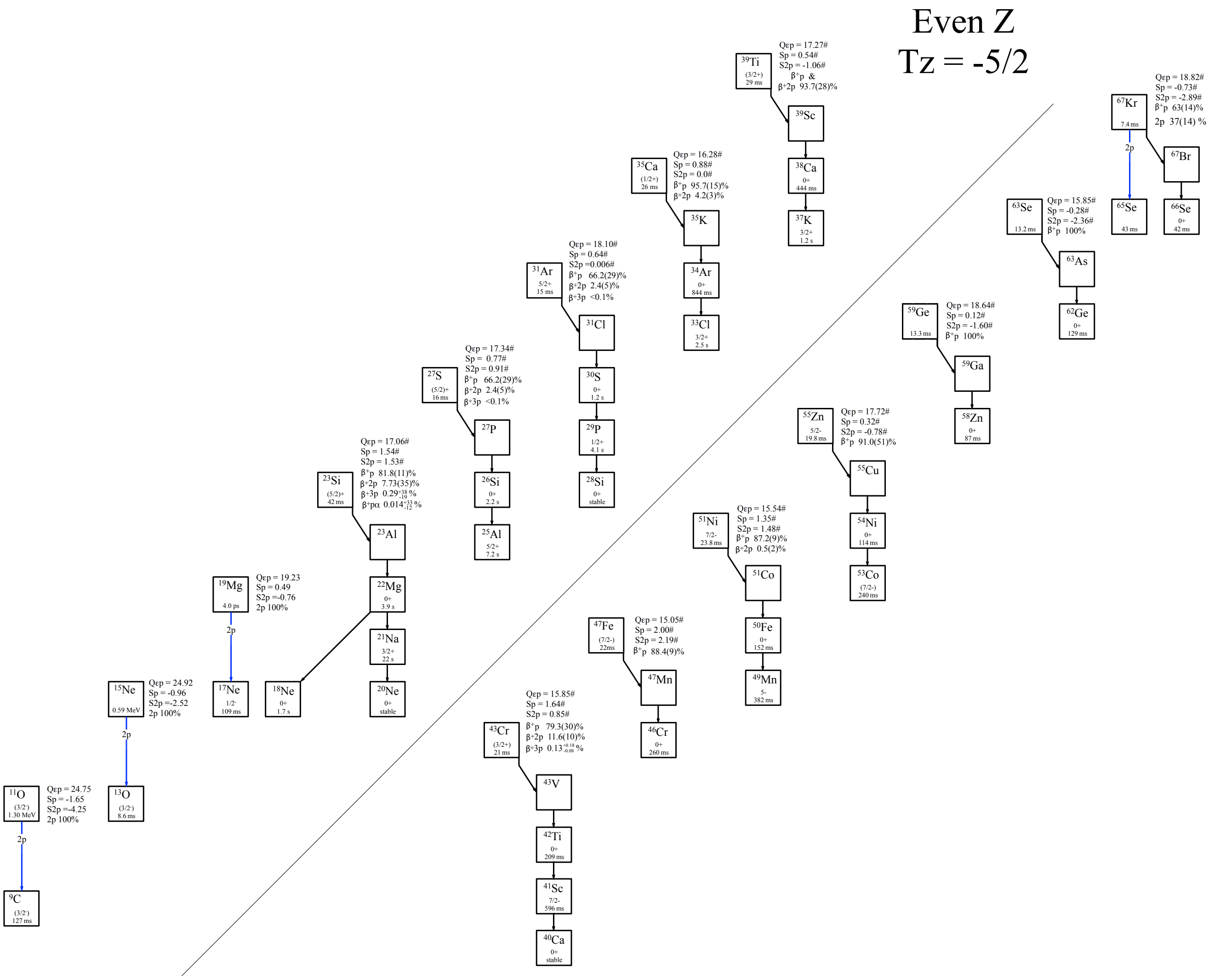

Fig. 1: Known experimental values for heavy particle emission of the even-Z T_z= -5/2 nuclei.

Last updated 3/17/23

Table 1
Observed and predicted β-p, β-2p, and β-3p emission from the even-Z T_z = -5/2 nuclei. Unless otherwise stated, all Q-values are taken from [2021Wa16] or deduced from values therein.

