Direct heavy charged particle emitters (through Tz=+49/2). 10/21/2024

Table 1
Summary of known direct p emitters. Detailed references for each nucleus can be found in their respective T_z tables.

Nuclide	J^π	$T_{1/2}$	S_p	BR_p (%)	other decays	T_z
^{4}Li	2^-		-3.10(21)	100%		-1
^{7}B	$(3/2^-)$	801(20) keV	-2.013(26)	100%		-3/2
^{10}N	(1^-)	$2.5^{+2.0}_{-1.5}$ MeV	-2.60(40)	100%		-2
^{11}N	$1/2^+$	830(30) keV	-1.378(5)	100%		-3/2
^{13}F			-2.73(50)#	100%		-5/2
^{14}F	2^-	0.91(10) MeV	-1.560(40)	100%		-2
^{15}F	$1/2^+$	660(20) keV	-1.27(14)	100%		-3/2
^{16}F	0^-	40 (20) keV	-0.531(5)	100%		-1
^{17}Na			-3.44(6)	100%		-5/2
^{18}Na	$(1)^-$	<0.2 MeV	-1.250(90)	100%		-2
^{19}Na	$(5/2^+)$	<40 keV	-0.323(11)	100%		-3/2
^{21}Al		<10 ps	$-1.15^{+0.10}_{-0.07}$	100%		-5/2
^{25}P		< 35 ns	-2.16(40)#	100%		-5/2
^{29}Cl		< 20 ns	-2.66(10)#	100%		-5/2
^{28}Cl			-1.60(8)	100%		-3
^{39}Sc	(7/2-)	<300ns	-0.597(24)	100%		-3/2
^{44}Mn		< 105 ns	-2.14(36)	100%		-3
^{53m}Co	$(19/2^-)$	245(102) ms	-1.580(30)	1.3(1)%	γ	-1/2
^{54m}Ni	10^+	155(3) ns	-2.549(5)	49.5(21)%	γ	-1
^{68}Br		35(5) ns	-0.50(25)#	100%		-1
^{69}Br	$3/2^-$	< 24 ns	0.640(40)	100%		-1/2
^{72}Rb	(5^+)	103(22) ns	-0.71(52)#	100%		-1
^{73}Rb	$(3/2^-)$	< 81 ns	-0.640(40)	100%		-1/2
^{81}Nb		< 40 ns	-1.11(50)#	100%		-1/2
^{85}Tc		< 43 ns	1.03(50)#	100%		-1/2
^{89}Rh		< 120 ns	-1.40(20)#	100%		-1/2
^{92}Ag			1.35(58)#	100%		-1
^{93}Ag	$(9/2^+)$	228(16) ns	-1.09(53)#	100%		-1/2
^{94m2}Ag	$(21/2^+)$	0.39(4) s	-5.78(84)#	4.1(6)%	β_p, 2p	0
^{96}In			-1.68(76)#	100%		-1
^{97m}In	$(1/2^-)$	120(110) μs	-1.50(60)#	100%		-1/2
^{103}Sb		< 46 ns	-0.98(32)#	100 %		+1/2
^{109}I	$1/2^+$	93.5(3) μs	-0.820(4)	99.846(4)%	α	+3/2
^{112}Cs	(1^+)	486(37) μs	-0.816(4)	100%		+1
^{113}Cs	$(3/2^+)$	17.1(2) μs	-0.9728(22)	100%		+3/2
^{116}La		50(22) ms	-0.734(9)	60(18)%		+1
^{117}La	(3/2)	20.1(25) ms	-0.820(3)	100%		+3/2
^{117m}La	$(9/2^+)$	10(5) ms	-0.970(3)	100%		+3/2
^{121}Pr	(3/2)	10^{+6}_{-3} ms	-0.890(10)	≈ 100%		+3/2
^{130}Eu		0.90^{+49}_{-29} ms	-1.028(15)	100%		+2
^{131}Eu	$3/2^+$	17.8(19) ms	-0.947(5)	89(9)%		+5/2
^{135}Tb	$(7/2^-)$	$0.94^{+0.33}_{-0.22}$ ms	-1.188(7)	≈100%		+5/2
^{140}Ho		6(3) ms	-1.094(10)	100%		+3
^{141}Ho		4.1(1) ms	-1.177(7)	100%		+7/2
^{141m}Ho		7.4(3) μs	-1.243(14)	100%		+7/2
^{144}Tm	9^+	$1.9^{+1.2}_{-0.5}$ μs	-1.712(16)	100%		+3
^{145}Tm	$(11/2^-)$	3.17(20) μs	-1.736(7)	100%		+7/2
^{146}Tm	(5^-)	68(3) ms	-0.896(6)#	100%		+4
^{146m}Tm	(10^+)	198(3) ms	-1.078(7)#	71%	γ	+4
^{147}Tm	$11/2^-$	615(45) ms	-1.059(3)	15(5)%		+9/2
^{147m}Tm	$3/2^+$	0.36(4) ms	-1.127(7)	100%		+9/2
^{149}Lu		$0.45^{+0.17}_{-0.10}$ μs	-1.933(20)	100%		+7/2
^{150}Lu	(2^+)	45(3) ms	-1.292(2)	≈71%		+4
^{150m}Lu	$(1^-, 2^-)$	$39^{+8}_{-6}\mu$s	-1.292(2)#	100%		+4
^{151}Lu	$11/2^-$	78(1) ms	-1.241(2)	obs		+9/2
^{151m}Lu	$3/2^+$	17(1) μs	-1.319(10)	100%		+9/2
^{155}Ta	$[1/2^+]$	$2.9^{+1.5}_{-1.1}$ ms	-1.453(15)	100%		+9/2
^{155m}Ta	$11/2^-$	12^{+4}_{-3} μs	-1.453(15)-x	100%		+9/2

Table 1
Summary of known direct p emitters. Detailed references for each nucleus can be found in their respective T$_z$ tables.

^{156}Ta	(2$^-$)	106(4) ms	-1.020(4)	71(3) %		+5
^{156m}Ta	(9$^+$)	333^{+25}_{-22} ms	-1.122(4)	4.2(9) %	α	+5
^{157}Ta	1/2$^+$	10.1(4) ms	-0.935(10)	3.4(12) %	α	+11/2
^{159m}Re	11/2$^-$	21(4) μs	-1.599(53)#-x	92.5(35)%	α	+9/2
^{160}Re		611(7) μs	-1.267(7)	89(1) %	α	+5
^{161}Re	1/2$^+$	0.44(1) ms	-1.197(5)	100%	α	+11/2
^{161m}Re	11/2$^-$	14.8(3) ms	-1.300(14)	7.0(3) %	α	+11/2
^{164m}Ir	(9$^+$)	70(10) μs	-1.56(10)#-x	96(2) %	α	+5
^{165m}Ir	(11/2$^-$)	340(40) μs	-1.721(71)#	88(2)%	α	+11/2
^{166}Ir	(2$^-$)	10.5(22) ms	-1.152(8)	6.9(29)%	α	+6
^{166m}Ir	(9$^+$)	15.1(9) ms	-1.324(10)	1.76(58)%	α	+6
^{167}Ir	(1/2$^+$)	29.3(6) ms	-1.070(4)	39.3(13)%	α	+13/2
^{167m}Ir	(11/2$^-$)	28.5(6) ms	-1.185(6)	0.42(8)%	α	+13/2
^{169}Au		<5 μs	-1.93(33)#	$\approx$ 100%		+11/2
^{170}Au	(2$^-$)	286^{+50}_{-40} μs	-1.472(12)	89(10)%	α	+6
^{170m}Au	(9$^+$)	617^{+50}_{-40} μs	-1.754(16)	58(5)%	α	+6
^{171}Au	(1/2$^+$)	22^{+3}_{-2} μs	-1.448(10)	100%	α	+13/2
^{171m}Au	(11/2$^-$)	1.09(3) ms	-1.706(16)	40(4)%	α	+13/2
^{176}Tl		$5.2^{+3.0}_{-1.4}$ ms	-1.265(18)	100%		+7
^{177}Tl	(1/2$^+$)	18(5) ms	-1.156(19)	27(13)%	α	+15/2
^{177m}Tl	(11/2$^-$)	230(40) μs	-1.963(26)	51(8)%	α	+15/2
^{185}Bi	(1/2$^+$)	2.8^{+23}_{-10} μs	-1.592(5)	91(2)%	α	+19/2

Table 2
Summary of known direct 2p emitters. Detailed references for each nucleus can be found in their respective T$_z$ tables.

Nuclide	J^π	$T_{1/2}$	S$_{2p}$	BR$_{2p}$ (%)	other decays	T$_z$
^{11}O	(3/2$^-$)	1.30 MeV	-4.25(6)	100%		-5/2
^{12}O	0$^+$	< 72 keV	-1.737(12)	100%		-2
^{15}Ne	(3/2$^-$)	0.59 MeV	-2.52(7)	100%		-5/2
^{19}Mg	(3/2$^-$)	4.0(15) ps	-0.760(50)	100%		-5/2
^{30}Ar	0$^+$	< 10 ps	-2.45(10)	100%		-3
^{48}Ni	0$^+$	$2.1^{+1.4}_{-0.6}$ ms	-2.39(30)#	70(20)%	β_p	-4
^{54}Zn	0$^+$	$1.59^{+0.60}_{-0.35}$ ms	-2.28(20)	90^{+5}_{-10}%		-3
^{67}Kr		7.4(30) ms	-2.89(30)#	37(14)%	β_p	-5/2
^{94m2}Ag	(21/2$^+$)	0.39(4) s	-2.50(75)#	0.5(3)%	β_p, p	0

Table 3
Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T$_z$ tables.

Nuclide	J^π	$T_{1/2}$	Q$_\alpha$	BR$_\alpha$ (%)	other decays	T$_z$
^{104}Te	0$^+$	<18 ns	5.10(21)	100%		0
^{105}Te	(5/2$^+$)	0.62(7) μs	5.069(3)	100%		+1/2
^{106}Te	0$^+$	$70\,^{+20}_{-10}$ μs	4.290(9)	100%		+1
^{107}Te	(5/2$^+$)	3.1(1) ms	4.004(6)	70(30)%		+3/2
^{108}I		26.4(8) ms	4.099(5)	100%		+1
^{108}Te	0$^+$	2.1(1) s	3.445(4)	49(4)%		+2
^{108}Xe	0$^+$	58^{+106}_{-23} μs	4.57(21)	100%		0
^{109}I	1/2$^+$	93.5(3) μs	3.918(21)	0.014(4)%	p	+3/2
^{109}Xe	(7/2$^+$)	13(2) ms	4.217(7)	100%		+1/2
^{109}Te	(5/2$^+$)	4.3(1) s	3.198(6)	3.9(13)%	β_p, β_α	+5/2
^{110}Xe	0$^+$	93(3) ms	3.872(9)	64(35)%		+1
^{110}Te	0$^+$	18.4(8) s	2.723(15)	$\approx$0.00076%		+3
^{110}I	(1$^+$)	664(24) ms	3.536(10)	17(4)%	β_p, β_α	+2
^{111}Xe	(7/2$^+$)	0.81(20) s	3.719(10)	10.4(19)%		+3/2
^{112}Xe	0$^+$	2.7(8) s	3.330(6)	$0.8^{+1.1}_{-0.5}$ %		+2
^{112}I	(1$^+$)	3.34(8)s	2.957(12)	$\approx$0.0012%	β_p, β_α	+3
^{113}Xe	(5/2$^+$)	2.74(8) s	3.087(8)	$\approx$0.011%	β_p, β_α	+5/2
^{114}Cs	(1$^+$)	0.57(2) s	3.360(60)	0.018(6)%	β_p, β_α	+2

