



**Fig. 1:** Known experimental values for heavy particle emission of the odd-Z  $T_z = -1$  nuclei.

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**Table 1**

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

Nuclide	Ex	$J^\pi$	$T_{1/2}$	$Q_\varepsilon$	$Q_{\varepsilon p}$	$BR_{\beta p}$	$Q_{\varepsilon 2p}$	$Q_{\varepsilon \alpha}$	$BR_{\beta \alpha}$	Experimental
<sup>4</sup> Li		2 <sup>-</sup>		22.90(21)	3.08(21)					
<sup>8</sup> B		2 <sup>+</sup>	768(3) ms	17.980(1)	0.7255(10)		-9.248(1)	6.106(1)	100%	[1988Aj01, 1971Wi05, 1964Ma35]
<sup>12</sup> N		1 <sup>+</sup>	11.000(16) ms	17.3881(10)	1.3814(10)		-9.847(1)	9.971(1)	4.12(22)%	[2020Bi15, 2020Bi11, 2009Hy01, 2009Hy02, 2010Hy01]
<sup>16</sup> F		0 <sup>-</sup>	40 (20) keV	15.412(5)	3.285(5)		-6.923(5)	8.250(5)		[1993Ti07, 2014Wu03]
<sup>20</sup> Na		2 <sup>+</sup>	447.9(40) ms	13.8924(11)	1.0490(11)		-6.9447(11)	9.1625(11)	20.05(22)%	[2021Wa06, 2013La22, 1989Cl02, 1972To08, 1972Mo08, 1971Go18, 1989Ra17]
<sup>24</sup> Al		4 <sup>+</sup>	2.053(4) s	13.8848(2)	2.19207(23)	0.0012(3)%	-6.6021(2)	4.5681(2)	0.035(6)%	[1994Ba54, 2011Ma88]
<sup>24m</sup> Al	0.4258(1)	1 <sup>+</sup>	130.9(13) ms	14.3106(2)	2.6179(3)		-6.1763(2)	4.9939(2)	0.028(6)%	[1994Ba54, 1979Ho08, 2011Ma88, 1979Ho08]
<sup>28</sup> P		3 <sup>+</sup>	270.3(5) ms	14.3449(11)	2.7600(11)	0.0013(4)%	-5.5114(11)	4.3607(11)	0.00086(25)%	[1996Og01, 1968Ar03, 1979Ho27]
<sup>32</sup> Cl		1 <sup>+</sup>	298(1) ms	12.6808(6)	3.8169(6)	0.026(5)%	-3.4797(6)	5.7331(6)	0.054(8)%	[1979Ho27, 2008Bh08, 2018Ab06, 2012Me03, 1985Bj01]
<sup>36</sup> K		2 <sup>+</sup>	342(2) ms	12.8144(3)	4.3074(3)	0.048(9)%	-2.0635(3)	6.1733(3)	0.0034(7)%	[1996Pi02, 1980Es01, 1997Pi03, 1980Ew01]
<sup>40</sup> Sc		4 <sup>-</sup>	182.7(8) ms	14.3230(28)	5.9949(28)	0.44(7)%	-0.3866(28)	7.2831(28)	0.017(5)%	[1982Ho09, 1968Ar03, 1969Ve04, 1974Se11]
<sup>44</sup> V		(2) <sup>+</sup>	111(7) ms	13.4741(7)	5.091(7)		0.161(7)	8.613(7)	obs	[1977Ha04, 1971Ce02]
<sup>48</sup> Mn		4 <sup>+</sup>	158.1(22) ms	13.525(10)	5.421(7)	0.280(37)%	0.253(7)	5.827(7)		[1991Sz03, 1987Se07]
<sup>52</sup> Co		(6 <sup>+</sup> )	111(4) ms	13.988(5)	6.610(5)		1.339(5)	6.052(9)		[2017Ku12]
<sup>56</sup> Cu		(4 <sup>+</sup> )	80(2) ms	15.278(6)	8.111(6)#	0.40(12)%	3.047(6)	7.277(6)		[2001Bo54, 2017Ku12]
<sup>60</sup> Ga		(2 <sup>+</sup> )	69.4(2) ms	14.58(20)#	9.48(20)#	1.6(7)%	6.06(20)#	11.89(20)#		[2021Or01, 2017Ku12, 2001Ma96]
<sup>64</sup> As			69.0(14) ms	14.78(20)#	9.73(20)#		7.06(20)#	12.22(20)#		[2020Gi02]
<sup>68</sup> Br			35(5) ns	15.40(26)#	10.51(26)#		8.24(26)#	13.10(26)#		[2019Wi08, 1995Bl06, 1997Au04]
<sup>72</sup> Rb		(5 <sup>+</sup> )	103(22) ns	15.61(50)#	10.88(50)#		9.02(50)#	13.43(50)#		[2019Si33, 2017Su31]
<sup>76</sup> Y			24 <sup>+12</sup> <sub>-6</sub> ms	16.00(30)#	11.68(30)#		9.50(30)#	13.27(30)#		[2019Si33]
<sup>80</sup> Nb				16.34(50)#	12.09(41)#		10.18(40)#	13.41(40)#		
<sup>84</sup> Tc				16.47(50)#	12.62(43)#		11.34(40)#	14.37(50)#		
<sup>88</sup> Rh				17.48(50)#	13.54(40)#		12.67(40)#	14.89(50)#		
<sup>92</sup> Ag		**		17.25(53)#	13.75(50)#		12.78(40)#	14.39(50)#		[2016Ce02]
<sup>96</sup> In		**		17.48(65)#	14.53(64)#		13.43(50)#	14.27(61)#		[2016Ce02]