Nuclide	J^π	$T_{1/2}$	Q_ε	$Q_{\varepsilon p}$	$BR_{\beta p}$	$Q_{\varepsilon 2p}$	$BR_{\beta 2p}$	$Q_{\varepsilon 3p}$	$BR_{\beta 3p}$	$Q_{\varepsilon \alpha}$	Experimental
^{11}O	(3/2$^-$)	1.30 MeV	23.37(6)	24.75(6)		20.75(6)		17.637(65)		11.24(64)#	[**2019We03**]
^{15}Ne		0.59 MeV	23.65(7)	24.92(7)		20.30(7)		18.35(7)		13.43(67)#	[**2014Wa09**]
^{19}Mg		4.0(15) ps	18.910(60)	19.23(60)		15.31(60)		14.71(60)		12.85(60)	[2007Mu15]
^{23}Si*	(5/2)$^+$	42.3(4) ms	17.20(50)#	17.06(50)#	81.8(11)%**	11.56(50)#	7.73(35)%**	9.13(50)#	$0.029^{+0.038}_{-0.019}$%**	8.60(50)#	[**2022Ci04, 2018Wa05, 1997Cz02, 1997Bl04**]
^{27}S	(5/2)$^+$	16.3(2) ms***	18.15(40)#	17.34(40)#	62.2(29)%$^@$	11.83(40)#	2.4(5)%***	9.56(40)#	<0.1%	8.32(40)#	[**2021Sh23, 2020Su05, 2019Su14, 2017Ja05**, 2001Ca60, 1991Bo32]
^{31}Ar	5/2$^+$	15.1(3) ms$^{@@}$	18.36(20)#	18.10(20)#	68.3(3)%	13.71(20)#	9.0(2)%	10.96(20)#	0.07(2)%	9.57(20)#	@@@
^{35}Ca	(1/2$^+$)	25.7(2) ms	16.36(20)#	16.28(20) #	95.7(15)%	11.62(20)#	4.2(3)%	9.34(20)#		9.80(20)#	[**2016Ci05, 1999Tr04**, 1985Ay01]
^{39}Ti	(3/2$^+$)	28.5(9) ms	16.67(20)#	17.27(20)#	93.7(28)%^{a}	12.72(20)#	^{a}	10.87(20)#		11.25(20)#	[**2007Do17, 1992Mo15**, 2001Gi01, 1990De43]
^{43}Cr	(3/2$^+$)	21.2(7) ms	15.95(21)#	15.85(20)#	79.3(30)%	12.09(20)#	11.6(10)%	11.01(20)#	$0.13^{+0.18}_{-0.08}$%	9.78(20)#	[**2012Au08, 2007Do17**, 2011Po01, 2001Gi01, 1992Bo37]
^{47}Fe	(7/2$^-$)	21.9(2) ms	15.44(50)#	15.05(50)#	88.4(9)%	10.18(50)#		8.55(50)#		8.37(50)#	[**2007Do17**, 1992Bo37]
^{51}Ni	7/2$^-$	23.8(2) ms	15.69(50)#	15.54(50)#	87.2(9)%^{b}	11.39(50)#	0.50(2)%^{c}	9.30(50)#		8.50(80)#	[**2012Au08, 2007Do17**]
^{55}Zn	5/2$^-$	19.8(13) ms	17.37(43)#	17.72(40)#	91.0(51)%	13.81(40)#		12.20(40)#		10.65(40)#	[**2007Do17**]
^{59}Ge		13.3(17) ms	17.39(43)#	18.64(40)#	100%	16.36(40)#		15.67(40)#		12.85(53)#	[**2017GoZT**, 2016Go26, 2015Ci06]
^{63}Se		13.2(39) ms	16.65(54)#	18.00(52)#	100%	15.70(50)#		15.46(50)#		14.49(53)#	[**2017GoZT**, 2016Go26]
^{67}Kr		7.4(30) ms	16.98(52)#	18.82(47)#	63(14)%^{d}	16.81(43)#		16.90(42)#		15.52(47)#	[**2017GoZT**, 2016Go26]

* In addition a branching ratio for β-pα is reported as $0.014^{+0.033}_{-0.012}$% [2022Ci04].
** [2022Ci04]
*** [2021Sh23]
$^@$ From [2021Sh23] plus two high energy peaks from [2001Ca60].
$^{@@}$ [2015Li20]
@@@ [**2015Li20, 2000Fy01, 1998Ax02, 1992Ba01**, 2019Ko29, 2018Mu18, 2016Ci05, 2016Ma17, 2014Ko17, 2014Ko34, 2013Ko13, 2002Fy01, 2002Bo29, 1999Fy01, 1999Th09, 1998Ax01, 1998Mu06, 1991Bo32, 1990Bo24, 1989Re02]].
^{a} Mixture of β-p and β-2p [2007Do17], β-xp is expected to be 100% as ^{39}Sc is unbound to proton emission S_p= -597(24) keV [2021Wa21].
^{b} [2007Do17].
^{c} [2012Au08].
^{d} β-daughter ^{67}Br is unbound to proton emission.

