6.3902(7)	0	
0.806(2)	20.4(2)	0.367(6)	6.936(2)	0	
0.906(2)	12.4(2)	0.161(6)	7.037(2)	0	
1.026(2)	100(4)	1.31(2)	7.157(2)	0	
1.225(3)	2.7(1)	0.035(2)	7.355(3)	0	
1.390(17)	1.3(12)	0.017(16)	7.521(17)	0	
1.571(3)	21.0(4)	0.273(6)	7.702(3)	0	
1.647(17)	1.4(2)	0.019(25)	7.778(17)	0	
1.763(3)	6.4(2)	0.084(3)	7.894(3)	0	
1.891(3)	10.9(2)	0.143(3)	8.022(3)	0	
1.991(17)	1.4(1)	0.019(1)	8.122(17)	0	
2.139(17)	1.3(1)	0.017(1)	8.270(17)	0	
2.298(3)	2.3(1)	0.030(1)	8.429(3)	0	
2.362(17)	0.9(7)	0.011(1)	8.493(17)	0	
2.572(17)	0.91(6)	0.012(1)	8.703(17)	0	
2.729(17)	0.19(4)	0.002(1)	8.860(17)	0	
2.901(17)	0.3(1)	0.004(1)	9.031(17)	0	

* All values taken from [2011SaZM], except where noted.
** energy calculated from proton energies and S_p (^{31}S) = 6130.65(24) keV [2021Wa16].
*** From [2022Bu14].

Table 6
β-p emission from ^{35}K*, $T_{1/2}$ = 150(25) ms, $BR_{\beta p}$ = 0.37(15)%.

E_p	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{35}Ar)**	$E_{daughter}$(^{34}Cl)***	coincident γ-rays***
1.320(20)	16(3)	5.4(10)			
1.467(20)	100(8)	33.6(27)	7.503(20)	0.1464	0.146
1.601(20)	41(5)	13.8(17)	7.503(20)	0	——
1.755(20)	42(6)	14.1(20)			
1.930(20)	24(4)	8.1(14)			
2.038(20)	17(3)	5.7(10)	8.393(20)	0.4610	0.461
2.349(20)	23(4)	7.7(13)	8.393(20)	0.1464	0.146
2.496(20)	19(4)	6.4(13)	8.393(20)	0	——
2.651(20)	10(3)	3.4(10)			
2.890(20)	5.7(18)	1.9(6)			

*All values taken from [1980Ew02] except where noted.

** Listed energy calculated from proton energies and S_p (^{35}Ar) = 5896.2(7) keV [2021Wa16]. For levels de-excited by more than one proton transition, E_{level} (emitter) is the weighted average.

*** Values from adopted levels in ENSDF [2012Ni10].

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