

## Muons in liquid helium (He)

Z	A [g/mol]	$\rho$ [g/cm <sup>3</sup> ]	I [eV]	$a$	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
2 (He)	4.002602 (2)	0.125	41.8	0.65713	3.0000	0.4729	2.0000	4.5180	0.00
$T$	$p$ [MeV/c]	Ionization	Brems	Pair prod [MeV cm <sup>2</sup> /g]	Photonucl	Total	CSDA range [g/cm <sup>2</sup> ]		
10.0 MeV	$4.704 \times 10^1$	7.709				7.709	$7.138 \times 10^{-1}$		
14.0 MeV	$5.616 \times 10^1$	5.998				5.998	$1.308 \times 10^0$		
20.0 MeV	$6.802 \times 10^1$	4.673				4.673	$2.455 \times 10^0$		
30.0 MeV	$8.509 \times 10^1$	3.616				3.616	$4.922 \times 10^0$		
40.0 MeV	$1.003 \times 10^2$	3.082				3.083	$7.937 \times 10^0$		
80.0 MeV	$1.527 \times 10^2$	2.305				2.305	$2.343 \times 10^1$		
100. MeV	$1.764 \times 10^2$	2.165				2.165	$3.240 \times 10^1$		
140. MeV	$2.218 \times 10^2$	2.026				2.026	$5.159 \times 10^1$		
200. MeV	$2.868 \times 10^2$	1.954			0.000	1.954	$8.186 \times 10^1$		
277. MeV	$3.683 \times 10^2$	1.936			0.000	1.936	<i>Minimum ionization</i>		
300. MeV	$3.917 \times 10^2$	1.937			0.000	1.937	$1.334 \times 10^2$		
400. MeV	$4.945 \times 10^2$	1.952			0.000	1.952	$1.849 \times 10^2$		
800. MeV	$8.995 \times 10^2$	2.037			0.000	2.037	$3.853 \times 10^2$		
1.00 GeV	$1.101 \times 10^3$	2.072			0.001	2.072	$4.826 \times 10^2$		
1.40 GeV	$1.502 \times 10^3$	2.126	0.000		0.001	2.127	$6.730 \times 10^2$		
2.00 GeV	$2.103 \times 10^3$	2.184	0.000		0.001	2.185	$9.511 \times 10^2$		
3.00 GeV	$3.104 \times 10^3$	2.247	0.000	0.000	0.002	2.249	$1.402 \times 10^3$		
4.00 GeV	$4.104 \times 10^3$	2.290	0.000	0.000	0.002	2.293	$1.842 \times 10^3$		
8.00 GeV	$8.105 \times 10^3$	2.386	0.001	0.001	0.004	2.392	$3.545 \times 10^3$		
10.0 GeV	$1.011 \times 10^4$	2.415	0.002	0.002	0.005	2.423	$4.375 \times 10^3$		
14.0 GeV	$1.411 \times 10^4$	2.458	0.002	0.003	0.007	2.470	$6.010 \times 10^3$		
20.0 GeV	$2.011 \times 10^4$	2.501	0.004	0.004	0.010	2.519	$8.414 \times 10^3$		
30.0 GeV	$3.011 \times 10^4$	2.549	0.006	0.008	0.014	2.578	$1.233 \times 10^4$		
40.0 GeV	$4.011 \times 10^4$	2.582	0.009	0.012	0.019	2.622	$1.618 \times 10^4$		
80.0 GeV	$8.011 \times 10^4$	2.657	0.021	0.029	0.036	2.744	$3.107 \times 10^4$		
100. GeV	$1.001 \times 10^5$	2.681	0.028	0.039	0.045	2.792	$3.829 \times 10^4$		
140. GeV	$1.401 \times 10^5$	2.716	0.042	0.058	0.062	2.878	$5.240 \times 10^4$		
200. GeV	$2.001 \times 10^5$	2.752	0.063	0.090	0.088	2.993	$7.284 \times 10^4$		
300. GeV	$3.001 \times 10^5$	2.794	0.101	0.144	0.132	3.171	$1.053 \times 10^5$		
400. GeV	$4.001 \times 10^5$	2.823	0.140	0.201	0.175	3.340	$1.360 \times 10^5$		
800. GeV	$8.001 \times 10^5$	2.895	0.306	0.443	0.354	3.998	$2.453 \times 10^5$		
1.00 TeV	$1.000 \times 10^6$	2.918	0.392	0.569	0.445	4.324	$2.934 \times 10^5$		
1.40 TeV	$1.400 \times 10^6$	2.953	0.566	0.821	0.632	4.973	$3.796 \times 10^5$		
2.00 TeV	$2.000 \times 10^6$	2.991	0.836	1.210	0.916	5.953	$4.897 \times 10^5$		
2.02 TeV	$2.020 \times 10^6$	2.992	0.844	1.223	0.925	5.985	<i>Muon critical energy</i>		
3.00 TeV	$3.000 \times 10^6$	3.035	1.289	1.861	1.404	7.589	$6.382 \times 10^5$		
4.00 TeV	$4.000 \times 10^6$	3.067	1.751	2.524	1.902	9.245	$7.574 \times 10^5$		
8.00 TeV	$8.000 \times 10^6$	3.144	3.634	5.207	3.979	15.964	$1.083 \times 10^6$		
10.0 TeV	$1.000 \times 10^7$	3.170	4.589	6.563	5.050	19.372	$1.196 \times 10^6$		
14.0 TeV	$1.400 \times 10^7$	3.209	6.497	9.260	7.260	26.226	$1.373 \times 10^6$		
20.0 TeV	$2.000 \times 10^7$	3.250	9.390	13.338	10.660	36.639	$1.566 \times 10^6$		
30.0 TeV	$3.000 \times 10^7$	3.299	14.206	20.112	16.578	54.195	$1.789 \times 10^6$		
40.0 TeV	$4.000 \times 10^7$	3.334	19.055	26.915	22.660	71.965	$1.949 \times 10^6$		
80.0 TeV	$8.000 \times 10^7$	3.420	38.527	54.158	48.256	144.361	$2.334 \times 10^6$		
100. TeV	$1.000 \times 10^8$	3.448	48.300	67.800	61.550	181.099	$2.457 \times 10^6$		