Table 3
Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{114}Ba	0^+	380^{+190}_{-110} ms	3.592(19)	0.9(3)%	β_p	+1
^{144}Nd	0^+	2.4(2)$\times10^{15}$ y	1.901(1)	100%		+12
^{145}Pm	$5/2^+$	17.7(4) y	2.322(3)	2.8(6)$\times10^{-7}$%		+23/2
^{146}Sm	0^+	6.8(7)$\times10^{7}$ y	2.529(3)	100%		+11
^{147}Eu	$5/2^+$	24.1(6) d	2.991(3)	0.0022(6)%		+21/2
^{148}Gd	0^+	72.1(10) y	3.271(0)	100%		+10
^{148}Eu	5^-	55.6(2) d	2.694(10)	9.4(28)$\times10^{-7}$%		+11
^{148}Sm	0^+	$6.4^{+1.2}_{-1.3}\times10^{15}$ y	1.987(1)	100%		+12
^{149}Tb	$1/2^+$	4.13(5) h	4.078(2)	17.6(14)%		+19/2
^{149m}Tb	$11/2^-$	4.16(4) m	4.114(2)	0.022(3)%		+19/2
^{149}Gd		$7/2^-$	9.25(10) d	4.3(12)$\times10^{-4}$%		+21/2
^{150}Dy	0^+	2.17(2) m	4.351(2)	34(3)%		+9
^{150}Gd	0^+	1.78(8)$\times10^{6}$ y	2.807(6)	100%		+11
^{151}Ho	$(11/2^-)$	35.1(2) s	4.695(2)	21(2)%		+17/2
^{151m}Ho	$(1/2^+)$	47.6(13) s	4.736(2)	80^{+15}_{-20}%		+17/2
^{151}Dy	$7/2^-$	17.8(2) m	4.180(3)	5.6(4)%		+19/2
^{151}Tb	1/26+	17.609(14) h	3.496(4)	0.0095(15)%		+21/2
^{151}Gd	$7/2^-$	123.9(10) d	2.652(3)	$8^{+8}_{-4}\times10^{-7}$%		+23/2
^{151}Eu	$5/2^+$	4.6(12)$\times10^{18}$ y	1.964(1)	100%		+25/2
^{152}Er	0^+	10.3(1) s	4.934(2)	92(4)%		+8
^{152}Ho	2^-	161.8(3) s	4.507(1)	11(3)%		+9
^{152m}Ho	9^+	49.7(3) s	4.667(1)	10.8(17)%		+9
^{152}Dy	0^+	2.37(2) h	3.727(4)	1.0(7)%		+10
^{152}Gd	0^+	1.08(8)$\times10^{14}$ y	2.204(1)	100%		+12
^{153}Tm	$(11/2^-)$	1.7(2) s	5.248(1)	91(3)%		+15/2
^{153m}Tm	$(1/2^+)$	2.5(2) s	5.291(1)	92(3)%		+15/2
^{153}Er	$(7/2^-)$	37.1(2) s	4.802(1)	53(3)%		+17/2
^{153}Ho	$11/2^-$	2.02(3) m	4.052(4)	0.039(14)%		+19/2
^{153m}Ho	$1/2^+$	9.3(5) m	4.121(4)	0.14(4)%		+19/2
^{153}Dy	$7/2^-$	6.29(10) h	3.557(5)	0.0113(17)%		+21/2
^{154}Yb	0^+	409(2) ms	5.474(2)	92.6(20)%		+7
^{154}Tm	(2^-)	8.3(3) s	5.094(3)	54(5)%		+8
^{154m}Tm	(9^+)	3.35(5) s	5.094(3)+x	58(5)%		+8
^{154}Er	0^+	3.75(12) m	4.280(3)	0.52(13)%		+9
^{154}Ho	2^-	11.75(20 m	4.041(4)	0.028(9)%		+10
^{154m}Ho	8^+	2.80(13) m	4.280(28)	<0.01%		+10
^{154}Dy	0^+	3.0(15)$\times10^{6}$ y	2.945(5)	100%		+11
^{155}Hf	$(7/2^-)$	840(30) ms	4.81(43)#	0.06%		+11/2
^{155}Lu	$(11/2^-)$	70(1) ms	5.802(2)	90(2)%		+13/2
^{155m1}Lu	$(1/2^+)$	136(9) ms	5.822(6)	76(16)%		+13/2
^{155m2}Lu	$(25/2^-)$	2.71(3) ms	7.583(6)	obs		+13/2
^{155}Er	$(7/2^-)$	5.3(3) m	4.118(5)	<0.022(7)%		+19/2
^{155}Yb	$(7/2^-)$	1.79(2) s	5.339(2)	90(5)%		+15/2
^{155}Tm	$(11/2^-)$	21.6(2) s	4.572(5)	0.84(20)%		+17/2
^{155m}Tm	$(1/2^+)$	44(4) s	4.613(8)	obs		+17/2
^{156}Hf	0^+	23(1) ms	6.026(3)	100%		+6
^{156m}Hf	1.952(6)**	8^+	7.978(7)	100%		+6
^{156}Lu	(2^-)	494(12) ms	5.596(3)	$\approx$ 100%		+7
^{156m}Lu	(10^+)	198(2) ms	5.596(3)+x	98^{+2}_{-9}%		+7
^{156}Yb	0^+	25.3(5) s	4.810(4)	9(2)%		+8
^{156}Tm	2^-	82(3) s	4.345(7)	0.064(10)%		+9
^{156}Er	0^+	19.5(10) m	3.481(25)	7(2)$\times10^{-6}$%		+10
^{157}Ta	$1/2^+$	10.1(4) ms	6.355(6)	96.6(12)%	p	+11/2
^{157}Hf	$(7/2^-)$	115(1) s	5.880(3)	94(5)%		+13/2
^{157}Lu	$(1/2^+, 3/2^+)$	6.8(5) s	5.108(3)	obs		+15/2
^{157m}Lu	$(11/2^-)$	4.75(10) s	5.140(3)	6(2)%		+15/2
^{157}Yb	$7/2^-$	37.9(9) s	4.622(6)	obs		+17/2
^{158}W	0^+	1.5(2) ms	6.612(3)	100 %		+5
^{158m}W	(8^+)	143(19) μs	8.503(8)	100 %		+5
^{158}Ta	(2^-)	46(4) ms	6.124(4)	$\approx$ 100%		+6
^{158m1}Ta	(9^+)	35(1) ms	6.265(10)	$\approx$ 100%		+6
^{158m2}Ta	(19^-)	6.1(1) μs	8.930(4)	1.4(2)%	γ	+6
^{158}Hf	0^+	2.85(7) s	5.405(3)	45(3)%		+7
^{158}Lu	(2^-)	10.6(3) s	4.790(5)	0.91(20)%		+8
^{158}Yb	0^+	1.65(20) m	4.170(7)	0.0021(12)%		+9

Table 3
Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{159m}Re	$11/2^-$	21(4) μs	6.76(55)#+x	7.5(35)%	p	+9/2
^{159}W	$(7/2^-)$	8.2(7) ms	6.451(4)	92^{+8}_{-23}%		+11/2
^{159}Ta	$(1/2^+)$	1.10(10) s	5.681(6)	34(5)%		+13/2
^{159m}Ta	$(11/2^-)$	514(9) ms	5.745(8)	55(1)%		+13/2
^{159}Hf	$(7/2^-)$	5.2(1) s	5.225(3)	12(1)%		+15/2
^{159}Lu		12.1(10) s	4.492(39)	<0.15(3)%		+17/2
^{160}Os	0^+	97^{+97}_{-32} μs	7.724(15)	100%		+4
^{160m}Os	(8^+)	41^{+15}_{-9} μs	9.18(10)	100%		+4
^{160}Re		611(7) μs	6.698(4)	11(1) %	p	+5
^{160}W	0^+	91(5) ms	6.066(5)	87(8)%		+6
^{160}Ta		1.7(2) s	5.451(5)	obs		+7
^{160m}Ta		1.55(4) s	5.451(5)+x	obs		+7
^{160}Hf	0^+	13.6(2) s	4.902(3)	0.7(2)%		+8
^{160}Lu		34.5(15) s	4.140(59)	$\leq 10^{-4}$%		+9
^{161}Os	$(7/2^-)$	640(60) μs	7.069(11)#	5.9(27)%		+9/2
^{161}Re	$1/2^+$	0.44(1) ms	6.162(15)	93.0(3)%	p	+11/2
^{161m}Re	$11/2^-$	14.8(3) ms	6.162(15)	93.0(3)%	p	+11/2
^{161}W		409(18) ms	5.923(4)	73(3)%		+13/2
^{161m}Ta	$(11/2^-)$	3157^{+74}_{-79} ms	5.332(37)	7(3)%		+15/2
^{161}Hf	$(7/2^-)$	18.7(5) s	4.718(7)	0.30(5)%		+17/2
^{162}Os	0^+	2.05(10) ms	6.768(3)	100 %		+5
^{162}Re	(2^-)	107(13) ms	6.240(5)	≈100%		+6
^{162}W	0^+	1.13(3) s	5.678(2)	44(2)%		+7
^{162m}Re	(9^+)	76(6) ms	6.412(9)	91(5)%	γ	+6
^{162}Ta		3.60(15) s	5.008(5)	0.074(13)%		+8
^{162}Hf	0^+	39.8(4) s	4.416(5)	0.008(1)%		+9
^{163}Os	$(7/2^-)$	$6.2^{+1.3}_{-0.9}$ms	6.673(7)	100%		+11/2
^{163}Re	$(1/2^+)$	390(72) ms	6.012(8)	32(3)%		+13/2
^{163m}Re	$(11/2^-)$	214(5) ms	6.127(9)	66(4)%		+13/2
^{163}W	$7/2^-$	2.7(1) s***	5.519(5)	14(2)%		+15/2
^{163}Ta		10.9(12) s	4.749(5)	<0.28(4)%		+17/2
^{164m}Ir	(9^+)	70(10) μs	6.97(10)#+x	4(2) %	p	+5
^{164}Os	0^+	21(1) ms	6.479(5)	96^{+4}_{-5}%		+6
^{164}Re		848^{+140}_{-105} ms	5.926(5)	obs		+7
^{164m}Re		864^{+150}_{-110} ms	5.926(5)+x	3(1)%		+7
^{164}W	0^+	6.0(3) s	5.278(2)	4.4(9)%		+8
^{165m}Ir	$(11/2^-)$	340(40) μs	7.003(71)#	12(2)%	p	+11/2
^{165}Pt	$(7/2^-)$	$0.26^{+0.26}_{-0.09}$ ms	7.453(14)#	100%		+9/2
^{165}Os	$(7/2^-)$	21(1) ms	6.335(6)	90(2)%		+13/2
^{165}Re	$(1/2^+)$	1.6(6) s	5.694(6)	14(8)%		+15/2
^{165m}Re	$(11/2^-)$	1.74(6) s	5.694(6)	14(8)%		+15/2
^{165}W	$(5/2^-)$	5.1(5) s	5.031(5)	< 1.5%		+17/2
^{166}Pt	0^+	260^{+100}_{-60} μs	7.292(7)	100 %		+5
^{166}Ir	(2^-)	10.5(22) ms	6.722(6)	93.1(29)%	p	+6
^{166m}Ir	(9^+)	15.1(9) ms	6.894(8)	98.24(58)%	p	+6
^{166}Os	0^+	214(6) ms	6.143(3)	84(4)%		+7
^{166}Re	(3^-)	2.4(2) s	5.663(4)	obs		+8
^{166}W	0^+	18.8(4) s	4.856(4)	0.6(2)%		+9
^{167}Pt		0.90(13) ms	7.160(60)	100%		+11/2
^{167}Ir	$(1/2^+)$	29.3(6) ms	6.505(3)	43(2)%	p	+13/2
^{167m}Ir	$(11/2^-)$	28.5(6) ms	6.620(5)	90(3)%	p	+13/2
^{167}Os	$(7/2^-)$	839(5) ms	5.978(5)	58(7)%		+15/2
^{167}Re		3.4(4) s	5.276(13)#	obs		+17/2
^{167m}Re		6.1(2) s	5.276(13)#+x	≈1%		+17/2
^{167}W	$(5/2^-)$	19.9(5) s	4.751(30)	<0.04(1)%		+19/2
^{168}Pt	0^+	2.04(16) ms	6.990(3)	≈ 100%		+6
^{168}Ir		155(40) ms	6.381(9)	obs		+7
^{168m}Ir		161(21) ms	6.381(9)+x	78(11)%		+7
^{168}Os	0^+	2.2(1) s	5.816(3)	43(3)%		+8
^{168}Re	(7^+)	4.4(1) s	5.063(13)	≈0.005%		+9
^{168}W	0^+	51(2) s	4.501(11)	$<4.1(6)\times10^{-3}$%		+10
^{169}Pt	$(7/2^-)$	7.0(2) ms	6.858(5)	≈ 100%		+13/2
^{169}Ir	$(1/2^+)$	3.53(4) s	6.141(4)	53(9)%		+15/2
^{169m}Ir	$(11/2^-)$	280(3) ms	6.294(24)	68(4)%		+15/2
^{169}Os	$(5/2^-)$	3.3(3) s	5.713(3)	13(2)%		+17/2