Table 2
Particle emission from the even-Z T_z = -5/2 nuclei. Unless otherwise stated, all Q-values and separation energies are taken from [2021Wa16] or deduced from values therein.

Nuclide	S_p	S_{2p}	BR_{2p}	Q_α	Experimental
^{11}O	-1.65(40)	-4.25(6)	100%		[**2019We03**]
^{15}Ne	-0.96(8)	-2.52(7)	100%	-9.95(9)	[**2014Wa09**]
^{19}Mg	0.49(11)	-0.760(50)	100%	-10.80(90)	[**2018Xu04, 2016Xu08, 2015Mu13, 2012Mu05, 2009Mu17, 2007Mu15**]
^{23}Si	1.54(64)#	1.53(50)#	——	-10.31(50)#	
^{27}S	0.77(45)#	0.91(40)#	——	-8.88(64)#	
^{31}Ar	0.64(20)#	0.006(34)*		-8.59(45)#	
^{35}Ca	0.88(28)#	0.00(20)#		-8.56(28)#	
^{39}Ti	0.54(28)#	-1.06(20)#		-5.12(28)#	
^{43}Cr	1.64(28)#	0.85(20)#	——	-6.90(28)#	
^{47}Fe	2.00(51)#	2.19(50)#	——	-7.58(54)#	
^{51}Ni	1.35(52)#	1.48(50)#	——	-6.95(71)#	
^{55}Zn	0.32(57)#	-0.78(40)#		-5.04(64)#	
^{59}Ge	0.12(50)#	-1.60(45)#	<0.2%	-4.53(57)#	[**2017GoZT**]
^{63}Se	-0.28(58)#	-2.36(58)#	<0.5%	-2.91(64)#	[**2017GoZT**]
^{67}Kr	-0.73(58)#	-2.89(30)#	37(14)%	-1.13(66)#	**2017GoZT**, 2016Go26]

* from [2018Mu18], [2021Wa16] lists 0.64(20)#

Table 3

β-p Emission from ^{23}Si*, $T_{1/2}$= 42.3(4) ms, $BR_{\beta p}$ = 81.8(11) %[c]

E_p(c.m.)	I_p(rel)%	I_p(abs)%	$E_{emitter}$ (^{23}Al)**	$E_{daughter}$(^{22}Mg)***	coincident γ-rays***
0.300(90)[c]	$0.45^{+0.22}_{-0.15}$	$0.12^{+0.06}_{-0.04}$			
0.654(31)	9.1(4)	2.4(1)	0.795(31)	0	——
1.333(28)	21.8(14)	5.78(37)	1.474(28)	0	——
1.657(37)	17(2)	4.6(6)	1.798(37)	0	——
2.356(29)	100(5)	26.5(14)	3.744(29)	1.247	1.247
2.764(35)	36.4(4)	9.64(10)	4.152(35)	1.247	1.247
3.024(36)	31.9(14)	8.5(4)	3.165(36)	0	——
3.592(44)	27.2(8)	7.2(2)	3.733(44)	0	——
—— 3.811(51)[a]	23.4(4)	6.2(1)[a]	3.952(51)	0	
4.235(39)	18.8(4)	4.99(10)	4.376(39)	0	——
4.781(41)	10.1(7)	2.7(2)	4.922(41)	0	——
5.545(82)[a]			5.686(82)	0	——
8.680(70)[b]	1.5(4)	0.4(1)[b]	8.821(70)	0	——
9.670(70)[b]	0.4(2)	0.11(4)[b]	9.811(70)	0	——
10.410(70)[b]	0.3(1)	0.07(3)[b]	10.551(70)	0	——
10.930(80)[b]	0.3(1)	0.09(3)[b]	11.071(80)	0	——
11.620(100)[b]	0.1(1)	0.03(2)[b]	11.761(100)	0	——

* Weighted average of [2018Wa05] and [1997Bl04, 1997Cz02], except where noted.