\* Calculated from the sum of the  $\beta$  feeding to states [2020Bi15] above the alpha separation energy

\*\* Observed at RIKEN with BigRIPS and ZDS that have a time of flight 760 ns [2016Ce02].

**Table 2**

Particle emission from the odd-Z,  $T_z = -1$  nuclei. Unless otherwise stated, all Q-values and separation energies are taken from [2021Wa16] or deduced from values therein.

Nuclide	$S_p$	$BR_{1p}$	$S_{2p}$	$Q_\alpha$	Experimental
$^4\text{Li}$	-3.10(21)	100%	-6.80(200)#		[1996Ed02, 1990Br14, 1973Fr04]
$^8\text{B}$	0.1364(10)	—	5.7433(10)	-4.83(21)	
$^{12}\text{N}$	0.6003(10)	—	9.2905(10)	-8.0084(14)	
$^{16}\text{F}$	-0.531(5)	100%	6.766(5)	-9.088(5)	[2014Wu03, 1993Ti07]
$^{20}\text{Na}$	2.1905(11)	—	8.6006(12)	-6.250(5)	
$^{24}\text{Al}$	1.86411(23)	—	9.44536(26)	-9.3242(11)	
$^{24m}\text{Al}^\oplus$	2.2899(3)	—	9.8712(3)	-9.7500(11)	
$^{28}\text{P}$	2.0523(12)	—	9.5157(11)	-9.52240(12)	
$^{32}\text{Cl}$	1.5811(5)	—	7.7118(6)	-8.6118(13)	
$^{36}\text{K}$	1.6589(8)	—	7.5550(3)	-6.5074(6)	
$^{40}\text{Sc}$	0.5296(29)	—	6.3005(28)	-5.5311(28)	
$^{44}\text{V}$	1.781(9)	—	6.265(7)	-5.710(8)	
$^{48}\text{Mn}$	2.023(6)	—	6.799(7)	-7.913(10)	
$^{52}\text{Co}$	1.444(5)	—	6.295(5)	-7.472(9)	
$^{56}\text{Cu}$	0.583(6)	—	5.198(6)	-6.711(8)	
$^{60}\text{Ga}$	-0.34(20)#		2.50(20)#	-3.39(20)#	
$^{64}\text{As}$	-0.10(20)#		2.12(20)#	-2.37(29)#	
$^{68}\text{Br}$	-0.50(25)#	100%**	1.34(26)#	-1.68(33)#	[2019Wi08, 1995Bl06, 1997Au04]
$^{72}\text{Rb}$	-0.71(52)#	100%**	1.48(50)#	-1.96(56)#	[2019Si33, 2017Su31]
$^{76}\text{Y}$	-1.08(37)#		0.91(30)#	-2.35(58)#	
$^{80}\text{Nb}$	-1.06(50)#		70.83(50)#	-2.60(50)#	
$^{84}\text{Tc}$	-1.35(57)#		0.47(50)#	-1.71(57)#	
$^{88}\text{Rh}$	-1.58(57)#		-0.13(50)#	-1.59(57)#	
$^{92}\text{Ag}$	-1.35(58)#	100%**	0.47(45)#	-3.10(57)#	[2016Ce02]
$^{96}\text{In}$	-1.68(76)#	100%**	0.27(64)#	-2.99(64)#	[2016Ce02]