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Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{169}Re	(9/2$^-$)	8.1(3) s	5.014(13)	obs		+19/2
^{169m}Re	(1/2$^+$, 3/2$^+$)	16.3(8) s	5.101(21)	obs		+19/2
^{170}Hg	0$^+$	80^{+40}_{-4} μs	7.773(30)	100 %		+5
^{170}Au	(2$^-$)	286^{+50}_{-40} μs	7.177(15)	11(10)%	p	+6
^{170}Pt	0$^+$	13.9(2) ms	6.707(3)	≈ 100%		+7
^{170m}Au	(9$^+$)	617^{+50}_{-40} μs	7.459(18)	42(5)%	p	+6
^{170}Ir	(3$^-$)	870^{+180}_{-120} ms	5.955(5)	5.2(17)%		+8
^{170m}Ir	(8$^+$)	811(18) ms	5.955(5)+x	39(6)%		+8
^{170}Os	0$^+$	7.3(2) s	5.537(3)	9.4(6)%		+9
^{171}Hg		59^{+36}_{-16} μs	7.668(15)	100%		+11/2
^{171m}Au	(11/2$^-$)	1.09(3) ms	7.343(17)	60(4)%	p	+13/2
^{171}Pt	(7/2$^-$)	43(3) ms	6.607(3)	≈ 100%		+15/2
^{171}Ir	(1/2$^+$)	$3.2^{+1.7}_{-0.7}$ s	5.997(12)	15(2)%		+17/2
^{171m}Ir	(11/2$^-$)	1.24(4) s	5.997(12)+x	62(6)%		+17/2
^{171}Os	5/2$^-$	8.3(2) s	5.371(4)	1.8(3)%		+19/2
^{172}Hg	0$^+$	231(9) μs	7.524(6)	100%		+6
^{172}Au		22^{+6}_{-4} ms	6.923(10)	100%		+7
^{172m}Au		5(1) ms	6.923(10)+x	100%		+7
^{172}Pt	0$^+$	96(3) ms	6.463(4)	94(6)%		+8
^{172}Ir	(3$^-$, 4$^-$)	4.1(2) s	5.991(10)	2.0(2)%		+9
^{172m}Ir	(7$^+$)	1.89(5) s	5.991(10)+x	9.5(11)%		+9
^{172}Os	0$^+$	19.2(9) s	5.224(7)	1.2(2)%		+10
^{173}Hg	(7/2$^-$)	0.80(8) ms	7.378(4)	100%		+13/2
^{173}Au	(1/2$^+$)	26.3(12) ms	6.891(4)	94^{+6}_{-19} %		+15/2
^{173m}Au	(11/2$^-$)	12.2(1) ms	7.105(23)	92^{+8}_{-13} %		+15/2
^{173}Pt	(5/2$^-$)	382(2) ms	6.380(5)	86(6)%		+17/2
^{173}Ir	(3/2$^+$, 5/2$^+$)	8.3(3) s	5.716(9)	4(2)%		+19/2
^{173m}Ir	(11/2$^-$)	2.150(47) s	5.929(11)	11(1)%		+19/2
^{173}Os	(5/2$^-$)	22.4(9) s	5.055(6)	$0.020^{+0.010}_{-0.004}$%		+21/2
^{174}Hg	0$^+$	$1.9^{+0.4}_{-0.3}$ ms	7.233(6)	100%		+7
^{174}Au	(2$^-$)	120(20) ms	6.699(7)	90(6)%		+8
^{174m}Au	(9$^+$)	162(3) ms	6.699(7)+x	obs		+8
^{174}Pt	0$^+$	866(5) ms	6.183(3)	74(3)%		+9
^{174}Ir	(3$^+$)	7.8(6) s	5.693(16)	≈0.4%		+10
^{174m}Ir	(7$^+$)	5.0(2) s	5.822(23)	2.5(3)%		+10
^{174}Os	0$^+$	44(4) s	4.871(10)	$0.020^{+0.010}_{-0.004}$%		+11
^{174}Hf	0$^+$	2.0(4)×10^{15} y	2.494(2)	100%		+15
^{175}Hg	(7/2$^-$)	10.2(4) ms	7.008(4)	≈ 100%		+15/2
^{175}Au	(1/2$^+$)	200(3) ms	6.583(3)	90(7)%		+17/2
^{175m}Au	(11/2$^-$)	137(1) ms	6.583(3)+x	90(3)%		+17/2
^{175}Pt	(7/2$^-$)	2.43(4) s	6.164(4)	64.5(13)%		+19/2
^{175}Ir	(5/2$^-$)	8(1) s	5.710(5)	0.85(22)%		+21/2
^{175m}Ir	(9/2$^-$)	4.9(4) s	5.879(9)	≈ 70%		+21/2
^{176}Hg	0$^+$	21.3(8) ms	6.897(6)	98(2)%		+8
^{176}Au	(2$^-$,3$^-$)	1.046(11) s	6.433(7)+x	58(5)%		+9
^{176m}Au	(7$^+$, 8$^+$, 9$^+$)	1.36(2) s	6.433(7)+x	29(3)%		+9
^{176}Pt	0$^+$	6.33(15) s	5.885(2)	38(3)%		+10
^{176}Ir	5$^+$	8(1) s	5.260(36)	2.4(4)%		+11
^{177}Tl	(1/2$^+$)	18(5) ms	7.067(7)	73(13)%	p	+15/2
^{177m}Tl	(11/2$^-$)	230(40) μs	7.874(19)	49(8)%	p	+15/2
^{177}Hg	(7/2$^-$)	127(2) ms	6.731(5)	100%		+17/2
^{177}Au	(1/2$^+$)	1.486(20) s	6.298(4)	54(5)%		+19/2
^{177m}Au	(11/2$^-$)	1.186(12) s	6.298(4)	56(8)%		+19/2
^{177}Pt	5/2$^-$	9.8(4) s	5.643(3)	5.7(5)%		+21/2
^{177}Ir	5/2$^-$	26(2) s	5.082(34)	0.06(1)%		+23/2
^{178}Pb	0$^+$	180^{+130}_{-50} μs	7.789(13)	100%		+7
^{178}Tl	(4$^-$, 5$^-$)	252(20) ms	7.020(10)	62(2)%		+8
^{178}Hg	0$^+$	266(3) ms	6.577(3)	89(4)%		+9
^{178}Au	(2$^+$, 3$^-$)	3.4(5) s	6.058(5)	16(1)%		+10
^{178m}Au	(7$^+$, 8$^-$)	2.7(5) s	6.247(15)	18(1)%		+10
^{178}Pt	0$^+$	20.8(5) s	5.573(2)	7.5(3)%		+11
^{179}Pb	(9/2$^-$)	2.7(2) ms	7.516(4)	≈ 100%		+15/2
^{179}Tl	(1/2$^+$)	426(10) ms	6.709(3)	60(20)%		+17/2
^{179m}Tl	(11/2$^-$)	1.42(3) ms	6.709(3)	100%		+17/2
^{179}Hg	(7/2$^-$)	1.06(4) s	6.430(4)	75(4)%	β_p	+19/2