** Calculated from proton energies [1997Bl04] and Sp (^{23}Al) = 140.9(4) keV [2021Hu06]. For levels de-excited by more than one proton transition, E_{level} (emitter) is the weighted average.

*** Values from adopted levels in ENSDF [2015Ba27].

[a] [2018Wa05].

[b] [1997Bl04].

[c] [2022Ci04].

Table 4

β-2p emission from ^{23}Si*, $BR_{\beta 2p}$ = 7.73(35)%[@].

$E_{2p}(c.m.)$	I_{2p}(rel)%	I_{2p}(abs)%	$E_{emitter}$ (^{23}Al)**	$E_{daughter}$(^{21}Na)***	coincident γ-rays***
5.858(55)	100	1.85(20)	11.78(7)	0.3319(10)	0.332
6.052(55)	86(20)	1.60(20)	11.78(7)	0	——

* Weighted average of [2018Wa05] and [1997Bl04, 1997Cz02].

** Determined from ^{23}Si β-p emission.

*** Values from adopted levels in ENSDF [2015Fi05].

[@] [2022Ci04].

Table 5
β-p emission from ^{27}S*, $T_{1/2}$= 16.3(2) ms[b], $BR_{\beta p}$ = 62.2(29)%

$E_p(c.m.)$	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{27}P)[a]	$E_{daughter}$(^{26}Si)[@]	coincident γ-rays[@]
0.318(8)	100.0(9.1)	23.1(2.1)	1.125(12)	0	—
0.762(8)	38.5(6.1)	8.9(1)	1.569(12)	0	—
0.913(9)	6.5(1.8)	1.5(0.3)	4.507(13)	2.7871(1)	0.9889, 1.7922, 2.7870
1.054(9)	7.8(1.8)	1.8(0.3)	1.861(13)	0	—
1.282(9)	4.8(1.2)	1.1(0.2)	4.876(13)	2.7871(1)	0.9889, 1.7922, 2.7870
1.676(9)	2.6(1.8)	0.6(0.3)	5.270(13)	2.7871(1)	0.9889, 1.7922, 2.7870
1.86(12)	1.3(1.8)	0.3(0.3)	4.464(15)	1.7973	1.7973
1.951(11)	3.5(1.8)	0.8(0.3)	5.545(14)	2.7871(1)	0.9889, 1.7922, 2.7870
2.128(10)	4.3(1.8)	1(0.3)	5.722(13)	2.7871(1)	0.9889, 1.7922, 2.7870
2.264(9)	24.7(4.9)	5.7(0.8)	5.858(13)	2.7871(1)	0.9889, 1.7922, 2.7870
2.417(11)	6.9(2.4)	1.6(0.4)	5.021(14)	1.7973	1.7973
2.576(11)	5.6(2.4)	1.3(0.4)	6.170(14)	2.7871(1)	0.9889, 1.7922, 2.7870
2.717(10)	2.6(1.2)	0.6(0.2)	3.524(13)	0	—
2.808(10)	8.7(3.1)	2(0.5)	6.402(13)	2.7871(1)	0.9889, 1.7922, 2.7870
2.953(12)	4.8(2.4)	1.1(0.4)	6.547(15)	2.7871(1)	0.9889, 1.7922, 2.7870
3.03(12)	4.3(1.8)	1(0.3)	6.624(15)	2.7871(1)	0.9889, 1.7922, 2.7870
3.121(11)	4.8(2.4)	1.1(0.4)	6.715(14)	2.7871(1)	0.9889, 1.7922, 2.7870
3.238(11)	6.1(2.4)	1.4(0.4)	5.842(14)	1.7973	1.7973
3.475(12)	3.5(1.8)	0.8(0.3)	7.069(15)	2.7871(1)	0.9889, 1.7922, 2.7870
3.720(11)	1.7(1.2)	0.4(0.2)	6.324(14)	1.7973	1.7973
3.786(11)	1.7(1.2)	0.4(0.2)	7.380(14)	2.7871(1)	0.9889, 1.7922, 2.7870
3.95(11)	1.7(0.6)	0.4(0.1)	6.554(14)	1.7973	1.7973
4.05(11)	5.2(1.8)	1.2(0.3)	6.654(14)	1.7973	1.7973
4.26(15)	1.7(1.2)	0.4(0.2)	6.864(17)	1.7973	1.7973
4.399(15)	2.2(1.2)	0.5(0.2)	7.993(17)	2.7871(1)	0.9889, 1.7922, 2.7870
4.693(15)	1.7(1.2)	0.4(0.2)	8.287(17	2.7871(1)	0.9889, 1.7922, 2.7870)
4.84(12)	2.2(1.2)	0.5(0.2)	7.444(15)	1.7973	1.7973
7.80(40)***	5.4(19)	1.4(5)%***			
10.56(40)***	3.4(15)	0.9(4)%***	13.164(400)	1.7973	1.7973