$^\oplus$  Excitation energy = 0.4258(1) MeV.

\*\* Inferred by half-life

**Table 3**

$\beta$ - $\alpha$  emission from  $^{20}\text{Na}^*$ ,  $T_{1/2} = 447.9(40)$  ms $^\oplus$ ,  $BR_{\beta\alpha} = 20.05(22)$  %.

$E_\alpha$ (c.m.)	$I_\alpha(\text{rel})\%$	$I_\alpha(\text{abs})\%$	$E_{\text{emitter}}(^{20}\text{Ne})$	$E_{\text{daughter}}(^{16}\text{O})^{***}$	coincident $\gamma$ -rays
0.8915(17)	0.039(6)	0.0063(9)	5.6214(17)	0	—
1.5073(35)	0.0099(44)	0.0016(7)	12.367(35)	6.12989(4)	6.130
1.0579(26)	0.0099(31)	0.0016(5)	5.7877(26)	0	—
1.9902(5)	0.0149(44)	0.0024(7)	6.720(5)	0	—
2.6937(18)	100(4)	16.1(6)	7.4235(18)	0	—
3.1020(23)	4.3(3)	0.69(3)	7.8318(23)	0	—
3.324(7)**	0.074(6)	0.015(1)**	8.054(7)**	0	—
4.0402(50)	0.21(5)	0.034(8)	8.770(50)	0	—
4.7587(22)	1.91(13)	0.307(18)	9.4885(22)	0	—
5.5469(2)	17.4(10)	2.80(12)	10.2767(20)	0	—
5.8522(3)	0.53(3)	0.085(4)	10.582(3)	0	—
6.1117(22)	1.21(7)	0.195(8)	11.300(10)	0	—
6.383(7)**	0.055(7)	0.011(2)**	11.116(9)**	0	—
6.561(4)**	0.165(11)	0.033(2)**	11.291(4)**	0	—
6.5702(10)	0.217(15)	0.035(2)	11.870(50)	0	—
7.1402(50)	0.014(1)	0.0023(1)	12.367(35)	0	—

\* All values taken from [2021Wa06], except where noted.

\*\* [1989Cl02].

\*\*\* Values from adopted levels in ENSDF [1998Ti06].

$^\oplus$  Weighted average of 442(5) ms [1971Go18], 446(8) ms [1972Mo08], 448(4) ms [1972To08], and 452(4) ms [1989Cl02].

**Table 4** $\beta$ -p emission from  $^{28}\text{P}^*$ ,  $T_{1/2} = 270.3(5)$  ms<sup>\*\*\*</sup>,  $BR_{\beta p} = 0.0013(4)\%$ .