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^{179}Au	1/2$^+$	7.3(3) s	5.981(5)	22.0(9)%		+21/2
^{179}Pt	1/2$^-$	21.2(4) s	5.307(7)	0.24(4)%		+23/2
^{180}Pb	0$^+$	4.1(3) ms	7.419(5)	≈100%		+8
^{180}Tl	(5$^-$)		6.706(62)	6(4)%		+9
^{180}Hg	0$^+$	2.56(2) s	6.258(2)	48(2)%		+10
^{180}Au	(1$^+$)	8.1(3) s	5.831(7)	0.58(10)%		+11
^{180}Pt	0$^+$	58(3) s	5.276(5)	0.52(5)%		+12
^{180}W	0$^+$	1.8(2) $\times 10^{18}$ y	2.515(1)	100%		+16
^{181}Pb	(9/2$^-$)	39.0(9) ms	7.240(7)	≈100%		+17/2
^{181}Tl	(1/2$^+$)	2.9(1) s	6.322(4)	8.6(6)%		+19/2
^{181m}Tl	(9/2$^-$)	1.40(3) ms	7.158(4)	0.40(6)%		+19/2
^{181}Hg	1/2$^-$	3.6(1) s	6.284(4)	26.3(41)%	β_p, β_α	+21/2
^{181}Au	(3/2$^-$)	14.5(4) s	5.751(3)	2.7(5)%		+23/2
^{181}Pt	1/2$^-$	51(5) s	5.150(5)	0.074(10)%		+25/2
^{182}Pb	0$^+$	55(5) ms	7.066(6)	≈100%		+9
^{182}Tl	low spin	1.9(1) s	6.551(6)	>0.49%		+10
^{182}Hg	0$^+$	10.83(6) s	5.996(5)	15.2(8)%		+11
^{182}Au	(2$^+$)	15.6(4) s	5.525(4)	0.13(5)%		+12
^{182}Pt	0$^+$	2.2(1) m	4.951(5)	0.038(2)%		+13
^{183}Pb	(3/2$^-$)	535(30) ms	6.928(7)	obs		+19/2
^{183m}Pb	(13/2+)	415(20) ms	7.007(9)	obs		+19/2
^{183m}Tl	(9/2$^-$)	53.3(3) ms	6.605(9)	1.45(42)%		+21/2
^{183}Hg	1/2$^-$	8.9(2) s	6.039(4)	23.7(7)%	β_p	+23/2
^{183}Au	(5/2$^-$)	44.6(19) s	5.465(3)	0.8(2)%		+25/2
^{183}Pt	1/2$^-$	6.5(10) m	4.822(9)	9.6(5)$\times 10^{-3}$%		+27/2
^{195m}Po	(13/2$^+$)	1.92(2) s	6.900(10)	93(7)%		+27/2
^{184}Bi		13(2) ms	8.22(10)#+y	≈ 100%		+9
^{184m}Bi		6.6(15) ms	8.22(10)#+x	≈ 100%		+9
^{184}Pb	0$^+$	480(25) ms	6.774(3)	80(15)%		+10
^{184}Tl	(2$^-$)	9.5(2) s	6.317(9)+y	1.22(30)%		+11
^{184m1}Tl	(7$^+$)	11(1) s	6.317(9)+x	0.047(6)%		+11
^{184m2}Tl	(10$^-$)	47.1(7) ms	6.823(9)+x	0.089(19)%		+11
^{184}Hg	0$^+$	30.6(3) s	5.660(4)	1.26(20)%		+12
^{184m}Au	2$^+$	46.4(10) s	5.305(5)	0.013(3)%		+13
^{184}Pt	0$^+$	17.3(2) m	4.599(8)	1.7(7)$\times 10^{-3}$%		+27/2
^{184}Os	0$^+$	1.12(23)$\times 10^{13}$ y	2.959(2)	100%		+16
^{185}Bi	(1/2$^+$)	2.8^{+23}_{-10} μs	8.207(15)	9(2)%	p	+19/2
^{185}Pb	(3/2$^-$)	4.3(2) s	6.695(5)	42(25)%		+21/2
^{185m}Pb	(13/2$^+$)	6.3(4) s	6.695(5)+x	50(25)%		+21/2
^{185m}Tl	(9/2$^-$)	1.7(2) s	6.143(5)	obs		+23/2
^{185}Hg	1/2$^-$	49.1(10) s	5.773(4)	≈6.04%		+25/2
^{185m}Hg	13/2$^+$	21.6(15) s	5.877(4)	≈0.030%		+25/2
^{185}Au	5/2$^-$	4.2(1) m	5.180(5)	0.26(6)%		+27/2
^{186}Po	0$^+$	28^{+16}_{-6} μs	8.501(14)	100%		+9
^{186}Bi	(3$^+$)	14.8(8) ms	7.757(12)	≈100%	β_F	+10
^{186m}Bi	(10$^-$)	9.8(4) ms	7.757(12)+x	≈100%	β_F	+10
^{186}Pb	0$^+$	4.79(5) s	6.471(5)	38(9)%		+11
^{186}Tl	(2$^-$)	$3.4^{+0.5}_{-0.4}$ s	5.996(26)	obs		+12
^{186m}Tl	(7$^+$)	27.5(10) s	6.073(63)	0.006(2)%		+12
^{186}Hg	0$^+$	1.41(8) m	5.204(10)	0.016(5)%		+13
^{186}Au	3$^-$	10.7(5) m	4.912(14)	8(2)$\times 10^{-4}$%		+14
^{186}Pt	0$^+$	2.10(5) h	4.320(18)	≈ 1.4$\times 10^{-4}$%		+15
^{186}Os	0$^+$	2.0(11)$\times 10^{+15}$ y	2.821(1)	100%		+17
^{187}Po	(1/2$^-$, 5/2$^-$)	1.40(25) ms	7.979(15)	100%		+19/2
^{187}Bi	(1/2$^+$)	38(2) ms	7.779(4)	≈100%		+21/2
^{187m}Bi	(9/2$^-$)	370(20) μs	7.891(12)	≈100%		+21/2
^{187}Pb	(3/2$^-$)	15.2(3) s	6.393(6)	7(2)%		+23/2
^{187m}Pb	(13/2$^+$)	17.9(2) s	6.413(18)	12(2)%		+23/2
^{187m}Tl	(9/2$^-$)	15.60(12) s	5.655(11)	0.15(5)%		+25/2
^{187}Hg	3/2$^-$	2.2(3) m	5.145(20)	>3.7$\times 10^{-3}$%		+27/2
^{187}Au	1/2$^+$	8.3(3) m	4.748(30)	≈ 2$\times 10^{-3}$%		+29/2
^{188}Po	0$^+$	270(30) μs	8.082(15)	100%		+10
^{188}Bi	(3$^+$)	60(3) ms	7.264(5)	≈100%	β_F	+11
^{188m}Bi	(10$^-$)	265(10) ms	7.264(5)+x	≈100%	β_F	+11
^{188}Pb	0$^+$	25.5(1) s	6.109(3)	8.5(5)%		+12

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^{188}Hg	0^+	3.25(15) m	4.709(15)	$\approx 3.7\times10^{-5}$%		+27/2
^{189}Po	$(5/2^-)$	3.5(5) ms	7.694(15)	$\approx$ 100%		+21/2
^{189}Bi	$(9/2^-)$	688(3) ms	7.268(3)	obs		+23/2
^{189m}Bi	$(1/2^+)$	5.0(1) ms	7.450(9)	83(5)%		+23/2
^{189}Pb	$(3/2^-)$	39(8) s	5.915(4)	$\leq$0.4%		+25/2
^{189m}Pb	$(13/2^+)$	50(3) s	5.955(4)	$\approx$0.4%		+25/2
^{189}Hg	$3/2^-$	7.9(2) m	4.637(41)	$<3\times10^{-7}$%		+29/2
^{190}At	(10^-)	$1.0^{+1.4}_{-0.4}$ ms	7.917(20)-x	100%		+10
^{190}Po	0^+	2.45(5) ms	7.693(7)	100%		+11
^{190}Bi	(3^+)	6.3(1) s	6.862(3)	90^{+10}_{-30}%	β_F	+12
^{190m}Bi	(10^-)	6.2(1) s	7.053(65)	70(9)%	β_F	+12
^{190}Pb	0^+	71(1) s	5.698(5)	0.24(7)%		+13
^{190}Hg	0^+	19.9(4) m	4.069(27)	$< 3.4\times10^{-7}$%		+15
^{190}Pt	0^+	$6.65(28)\times10^{11}$ y	3.269(1)	100%		+17
^{191}At	$(1/2^+)$	$1.7^{+1.1}_{-0.5}$ ms	7.822(14)	100%		+21/2
^{191m}At	$(7/2^-)$	$2.1^{+0.4}_{-0.3}$ ms	7.822(14)	100%		+21/2
^{191}Po	$(3/2^-)$	22(2) ms	7.493(5)	$\approx$100%		+23/2
^{191m}Po	$(13/2^+)$	93(3) ms	7.556(25)	$\approx$100%		+23/2
^{191}Bi	$(9/2^-)$	12.1(4) s	6.780(3)	51(10)%		+25/2
^{191m}Bi	$(1/2^+)$	116(5) ms	7.014(7)	68(5)%		+25/2
^{191}Pb	$(3/2^-)$	1.3(3) m	5.402(14)	0.051(5)%		+27/2
^{192}At		11.5(6) ms	7.696(26)	$\approx$100%	β_F	+11
^{192m}At	$(9^-, 10^-)$	88(6) ms	7.696(26)+x	$\approx$100%	β_F	+11
^{192}Po	0^+	32.5(10) ms	7.320(3)	$\approx$100%		+12
^{192}Bi	(3^+)	34.6(7) s	6.377(4)	12(5)%		+13
^{192m}Bi	(10^-)	39.7(4) s	6.517(30)	10(3)%		+13
^{192}Pb	0^+	3.5(1) m	5.222(5)	$6.0(5)\times10^{-3}$%		+27/2
^{193}Rn		1.15(27) ms	8.040(12)	100%		+21/2
^{193}At	$(1/2^+)$	28^{+5}_{-4} ms	7.572(7)	$\approx$100%		+23/2
^{193m1}At	$(7/2^-)$	21(5) ms	7.582(9)	$\approx$100%		+23/2
^{193m2}At	$(13/2^+)$	27^{+4}_{-3} ms	7.616(10)	24(10)%		+23/2
^{193}Po	$(3/2^-)$	420(40) ms	7.094(4)	$\approx$ 100%		+25/2
^{193m}Po	$(13/2^+)$	240(10) ms	7.094(4)	$\approx$ 100%		+25/2
^{193}Bi	$(9/2^-)$	67(3) s	6.307(5)	2.2(5)%		+27/2
^{193m}Bi	$(1/2^+)$	3.4(2) s	6.614(9)	75(25)%		+27/2
^{194}Rn	0^+	780(160)μs	7.862(10)	100%		+11
^{194}At	(2^-)	253(10) ms	7.454(11)	$\approx$ 100%	β_F	+12
^{194m}At	$(9^-, 10^-)$	310(8) ms	7.510(24)	$\approx$ 100%	β_F	+12
^{194}Po	0^+	392(4) ms	6.987(3)	93(7)%		+13
^{194}Bi	(3^+)	95(3) s	5.918(5)	0.46(25)%		+14
^{194m}Bi	(10^-)	114(4) s	6.079(9)	0.20(7)%		+14
^{194}Pb	0^+	12.0(5) m	4.738(17)	$7.3(29)\times10^{-6}$%		+15
^{195}Rn	$(3/2^-)$	6^{+3}_{-2} ms	7.694(11)	100%		+23/2
^{195m}Rn	$(13/2^+)$	5^{+3}_{-2} ms	7.776(28)	100%		+23/2
^{195}At	$(1/2^+)$	309(20) ms	7.344(6)	$\approx$100%		+25/2
^{195m}At	$(7/2^-)$	144(3) ms	7.377(10)	88(4)%		+25/2
^{195}Po	$(3/2^-)$	4.64(9) s	6.750(3)	94(4)%		+27/2
^{195}Bi	$(9/2^-)$	187(5) s	5.832(5)	0.01 - 0.05%		+29/2
^{195m}Bi	$(1/2^+)$	87(1) s	6.233(9)	16 - 49%		+29/2
^{196}Rn	0^+	$4.4^{+1.3}_{-0.9}$ ms	7.617(9)	100%		+12
^{196}At	(3^+)	371(5) ms	7.196(3)	97.5(3)%	β_F	+13
^{196}Po	0^+	5.8(2) s	6.658(2)	94(5)%		+27/2
^{196}Bi	(3^+)	308(12) s	5.438(40)	$1.15(34)\times10^{-3}$ %		+15
^{196m}Bi	(10^-)	240(3) s	5.694(41)	$3.8(10)\times10^{-4}$ %		+15
^{197}Fr	$(7/2^-)$	$0.6^{+3.0}_{-0.3}$ ms	7.896(53)	100%		+23/2
^{197}Rn	$(3/2^-)$	53^{+7}_{-5} ms	7.411(7)	$\approx$ 100%		+25/2
^{197m}Rn	$(13/2^+)$	25^{+3}_{-2} ms	7.411(7)	$\approx$ 100%		+25/2
^{197}At	$(9/2^-)$	388(6) ms	7.104(3)	$\approx$ 100%		+27/2
^{197m}At	$(1/2^+)$	2.0(2) s	7.152(10)	$\approx$ 100%		+27/2
^{197}Po	$(3/2^-)$	53(1) s	6.411(3)	71(3)%		+29/2
^{197m}Po	$(13/2^+)$	25.8(1) s	6.610(11)	56(2)%		+29/2
^{197m}Bi	$(1/2^+)$	309(33) s	5.365(11)+x	15-95 %		+31/2
^{198}Fr	(2^-)	15(3) ms	7.770(15)**	100%		+12
^{198m1}Fr	$(6^+, 7^+)$	16^{+13}_{-5} ms	7.770(15)+x	100%		+12
^{198m2}Fr	h.s.	1.1(7) ms	7.770(15)+y	100%		+12