* From [2019Su14] unless otherwise stated.
** [2017Ja05]
*** [2001Ca60] (above energy threshold for [2019Su14].
[@] Values from adopted levels in ENSDF [2016Ba18].
[a] Calculated from proton energies and S_p (^{27}P) = 7807(9) keV [2021Hu06].
[b] [2021Sh23].

Table 6
β-2p emission from ^{27}S*, $BR_{\beta 2p}$ = 2.4(5)%

$E_{2p}(c.m.)$	I_{2p}(rel)	I_{2p}(abs)	$E_{emitter}$ (^{27}P)**	$E_{daughter}$(^{25}Al)[@]	coincident γ-rays[@]
6.372(15)	100	0.7(3)%	12.693(17)	0	——

* All values taken from [2021Sh23], a 5.3 MeV transition from [2017Ja05] was not observed.
** Calculated from two proton energy and S_{2p} (^{27}P) = 6321(9) keV [2021Hu06].

Table 7
β-p emission from ^{31}Ar*, $T_{1/2}$= 15.1(3) ms[e], $BR_{\beta p}$ = 68.3(3)%**.

$E_p(c.m.)$	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{31}Cl)	$E_{daughter}$(^{30}S)[d]	coincident γ-rays[d]
0.461(15)[b]	0.49(16)[b]	0.14(5)	0.725(15)	0	——
0.779(15)[b]	3.0(3)[b]	0.87(9)	3.254(15)	2.2106(5)	2.211
0.844(15)[ab]	4.2(4)	1.2(1)			
1.006(15)[b]	1.4(2)[b]	0.41(6)	1.270(15)	0	——
1.169(5)[ab]	2.7(16)[b]	0.78(46)	6.651(6)	5.2174(7)	2nd proton emitted
1.251(4)	1.7(5)	0.49(14)	6.651(6)	5.136(2)	2.2106, 2.925
1.343(13)[a]	0.70(11)	0.20(3)	6.825(13)	5.2174(7)	2nd proton emitted
1.463(2)	34.0(3)	9.88(9)	1.7527(4)	0	——
1.554(2)	6.2(2)	1.80(6)	4.029(4)	2.2106(5)	2.211
1.698(2)	2.88(14)	0.84(4)	5.364(4)	3.4026(5)	1.192, 2.211, 3.402
1.880(3)[a]	3.0(4)	0.87(11)	7.361(4)	5.2174(7)	2nd proton emitted
1.932(3)	0.8(2)	0.23(6)	5.599(4)	3.4026(5)	1.192, 2.211, 3.402
1.987(3)[a]	0.44(14)	0.13(4)	7.469(4)	5.2174(7)	2nd proton emitted
2.075(3)	10.0(2)	2.91(6)	5.742(4)	3.4026(5)	1.192, 2.211, 3.402
2.153(2)	100.0	29.1(2)	2.417(4)	0	——
2.328(2)	4.0(3)	1.16(9)	2.592(4)	0	——
2.405(4)	5.1(4)	1.48(11)	2.669(5)	0	——
2.977(3)	0.99(13)	0.29(4)	6.644(4)	3.4026(5)	1.192, 2.211, 3.402
3.121(3)	1.08(14)	0.31(4)	5.595(4)	2.2106(5)	2.211
3.258(4)	0.44(10)	0.13(3)	5.733(5)	2.2106(5)	2.211
3.357(4)	1.17(15)	0.34(4)	3.621(5)	0	——
3.546(3)	0.89(11)	0.26(3)	7.477(4)	3.6675(10)	1.4566, 2.211
3.680(11)	3.6(8)	1.0(2)	7.346(11)	3.4026(5)	1.192, 2.211, 3.402
3.755(3)	6.1(8)	1.8(2)	4.019(4)	0	——
3.933(4)[a]	0.53(13)	0.15(4)	9.414(5)	5.2174(7)	2nd proton emitted
4.032(3)	2.22(14)	0.65(4)	6.507(4)	2.2106(5)	2.211
4.164(3)	7.0(2)	2.03(6)	6.639(4)	2.2106(5)	2.211
4.340(4)[a]	1.09(18)	0.32(5)	12.295(5)	7.693(4)	2nd proton emitted
4.432(4)[a]	0.31(8)	0.09(2)	12.295(5)	7.598(4)	2nd proton emitted
4.535(5)[a]	0.59(11)	0.17(3)	12.295(5)	7.485(4)	2nd proton emitted
4.778(9)[b]	0.7(2)[b]	0.20(6)	5.042(9)	0	——
4.888(5)	1.68(18)	0.49(5)	7.361(6)	2.2106(5)	2.211
5.454(5)	17.6(3)	5.06(9)	5.716(6)	0	——
5.820(9)[a]	0.31(5)	0.09(1)	12.286(9)	5.389(2)	2nd proton emitted
6.150(7)[a]	0.19(6)	0.05(2)	12.256(8)	5.843(5)	2nd proton emitted
6.251(9)	0.51(12)	0.15(3)	6.515(9)	0	——
6.350(7)	0.51(12)	0.15(3)	6.614(8)	0	——
6.599(7)[a]	0.26(5)	0.08(1)	12.252(8)	5.389(2)	2nd proton emitted
6.758(8)[a]	0.84(11)	0.24(3)	12.239(9)	5.2174(7)	2nd proton emitted
7.182(9)	0.70(9)	0.20(2)	7.446(9)	0	——
7.310(16)	0.49(7)	0.14(2)	7.574(9)	0	——
8.362(12)	0.25(4)	0.07(1)	12.295(6)	3.6675(10)	1.457, 2.211
8.625(15)	0.51(6)	0.15(2)	12.295(6)	3.4026(5)	1.192, 2.211, 3.402
9.155(19)	0.22(19)	0.064(55)	9.419(19)	0	——
9.809(20)	0.30(4)	0.087(12)	12.284(20)	2.2106(5)	2.211
12.042(28)	0.23(11)	0.067(32)	12.310(25)	0	——
12.253(29)	0.034(3)	0.010(1)	12.517(29)	0	——

