

**Table 029: Muons in Copper**

Z	A [g/mol]	$\rho$ [g/cm <sup>3</sup> ]	I [eV]	a	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
29 (Cu)	63.546 (3)	8.960	322.0	0.14339	2.9044	-0.0254	3.2792	4.4190	0.08
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	$4.704 \times 10^1$	5.283				5.283	$1.069 \times 10^0$		
14.0 MeV	$5.616 \times 10^1$	4.160				4.160	$1.930 \times 10^0$		
20.0 MeV	$6.802 \times 10^1$	3.277				3.277	$3.573 \times 10^0$		
30.0 MeV	$8.509 \times 10^1$	2.562				2.562	$7.071 \times 10^0$		
40.0 MeV	$1.003 \times 10^2$	2.198				2.198	$1.131 \times 10^1$		
80.0 MeV	$1.527 \times 10^2$	1.659				1.659	$3.291 \times 10^1$		
100. MeV	$1.764 \times 10^2$	1.561				1.561	$4.537 \times 10^1$		
140. MeV	$2.218 \times 10^2$	1.464				1.465	$7.195 \times 10^1$		
200. MeV	$2.868 \times 10^2$	1.414				1.414	$1.138 \times 10^2$		
267. MeV	$3.577 \times 10^2$	1.403			0.000	1.403	<i>Minimum ionization</i>		
300. MeV	$3.917 \times 10^2$	1.404			0.000	1.404	$1.849 \times 10^2$		
400. MeV	$4.945 \times 10^2$	1.419	0.000		0.000	1.419	$2.558 \times 10^2$		
800. MeV	$8.995 \times 10^2$	1.499	0.000		0.000	1.500	$5.298 \times 10^2$		
1.00 GeV	$1.101 \times 10^3$	1.532	0.001		0.000	1.533	$6.617 \times 10^2$		
1.40 GeV	$1.502 \times 10^3$	1.585	0.001	0.000	0.001	1.587	$9.179 \times 10^2$		
2.00 GeV	$2.103 \times 10^3$	1.643	0.002	0.001	0.001	1.647	$1.289 \times 10^3$		
3.00 GeV	$3.104 \times 10^3$	1.709	0.003	0.002	0.001	1.716	$1.882 \times 10^3$		
4.00 GeV	$4.104 \times 10^3$	1.755	0.005	0.004	0.002	1.765	$2.457 \times 10^3$		
8.00 GeV	$8.105 \times 10^3$	1.860	0.011	0.011	0.003	1.886	$4.641 \times 10^3$		
10.0 GeV	$1.011 \times 10^4$	1.891	0.015	0.016	0.004	1.926	$5.690 \times 10^3$		
14.0 GeV	$1.411 \times 10^4$	1.936	0.023	0.025	0.006	1.991	$7.731 \times 10^3$		
20.0 GeV	$2.011 \times 10^4$	1.981	0.035	0.041	0.008	2.067	$1.069 \times 10^4$		
30.0 GeV	$3.011 \times 10^4$	2.029	0.058	0.072	0.012	2.172	$1.540 \times 10^4$		
40.0 GeV	$4.011 \times 10^4$	2.061	0.082	0.105	0.016	2.265	$1.991 \times 10^4$		
80.0 GeV	$8.011 \times 10^4$	2.133	0.185	0.252	0.031	2.602	$3.636 \times 10^4$		
100. GeV	$1.001 \times 10^5$	2.155	0.240	0.332	0.038	2.765	$4.381 \times 10^4$		
140. GeV	$1.401 \times 10^5$	2.187	0.352	0.495	0.053	3.088	$5.750 \times 10^4$		
200. GeV	$2.001 \times 10^5$	2.221	0.527	0.755	0.075	3.579	$7.553 \times 10^4$		
300. GeV	$3.001 \times 10^5$	2.259	0.828	1.189	0.113	4.389	$1.007 \times 10^5$		
317. GeV	$3.170 \times 10^5$	2.264	0.880	1.264	0.119	4.528	<i>Muon critical energy</i>		
400. GeV	$4.001 \times 10^5$	2.285	1.139	1.640	0.151	5.215	$1.216 \times 10^5$		
800. GeV	$8.001 \times 10^5$	2.351	2.425	3.491	0.304	8.571	$1.809 \times 10^5$		
1.00 TeV	$1.000 \times 10^6$	2.372	3.087	4.439	0.382	10.280	$2.021 \times 10^5$		
1.40 TeV	$1.400 \times 10^6$	2.404	4.414	6.331	0.542	13.691	$2.357 \times 10^5$		
2.00 TeV	$2.000 \times 10^6$	2.439	6.446	9.220	0.784	18.890	$2.729 \times 10^5$		
3.00 TeV	$3.000 \times 10^6$	2.479	9.842	14.023	1.199	27.544	$3.165 \times 10^5$		
4.00 TeV	$4.000 \times 10^6$	2.508	13.286	18.879	1.621	36.295	$3.480 \times 10^5$		
8.00 TeV	$8.000 \times 10^6$	2.579	27.184	38.410	3.372	71.545	$4.251 \times 10^5$		
10.0 TeV	$1.000 \times 10^7$	2.602	34.193	48.231	4.272	89.299	$4.500 \times 10^5$		
14.0 TeV	$1.400 \times 10^7$	2.637	48.174	67.823	6.121	124.756	$4.878 \times 10^5$		
20.0 TeV	$2.000 \times 10^7$	2.676	69.280	97.344	8.956	178.257	$5.278 \times 10^5$		
30.0 TeV	$3.000 \times 10^7$	2.720	104.417	146.463	13.860	267.461	$5.733 \times 10^5$		
40.0 TeV	$4.000 \times 10^7$	2.752	139.692	195.708	18.883	357.035	$6.055 \times 10^5$		
80.0 TeV	$8.000 \times 10^7$	2.831	281.045	392.831	39.878	716.586	$6.831 \times 10^5$		
100. TeV	$1.000 \times 10^8$	2.856	351.860	491.490	50.730	896.937	$7.080 \times 10^5$		