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Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{198}Rn	0^+	65(2) ms	7.349(4)	≈100%		+13
^{198}At	(3^+)	4.47(5) s	6.889(2)	>94%		+14
^{198m}At	(10^-)	1.25(5) s	7.154(4)	>86%		+14
^{198}Po	0^+	107(2) s	6.310(1)	58(2)%		+15
^{199}Fr	$(1/2^+)$	5^{+7}_{-2} ms	7.817(10)	100%		+25/2
^{199m1}Fr	$(7/2^-)$	7^{+3}_{-2} ms	7.874(28)	100%		+25/2
^{199m2}Fr	$(13/2^+)$	$1.6^{+1.6}_{-0.6}$ ms	≤8.117(10)	100%		+25/2
^{199}Rn	$(3/2^-)$	620(25) ms	7.132(4)	≈ 100%		+27/2
^{199m}Rn	$(13/2^+)$	316(16) ms	7.355(13)	≈ 100%		+27/2
^{199}At	$(9/2^-)$	6.92(13) s	6.830(1)	92^{+3}_{-8}%		+29/2
^{199m}At	$(1/2^+)$	0.31(8) s	≈7.017(1)	≈ 1%		+29/2
^{199}Po	$(3/2^-)$	312(6) s	6.074(2)	7.5(3)%		+31/2
^{199m}Po	$(13/2^+)$	252(6) s	6.386(3)	24.7(9)%		+31/2
^{200}Fr	(3^+)	48(4) ms	7.622(4)	>97.5%	β_F	+13
^{200}Rn	0^+	1.06(2) s	7.043(2)	86^{+14}_{-4}%		+27/2
^{200}At	(3^+)	43(1) s	6.596(1)	46(2)%		+15
^{200m1}At	(7^+)	47(1) s	6.709(2)	43(7)%		+15
^{200m2}At	(10^-)	4.8(3) s	6.852(6)	10.5(3)%		+15
^{200}Po	0^+	11.6(1) m	5.982(2)	11.3(3)%		+16
^{201}Ra	$(3/2^-)$	8^{+40}_{-4} ms	8.002(12)	100%		+25/2
^{201m}Ra	$(13/2^+)$	$1.6^{+7.7}_{-0.7}$ ms	8.362(32)	100%		+25/2
^{201}Fr	$(9/2^-)$	63(3) ms	7.519(4)	≈ 100%		+27/2
^{201m}Fr	$(1/2^+)$	10^{+12}_{-3} ms	7.649(14)	100%		+27/2
^{201}Rn	$(3/2^-)$	7.0(4) s	6.861(2)	≈ 80%		+29/2
^{201m}Rn	$13/2^{(+)}$	3.8(4) s	7.109(12)	≈ 90%		+29/2
^{201}At	$9/2^-$	85(2) s	6.473(2)	61(3)%		+31/2
^{201}Po	$3/2^-$	15.8(3) m	5.799(2)	1.15(1)%		+33/2
^{201m}Po	$13/2^+$	9(2) m	5.799(2)	2.9(2)%		+33/2
^{202}Ra	0^+	$3.8^{+1.3}_{-0.8}$ ms	7.880(7)	100%		+13
^{202}Fr	(3^+)	372(10) ms	7.385(4)	97.6(2)%	β_F	+14
^{202m}Fr	(10^-)	286(13) ms	7.638(9)	97.6(2)%	β_F	+14
^{202}Rn	0^+	9.7(2) s	6.774(2)	78(8)%		+15
^{202}At	(3^+)	184(1) s	6.354(1)	9(1)%		+16
^{202m1}At	(7^+)	182(2) s	6.354(1)	8.6(11)%		+16
^{202m2}At	(10^-)	3.46(5) s	6.354(1)	4.6(11)%		+16
^{202}Po	0^+	45.4(2) m	5.701(2)	1.93(6)%		+17
^{203}Ac		56^{+269}_{-25} μs	8.382(16)	100%		+25/2
^{203}Ra	$(3/2^-)$	31^{+17}_{-9} ms	7.736(6)	≈ 100%		+27/2
^{203m}Ra	$(13/2^+)$	24^{+6}_{-4} ms	7.986(19)	≈ 100%		+27/2
^{203}Fr	$(9/2^-)$	550(7) ms	7.275(4)	≈ 100%		+29/2
^{203m}Fr	$(1/2^+)$	43(4) ms	≈7.635(4)	20(4) %		+29/2
^{203}Rn	$(3/2^-)$	44(2) s	6.630(2)	66(9)%		+31/2
^{203m}Rn	$(13/2^+)$	26.7(5) s	6.994(3)	78(7)%		+31/2
^{203}At	$9/2^-$	7.4(3) m	6.210(1)	27(3)%		+33/2
^{203}Po	$5/2^-$	34.8(5) m	5.496(5)	0.11(2)%		+35/2
^{204}Ac	(3^+)	75^{+23}_{-15} ms	8.107(15)	≈100%		+13
^{204}Ra	0^+	58^{+10}_{-7} ms	7.637(7)	≈ 100%		+27/2
^{204}Fr	(3^+)	1.99(12) s	7.170(2)	96(2)%		+15
^{204m1}Fr	(7^+)	2.3(3) s	7.219(7)	90(2)%		+15
^{204m2}Fr	(10^-)	2.19(41) s	7.359(7)	74(8)%		+15
^{204}Rn	0^+	75(1) s	6.547(2)	72(1)%		+16
^{204}At	7^+	9.1(1) m	6.070(1)	4.52(4)%		+17
^{204}Po	0^+	3.52(1) h	5.485(1)	0.660(7)%		+18
^{205}Ac	$(9/2^-)$	20^{+97}_{-9} ms	8.093(59)	≈ 100%		+27/2
^{205}Ra	$(3/2^-)$	210^{+41}_{-26} ms	7.764(37)	≈ 100%		+29/2
^{205m}Ra	$13/2^{(+)}$	182^{+38}_{-24} ms	7.764(37)	≈ 100%		+29/2
^{205}Fr	$9/2^-$	3.80(3) s	7.055(2)	98.5(2)%		+31/2
^{205}Rn	$5/2^-$	170(4) s	6.386(2)	26(1)%		+33/2
^{205}At	$9/2^-$	26.0(5) m	6.020(2)	15.1(16)%		+35/2
^{205}Po	$5/2^-$	5.79(2) h	5.325(10)	0.074(16)%		+37/2
^{206}Ac	(3^+)	22^{+9}_{-5} ms	7.958(65)	≈ 100%		+14
^{206m}Ac	(10^-)	33^{+22}_{-9} ms	8.156(71)	≈ 100%		+14
^{206}Ra	0^+	244(13) ms	7.415(4)	≈ 100%		+15
^{206}Fr	$3^{(+)}$	15.9(3) s	6.923(3)	88.4(33)%		+16

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^{206m1}Fr	7$(^{+})$	15.9(3) s	6.923(3)+x	84.7(15)%		+16
^{206m2}Fr	10$(^{-})$	0.7(1) s	7.436(8)+x	13(2)%		+16
^{206}Rn	0^{+}	6.29(10) m	6.384(2)	62(3)%		+17
^{206}At	(5^{+})	29.3(4) m	5.887(5)	0.87(8)%		+18
^{206}Po	0^{+}	8.8(1) d	5.327(1)	5.2(4)%		+19
^{207}Th		$9.7^{+46.6}_{-4.4}$ ms	8.328(21)	≈ 100%		+27/2
^{207}Ac	$(9/2^{-})$	27^{+11}_{-6} ms	7.855(18)	≈ 100%		+29/2
^{207}Ra	$(3/2^{-})$	1.2(2) s	7.272(5)	obs		+31/2
^{207m}Ra	$(13/2^{+})$	55(7) ms	7.781(11)	26(20)%		+31/2
^{207}Fr	$9/2^{-}$	14.9(1) s	6.901(3)**	95(3)%		+33/2
^{207}Rn	$5/2^{-}$	555(10) s	6.251(2)	23(2)%		+35/2
^{207}At	$9/2^{-}$	1.80(3) h	5.872(3)	obs		+37/2
^{207}Po	$5/2^{-}$	350.3(41) m	5.216(3)	0.0210(18)%		+39/2
^{208}Th	0^{+}	$1.7^{+1.7}_{-0.6}$ ms	8.202(31)	100%		+14
^{208}Ac	(3^{+})	171(13) ms	7.714(10)	≈100%		+15
^{208m}Ac	(10^{-})	37.1(37) ms	8.089(20)	≈100%		+15
^{208}Ra	0^{+}	1.2(2) s	7.273(5)	obs		+16
^{208}Fr	7^{+}	58.6(3) s	6.785(25)	80(3)%		+17
^{208}Rn	0^{+}	1461(8) s	6.261(2)	63(3)%		+18
^{208}At	6^{+}	1.63(3) h	5.751(2)	0.56(5)%		+19
^{208}Po	0^{+}	2.888 y	5.216(1)	99.9958(4)%		+20
^{209m}Th	$(13/2^{+})$	$2.5^{+1.7}_{-0.7}$ ms	8.17(11)+x	100%		+29/2
^{209}Ac	$(9/2^{-})$	89^{+12}_{-9} ms	7.730(55)	≈ 100%		+31/2
^{209}Ra	$5/2^{-}$	4.9(2) s	7.143(3)	≈ 100%		+33/2
^{209}Fr	$9/2^{-}$	51.3(8) s	6.777(4)	89(3)%		+35/2
^{209}Rn	$5/2^{-}$	28.5(10) m	6.155(2)	17(2)%		+37/2
^{209}At	$9/2^{-}$	5.41(5) h	5.757(2)	3.6(7)%		+39/2
^{209}Po	$1/2^{-}$	128.7(3) y	4.979(1)	99.55(1)%		+41/2
^{209}Bi	$9/2^{-}$	$2.01(8)\times10^{19}$ y	3.137(1)	100%		+43/2
^{210}Th	0^{+}	15.1(27) ms	8.069(6)	≈ 100%		+15
^{210}Ac		350(50) ms	7.586(57)	≈ 100%		+16
^{210}Ra	0^{+}	3.7(2) s	7.151(3)	≈ 100%		+17
^{210}Fr	6^{+}	3.18(6) m	6.671(5)	71(4)%		+18
^{210}Rn	0^{+}	144(6) m	6.159(2)	96(1)%		+19
^{210}At	(5^{+})	8.440(79) h	5.631(1)	0.18(2)%		+20
^{210}Po	0^{+}	138.3787(16) d	5.408	100%		+21
^{210}Bi	1^{-}	5.013(5) d	5.036(1)	$1.32(10)\times10^{-4}$%		+22
^{210m}Bi	9^{-}	$3.04(6)\times10^{6}$ y	5.307(1)	100%		+22
^{210}Pb(RaD)	0^{+}	22.23(12) y	3.792(20)	$1.9(3)\times10^{-6}$%		+23
^{211}Pa	$(9/2^{-})$	$3.8^{+4.6}_{-1.4}$ ms	8.481(41)	100 %		+29/2
^{211}Th	$(3/2^{-})$	36^{+13}_{-6} ms	7.941(10)	≈ 100%		+31/2
^{211m}Th	$(13/2^{+})$	83(8) μs	8.706(66)	4(3)%		+31/2
^{211}Ac	$(9/2^{-})$	229(25) ms	7.624(6)	≈ 100%		+33/2
^{211}Ra	$5/2^{-}$	13(2) s	7.042(3)	≈ 100%		+35/2
^{211}Fr	$9/2^{-}$	3.10(2) m	6.662(3)	87(3)%		+37/2
^{211}Rn	$1/2^{-}$	14.6(2) h	5.965(1)	26(1)%		+39/2
^{211}At	$9/2^{-}$	7.214(7) h	5.982(1)	41.80(8)%		+41/2
^{211}Po	$9/2^{+}$	516(3) ms	7.595(1)	≈ 100%		+43/2
^{211m}Po	$(25/2^{+})$	25.2(5) s	9.048(10)	99.984(4)%		+43/2
^{211}Bi(AcC)	$9/2^{-}$	2.13(2) m	6.750(1)	99.72(1)%		+45/2
^{212}Pa		$4.5^{+2.7}_{-1.3}$ ms	8.411(59)	100%		+15
^{212}Th	0^{+}	31.7(13) ms	7.958(5)	≈ 100%		+16
^{212}Ac	(7^{+})	896(35) ms	7.540(24)	≈ 100%		+17
^{212}Ra	0^{+}	13.0(2) s	7.032(2)	≈ 94%		+18
^{212}Fr	5^{+}	20.3(3) m	6.529(2)	44(4)%		+19
^{212}Rn	0^{+}	24.8(5) m	6.385(3)	100%		+20
^{212}At	(1^{-})	314.5(21) ms	7.817(1)	100%		+21
^{212m}At	(9^{-})	112.6(9) ms	8.046(3)	≈ 100%		+21
^{212}Po (ThC')	0^{+}	294.965(178) ns	8.9542(1)	100%		+22
^{212m1}Po	(8^{+})	17.1(2) ns	10.4306(2)	≈42%		+22
^{212m2}Po	(18^{+})	45.1(6) s	11.884(10)	99.93(2)%		+22
^{212}Bi(ThC)	1^{-}	60.600(43) m	6.207	35.94(3) %		+23
^{212m}Bi	(9^{-})	25.0(2) m	6.446(30)	67(1)%	$\beta^{-}\ \alpha$	+23
^{213}Pa	$(9/2^{-})$	$5.1^{+3.3}_{-1.2}$ ms	8.384(12)	100%		+31/2
^{213}Th	$5/2^{-}$	86(10) ms	7.837(7)	100%		+33/2

