

## Muons in Liquid hydrogen (H<sub>2</sub>)

Z	A [g/mol]	$\rho$ [g/cm <sup>3</sup> ]	I [eV]	$a$	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
1 (H)	1.008(7)	$7.080 \times 10^{-2}$	21.8	0.32969	3.0000	0.1641	1.9641	2.6783	0.00

  

T	$p$	Ionization	Brems	Pair prod	Photonucl	Total	CSDA range
	[MeV/c]	[MeV cm <sup>2</sup> /g]			[MeV cm <sup>2</sup> /g]		[g/cm <sup>2</sup> ]
10.0 MeV	$4.704 \times 10^1$	16.508				16.508	$3.316 \times 10^{-1}$
14.0 MeV	$5.616 \times 10^1$	12.812				12.812	$6.097 \times 10^{-1}$
20.0 MeV	$6.802 \times 10^1$	9.956				9.956	$1.147 \times 10^0$
30.0 MeV	$8.509 \times 10^1$	7.684				7.684	$2.307 \times 10^0$
40.0 MeV	$1.003 \times 10^2$	6.539				6.539	$3.727 \times 10^0$
80.0 MeV	$1.527 \times 10^2$	4.870				4.870	$1.105 \times 10^1$
100. MeV	$1.764 \times 10^2$	4.550				4.550	$1.531 \times 10^1$
140. MeV	$2.218 \times 10^2$	4.217				4.217	$2.448 \times 10^1$
200. MeV	$2.868 \times 10^2$	4.018			0.000	4.018	$3.912 \times 10^1$
300. MeV	$3.917 \times 10^2$	3.926			0.000	3.926	$6.438 \times 10^1$
354. MeV	$4.478 \times 10^2$	3.919			0.000	3.919	<i>Minimum ionization</i>
400. MeV	$4.945 \times 10^2$	3.922			0.000	3.922	$8.988 \times 10^1$
800. MeV	$8.995 \times 10^2$	4.029			0.000	4.030	$1.906 \times 10^2$
1.00 GeV	$1.101 \times 10^3$	4.084			0.001	4.084	$2.399 \times 10^2$
1.40 GeV	$1.502 \times 10^3$	4.174	0.000		0.001	4.175	$3.367 \times 10^2$
2.00 GeV	$2.103 \times 10^3$	4.274	0.000		0.001	4.275	$4.786 \times 10^2$
3.00 GeV	$3.104 \times 10^3$	4.389	0.000	0.000	0.002	4.391	$7.092 \times 10^2$
4.00 GeV	$4.104 \times 10^3$	4.469	0.001	0.000	0.002	4.472	$9.348 \times 10^2$
8.00 GeV	$8.105 \times 10^3$	4.655	0.001	0.001	0.005	4.663	$1.808 \times 10^3$
10.0 GeV	$1.011 \times 10^4$	4.713	0.002	0.002	0.006	4.722	$2.235 \times 10^3$
14.0 GeV	$1.411 \times 10^4$	4.798	0.003	0.003	0.008	4.812	$3.073 \times 10^3$
20.0 GeV	$2.011 \times 10^4$	4.884	0.005	0.006	0.011	4.906	$4.307 \times 10^3$
30.0 GeV	$3.011 \times 10^4$	4.979	0.008	0.010	0.015	5.013	$6.323 \times 10^3$
40.0 GeV	$4.011 \times 10^4$	5.044	0.012	0.015	0.020	5.091	$8.301 \times 10^3$
80.0 GeV	$8.011 \times 10^4$	5.194	0.028	0.038	0.038	5.298	$1.599 \times 10^4$
100. GeV	$1.001 \times 10^5$	5.241	0.037	0.050	0.047	5.375	$1.974 \times 10^4$
140. GeV	$1.401 \times 10^5$	5.310	0.055	0.076	0.066	5.508	$2.708 \times 10^4$
200. GeV	$2.001 \times 10^5$	5.383	0.085	0.118	0.093	5.679	$3.781 \times 10^4$
300. GeV	$3.001 \times 10^5$	5.465	0.137	0.191	0.139	5.932	$5.503 \times 10^4$
400. GeV	$4.001 \times 10^5$	5.524	0.191	0.268	0.185	6.168	$7.156 \times 10^4$
800. GeV	$8.001 \times 10^5$	5.666	0.423	0.592	0.373	7.053	$1.321 \times 10^5$
1.00 TeV	$1.000 \times 10^6$	5.712	0.544	0.761	0.468	7.485	$1.596 \times 10^5$
1.40 TeV	$1.400 \times 10^6$	5.782	0.791	1.101	0.663	8.338	$2.102 \times 10^5$
2.00 TeV	$2.000 \times 10^6$	5.858	1.175	1.627	0.961	9.621	$2.772 \times 10^5$
3.00 TeV	$3.000 \times 10^6$	5.945	1.827	2.504	1.474	11.749	$3.711 \times 10^5$
3.07 TeV	$3.070 \times 10^6$	5.950	1.873	2.566	1.510	11.899	<i>Muon critical energy</i>
4.00 TeV	$4.000 \times 10^6$	6.007	2.496	3.399	1.996	13.898	$4.493 \times 10^5$
8.00 TeV	$8.000 \times 10^6$	6.161	5.240	7.012	4.180	22.594	$6.729 \times 10^5$
10.0 TeV	$1.000 \times 10^7$	6.212	6.642	8.837	5.308	26.999	$7.538 \times 10^5$
14.0 TeV	$1.400 \times 10^7$	6.289	9.452	12.466	7.642	35.849	$8.820 \times 10^5$
20.0 TeV	$2.000 \times 10^7$	6.372	13.734	17.952	11.236	49.294	$1.024 \times 10^6$
30.0 TeV	$3.000 \times 10^7$	6.468	20.884	27.062	17.498	71.912	$1.191 \times 10^6$
40.0 TeV	$4.000 \times 10^7$	6.538	28.113	36.210	23.940	94.800	$1.312 \times 10^6$
80.0 TeV	$8.000 \times 10^7$	6.709	57.248	72.833	51.135	187.924	$1.606 \times 10^6$
100. TeV	$1.000 \times 10^8$	6.765	71.920	91.170	65.290	235.145	$1.701 \times 10^6$