

## Muons in thorium (Th)

Z	A [g/mol]	$\rho$ [g/cm <sup>3</sup> ]	I [eV]	a	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
90 (Th)	[232.0377 (4)]	11.720	847.0	0.08655	3.2610	0.4202	3.7681	6.2473	0.14
T	p [MeV/c]	Ionization	Brems	Pair prod [MeV cm <sup>2</sup> /g]	Photonucl	Total	CSDA range [g/cm <sup>2</sup> ]		
10.0 MeV	$4.704 \times 10^1$	3.727				3.727	$1.563 \times 10^0$		
14.0 MeV	$5.616 \times 10^1$	2.979				2.979	$2.774 \times 10^0$		
20.0 MeV	$6.802 \times 10^1$	2.376				2.376	$5.052 \times 10^0$		
30.0 MeV	$8.509 \times 10^1$	1.881				1.881	$9.842 \times 10^0$		
40.0 MeV	$1.003 \times 10^2$	1.626				1.626	$1.559 \times 10^1$		
80.0 MeV	$1.527 \times 10^2$	1.253				1.253	$4.444 \times 10^1$		
100. MeV	$1.764 \times 10^2$	1.187				1.188	$6.087 \times 10^1$		
140. MeV	$2.218 \times 10^2$	1.126				1.126	$9.561 \times 10^1$		
200. MeV	$2.868 \times 10^2$	1.099				1.099	$1.497 \times 10^2$		
223. MeV	$3.114 \times 10^2$	1.098	0.000			1.098	<i>Minimum ionization</i>		
300. MeV	$3.917 \times 10^2$	1.107	0.000		0.000	1.107	$2.405 \times 10^2$		
400. MeV	$4.945 \times 10^2$	1.129	0.000		0.000	1.129	$3.300 \times 10^2$		
800. MeV	$8.995 \times 10^2$	1.214	0.001		0.000	1.216	$6.707 \times 10^2$		
1.00 GeV	$1.101 \times 10^3$	1.247	0.002		0.000	1.249	$8.330 \times 10^2$		
1.40 GeV	$1.502 \times 10^3$	1.299	0.003		0.001	1.302	$1.146 \times 10^3$		
2.00 GeV	$2.103 \times 10^3$	1.354	0.004	0.001	0.001	1.360	$1.597 \times 10^3$		
3.00 GeV	$3.104 \times 10^3$	1.417	0.007	0.003	0.001	1.429	$2.313 \times 10^3$		
4.00 GeV	$4.104 \times 10^3$	1.459	0.011	0.006	0.002	1.478	$3.000 \times 10^3$		
8.00 GeV	$8.105 \times 10^3$	1.556	0.027	0.023	0.003	1.609	$5.583 \times 10^3$		
10.0 GeV	$1.011 \times 10^4$	1.585	0.035	0.032	0.004	1.657	$6.808 \times 10^3$		
14.0 GeV	$1.411 \times 10^4$	1.626	0.054	0.053	0.005	1.739	$9.163 \times 10^3$		
20.0 GeV	$2.011 \times 10^4$	1.667	0.084	0.087	0.007	1.847	$1.251 \times 10^4$		
30.0 GeV	$3.011 \times 10^4$	1.711	0.138	0.154	0.011	2.015	$1.769 \times 10^4$		
40.0 GeV	$4.011 \times 10^4$	1.740	0.195	0.228	0.014	2.178	$2.246 \times 10^4$		
80.0 GeV	$8.011 \times 10^4$	1.804	0.441	0.553	0.027	2.827	$3.854 \times 10^4$		
100. GeV	$1.001 \times 10^5$	1.823	0.572	0.729	0.034	3.159	$4.523 \times 10^4$		
132. GeV	$1.321 \times 10^5$	1.847	0.785	1.017	0.045	3.695	<i>Muon critical energy</i>		
140. GeV	$1.401 \times 10^5$	1.851	0.839	1.091	0.047	3.830	$5.672 \times 10^4$		
200. GeV	$2.001 \times 10^5$	1.881	1.257	1.664	0.067	4.871	$7.058 \times 10^4$		
300. GeV	$3.001 \times 10^5$	1.913	1.971	2.621	0.101	6.608	$8.815 \times 10^4$		
400. GeV	$4.001 \times 10^5$	1.936	2.708	3.613	0.135	8.394	$1.016 \times 10^5$		
800. GeV	$8.001 \times 10^5$	1.992	5.748	7.680	0.273	15.695	$1.359 \times 10^5$		
1.00 TeV	$1.000 \times 10^6$	2.010	7.309	9.760	0.343	19.423	$1.473 \times 10^5$		
1.40 TeV	$1.400 \times 10^6$	2.037	10.434	13.907	0.485	26.866	$1.648 \times 10^5$		
2.00 TeV	$2.000 \times 10^6$	2.067	15.212	20.235	0.702	38.218	$1.834 \times 10^5$		
3.00 TeV	$3.000 \times 10^6$	2.101	23.182	30.750	1.073	57.107	$2.047 \times 10^5$		
4.00 TeV	$4.000 \times 10^6$	2.125	31.254	41.375	1.449	76.205	$2.198 \times 10^5$		
8.00 TeV	$8.000 \times 10^6$	2.185	63.776	84.077	3.009	153.049	$2.561 \times 10^5$		
10.0 TeV	$1.000 \times 10^7$	2.205	80.155	105.539	3.809	191.710	$2.677 \times 10^5$		
14.0 TeV	$1.400 \times 10^7$	2.235	112.825	148.365	5.450	268.877	$2.853 \times 10^5$		
20.0 TeV	$2.000 \times 10^7$	2.268	162.098	212.874	7.964	385.206	$3.038 \times 10^5$		
30.0 TeV	$3.000 \times 10^7$	2.305	244.125	320.193	12.304	578.930	$3.248 \times 10^5$		
40.0 TeV	$4.000 \times 10^7$	2.333	326.426	427.757	16.745	773.263	$3.397 \times 10^5$		
80.0 TeV	$8.000 \times 10^7$	2.399	656.056	858.311	35.269	1552.038	$3.755 \times 10^5$		
100. TeV	$1.000 \times 10^8$	2.421	821.120	1073.780	44.830	1942.153	$3.870 \times 10^5$		