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^{213}Ac	9/2$^-$	731(17) ms	7.498(4)	$\approx$ 100%		+35/2
^{213}Ra	1/2$^-$	2.73(5) m	6.862(2)	87(2)%		+37/2
^{213m}Ra	17/2$^-$	2.20(5) ms	8.632(5)	0.6(4)%	γ	+37/2
^{213}Fr	9/2$^-$	34.14(6) s	6.905(1)	99.45(3)%		+39/2
^{213}Rn	(9/2$^+$)	19.5(1) ms	8.245(3)	$\approx$ 100%		+41/2
^{213}At	9/2$^-$	110(20) ns	9.254(5)	100%		+43/2
^{213}Po	9/2$^+$	3.6984(6) μs	8.536(3)	100%		+45/2
^{213}Bi	9/2$^-$	45.61(4) m	5.988(3)	2.140(10)%		+47/2
^{214}U	0$^+$	520$^{+950}_{-210}$ μs	8.696(18)	100%		+15
^{214}Pa		17(3) ms	7.586(57)	$\approx$ 100%		+16
^{214}Th	0$^+$	113$^{+11}_{-9}$ ms	7.827(5)	100%		+17
^{214}Ac	5$^+$	8.2(2) s	7.352(2)	89(3)%		+18
^{214}Ra	0$^+$	2.47(2) s	7.273(3)	$\approx$100%		+19
^{214m}Ra	8$^+$	68.6(20) μs	9.138(3)	0.09(7)%	γ	+19
^{214}Fr	(1$^-$)	5.0(2) ms	8.589(4)	100%		+20
^{214m}Fr	(8$^-$)	3.35(5) ms	8.710(8)	100%		+20
^{214}Rn	0$^+$	259(3) ns	9.208(9)	100%		+21
^{214m1}Rn	6$^+$	1.0(3) ns	10.681(9)	obs		+21
^{214m2}Rn	8$^+$	4.8(3) ns	10.765	4.3(7)%		+21
^{214}At	(2$^-$)	558(10) ns	8.988(4)	100%		+22
^{214m1}At		265(30) ns	9.047(10)	$\approx$ 100%		+22
^{214m2}At	(9$^-$)	760(15) ns	9.221(7)	$\approx$ 100%		+22
^{214}Po(RaC')	0$^+$	163.45(4) μs	7.834(0)	100%		+23
^{214}Bi	1$^-$	19.71(2) m	5.621(3)	0.0210(13)%	β^-_α	+24
^{215}U		0.73$^{+1.33}_{-0.29}$ ms	8.588(30)	100%		+31/2
^{215}Pa	(9/2$^-$)	14(2) ms	8.241(7)	100%		+33/2
^{215}Th	(1/2$^-$)	12(2) s	7.665(4)	$\approx$ 100%		+35/2
^{215}Ac	(9/2$^-$)	170(10) ms	7.746(3)	99.91(2)%		+37/2
^{215}Ra	(9/2$^+$)	1.67(1) ms	8.862(2)	100%		+39/2
^{215}Fr	9/2$^-$	86(5) ns	9.540(7)	100%		+41/2
^{215m1}Fr	(13/2$^+$)		10.375(7)	3.8(15)%		+41/2
^{215m2}Fr	(15/2$^-$)	30(8) ns	10.686(7)	0.8(1)%		+41/2
^{215m3}Fr	(19/2$^-$)	30(5) ns	10.986(7)	4.1(3)%		+41/2
^{215m4}Fr	(23/2$^-$)	30(5) ns	11.119(7)	3.6(3)%		+41/2
^{215}Rn	9/2$^+$	2.3(1) μs	8.839(6)	100%		+43/2
^{215}At	9/2$^-$	36.3(9) μs	8.178(4)	100%		+45/2
^{215}Po(AcA)	9/2$^+$	1.780(4) ms	7.526(1)	99.99977(2)%		+47/2
^{216}U	0$^+$	2.25$^{+0.63}_{0.40}$ ms	8.531(26)	100%		+16
^{216m}U	8$^+$	0.89$^{+0.27}_{0.17}$ ms	10.737(35)	100%		+16
^{216}Pa		105(12) ms	8.099(11)	$\approx$ 100%		+17
^{216}Th	0$^+$	26.3(2) ms	8.072(4)	100%		+18
^{216m}Th	8$^+$	140(5) μs	10.117(10)	2.8(4)%	γ	+18
^{216}Ac	1$^-$	443(7) μs	9.241(3)	100%		+19
^{216}Ra	0$^+$	182(10) ns	9.526(7)	100%		+20
^{216}Fr	(1$^-$)	0.7(2) μs	9.174(3)	100%		+21
^{216m1}Fr	(3$^-$)	71(5) ns	9.307(3)	>50%		+21
^{216m2}Fr	(9$^-$)	850(30) ns	9.393(6)	100%		+21
^{216}Rn	0$^+$	29(4) μs	8.198(6)	100%		+22
^{216}At	1$^-$	300(30) μs	7.950(3)	100%		+23
^{216m1}At	(4$^-$)		7.998(24)	obs		+23
^{216m2}At	(9$^-$)		8.349(30)	obs		+23
^{216}Po	0$^+$	145(2) ms	6.906(1)	100%		+24
^{217}U		15.6$^{+21.3}_{-5.7}$ ms	8.426(80)	100%		+33/2
^{217}Pa	9/2$^-$	3.6(2) ms	8.489(4)	100%		+35/2
^{217m}Pa	29/2$^+$	1.08(3) ms	10.373(4)	100%		+35/2
^{217}Th	(9/2$^+$)	247(2) μs	9.435(4)	100%		+37/2
^{217}Ac	9/2$^-$	69(4) ns	9.832(10)	100%		+39/2
^{217m1}Ac	(15/2$^-$, 17/2$^-$)	<4 ns	10.979(10)	0.27(4)%	γ	+39/2
^{217m2}Ac	(19/2$^-$, 21/2$^-$)	8(2) ns	11.346(32)	0.46(13)%	γ	+39/2
^{217m3}Ac	(29/2)$^+$	740(40) ns	11.844(10)	4.51(17)%	γ	+39/2
^{217}Ra	(9/2$^+$)	1.7(1) μs	9.161(6)	100%		+41/2
^{217}Fr	9/2$^-$	22(5) μs	8.469(4)	100%		+43/2
^{217}Rn	9/2$^+$	0.59(4) ms	7.887(3)	100%		+45/2
^{217}At	9/2$^-$	32.8(3) ms	7.201(1)	99.32(24) %		+47/2
^{217}Po	(9/2$^+$)	1.52(3) s	6.662(2)	$\approx$ 100%		+49/2

