

## Muons in neptunium (Np)

Z	A [g/mol]	$\rho$ [g/cm <sup>3</sup> ]	I [eV]	a	$k = m_s$	$x_0$	$x_1$	$\bar{C}$	$\delta_0$
93 (Np)	[237.04817 (2)]	20.250	902.0	0.19741	2.8082	0.1869	3.3690	5.8149	0.14
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	$4.704 \times 10^1$	3.707				3.707	$1.578 \times 10^0$		
14.0 MeV	$5.616 \times 10^1$	2.967				2.968	$2.795 \times 10^0$		
20.0 MeV	$6.802 \times 10^1$	2.370				2.370	$5.080 \times 10^0$		
30.0 MeV	$8.509 \times 10^1$	1.878				1.878	$9.879 \times 10^0$		
40.0 MeV	$1.003 \times 10^2$	1.623				1.623	$1.564 \times 10^1$		
80.0 MeV	$1.527 \times 10^2$	1.249				1.249	$4.456 \times 10^1$		
100. MeV	$1.764 \times 10^2$	1.183				1.183	$6.106 \times 10^1$		
140. MeV	$2.218 \times 10^2$	1.123				1.123	$9.590 \times 10^1$		
200. MeV	$2.868 \times 10^2$	1.096				1.097	$1.502 \times 10^2$		
227. MeV	$3.154 \times 10^2$	1.095	0.000			1.095	<i>Minimum ionization</i>		
300. MeV	$3.917 \times 10^2$	1.102	0.000		0.000	1.102	$2.413 \times 10^2$		
400. MeV	$4.945 \times 10^2$	1.122	0.000		0.000	1.123	$3.312 \times 10^2$		
800. MeV	$8.995 \times 10^2$	1.205	0.001		0.000	1.207	$6.743 \times 10^2$		
1.00 GeV	$1.101 \times 10^3$	1.237	0.002		0.000	1.240	$8.377 \times 10^2$		
1.40 GeV	$1.502 \times 10^3$	1.289	0.003		0.001	1.292	$1.153 \times 10^3$		
2.00 GeV	$2.103 \times 10^3$	1.344	0.004	0.001	0.001	1.350	$1.607 \times 10^3$		
3.00 GeV	$3.104 \times 10^3$	1.406	0.008	0.003	0.001	1.418	$2.329 \times 10^3$		
4.00 GeV	$4.104 \times 10^3$	1.449	0.011	0.006	0.002	1.468	$3.021 \times 10^3$		
8.00 GeV	$8.105 \times 10^3$	1.545	0.028	0.023	0.003	1.600	$5.621 \times 10^3$		
10.0 GeV	$1.011 \times 10^4$	1.574	0.037	0.033	0.004	1.649	$6.852 \times 10^3$		
14.0 GeV	$1.411 \times 10^4$	1.616	0.056	0.054	0.005	1.733	$9.217 \times 10^3$		
20.0 GeV	$2.011 \times 10^4$	1.657	0.088	0.090	0.007	1.843	$1.257 \times 10^4$		
30.0 GeV	$3.011 \times 10^4$	1.700	0.144	0.159	0.011	2.015	$1.776 \times 10^4$		
40.0 GeV	$4.011 \times 10^4$	1.729	0.203	0.236	0.014	2.183	$2.252 \times 10^4$		
80.0 GeV	$8.011 \times 10^4$	1.793	0.460	0.573	0.027	2.855	$3.850 \times 10^4$		
100. GeV	$1.001 \times 10^5$	1.812	0.596	0.755	0.034	3.199	$4.512 \times 10^4$		
127. GeV	$1.271 \times 10^5$	1.832	0.783	1.006	0.043	3.666	<i>Muon critical energy</i>		
140. GeV	$1.401 \times 10^5$	1.840	0.875	1.130	0.047	3.894	$5.644 \times 10^4$		
200. GeV	$2.001 \times 10^5$	1.869	1.312	1.725	0.067	4.974	$7.005 \times 10^4$		
300. GeV	$3.001 \times 10^5$	1.902	2.056	2.717	0.101	6.777	$8.721 \times 10^4$		
400. GeV	$4.001 \times 10^5$	1.925	2.824	3.746	0.135	8.631	$1.003 \times 10^5$		
800. GeV	$8.001 \times 10^5$	1.981	5.995	7.962	0.272	16.212	$1.336 \times 10^5$		
1.00 TeV	$1.000 \times 10^6$	1.999	7.622	10.119	0.342	20.084	$1.446 \times 10^5$		
1.40 TeV	$1.400 \times 10^6$	2.027	10.880	14.419	0.485	27.813	$1.615 \times 10^5$		
2.00 TeV	$2.000 \times 10^6$	2.057	15.861	20.982	0.701	39.602	$1.795 \times 10^5$		
3.00 TeV	$3.000 \times 10^6$	2.091	24.170	31.884	1.071	59.218	$2.000 \times 10^5$		
4.00 TeV	$4.000 \times 10^6$	2.116	32.585	42.901	1.446	79.051	$2.146 \times 10^5$		
8.00 TeV	$8.000 \times 10^6$	2.177	66.487	87.181	3.002	158.849	$2.495 \times 10^5$		
10.0 TeV	$1.000 \times 10^7$	2.197	83.561	109.435	3.801	198.996	$2.608 \times 10^5$		
14.0 TeV	$1.400 \times 10^7$	2.227	117.615	153.842	5.438	279.125	$2.777 \times 10^5$		
20.0 TeV	$2.000 \times 10^7$	2.260	168.976	220.732	7.946	399.916	$2.955 \times 10^5$		
30.0 TeV	$3.000 \times 10^7$	2.298	254.563	332.013	12.277	601.154	$3.158 \times 10^5$		
40.0 TeV	$4.000 \times 10^7$	2.326	340.457	443.549	16.709	803.043	$3.301 \times 10^5$		
80.0 TeV	$8.000 \times 10^7$	2.393	684.014	890.002	35.192	1611.604	$3.646 \times 10^5$		
100. TeV	$1.000 \times 10^8$	2.416	855.900	1113.430	44.730	2016.478	$3.757 \times 10^5$		