## Muons in carbon dioxide gas ($CO_2$)

| $\langle Z/A \rangle$ | $\rho$ [g/cm$^3$] | $I$ [eV] | $a$ | $k = m_s$ | $x_0$ | $x_1$ | $\overline{C}$ | $\delta_0$ |
|---|---|---|---|---|---|---|---|---|
| 0.49989 | $1.842 \times 10^{-3}$ | 85.0 | 0.11768 | 3.3227 | 1.6294 | 4.1825 | 10.1537 | 0.00 |

| $T$ | $p$ [MeV/$c$] | Ionization | Brems | Pair prod | Photonucl | Total | CSDA range [g/cm$^2$] |
|---|---|---|---|---|---|---|---|
| | | [MeV cm$^2$/g] | | | | | |
| 10.0 MeV | $4.704 \times 10^1$ | 7.057 | | | | 7.057 | $7.842 \times 10^{-1}$ |
| 14.0 MeV | $5.616 \times 10^1$ | 5.508 | | | | 5.508 | $1.433 \times 10^0$ |
| 20.0 MeV | $6.802 \times 10^1$ | 4.304 | | | | 4.304 | $2.679 \times 10^0$ |
| 30.0 MeV | $8.509 \times 10^1$ | 3.341 | | | | 3.341 | $5.353 \times 10^0$ |
| 40.0 MeV | $1.003 \times 10^2$ | 2.854 | | | | 2.854 | $8.612 \times 10^0$ |
| 80.0 MeV | $1.527 \times 10^2$ | 2.145 | | | | 2.145 | $2.529 \times 10^1$ |
| 100. MeV | $1.764 \times 10^2$ | 2.018 | | | | 2.018 | $3.493 \times 10^1$ |
| 140. MeV | $2.218 \times 10^2$ | 1.894 | | | | 1.894 | $5.549 \times 10^1$ |
| 200. MeV | $2.868 \times 10^2$ | 1.831 | | | | 1.831 | $8.783 \times 10^1$ |
| 257. MeV | $3.471 \times 10^2$ | 1.819 | | | 0.000 | 1.820 | *Minimum ionization* |
| 300. MeV | $3.917 \times 10^2$ | 1.823 | | | 0.000 | 1.823 | $1.427 \times 10^2$ |
| 400. MeV | $4.945 \times 10^2$ | 1.848 | | | 0.000 | 1.848 | $1.972 \times 10^2$ |
| 800. MeV | $8.995 \times 10^2$ | 1.972 | 0.000 | | 0.000 | 1.972 | $4.066 \times 10^2$ |
| 1.00 GeV | $1.101 \times 10^3$ | 2.024 | 0.000 | | 0.000 | 2.025 | $5.066 \times 10^2$ |
| 1.40 GeV | $1.502 \times 10^3$ | 2.109 | 0.000 | | 0.001 | 2.111 | $6.999 \times 10^2$ |
| 2.00 GeV | $2.103 \times 10^3$ | 2.206 | 0.001 | 0.000 | 0.001 | 2.208 | $9.776 \times 10^2$ |
| 3.00 GeV | $3.104 \times 10^3$ | 2.319 | 0.001 | 0.001 | 0.001 | 2.322 | $1.418 \times 10^3$ |
| 4.00 GeV | $4.104 \times 10^3$ | 2.401 | 0.002 | 0.001 | 0.002 | 2.405 | $1.841 \times 10^3$ |
| 8.00 GeV | $8.105 \times 10^3$ | 2.567 | 0.004 | 0.003 | 0.004 | 2.578 | $3.439 \times 10^3$ |
| 10.0 GeV | $1.011 \times 10^4$ | 2.615 | 0.005 | 0.005 | 0.005 | 2.630 | $4.207 \times 10^3$ |
| 14.0 GeV | $1.411 \times 10^4$ | 2.683 | 0.007 | 0.008 | 0.007 | 2.705 | $5.705 \times 10^3$ |