Table 3
Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{218}U	0^+	650^{+80}_{-70} μs	8.775(9)	100%		+17
^{218m}U	28^+	390^{+60}_{-50} μs	10.887(17)	100%		+17
^{218}Pa	(8^-)	108(5) μ	9.791(12)	100%		+18
^{218m}Pa	(1^-)	135^{+62}_{-32} μs	9.871(16)	100%		+18
^{218}Th	0^+	117(5) ns	9.849(9)	100%		+19
^{218}Ac	(1^-)	1.12(3) μs	9.379(10)	100%		+20
^{218}Ra	0^+	25.99(10) μs	8.540(3)	100%		+21
^{218}Fr	1^-	$1.3^{+0.5}_{-0.4}$ ms	8.014(1)	100%		+22
^{218m}Fr	(8^-)	22.0(5) ms	8.102(5)	100%		+22
^{218}Rn(Em)	0^+	33.75(15) ms	7.262(2)	100%		+23
^{218}At	(3^-)	1.27(6) s	6.876(3)	99.9%		+24
^{219}Np	$(9/2^-)$	150^{+720}_{-70} μs	9.207(41)	100%		+33/2
^{219}U	$(9/2^+)$	60(7) μs	9.950(12)	100%		+35/2
^{219}Pa	$(9/2^-)$	60^{+28}_{-15} ns	10.128(69)	100%		+37/2
^{219}Th	$(9/2^+)$	1.03(3) μs	9.507(11)	100%		+39/2
^{219}Ac	$9/2^-$	11.8(15) μs	8.825(10)	100%		+41/2
^{219}Ra	$(7/2)^+$	8.6(17) ms	8.138(3)	100%		+43/2
^{219m}Ra	$(11/2)^+$	10(3) ms	8.155(3)	100%		+43/2
^{219}Fr	$9/2^-$	22(2) ms	7.449(2)	100%		+45/2
^{219}Rn(An)	$5/2^+$	3.96(1) s	6.9462(3)	100%		+47/2
^{219}At	$(9/2^-)$	56(3) s	6.342(5)	93.6(10)%		+49/2
^{220}Np		25^{+14}_{-7} μs	10.226(18)	100%		+17
^{220}Pa	(1^-)	0.75(4) μs	9.704(11)	100%		+19
^{220m1}Pa	(3^-)	233^{+108}_{-56} ns	9.828(41)	100%		+19
^{220m2}Pa		69^{+330}_{-30} ns	9.976(63)	100%		+19
^{220}Th	0^+	10.2(4) μs	8.973(11)	100%		+20
^{220}Ac		26.4(2) ms	8.348(4)	≈ 100%		+21
^{220}Ra	0^+	18(2) ms	7.594(5)	100%		+22
^{220}Fr	1^+	27.4(3) s	6.801(2)	99.65%		+23
^{220}Rn	0^+	55.61(4) s	6.405	100%		+24
^{221}U		0.66(14) μs	9.889(71)	100%		+37/2
^{221}Pa	$9/2^-$	4.9(8) μs	9.248(58)	100%		+39/2
^{221}Th	$(7/2^+)$	1.73(3) ms	8.625(4)	100%		+41/2
^{221}Ac	$5/2^-$	52(2) ms	7.791(57)	100%		+43/2
^{221}Ra	$5/2^+$	26.20(39) s	6.880(2)	100%	^{14}C	+45/2
^{221}Fr	$5/2^-$	4.806(6) m	6.458(1)	100%	^{12}C	+47/2
^{221}Rn	$(7/2^+)$	25(2) m	6.148(2)	22(1)%		+49/2
^{222}U	0^+	4.7(7) μs	9.416(8)	100%		+19
^{222}Pa		$2.76^{+0.43}_{-0.33}$ ms	8.789(65)	100%		+20
^{222}Th	0^+	1.964(2) ms	8.133(3)	100%		+21
^{222}Ac	1^-	4.9(5) s	7.137(2)	≈ 100%		+22
^{222m}Ac		64(2) s	7.137(2)+x	>97%		+22
^{222}Ra	0^+	33.17(10) s	6.678(4)	100%	^{14}C	+23
^{223}Np		$2.15^{+1.00}_{-0.52}$ μs	9.650(45)	100%		+37/2
^{223}U	$(7/2^+)$	62^{+14}_{-10} μs	9.158(17)	100%		+39/2
^{223}Pa		5.4(4) ms	8.343(8)	100%		+41/2
^{223}Th	$(5/2^+)$	660(10) ms	7.567(4)	100%		+43/2
^{223}Ac	$(5/2^-)$	2.2(1) m	6.783(1)	99%	^{14}C	+45/2
^{223}Ra(AcX)	$3/2^+$	11.4354(17) d	5.9790(2)	100%		+47/2
^{223}Fr	$3/2^-$	22.00(7) m	5.561(3)	0.02(1)%		+49/2
^{224}Np		38^{+26}_{-11} μs	9.329(30)	100%		+19
^{224}U	0^+	396(17) μs	8.628(7)	100%		+20
^{224}Pa	(5^-)	844(19) ms	7.694(4)	≈ 100%		+21
^{224}Th	0^+	1.05(2) s	7.299(6)	≈ 100%		+22
^{224}Ac	0^-	2.78(16) h	6.327(1)	10(2)%		+23
^{224}Ra	0^+	3.6313(14) d	5.789	100 %	^{14}C	+24
^{225}Np		$0.31^{+0.75}_{-13}$ ms	8.818(70)	100%		+39/2
^{225}U		72(4) ms	8.007(6)	≈ 100%		+41/2
^{225}Pa	$5/2^-$	1.8(3) s	7.401(59)	≈100%		+43/2
^{225}Th	$(3/2^+)$	8.72(4) m	6.921(2)	100%		+45/2
^{225}Ac	$(3/2^-)$	9.9176(18) d	5.935(1)	100%	^{14}C	+47/2
^{225}Ra	$1/2^+$	14.8(2) d	5.097(5)	5.097(5)	$2.6(8)\times10^{-3}$%	+49/2
^{226}Np		43(5) ms	8.328(54)	≈ 100%		+20
^{226}U	0^+	271(6) ms	7.701(4)	≈ 100%		+21
^{226}Pa		1.8(2) m	6.987(10)	74%		+22

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^{226}Th	0^+	30.70(3) m	6.453(1)	100%		+23
^{226}Ac	(1^-)	29.37(12) h	5.506(8)	$6(2)\times10^{-3}$%		+24
^{227}Np		510(60) ms	7.816(14)	≈ 100%		+41/2
^{227}U	$(3/2^+)$	1.1(1) m	7.235(3)	≈ 100%		+43/2
^{227}Pa	(5/2)	38.3(3) m	6.580(2)	≈ 85%		+45/2
^{227}Th(RdAc)	$(1/2^+)$	18.681(9) d	6.1466(1)	100%		+47/2
^{227}Ac	$3/2^-$	21.778^{+29}_{-32} y	5.042(0)	1.3800(36)%		+49/2
^{228}Pu	0^+	$1.1^{+2.0}_{-0.5}$ s	7.940(18)	≈ 100%		+20
^{228}Np		61.4(15) s	7.54(10)#	40(11)%	β_F	+21
^{228}U	0^+	9.1(2) m	6.800(9)	> 95%		+22
^{228}Pa	3^+	19.5(4) h	6.265(1)	2.0(2)%		+23
^{228}Th	0^+	698.3(6) d	5.520	100%	^{20}O	+24
^{229}Am		$0.9^{+2.1}_{-0.7}$ s	8.132(20)	≈100%		+39/2
^{229}Pu		90(10) s	7.590(20)	50(20)%		+41/2
^{229}Np		4.0(2) m	7.015(23)	68(11)%		+43/2
^{229}U	$(3/2^+)$	58(3) m	6.468(3)	≈ 20%		+45/2
^{229}Pa	$(5/2^+)$	1.50(5) d	5.835(4)	0.48(5)%		+47/2
^{229}Th	$5/2^+$	7894(40) y	5.168(1)	100%		+49/2
^{230}Pu	0^+	102(10) s	7.178(9)	≈ 100%		+21
^{230}Np		4.6(3) m	6.778(54)	≈ 3%		+22
^{230}U	0^+	20.23(2) d	5.992(1)	100%	^{22}Ne	+23
^{230}Pa	2^-	17.4(4) d	5.439(1)	$3.2(1)\times10^{-3}$%		+24
^{231}Pu	$(3/2^+)$	8.6(5) m	6.839(20)	10^{+7}_{-3}%		+43/2
^{231}U	$(5/2^-)$	4(1) d	5.576(2)	$4(1)\times10^{-3}$%		+47/2
^{231}Pa	$3/2^-$	$3.257(13)\times10^4$ y	5.150(1)	100%	SF, ^{24}Ne, ^{23}F	+49/2
^{232}Pu	0^+	33.7(5) m	6.716(10)	≤20%		+22
^{232}U	0^+	68.81(38) y	5.414	100%	SF, ^{24}Ne	+24
^{233}Bk		21^{+48}_{-17} s	7.906(20)	obs		+39/2
^{233}Cm		23^{+13}_{-6} s	7.473(20)	20(10)%		+41/2
^{233}Am		3.2(8) m	6.898(17)	>3%		+43/2
^{233}Pu		20.9(4) m	6.410(20)	0.12(5)%		+45/2
^{233}U	$5/2^+$	$1.5903(13)\times10^5 y$	4.909(1)	100%	^{24}Ne	+49/2
^{234}Bk		19^{+6}_{-4} s	8.100(50)	>80%		+20
^{234}Cm	0^+	51(12) s	7.365(9)	≈ 27%	SF	+21
^{234}Am		2.32(8) m	6.80(15)#	0.039(12)%	β_F	+22
^{234}Pu	0^+	8.7(1) h	6.310(5)	≈ 6%		+23
^{235}Cm	$(5/2^+)$	300^{+250}_{-100} s	7.116(14)	$1.0^{+0.7}_{-0.5}$%		+43/2
^{235}Am	$(5/2^-)$	10.3(6) m	6.576(13)	0.40(5)%		+45/2
^{235}Pu	$(5/2^+)$	25.8(1) m	5.951(20)	$3.0(6)\times10^{-3}$%		+47/2
^{235}Np	$5/2^+$	396.1(12) d	5.194(1)	$2.60(13)\times10^{-3}$%		+49/2
^{236}Bk		22^{+13}_{-6} s	7.70(20)#	≈ 17%	β_F	+21
^{236}Cm	0^+	410(50) s	7.067(5)	18(2)%		+22
^{236}Am	5^-	3.6(2) m	6.256(64)	$4.0(10)\times10^{-3}$%		+23
^{236}Pu	0^+	2.862(8) y	5.867	100%	SF, ^{28}Mg	+24
^{237}Cf		0.8(2) s	8.220(54)	70(10)%	SF	+41/2
^{237}Am	$5/2^-$	73.0(10) m	6.146(5)	0.025(3)%		+47/2
^{237}Pu	$7/2^-$	45.31(3) d	5.748(2)	$4.2(4)\times10^{-3}$%		+49/2
^{238}Cm	0^+	2.2(4) h	6.670(10)	obs		+23
^{238}Am	1^+	98(3) m	6.042(58)	$1.0(4)\times10^{-4}$%		+24
^{239}Cf	$(5/2^+)$	28(2) s	7.766(8)	65(3)%		+43/2
^{239}Am	$(5/2^-)$	11.9(1) h	5.922(1)	0.010(1)%		+49/2
^{240}Es		5(2) s	8.259(63)	70(10)%	β_F	+21
^{240}Cf	0^+	1.00(12) m	7.711(4)	98.5(23)%	SF	+22
^{240}Cf	0^+	1.00(12) m	7.711(4)	98.5(23)%	SF	+22
^{240}Cm	0^+	26.8(3) d	6.398(1)	≈ 100%	SF	+24
^{241}Es		$4.3^{+2.4}_{-1.2}s$	8.259(17)	obs		+43/2
^{241}Cf		141(11) s	7.502(4)	15(1)%		+45/2
^{241}Cm	$(1/2^+)$	32.8(2) d	6.185(1)	1.0(1)%		+49/2
^{242}Es		16.9(8) s	8.160(20)	49(3)%	β_F	+22
^{242}Cf	0^+	3.49(10) m	7.517(4)	61(3)%		+23
^{243}Fm	$(7/2^-)$	231(9) ms	8.691(8)	91(3)%	SF	+43/2
^{243}Es	$(7/2^+)$	24.7(8) s	8.025(10)	59.7(25)%		+45/2
^{243}Cf	$(1/2^+)$	10.3(5) m	7.42(10)#	obs		+47/2
^{243}Bk	$(3/2^-)$	4.5(1) h	6.874(4)	0.15%		+49/2
^{244}Md		≈ 6 s	8.947(79)	≈100%		+21