$E_p$	$I_p(\text{rel})$	$I_p(\text{abs})(\times 10^{-4})$	$E_{\text{emitter}}(^{28}\text{Si})^{**}$	$E_{\text{daughter}}(^{27}\text{Al})$	coincident $\gamma$ -rays
0.486(1)	6(1)	0.4(14)	12.071(1)	0	—
0.704(1)	100	6.8(21)	12.289(1)	0	—
0.859(1)	6(1)	0.41(14)	12.444(1)	0	—
0.988(1)	56(4)	3.8(12)	12.573(1)	0	—
1.129(1)	4(1)	0.27(11)	12.714(1)	0	—
1.314(1)	18(2)	1.2(4)	12.899(1)	0	—
1.506(4)	2(1)	0.14(8)	13.091(4)	0	—

\*All values taken from [1996Og01], except where noted.

\*\* Calculated from proton energies and  $S_\alpha(^{28}\text{Si}) = 11584.90(5)$  keV [2021Wa16].

\*\*\* [1968Ar03]

**Table 5** $\beta$ - $\alpha$  emission from  $^{28}\text{P}^*$ ,  $BR_{\beta\alpha} = 0.00086(25)\%$ .

$E_\alpha$	$I_\alpha(\text{rel})$	$I_\alpha(\text{abs})(\times 10^{-5})$	$E_{\text{emitter}}(^{28}\text{Si})^{**}$	$E_{\text{daughter}}(^{24}\text{Mg})$	coincident $\gamma$ -rays
1.528(1)	25(3)	8(2)	11.512(1)	0	—
1.671(1)	79(6)	24(7)	11.65(1)7	0	—
1.945(1)	<3	<0.9	11.929(1)	0	—
2.085(1)	15(4)	4(2)	12.069(1)	0	—
2.303(1)	14(5)	5(2)	12.287(1)	0	—
2.457(1)	100	31(9)	12.441(1)	0	—
2.563(1)	23(6)	7(3)	12.547(1)	0	—
2.738(1)	6(2)	1.8(8)	12.722(1)	0	—
2.912(1)	13(3)	4.0(15)	12.896(1)	0	—
3.107(1)	3(1)	0.9(4)	13.091(1)	0	—

\*All values taken from [1996Og01], except where noted.

\*\* Calculated from  $\alpha$  energies and  $S_\alpha(^{28}\text{Si}) = 9984.14(1)$  keV [2021Wa16].**Table 6** $\beta$ -p emission from  $^{32}\text{Cl}^*$ ,  $T_{1/2} = 298(1)$  ms,  $BR_{\beta p} = 0.026(5)\%$ .

$E_p$	$I_p(\text{rel})$	$I_p(\text{abs})$	$E_{\text{emitter}}(^{32}\text{S})$	$E_{\text{daughter}}(^{31}\text{P})$	coincident $\gamma$ -rays
0.787(5)	47(10)	0.0052(8)	9.651(5)	0	—
1.023(5)	100	0.0113(17)	9.887(5)	0	—
1.085(5)	17(4)	0.0019(4)	9.949(5)	0	—
1.367(5)	47(10)	0.0052(8)	10.231(5)	0	—
1.426(5)	7(2)	0.00078(2)	10.290(5)	0	—
1.916(5)	14(3)	0.0016(3)	10.780(5)	0	—

\*All values taken from [1979Ho27], except where noted.

\*\* Calculated from proton energies and  $S_p(^{32}\text{S}) = 8863.96$  keV [2021Wa16].

