

^{228}Th $Z = 90$ $N = 138$ [link to full NNDC output](#)

Based on ENSDF from Dec 2018, and mass evaluation from 2016

BE = 1743.078 (0.002) MeV

	Energy T	J+	J-	J-other	T1/2

S-alpha=	-5.520	(0.003)	-----		
228TH 1	0.000	0+			1 1.9116 Y 16
228TH 2	0.058	2+			2 0.406 NS 7
228TH 3	0.187	4+			3 0.164 NS 4
228TH 4			0.328	1-	4
228TH 5	0.378	6+			5
228TH 6			0.396	3-	6
228TH 7			0.519	5-	7
228TH 8	0.623	8+			8
228TH 9			0.695	7-	9
228TH 10	0.832	0+			10

228TH 11	0.875	2+			11
228TH 12				0.912 (10+)	12
228TH 13			0.921	9-	13
228TH 14	0.939	0+			14
228TH 15			0.944	1-	15
228TH 16			0.968	2-	16
228TH 17	0.968	4+			17
228TH 18	0.969	2+			18
228TH 19	0.980	2+			19
228TH 20			1.016	3-	20

228TH 21				1.023 (3)+	21
228TH 22			1.060	4-	22
228TH 23	1.075	4+			23
228TH 24	1.091	4+			24
228TH 25	1.105	6+			25
228TH 26	1.120	0+			26
228TH 27			1.123	2-	27
228TH 28			1.143	5-	28
228TH 29	1.153	2+			29 0.29 NS 2
228TH 30				1.160	30

228TH 31			1.168	3-	31
228TH 32				1.175 (5+)	32
228TH 33	1.175	2+			33
228TH 34			1.190	11-	34
228TH 35				1.201 3(+)	35
228TH 36			1.227	4-	36
228TH 37				1.239 (12+)	37

228TH	38	1.262	4+					38
228TH	39	1.270	6+					39
228TH	40	1.280	8+					40

228TH	41	1.290	4+					41
228TH	42					1.297	(5-)	42
228TH	43					1.319	(2+)	43
228TH	44			1.344	3-			44
228TH	45	1.380	7+					45
228TH	46					1.393	(1+,2,3-)	46
228TH	47					1.416	(3-)	47
228TH	48					1.420		48
228TH	49					1.424	(2+)	49
228TH	50	1.432	4+					50

228TH	51					1.449	3,4-	51
228TH	52			1.450	4-			52
228TH	53					1.454	(3-)	53
228TH	54					1.467		54
228TH	55					1.470	(6+)	55
228TH	56	1.490	10+					56
228TH	57					1.497	(13-)	57
228TH	58	1.497	8+					58
228TH	59					1.498	(5-)	59
228TH	60	1.511	0+					60

228TH	61					1.531	0+&3+	61
228TH	62	1.539	2+					62
228TH	63					1.581	(2-)	63
228TH	64	1.587	2+					64
228TH	65					1.588	(4-)	65
228TH	66					1.599	(14+)	66
228TH	67	1.618	4+					67
228TH	68	1.618	4+					68
228TH	69					1.628	(9+)	69
228TH	70	1.628	0+					70

228TH	71	1.638	2+					71
228TH	72					1.643	(2-,3-)	72
228TH	73	1.644	4+					73
228TH	74	1.646	3+					74
228TH	75					1.651	(3-)	75
228TH	76	1.667	2+					76
228TH	77	1.672	2+					77
228TH	78	1.678	2+					78
228TH	79					1.683	(2+,3+,4+)	79
228TH	80					1.684	(4-)	80

228TH	81					1.688	2+,3+	81
228TH	82	1.691	0+					82

228TH 83					1.707	(2,3-)	83
228TH 84	1.711	0+					84
228TH 85	1.724	2+					85
228TH 86	1.733	12+					86
228TH 87	1.735	4+					87
228TH 88	1.744	4+					88
228TH 89	1.751	0+					89
228TH 90	1.758	2+					90

228TH 91					1.758	2+,3,4+	91
228TH 92					1.760	2(+),3(+)	92
228TH 93	1.763	10+					93
228TH 94	1.796	4+					94
228TH 95	1.796	4+					95
228TH 96	1.798	2+					96
228TH 97	1.803	2+					97
228TH 98	1.805	4+					98
228TH 99					1.812	(1-,2,3-)	99
228TH 100					1.813	(6+)	100

228TH 101			1.817	4-			101
228TH 102					1.823	(4+)	102
228TH 103					1.838	(15-)	103
228TH 104					1.842	(2,3)	104
228TH 105					1.859	(6+)	105
228TH 106					1.865	(2+)	106
228TH 107					1.876	(3-,4,5-)	107
228TH 108					1.879	(3-)	108
228TH 109	1.893	3+					109
228TH 110					1.900	(2+)	110