*All values are taken from [2000Fy01] except where indicated. (Values from [2016Ma17] are listed as preliminary and are not included in this table).
** From [2015Li20].
[a] Single proton from a β-2p decay.
[b] [1998Ax02]
[c] Calculated from proton energies and S_p (^{31}Cl) = 264(3) keV [2021Hu06].
[d] Values from adopted levels in ENSDF [2010Ba29].
[e] [2015Li20].

Table 8
β-2p emission from ^{31}Ar*, $BR_{\beta 2p}$ = 9.0(2)%**

$E_{2p}(c.m.)$	I_{2p}(rel)	I_{2p}(abs)	$E_{emitter}$ (^{31}Cl)***	$E_{daughter}$(^{29}P)[@]	coincident γ-rays[@]
5.680(20)	48(23)	0.61(11)	12.295(5)	1.9539(2)	1.954, 0.570, 1.384
6.230(20)	56(23)	0.71(12)	12.295(5)	1.3836(1)	1.384
7.635(25)	100	1.26(20)	12.295(5)	0	——

*All values are taken from [1998Ax02] except where indicated.
** From [2015Li20].
*** Determined from ^{31}Ar β-p emission.
[@] Values from adopted levels in ENSDF [2012Ba18].

Table 9
β-3p emission from ^{31}Ar, $BR_{\beta 2p}$ = 0.07(2)%**.

$E_{3p}(c.m.)$*	I_{3p}(rel)	I_{3p}(abs)**	$E_{emitter}$ (^{31}Cl)***	$E_{daughter}$(^{29}Si)	coincident γ-rays
5.03(29)	100	0.07(2)	12.295(5)	0	——

* [1992Ba01].
** [1998Ax02].
*** Determined from ^{31}Ar β-p emission.

Table 10
β-p emission from ^{35}Ca*, $T_{1/2}$= 25.7(2) ms, $BR_{\beta p}$ = 95.7(15)%**.