**Table 7** $\beta$ - $\alpha$  emission from  $^{32}\text{Cl}^*$ ,  $T_{1/2} = BR_{\beta\alpha} = 0.054(8)\%$ .

$E_\alpha$	$I_\alpha(\text{rel})$	$I_\alpha(\text{abs})$	$E_{\text{emitter}}(^{32}\text{S})$	$E_{\text{daughter}}(^{28}\text{Si})$	coincident $\gamma$ -rays
1.744(5)	3.7(8)	0.0011(2)	8.692(5)	0	—
1.912(5)	49(9)	0.0146(20)	8.860(5)	0	—
2.283(5)	0.7(3)	0.0002(1)	9.231(5)	0	—
2.515(5)	100	0.0300(42)	9.463(5)	0	—
2.762(5)	13(3)	0.0040(7)	9.710(5)	0	—
3.035(5)	2.3(5)	0.00069(20)	9.983(5)	0	—
3.345(5)	5.7(13)	0.0017(3)	10.293(5)	0	—
3.511(5)	0.8(3)	0.00024(10)	10.459(5)	0	—
3.583(5)	2.8(8)	0.00084(20)	10.531(5)	0	—
3.845(5)	1.7(4)	0.00051(10)	10.792(5)	0	—
4.115(5)	0.2(1)	0.00006(3)	11.063(5)	0	—

\*All values taken from [1979Ho27], except where noted.

\*\* Calculated from  $\alpha$  energies and  $S_\alpha(^{32}\text{S}) = 6947.66$  keV [2021Wa16].**Table 8** $\beta$ -p emission from  $^{36}\text{K}^*$ ,  $T_{1/2} = 342(2)$  ms\*\*,  $BR_{\beta p} = 0.048(14)\%$ \*\*.

$E_p$	$I_p(\text{rel})$	$I_p(\text{abs}) (\text{X } 10^{-4})$	$E_{\text{emitter}}(^{36}\text{Ar})^{**}$	$E_{\text{daughter}}(^{35}\text{Cl})$	coincident $\gamma$ -rays
0.5161(11)	0.33(9)	0.011(3)	9.023(1)	0	—
0.6405(14)	0.45(12)	0.015(4)	9.1475(14)	0	—
0.7133(8)	23.(6)	0.76(20)	9.2203(8)	0	—
0.876(1)	6.7(18)	0.22(6)	9.383(1)	0	—
0.9973(12)	100(27)	3.3(9)	9.5043(12)	0	—
1.2019(14)	0.18(6)	0.006(2)	9.7089(14)	0	—
1.2327(11)	0.73(18)	0.024(6)	9.7397(11)	0	—
1.308(2)	0.45(12)	0.015(4)	9.815(2)	0	—
1.3723(7)	13(3)	0.43(11)	9.8793(7)	0	—
1.4496(22)	0.30(9)	0.010(3)	9.9566(22)	0	—
1.928(10)	0.33(15)	0.011(5)	10.435(10)	0	—
2.049(10)	1.45(58)	0.048(19)	10.556(10)	0	—
2.107(10)	1.42(55)	0.047(18)	10.614(10)	0	—
2.528(10)	0.88(36)	0.029(12)	11.035(10)	0	—
2.715(10)	0.61(27)	0.020(9)	11.222(10)	0	—

\*All values taken from [1996Il02], except where noted.

\*\* [1980Es01]

\*\*\* Calculated from proton energies and  $S_p(^{36}\text{Ar}) = 8506.98(4)$  keV [2021Wa16].**Table 9** $\beta$ - $\alpha$  emission from  $^{36}\text{K}^*$ ,  $BR_{\beta\alpha} = 0.031(6)\%$ \*\*.