228TH 111					1.902	(6+)	111
228TH 112					1.907	(2+)	112
228TH 113	1.908	0+					113
228TH 114					1.924	(2-,3,4)	114
228TH 115					1.925	4+,5-	115
228TH 116					1.925	3+,4+	116
228TH 117	1.928	3+					117
228TH 118					1.937	2+,3,4+	118
228TH 119					1.939	(4+)	119
228TH 120	1.945	3+					120

228TH 121					1.946	4+,5-	121
228TH 122					1.950	(2+)	122
228TH 123					1.958	(2+)	123
228TH 124					1.965	(2+)	124
228TH 125					1.974	(2+,3-)	125
228TH 126					1.982	(3-)	126
228TH 127	1.987	4+					127
228TH 128					1.988	(16+)	128

228TH 129				1.994	(3-)	129
228TH 130				2.010	(2+)	130

228TH 131				2.014	2+,3,4+	131
228TH 132				2.017	(4+,5-)	132
228TH 133				2.023	(2+)	133
228TH 134	2.030	2+				134
228TH 135				2.037	2+,3,4+	135
228TH 136	2.045	0+				136
228TH 137				2.052	(6+)	137
228TH 138	2.070	2+				138
228TH 139	2.080	0+				139
228TH 140				2.091	(6+)	140

228TH 141				2.112	(2+)	141
228TH 142				2.123	(2+)	142
228TH 143	2.131	0+				143
228TH 144				2.153	(4+)	144
228TH 145	2.159	0+				145
228TH 146				2.170	(2+)	146
228TH 147	2.198	2+				147
228TH 148				2.210	(17-)	148
228TH 149				2.216	(4+)	149
228TH 150				2.235	(4+)	150

228TH 151	2.290	0+				151
228TH 152				2.303	(4+)	152
228TH 153	2.323	2+				153
228TH 154				2.336	(4+,0+)	154
228TH 155				2.344	(3-)	155
228TH 156				2.356	(2+)	156
228TH 157				2.375	(2+)	157
228TH 158				2.398	(3-)	158
228TH 159				2.401	(18+)	159
228TH 160				2.409	(4+)	160

228TH 161				2.442	(2+)	161
228TH 162	2.457	0+				162
228TH 163				2.477	(2+)	163
228TH 164				2.494	(2+)	164
228TH 165				2.513		165
228TH 166				2.532		166
228TH 167				2.537		167
228TH 168				2.542		168
228TH 169				2.555		169
228TH 170				2.566		170

228TH 171				2.595		171
228TH 172				2.606		172
228TH 173				2.608	(19-)	173

228TH 174			2.615		174
228TH 175			2.635		175
228TH 176			2.644		176
228TH 177			2.657		177
228TH 178			2.660		178
228TH 179			2.667		179
228TH 180			2.676		180

228TH 181			2.688		181
228TH 182			2.696		182
228TH 183			2.705		183
228TH 184			2.718		184
228TH 185			2.742		185
228TH 186			2.764		186
228TH 187			2.781		187
228TH 188			2.799		188
228TH 189			2.806		189
228TH 190			2.821		190

228TH 191			2.834	(20+)	191
228TH 192			2.839		192
228TH 193			2.854		193
228TH 194			2.868		194
228TH 195			2.878		195
228TH 196			2.884		196
228TH 197			2.919		197
228TH 198			2.927		198
228TH 199			2.937		199
228TH 200			2.945		200

228TH 201			2.955		201
228TH 202			2.993		202
228TH 203			3.000		203
228TH 204			3.014		204
228TH 205			3.036		205
228TH 206			3.046		206
228TH 207			3.059		207
228TH 208			3.075		208
228TH 209			3.085		209
228TH 210			3.097		210

228TH 211			3.105		211
228TH 212			3.113		212
228TH 213			3.120		213
228TH 214			3.128		214
228TH 215			3.159		215
228TH 216			3.166		216
228TH 217			3.186		217
228TH 218			3.195		218
228TH 219			3.210		219

228TH 220			3.215	220
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228TH 221			3.225	221
228TH 222			3.233	222
228TH 223			3.240	223
228TH 224			3.283 (22+)	224

S-p = 6.368 (0.003)-----
S-n = 7.105 (0.003)-----
S-2p = 11.475 (0.003)-----
S-2n = 12.569 (0.005)-----
S-alpha= -5.520 (0.003)-----

S+p = -4.163 (0.004)
S+n = -5.257 (0.003)
S+2p = -9.734 (0.005)
S+2n = -12.051 (0.002)
S+alpha = 5.414 (0.003)

gap p = 2.205 (0.004)
gap n = 1.849 (0.004)
gap 2p = 1.741 (0.006)
gap 2n = 0.518 (0.005)
gap alpha = -0.106 (0.004)