E_p(c.m.)	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{35}K)***	$E_{daughter}$(^{34}Ar)[@]	coincident γ-rays[@]
1.427(5)	100	48.5(13)	1.511(5)	0	——
1.909-2.647[a]	11(2)	5.4(9)	4.084-4.822	2.0911(3)	2.091
1.909-2.647[a]	2.1(8)	1.0(4)	5.280-6.018	3.2877(5)	1.197, 2.091, 3.286
1.909-2.647[a]	4.1(14)	2.0(7)	5.866-6.604	3873(3)	1.782, 2.091, 0.585, 1.197
2.727(13)	12.4(10)	6.0(5)	4.902(13)	2.0911(3)	2.091
2.947-3.500[a]	4.5(6)	2.2(3)	5.122-5675	2.0911(3)	2.091
3.592(25)	6.2(6)	3.0(3)	3.676(25)	0	——
3.822(36)	7.8(6)	3.8(3)	3.906(36)	0	——
4.041(71)	6.0(6)	2.9(3)	6.216(71)	2.0911(3)	2.091
4.570(48)	6.0(6)	2.9(3)	4.654(48)	0	——
4.754(38)	8.7(8)	4.2(4)	4.838(38)	0	——
5.018(71)	8.0(6)	3.9(3)	5.102(71)	0	——
5.294(48)	1.5(4)	0.72(18)	5.378(48)	0	——
5.466(48)	1.26(31)	0.61(15)	5.550(48)	0	——
5.616(37)	2.95(35)	1.43(17)	5.700(37)	0	——
5.834(60)	2.9(4)	1.40(19)	5.918(60)	0	——
5.983-6.649[a]	2.25(35)	1.09(17)	6.067-6.733	0	——
6.783(22)	7.8(4)	3.8(2)	8.958(22)	2.0911(3)	2.091
7.131-7.887[a]	2.3(4)	1.1(2)	4.084-7.971	0	——
8.802(89)	0.85(12)	0.41(6)	8.886(89)	0	——

* All values are taken from [1999Tr04], except where noted.
** From [2016Ci05].
*** Calculated from proton energies and S_p (^{35}K) = 83.6(5) keV [2021Wa16].
[@] Values from adopted levels in ENSDF [2012Si06].
[a] unresolved multiplet

Table 11
β-2p emission from ^{35}Ca*, $BR_{\beta 2p}$ = 4.2(3)%**.

E_{2p}(c.m.)	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{35}K)****	$E_{daughter}$(^{33}Cl)	coincident γ-rays
4.305(26)	100	4.2(3)	9.053(27)	0	——

* All values are taken from [1999Tr04], except where noted.
** From [2016Ci05].
*** Calculated from two-proton energy and S_{2p} (^{35}K) = 4747.5(6) keV [2021Hu06].

Table 12
β-p emission from ^{39}Ti*, $T_{1/2}$ = 28.5(9) ms, $BR_{\beta p}$ = 93.7(28)%**.

E_p(c.m.)	I_p(rel)***	I_p(abs)***	$E_{emitter}$ (^{39}Sc)	$E_{daughter}$(^{38}Ca)	coincident γ-rays[@]
3.27(2)	70(20)	7(2)			
5.17(3)[a]	100(30)	10(3)			

* All values taken from [2007Do17], except where noted.
** Mixture of β-p and β-2p [2007Do17], β-xp is expected to be 100% as ^{39}Sc is unbound to proton emission S_p= -597(24) keV [2021Hu06].
*** Note that there is considerable disagreement between the published works in this nucleus, and many β-p transitions are unknown.
[a] Possible two proton peak from the β-2p decay of 39Ti to the ground state of ^{37}K [2001Gi01, 1992Mo15].

Table 13
β-2p emission from ^{39}Ti*

E_{2p}(c.m.)	I_{2p}(rel)	I_{2p}(abs)	$E_{emitter}$ (^{39}Sc)	$E_{daughter}$(^{37}K)**	coincident γ-rays **
≈2.50	≈100			2.1702(1)	2.170
≈4.75	≈55			0	——

* All values taken from [1992Mo15], except where noted.
** Value from adopted levels in ENSDF [2012Ca15].

Table 14
β-p emission from ^{43}Cr*,$T_{1/2}$ = 21.2(7) ms, $BR_{\beta p}$ = 79.3(30)%**.