$E_\alpha$	$I_\alpha(\text{rel})$	$I_\alpha(\text{abs}) (\text{X } 10^{-6})$	$E_{\text{emitter}}(^{36}\text{Ar})^{***}$	$E_{\text{daughter}}(^{32}\text{S})$	coincident $\gamma$ -rays
1.712(3)	3.3(7)	0.5(1)	8.353(3)	0	—
1.757(3)	1.6(5)	0.24(8)	8.398(3)	0	—
2.208(3)	4.0(13)	0.6(2)	8.849(3)	0	—
2.268(3)	100(27)	15(4)	8.909(3)	0	—
2.508(3)	10(3)	1.5(4)	9.149(3)	0	—
2.721(3)	0.73(20)	0.11(3)	9.362(3)	0	—
2.827(3)	0.53(20)	0.08(3)	9.468(3)	0	—
3.068(3)	67(20)	10(3)	9.709(3)	0	—
3.355(3)	0.53(13)	0.08(2)	9.996(3)	0	—
3.566(3)	0.73(27)	0.11(4)	10.207(3)	0	—
3.688(3)	2.7(7)	0.4(1)	10.329(3)	0	—
3.808(3)	1.7(5)	0.26(7)	10.449(3)	0	—
3.923(3)	7.3(20)	1.1(3)	10.564(3)	0	—
3.958(3)	4.0(13)	0.6(2)	10.599(3)	0	—
4.065(4)	0.27(13)	0.04(2)	10.706(4)	0	—
4.217(3)	1.1(3)	0.17(5)	10.858(3)	0	—
4.330(4)	0.23(10)	0.034(15)	10.971(4)	0	—
4.417(3)	1.9(5)	0.28(8)	11.058(3)	0	—
4.597(4)	0.40(13)	0.059(20)	11.238(4)	0	—

\*All values taken from [1996Ii02], except where noted.

\*\* [1980Es01]

\*\*\* Calculated from  $\alpha$  energies and  $S_{\alpha}$  ( $^{36}\text{Ar}$ ) = 6640.92(3) keV [2017Wa10].

**Table 10**

$\beta$ -p Emission from  $^{40}\text{Sc}^*$ ,  $T_{1/2} = 182.7(8)$  ms\*\*,  $BR_{\beta p} = 0.44(7)\%$ .

$E_p$	$I_p(\text{rel})$	$I_p(\text{abs}) (\text{X } 10^{-4})$	$E_{\text{emitter}} (^{40}\text{Ca})$	$E_{\text{daughter}} (^{39}\text{K})^{***}$	coincident $\gamma$ -rays
1.032(3)	65(14)	7.2(11)	9.360(3)	0	—
1.087(8)	40(9)	4.40(75)	9.415(8)	0	—
1.098(6)	50(12)	5.50(95)	9.427(6)	0	—
1.123(3)	100.00	11.0(17)	9.451(3)	0	—
1.273(3)	29(6)	3.2(5)	9.601(3)	0	—
1.482(4)	8(2)	0.88(15)	9.810(4)	0	—
1.501(8)	2.4(7)	0.26(7)	9.829(8)	0	—
1.592(3)	4.5(11)	0.50(9)	9.920(3)	0	—
1.650(5)	0.8(5)	0.092(5)	9.978(5)	0	—
1.721(4)	3.8(10)	0.42(9)	10.049(4)	0	—
1.797(4)	1.2(4)	0.13(4)	10.125(4)	0	—
1.882(4)	12.6(28)	1.39(22)	10.210(4)	0	—
2.003(4)	0.42(19)	0.046(2)	10.331(4)	0	—
2.037(8)	0.27(19)	0.03(2)	10.365(8)	0	—
2.118(4)	2.(6)	0.28(5)	10.446(4)	0	—
2.143(4)	8.5(18)	0.94(14)	10.471(4)	0	—
2.175(4)	11.4(25)	1.25(19)	10.504(4)	0	—
2.253(5)	1.5(4)	0.17(4)	10.582(5)	0	—
2.268(10)	0.32(19)	0.035(20)	10.596(10)	0	—
2.364(5)	0.7(3)	0.076(30)	10.692(5)	0	—
2.426(8)	0.8(3)	0.092(30)	10.754(8)	0	—
2.447(5)	11.6(26)	1.28(20)	10.775(5)	0	—
2.485(9)	0.74(30)	0.081(3)	10.813(9)	0	—
2.520(5)	3.5(6)	0.38(2)	10.8548(5)	0	—
2.581(5)	0.32(19)	0.035(20)	10.909(5)	0	—
2.628(8)	1.82(46)	0.20(4)	10.956(8)	0	—
2.644(7)	1.82(46)	0.20(4)	10.972(7)	0	—
2.709(7)	0.63(21)	0.069(20)	11.037(7)	0	—
2.786(6)	1.00(31)	0.11(3)	11.114(6)	0	—
2.813(6)	2.09(49)	0.23(4)	11.142(6)	0	—
2.888(5)	6.2(14)	0.68(11)	11.216(5)	0	—
2.987(5)	0.46(20)	0.051(20)	11.315(5)	0	—
3.089(7)	0.25(19)	0.028(20)	11.417(7)	0	—
3.123(9)	0.75(22)	0.083(20)	11.451(9)	0	—
3.287(10)	0.22(10)	0.024(10)	11.615(10)	0	—
3.393(10)	0.66(29)	0.073(30)	11.721(10)	0	—
3.463(10)	0.24(19)	0.026(20)	11.791(10)	0	—
3.676(10)	0.09(9)	0.01(1)	12.004(10)	0	—
3.706(10)	0.22(10)	0.024(10)	12.034(10)	0	—
3.743(10)	0.11(9)	0.012(10)	12.071(10)	0	—

