

## Muons in tissue-equivalent gas (Methane based)

$\langle Z/A \rangle$	$\rho$ [g/cm <sup>3</sup> ]	$I$ [eV]	$a$	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
0.54993	$1.064 \times 10^{-3}$	61.2	0.09946	3.4708	1.6442	4.1399	9.9500	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	$4.704 \times 10^1$	8.098				8.098	$6.812 \times 10^{-1}$	
14.0 MeV	$5.616 \times 10^1$	6.311				6.311	$1.247 \times 10^0$	
20.0 MeV	$6.802 \times 10^1$	4.924				4.924	$2.335 \times 10^0$	
30.0 MeV	$8.509 \times 10^1$	3.817				3.817	$4.675 \times 10^0$	
40.0 MeV	$1.003 \times 10^2$	3.257				3.257	$7.530 \times 10^0$	
80.0 MeV	$1.527 \times 10^2$	2.442				2.442	$2.217 \times 10^1$	
100. MeV	$1.764 \times 10^2$	2.295				2.295	$3.064 \times 10^1$	
140. MeV	$2.218 \times 10^2$	2.151				2.151	$4.872 \times 10^1$	
200. MeV	$2.868 \times 10^2$	2.077				2.077	$7.721 \times 10^1$	
263. MeV	$3.527 \times 10^2$	2.062			0.000	2.062	<i>Minimum ionization</i>	
300. MeV	$3.917 \times 10^2$	2.065			0.000	2.065	$1.256 \times 10^2$	
400. MeV	$4.945 \times 10^2$	2.091			0.000	2.091	$1.738 \times 10^2$	
800. MeV	$8.995 \times 10^2$	2.225	0.000		0.000	2.226	$3.591 \times 10^2$	
1.00 GeV	$1.101 \times 10^3$	2.283	0.000		0.000	2.283	$4.478 \times 10^2$	
1.40 GeV	$1.502 \times 10^3$	2.376	0.000		0.001	2.378	$6.193 \times 10^2$	
2.00 GeV	$2.103 \times 10^3$	2.482	0.001	0.000	0.001	2.484	$8.659 \times 10^2$	
3.00 GeV	$3.104 \times 10^3$	2.607	0.001	0.001	0.001	2.610	$1.258 \times 10^3$	
4.00 GeV	$4.104 \times 10^3$	2.696	0.001	0.001	0.002	2.701	$1.634 \times 10^3$	
8.00 GeV	$8.105 \times 10^3$	2.879	0.003	0.003	0.004	2.889	$3.059 \times 10^3$	
10.0 GeV	$1.011 \times 10^4$	2.931	0.004	0.004	0.005	2.944	$3.744 \times 10^3$	
14.0 GeV	$1.411 \times 10^4$	3.004	0.007	0.007	0.007	3.024	$5.084 \times 10^3$	
20.0 GeV	$2.011 \times 10^4$	3.075	0.010	0.012	0.009	3.106	$7.040 \times 10^3$	
30.0 GeV	$3.011 \times 10^4$	3.148	0.017	0.020	0.014	3.199	$1.021 \times 10^4$	
40.0 GeV	$4.011 \times 10^4$	3.196	0.024	0.030	0.018	3.268	$1.330 \times 10^4$	
80.0 GeV	$8.011 \times 10^4$	3.300	0.054	0.073	0.034	3.461	$2.517 \times 10^4$	
100. GeV	$1.001 \times 10^5$	3.330	0.070	0.096	0.043	3.539	$3.088 \times 10^4$	
140. GeV	$1.401 \times 10^5$	3.374	0.104	0.144	0.059	3.681	$4.196 \times 10^4$	
200. GeV	$2.001 \times 10^5$	3.418	0.156	0.221	0.084	3.880	$5.783 \times 10^4$	
300. GeV	$3.001 \times 10^5$	3.467	0.247	0.351	0.126	4.191	$8.262 \times 10^4$	
400. GeV	$4.001 \times 10^5$	3.500	0.341	0.487	0.168	4.496	$1.057 \times 10^5$	
800. GeV	$8.001 \times 10^5$	3.580	0.732	1.053	0.339	5.704	$1.844 \times 10^5$	
1.00 TeV	$1.000 \times 10^6$	3.606	0.934	1.346	0.426	6.312	$2.178 \times 10^5$	
1.32 TeV	$1.320 \times 10^6$	3.638	1.259	1.810	0.568	7.276	<i>Muon critical energy</i>	
1.40 TeV	$1.400 \times 10^6$	3.645	1.342	1.928	0.604	7.519	$2.758 \times 10^5$	
2.00 TeV	$2.000 \times 10^6$	3.687	1.968	2.821	0.875	9.351	$3.472 \times 10^5$	
3.00 TeV	$3.000 \times 10^6$	3.735	3.019	4.308	1.341	12.403	$4.398 \times 10^5$	
4.00 TeV	$4.000 \times 10^6$	3.769	4.089	5.817	1.814	15.489	$5.118 \times 10^5$	
8.00 TeV	$8.000 \times 10^6$	3.855	8.421	11.893	3.788	27.957	$7.013 \times 10^5$	
10.0 TeV	$1.000 \times 10^7$	3.883	10.613	14.953	4.805	34.254	$7.658 \times 10^5$	
14.0 TeV	$1.400 \times 10^7$	3.926	14.987	21.051	6.900	46.864	$8.653 \times 10^5$	
20.0 TeV	$2.000 \times 10^7$	3.972	21.606	30.250	10.120	65.948	$9.727 \times 10^5$	
30.0 TeV	$3.000 \times 10^7$	4.025	32.628	45.553	15.711	97.917	$1.096 \times 10^6$	
40.0 TeV	$4.000 \times 10^7$	4.063	43.711	60.907	21.449	130.131	$1.185 \times 10^6$	
80.0 TeV	$8.000 \times 10^7$	4.158	88.153	122.376	45.541	260.229	$1.398 \times 10^6$	
100. TeV	$1.000 \times 10^8$	4.189	110.435	153.147	58.033	325.805	$1.466 \times 10^6$	