Table 3
Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{244m}Md		$0.4^{+0.4}_{-0.1}$ s	8.947(79)+x	≈100%		+21
^{244}Es		37(4) s	7.696(20)	4^{+3}_{-2}%	β_F	+23
^{244}Cf	0^+	19.4(6) m	7.329(2)#	75(6)%		+24
^{245}Md		330^{+150}_{-80} ms	8.824(20)	obs		+43/2
^{245}Fm	(1/2$^+$)	5.5(7) s	8.290(7)	$88.5^{+6.8}_{-5.0}$%		+45/2
^{245}Es	(3/2$^-$)	66(6) s	7.909(3)	54(7)%		+47/2
^{245}Cf	(1/2$^+$)	46.4(3) m	7.258(2)	36.0(26)%		+49/2
^{246}Md		0.9(2) s	8.889(41)	100%		+22
^{246m}Md		4.4(8) s	8.889(41)+x	< 23%	β_F	+22
^{246}Fm	0^+	1.54(4) s	8.379(5)	93.6(4)%	SF	+23
^{246}Es		7.7(5) m	7.64(10)	9.9(18)%	β_F	+24
^{247}Md	7/2$^-$	1.26(8) s	8.764(10)	99.14(10)%	SF	+45/2
^{247m}Md	1/2$^-$	240(20) ms	8.914(15)	80(2)%	SF	+45/2
^{247}Fm	(7/2$^+$)	31(1) s	8.258(10)	64%		+47/2
^{247m}Fm	(1/2$^+$)	5.1(2) s	8.305(11)	88(2)%		+47/2
^{247}Es	(7/2$^+$)	4.55(26) m	7.464(20)	obs		+49/2
^{248}Md		7(3) s	8.497(30)	20(10)%		+23
^{248}Fm	0^+	35.1(8) s	7.995(8)	93^{+7}_{-17}%	SF	+24
^{249}No	(5/2$^+$)	38.3(28) ms	9.278(22)	100%		+45/2
^{249}Md	(7/2$^-$)	26(1) s	8.441(18)	75(5)%		+47/2
^{249}Fm	(7/2$^+$)	99(6) s	7.709(6)	15.6(1)%		+49/2
^{250}Md		52(6) s	8.155(28)	7(1)%	β_F	+24
^{251}Lr	(7/2$^-$)	42^{+42}_{-14} ms	9.396(13)	100%		+45/2
^{251m}Lr	(1/2$^-$)	$24.4^{+7.0}_{-4.5}$ ms	9.513(30)	100%		+45/2
^{251}No	(7/2$^+$)	0.80(1) s	8.752(4)	91^{+9}_{-22}%	SF	+47/2
^{251m}No	(1/2$^+$)	1.02(3) s	8.858(7)	100%		+47/2
^{251}Md	(7/2$^-$)	4.28(12) m	7.963(4)	10(1)%		+49/2
^{252}Lr		335^{+94}_{-53} ms	9.164(17)	100%		+23
^{252}No	0^+	2.42(6) s	8.549(5)	65.3(5)%	SF	+24
^{253}Rf		9.9(12) ms	9.4460(20)	17(6)%	SF	+45/2
^{253}Lr	(7/2$^-$)	520^{+29}_{-32} ms	8.932(7)	$98.7^{+1.0}_{-3.0}$%	SF	+47/2
^{253m}Lr	(1/2$^-$)	$2.00^{+0.16}_{-0.19}$ s	8.932(7)+x	92(5)%	SF	+47/2
^{253}No	(9/2$^-$)	1.56(2) m	8.415(4)	55(3)%		+49/2
^{254}Lr	(4$^+$)	18.1(13) s	8.822(8)	72(2)%		+24
^{255}Db		37^{+51}_{-14} ms	9.716(27)	≈33%	SF	+45/2
^{255}Rf	(9/2$^-$)	1.66(7) s	9.055(4)	46(5)%	SF	+47/2
^{255}Lr	(1/2$^-$)	31.1(13) s	8.556(7)	99.7(5)%		+49/2
^{255m}Lr		(7/2$^-$)	2.53(5) s	8.593(12)	≈40%	+49/2
^{256}Db		$1.6^{+0.5}_{-0.3}$ s	9.336(30)	67(8)%		+23
^{256}Rf	0^+	6.66(10) ms	8.926(15)	$0.29^{+0.13}_{-0.10}$ %	SF	+24
^{256m}Rf		$10.4^{+8.4}_{-3.2}$ s	8.926(15)+x	≈ 100%		+24
^{257}Db	(9/2$^+$)	1.6(2) s	9.206(20)	≈ 100%		+47/2
^{257m}Db	(1/2$^-$)	670(60) ms	9.206(20)+x	≈ 100%		+47/2
^{257}Rf	(1/2$^+$)	5.5(4) s	9.083(8)	79.3(17)%	SF	+49/2
^{257m}Rf	(11/2$^-$)	4.9(7) s	9.157(18)	81.0(25)%	SF	+49/2
^{258}Db	(0$^-$)	2.17(36) s	9.437(10)	≈96%		+24
^{258m}Db		4.41(21) s	9.488(17)	≈57%		+24
^{259}Sg	(1/2$^+$)	402(56) ms	9.765(8)	≈ 97%	SF	+47/2
^{259m}Sg	(11/2$^-$)	226(27) ms	9.852(22)	≈ 97%	SF	+47/2
^{259}Db		510(160) ms	9.619(54)	≈ 100%		+49/2
^{260}Bh		35^{+19}_{-9} ms	10.400(59)	100%		+23
^{260}Sg	0^+	4.95(33) ms	9.901(10)	29(3)%	SF	+24
^{260m}Sg		180^{+150}_{-60} ms	9.901(10)+x	≈ 100%		+24
^{261}Bh	(5/2$^-$)	$11.8^{+3.9}_{-2.4}$ ms	10.500(72)	100%		+47/2
^{261}Sg	(3/2$^+$)	184(5) ms	9.714(15)	98.1(5)%	SF	+49/2
^{262}Bh		87(14) ms	10.319(15)+y	100%		+24
^{262m}Bh		11(2) ms	10.319(15)+x	100%		+24
^{263}Hs		$0.74^{+0.48}_{-0.21}$ ms	10.733(78)	100%		+47/2
^{264}Hs		$0.90^{+0.40}_{-0.20}$ ms	10.591(20)	80^{+20}_{-40}%	SF	+24
^{265}Hs		195(15) ms	10.470(15)	≈100%		+49/2
^{265m}Hs		300^{+200}_{-100} ms	10.470(15)+x	≈100%		+49/2
^{266}Mt		$0.7^{+0.4}_{-0.2}$ ms	10.996(25)+x	100%		+24
^{266}Mt		$1.2^{+1.0}_{-0.4}$ ms	10.996(25)+y	100%		+24
^{267}Ds		4 μs	11.777(51)	≈ 100%		+47/2

Table 3
Summary of known direct α emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{269}Ds	170^{160}_{70} μs	11.510(30)	100%	+49/2

Table 4
Summary of known SF emitters. Detailed references for each nucleus can be found in their respective T_z tables.

Nuclide	J^{π}	$T_{1/2}$	BR_{SF}	other decays	T_z
^{231}Pa	3/2$^-$	3.257(13)×10^4 y	^{24}Ne, ^{23}F	+49/2	
^{232}U	0$^+$	68.81(38) y	2.7(6)×10^{-12}%	α, ^{24}Ne	+24
^{234}Cm	0$^+$	51(12) s	≈ 2%	α	+21
^{235m}Pu		3.0(5) ns	100%		+47/2
^{236}Pu	0$^+$	2.862(8) y	1.25(3) × 10−7 %	α, ^{28}Mg	+24
^{237}Cf		0.8(2) s	30(10)%	α	+41/2
^{237m1}Pu		94.8 ns	obs	α	+49/2
^{237m2}Pu		1.12(8) μs	obs	α	+49/2
^{238}Cf	0$^+$	21(2) ms	>95%		+21
^{240}Cf	0$^+$	1.00(12) m	1.5(2)%	α	+22
^{240}Cm	0$^+$	26.8(3) d	3.9(8)×10^{-6}%	α	+24
^{240m}Cm		55(12) ns	obs		+24
^{241}Fm		0.73(6) ms	>78%	α	+41/2
^{241m}Cm		15.3(10) ns	obs	α	+49/2
^{243}Fm	(7/2$^-$)	231(9) ms	9(1)%	α	+43/2
^{244}Fm	0$^+$	3.12(8) ms		α	+22
^{245m}Md	(1/2$^-$)	$0.9^{+0.6}_{-0.3}$ ms	obs		+43/2
^{246}Fm	0$^+$	1.54(4) s	6.4(4)%	α	+23
^{247}Md	7/2$^-$	1.26(8) s	0.86(10)%	α	+45/2
^{247m}Md	1/2$^-$	240(20) ms	20(2)%	α	+45/2
^{248}Fm	0$^+$	35.1(8) s	0.097(48)%	α	+24
^{250}No	0$^+$	4.7(1) μs	100%		+23
^{251}No	(7/2$^+$)	0.80(1) s	$0.14^{+0.31}_{-10.12}$%	α	+47/2
^{252}No	0$^+$	2.42(6) s	33.9(3)%	α	+24
^{253}Rf		9.9(12) ms	83(6)%	α	+45/2
^{253m}Rf		52.8(44) μs	100%		+45/2
^{253}Lr	(7/2$^-$)	520^{+29}_{-32} ms	$1.3^{+1.0}_{-3.0}$%	α	+47/2
^{253m}Lr	(1/2$^-$)	$2.00^{+0.16}_{-0.19}$ s	8(5)%	α	+47/2
^{254}Rf	0$^+$	23.2(11) μs	100%		+23
^{255}Db		37^{+51}_{-14} ms	≈ 67%	α	+45/2
^{255}Rf	(9/2$^-$)	1.66(7) s	54(5)%	α	+47/2
^{256}Rf	0$^+$	6.66(10) ms	$99.71^{+0.10}_{-0.13}$ %	α	+24
^{257}Rf	(1/2$^+$)	5.5(4) s	1.3(3)%	α	+49/2
^{257m}Rf	(11/2$^-$)	4.9(7) s	14(9)%	α	+49/2
^{258}Sg	0$^+$	$2.6^{+0.6}_{-0.4}$ ms	100%		+23
^{259}Sg	(1/2$^+$)	402(56) ms	3(1)%	α	+47/2
^{259m}Sg	(11/2$^-$)	226(27) ms	3(1)%	α	+47/2
^{260}Sg	0$^+$	4.95(33) ms	71(3)%	α	+24
^{261}Sg	(3/2$^+$)	184(5) ms	0.6(2)%	α	+49/2
^{264}Hs		$0.90^{+0.40}_{-0.20}$ ms	20^{+46}_{-17}%	α	+24

Table 5
Summary of known cluster emitters. Detailed references for each nucleus can be found in their respective T_z tables.

Nuclide	J^{π}	$T_{1/2}$	$BR_{cluster}$(%)	particle emitted	other decays	T_z
^{221}Ra	5/2$^+$	26.20(39) s	1.15(94)×10^{-10}%	^{14}C	α	+45/2
^{221}Fr	5/2$^-$	4.806(6) m	1.0(2) × 10^{-10} %	^{12}C	α	+47/2
^{222}Ra	0$^+$	33.17(10) s	2.64(31)×10^{-8}%	^{14}C	α	+23
^{223}Ac	(5/2$^-$)	2.2(1) m	3.2(10)×10^{-9}	^{14}C	α	+45/2
^{223}Ra(AcX)	3/2$^+$	11.4354(17) d	8.9(4)×10^{-8}%	^{14}C	α	+47/2
^{224}Ra	0$^+$	3.6313(14) d	5.6(10)×10^{-9}%	^{14}C	α	+24
^{225}Ac	(3/2$^-$)	9.9176(18) d	5.3(10) × 10^{-10}%	^{14}C	α	+47/2
^{228}Th	0$^+$	698.3(6) d	1.13(22)×10^{-11}%	^{20}O	α	+24

Table 5
Summary of known cluster emitters. Detailed references for each nucleus can be found in their respective T_z tables.

^{230}U	0^+	20.23(2) d	$4.8(20)\times10^{-12}\%$	^{22}Ne	α	+23
^{231}Pa	3/2−	$3.257(13)\times10^4$ y	$1.0^{+4.8}_{-0.7}\times10^{-12}\%$	^{23}F	α, SF, ^{24}Ne	+49/2
^{231}Pa	3/2−	$3.257(13)\times10^4$ y	$1.34(17)\times10^{-9}\%$	^{24}Ne	α, SF, ^{23}F	+49/2
^{232}U	0^+	68.81(38) y	$8.78(49)\times10^{-10}\%$	^{24}Ne	α, SF	+24
^{233}U	$5/2^+$	$1.5903(13)\times10^5 y$	$7.2(12)\times10^{-11}\%$	^{24}Ne	α	+49/2
^{236}Pu	0^+	2.862(8) y	$2.7(7)\times10^{-12}\%$	^{28}Mg	α, SF	+24