\*All values taken from [1982Ho09], except where noted.

\*\* [1968Ar03]

\*\*\* Calculated from proton energies and  $S_p$  ( $^{40}\text{Ca}$ ) = 8328.18(2) keV [2021Wa16].

**Table 11** $\beta$ - $\alpha$  emission from  $^{40}\text{Sc}^*$ ,  $BR_{\beta-\alpha} = 0.017(5)\%$ .

$E_\alpha$	$I_\alpha(\text{rel})$	$I_\alpha(\text{abs})$	$E_{\text{emitter}} (^{40}\text{Ca})^{**}$	$E_{\text{daughter}}(^{36}\text{Ar})$	coincident $\gamma$ -rays
2.321(6)	14.9(5)	8.8(2)	9.361(6)	0	—
2.911(8)	2.7(2)	1.6(1)	9.951(8)	0	—
3.089(8)	3.2(2)	1.9(1)	10.129(8)	0	—
3.113(8)	5.4(2)	3.2(1)	10.153(8)	0	—
3.152(8)	3.6(2)	2.1(1)	10.192(8)	0	—
3.424(7)	13.2(4)	7.8(2)	10.464(7)	0	—
3.480(7)	14.1(4)	8.3(2)	10.520(7)	0	—
3.559(7)	11.7(4)	6.9(2)	10.599(7)	0	—
3.684(5)	100.0	59(12)	10.724(5)	0	—
3.779(7)	7.1(4)	4.2(2)	10.819(7)	0	—
3.947(12)	1.9(2)	1.1(1)	10.986(12)	0	—
4.048(12)	1.7(2)	1.0(1)	11.088(12)	0	—
4.164(5)	64.4(19)	38(8)	11.204(5)	0	—
4.266(7)	4.1(2)	2.4(1)	11.305(7)	0	—
4.431(7)	6.1(2)	3.6(1)	11.471(7)	0	—
4.509(6)	11.2(4)	6.6(2)	11.549(6)	0	—
4.622(7)	3.9(2)	2.3(1)	11.662(7)	0	—
4.687(7)	1.5(2)	0.9(1)	11.726(7)	0	—
4.800(6)	4.7(2)	2.8(1)	11.840(6)	0	—
4.958(7)	8.5(4)	5.0(2)	11.998(7)	0	—
5.021(9)	2.7(2)	1.6(1)	12.061(9)	0	—

\* All values taken from [1982Ho09], except where noted.

\*\* Calculated from  $\alpha$  energies and  $S_\alpha (^{40}\text{Ca}) = 7039.78(3)$  keV [2021Wa16].**References used in the Tables**

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