| 20.0 GeV | $2.011 \times 10^4$ | 2.749 | 0.011 | 0.013 | 0.009 | 2.783 | $7.890 \times 10^3$ |
| 30.0 GeV | $3.011 \times 10^4$ | 2.818 | 0.019 | 0.023 | 0.013 | 2.874 | $1.142 \times 10^4$ |
| 40.0 GeV | $4.011 \times 10^4$ | 2.863 | 0.027 | 0.034 | 0.017 | 2.941 | $1.486 \times 10^4$ |
| 80.0 GeV | $8.011 \times 10^4$ | 2.960 | 0.061 | 0.081 | 0.034 | 3.136 | $2.800 \times 10^4$ |
| 100. GeV | $1.001 \times 10^5$ | 2.989 | 0.079 | 0.107 | 0.042 | 3.217 | $3.430 \times 10^4$ |
| 140. GeV | $1.401 \times 10^5$ | 3.029 | 0.116 | 0.161 | 0.058 | 3.365 | $4.645 \times 10^4$ |
| 200. GeV | $2.001 \times 10^5$ | 3.071 | 0.174 | 0.247 | 0.083 | 3.575 | $6.374 \times 10^4$ |
| 300. GeV | $3.001 \times 10^5$ | 3.115 | 0.275 | 0.392 | 0.124 | 3.907 | $9.049 \times 10^4$ |
| 400. GeV | $4.001 \times 10^5$ | 3.146 | 0.379 | 0.543 | 0.165 | 4.234 | $1.151 \times 10^5$ |
| 800. GeV | $8.001 \times 10^5$ | 3.219 | 0.813 | 1.172 | 0.334 | 5.539 | $1.974 \times 10^5$ |
| 1.00 TeV | $1.000 \times 10^6$ | 3.243 | 1.037 | 1.497 | 0.420 | 6.197 | $2.315 \times 10^5$ |
| 1.09 TeV | $1.095 \times 10^6$ | 3.252 | 1.143 | 1.648 | 0.461 | 6.505 | *Muon critical energy* |
| 1.40 TeV | $1.400 \times 10^6$ | 3.278 | 1.489 | 2.143 | 0.595 | 7.505 | $2.901 \times 10^5$ |
| 2.00 TeV | $2.000 \times 10^6$ | 3.316 | 2.181 | 3.133 | 0.862 | 9.493 | $3.611 \times 10^5$ |
| 3.00 TeV | $3.000 \times 10^6$ | 3.360 | 3.342 | 4.781 | 1.320 | 12.804 | $4.515 \times 10^5$ |
| 4.00 TeV | $4.000 \times 10^6$ | 3.392 | 4.523 | 6.451 | 1.786 | 16.152 | $5.208 \times 10^5$ |
| 8.00 TeV | $8.000 \times 10^6$ | 3.469 | 9.300 | 13.178 | 3.728 | 29.675 | $7.008 \times 10^5$ |
| 10.0 TeV | $1.000 \times 10^7$ | 3.495 | 11.714 | 16.565 | 4.728 | 36.502 | $7.615 \times 10^5$ |
| 14.0 TeV | $1.400 \times 10^7$ | 3.534 | 16.532 | 23.316 | 6.787 | 50.168 | $8.546 \times 10^5$ |
| 20.0 TeV | $2.000 \times 10^7$ | 3.575 | 23.817 | 33.496 | 9.949 | 70.838 | $9.548 \times 10^5$ |
| 30.0 TeV | $3.000 \times 10^7$ | 3.624 | 35.946 | 50.437 | 15.437 | 105.444 | $1.070 \times 10^6$ |
| 40.0 TeV | $4.000 \times 10^7$ | 3.659 | 48.136 | 67.432 | 21.069 | 140.295 | $1.152 \times 10^6$ |
| 80.0 TeV | $8.000 \times 10^7$ | 3.745 | 97.010 | 135.468 | 44.687 | 280.911 | $1.349 \times 10^6$ |
| 100. TeV | $1.000 \times 10^8$ | 3.773 | 121.509 | 169.526 | 56.926 | 351.734 | $1.413 \times 10^6$ |