

## Muons in shielding concrete

	$\langle Z/A \rangle$	$\rho$ [g/cm <sup>3</sup> ]	$I$ [eV]	$a$	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
	0.50274	2.300	135.2	0.07515	3.5467	0.1301	3.0466	3.9464	0.00
$T$	$p$ [MeV/c]	Ionization	Brems	Pair prod	Photonucl	Total	CSDA range [g/cm <sup>2</sup> ]		
				[MeV cm <sup>2</sup> /g]					
10.0 MeV	$4.704 \times 10^1$	6.664				6.664		$8.343 \times 10^{-1}$	
14.0 MeV	$5.616 \times 10^1$	5.214				5.214		$1.520 \times 10^0$	
20.0 MeV	$6.802 \times 10^1$	4.084				4.084		$2.835 \times 10^0$	
30.0 MeV	$8.509 \times 10^1$	3.178				3.178		$5.649 \times 10^0$	
40.0 MeV	$1.003 \times 10^2$	2.719				2.719		$9.073 \times 10^0$	
80.0 MeV	$1.527 \times 10^2$	2.049				2.049		$2.655 \times 10^1$	
100. MeV	$1.764 \times 10^2$	1.925				1.925		$3.664 \times 10^1$	
140. MeV	$2.218 \times 10^2$	1.801				1.801		$5.822 \times 10^1$	
200. MeV	$2.868 \times 10^2$	1.732				1.732		$9.232 \times 10^1$	
293. MeV	$3.844 \times 10^2$	1.711			0.000	1.711			<i>Minimum ionization</i>
300. MeV	$3.917 \times 10^2$	1.711			0.000	1.711		$1.506 \times 10^2$	
400. MeV	$4.945 \times 10^2$	1.722			0.000	1.722		$2.089 \times 10^2$	
800. MeV	$8.995 \times 10^2$	1.800	0.000		0.000	1.801		$4.360 \times 10^2$	
1.00 GeV	$1.101 \times 10^3$	1.834	0.000		0.000	1.834		$5.460 \times 10^2$	
1.40 GeV	$1.502 \times 10^3$	1.888	0.001	0.000	0.001	1.889		$7.607 \times 10^2$	
2.00 GeV	$2.103 \times 10^3$	1.947	0.001	0.000	0.001	1.949		$1.073 \times 10^3$	
3.00 GeV	$3.104 \times 10^3$	2.014	0.001	0.001	0.001	2.018		$1.577 \times 10^3$	
4.00 GeV	$4.104 \times 10^3$	2.060	0.002	0.002	0.002	2.066		$2.066 \times 10^3$	
8.00 GeV	$8.105 \times 10^3$	2.165	0.005	0.005	0.004	2.179		$3.945 \times 10^3$	
10.0 GeV	$1.011 \times 10^4$	2.197	0.007	0.007	0.005	2.216		$4.855 \times 10^3$	
14.0 GeV	$1.411 \times 10^4$	2.243	0.010	0.011	0.006	2.271		$6.637 \times 10^3$	
20.0 GeV	$2.011 \times 10^4$	2.289	0.016	0.019	0.009	2.333		$9.242 \times 10^3$	
30.0 GeV	$3.011 \times 10^4$	2.338	0.027	0.033	0.013	2.411		$1.346 \times 10^4$	
40.0 GeV	$4.011 \times 10^4$	2.372	0.038	0.048	0.017	2.474		$1.755 \times 10^4$	
80.0 GeV	$8.011 \times 10^4$	2.448	0.085	0.115	0.033	2.682		$3.305 \times 10^4$	
100. GeV	$1.001 \times 10^5$	2.472	0.110	0.151	0.041	2.775		$4.038 \times 10^4$	
140. GeV	$1.401 \times 10^5$	2.507	0.162	0.226	0.057	2.953		$5.435 \times 10^4$	
200. GeV	$2.001 \times 10^5$	2.544	0.244	0.346	0.081	3.215		$7.382 \times 10^4$	
300. GeV	$3.001 \times 10^5$	2.586	0.384	0.548	0.122	3.639		$1.030 \times 10^5$	
400. GeV	$4.001 \times 10^5$	2.615	0.529	0.759	0.162	4.065		$1.290 \times 10^5$	
700. GeV	$7.005 \times 10^5$	2.673	0.978	1.409	0.286	5.347			<i>Muon critical energy</i>
800. GeV	$8.001 \times 10^5$	2.687	1.130	1.629	0.328	5.774		$2.112 \times 10^5$	
1.00 TeV	$1.000 \times 10^6$	2.711	1.441	2.077	0.412	6.640		$2.434 \times 10^5$	
1.40 TeV	$1.400 \times 10^6$	2.746	2.065	2.969	0.583	8.364		$2.970 \times 10^5$	
2.00 TeV	$2.000 \times 10^6$	2.784	3.022	4.335	0.845	10.987		$3.594 \times 10^5$	
3.00 TeV	$3.000 \times 10^6$	2.828	4.624	6.607	1.294	15.354		$4.361 \times 10^5$	
4.00 TeV	$4.000 \times 10^6$	2.860	6.252	8.908	1.750	19.770		$4.934 \times 10^5$	
8.00 TeV	$8.000 \times 10^6$	2.938	12.832	18.169	3.650	37.589		$6.376 \times 10^5$	
10.0 TeV	$1.000 \times 10^7$	2.964	16.155	22.831	4.627	46.577		$6.854 \times 10^5$	
14.0 TeV	$1.400 \times 10^7$	3.003	22.789	32.122	6.640	64.554		$7.580 \times 10^5$	
20.0 TeV	$2.000 \times 10^7$	3.045	32.815	46.131	9.730	91.721		$8.356 \times 10^5$	
30.0 TeV	$3.000 \times 10^7$	3.094	49.496	69.444	15.087	137.121		$9.242 \times 10^5$	
40.0 TeV	$4.000 \times 10^7$	3.129	66.253	92.826	20.582	182.791		$9.871 \times 10^5$	
80.0 TeV	$8.000 \times 10^7$	3.216	133.445	186.432	43.612	366.705		$1.139 \times 10^6$	
100. TeV	$1.000 \times 10^8$	3.244	167.127	233.286	55.538	459.196		$1.187 \times 10^6$	