E_p(c.m.)	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{43}V)***	$E_{daughter}$(^{42}Ti)	coincident γ-rays
1.014(17)	8(1)	0.6(1)			
1.614(34)	30(15)	2.1(11)			
1.812(15)	100	7.1(12)			
2.179(17)	66(10)	4.7(7)			
2.753(19)	17(6)	1.2(4)			
3.138(17)	48(10)	3.4(7)			
3.382(25)	14(6)	1.0(4)			
3.744(27)	42(20)	3.0(14)			
4.671(26)	63(11)	4.5(8)			

* All proton energies, intensity and half-life values taken from [2007Do17].
** From [2012Au08]. [2007Do17] gives a value of 92.5(28)% for the sum of β-p and β-2p.
*** Calculated from proton energies and S_p (^{43}V) = 100(40) keV [2021Hu06].

Table 15
β-2p emission from ^{43}Cr*, $BR_{\beta 2p}$ = 12.09(40)%**.

E_{2p}(c.m.)	I_{2p}	$E_{emitter}$ (^{43}V)***	$E_{daughter}$(^{41}Sc)	coincident γ-rays
4.348(16)		8.198(43)	0	——

* All values taken from [2007Do17] except where noted.
** [2012Au08].
*** Calculated from two-proton energy and S_{2p} (^{43}V) = 3850(40) keV [2021Hu06].

Table 16
β-p emission from ^{47}Fe*, $T_{1/2}$ = 21.5(7) ms, $BR_{\beta p}$ = 88.4(9)%.

E_p(c.m.)	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{47}Mn)**	$E_{daughter}$(^{46}Cr)	coincident γ-rays
1.548(19)	36(13)	1.9(7)			
1.718(20)	75(23)	4.0(12)			
1.864(15)	100	5.3(7)	5.44(3)	1.9871(3)	0.892, 1.095
2.462(29)	36(13)	1.9(7)			
3.973(20)	83(23)	4.4(12)	7.55(4)	3.1965(6)	0.892, 1.095
5.000(215)	38(8)	2.0(4)	7.38(4)[a]	1.9871(3)	0.892, 1.095
6.104(24)	70(13)	3.7(7)	7.38(4)[a]	0.8922(1)	0.829

* All values taken from [2007Do17], except where noted.
** Calculated from proton energy and S_p (^{47}Mn) = 380(30) keV [2021Hu06].
[a]IAS state [2007Do17].

Table 17
β-p Emission from ^{51}Ni*, $T_{1/2}$ = 23.8(2) ms, $BR_{\beta p}$ = 87.2(9)%*.

E_p(c.m.)	I_p(rel)	I_p(abs)	$E_{emitter}$ (^{51}Co)**	$E_{daughter}$(^{50}Fe)***	coincident γ-rays***
1.084(41)	14(9)	1.3(8)			
1.356(23)	17(6)	1.5(5)			
1.859(20)	35(10)	3.0(9)			
2.234(18)	21(6)	1.8(5)			
2.515(28)	55(25)	4.8(22)			
2.915(17)	46(10)	4.0(9)			
3.121(31)	24(12)	2.1(10)			
3.421(23)	6(5)	0.5(4)			
3.709(29)	17(6)	1.5(5)			
3.929(24)	13(7)	1.1(6)			
4.415(27)	6(3)	0.5(3)			
4.662(16)	100	8.7(8)	6.664(52)	1.8515(5)	0.765, 1.087
5.664(30)	10(5)	0.9(4)			

* All values taken from [2007Do17], except where noted.
** Calculated from proton energy and S_p (^{51}Co) = 150(50) keV [2021Hu06].
*** Values from adopted levels in ENSDF [2011El01].

Table 18
β-p Emission from ^{55}Zn*, $T_{1/2}$ = 19.8(13) ms, $BR_{\beta 2p}$ = 91.0(51)%.

E_p(c.m.)	I_p	$E_{emitter}$ (^{55}Cu)	$E_{daughter}$(^{54}Ni)	coincident γ-rays
4.689(38)	obs	≈7.30*	2.5-2.6**	

* All values taken from [2007Do17], except where noted.
** The emitted proton is assumed to be from IAS in ^{55}Cu at ≈7.300 MeV to the second excited state in ^{54}Ni which is expected to be ≈2.5-2.6 MeV.

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