## Muons in alanine ($C_3H_7NO_2$)

| $\langle Z/A \rangle$ | $\rho$ [g/cm$^3$] | $I$ [eV] | $a$ | $k = m_s$ | $x_0$ | $x_1$ | $\overline{C}$ | $\delta_0$ |
|---|---|---|---|---|---|---|---|---|
| 0.53976 | 1.420 | 71.9 | 0.11484 | 3.3526 | 0.1354 | 2.6336 | 3.0965 | 0.00 |

| $T$ | $p$ [MeV/$c$] | Ionization | Brems | Pair prod | Photonucl | Total | CSDA range [g/cm$^2$] |
|---|---|---|---|---|---|---|---|
| | | [MeV cm$^2$/g] | | | | | |
| 10.0 MeV | $4.704 \times 10^1$ | 7.787 | | | | 7.787 | $7.094 \times 10^{-1}$ |
| 14.0 MeV | $5.616 \times 10^1$ | 6.073 | | | | 6.073 | $1.297 \times 10^0$ |
| 20.0 MeV | $6.802 \times 10^1$ | 4.742 | | | | 4.742 | $2.428 \times 10^0$ |
| 30.0 MeV | $8.509 \times 10^1$ | 3.678 | | | | 3.678 | $4.856 \times 10^0$ |
| 40.0 MeV | $1.003 \times 10^2$ | 3.140 | | | | 3.140 | $7.818 \times 10^0$ |
| 80.0 MeV | $1.527 \times 10^2$ | 2.353 | | | | 2.353 | $2.299 \times 10^1$ |
| 100. MeV | $1.764 \times 10^2$ | 2.203 | | | | 2.203 | $3.180 \times 10^1$ |
| 140. MeV | $2.218 \times 10^2$ | 2.049 | | | | 2.049 | $5.072 \times 10^1$ |
| 200. MeV | $2.868 \times 10^2$ | 1.960 | | | | 1.960 | $8.078 \times 10^1$ |
| 300. MeV | $3.917 \times 10^2$ | 1.925 | | | 0.000 | 1.925 | $1.324 \times 10^2$ |
| 325. MeV | $4.171 \times 10^2$ | 1.924 | | | 0.000 | 1.924 | *Minimum ionization* |
| 400. MeV | $4.945 \times 10^2$ | 1.929 | | | 0.000 | 1.930 | $1.844 \times 10^2$ |
| 800. MeV | $8.995 \times 10^2$ | 2.000 | 0.000 | | 0.000 | 2.000 | $3.880 \times 10^2$ |
| 1.00 GeV | $1.101 \times 10^3$ | 2.032 | 0.000 | | 0.000 | 2.033 | $4.872 \times 10^2$ |
| 1.40 GeV | $1.502 \times 10^3$ | 2.086 | 0.000 | | 0.001 | 2.087 | $6.813 \times 10^2$ |
| 2.00 GeV | $2.103 \times 10^3$ | 2.145 | 0.001 | 0.000 | 0.001 | 2.146 | $9.645 \times 10^2$ |
| 3.00 GeV | $3.104 \times 10^3$ | 2.212 | 0.001 | 0.001 | 0.001 | 2.215 | $1.423 \times 10^3$ |
| 4.00 GeV | $4.104 \times 10^3$ | 2.259 | 0.001 | 0.001 | 0.002 | 2.263 | $1.869 \times 10^3$ |
| 8.00 GeV | $8.105 \times 10^3$ | 2.366 | 0.003 | 0.003 | 0.004 | 2.376 | $3.589 \times 10^3$ |
| 10.0 GeV | $1.011 \times 10^4$ | 2.399 | 0.004 | 0.004 | 0.005 | 2.412 | $4.424 \times 10^3$ |
| 14.0 GeV | $1.411 \times 10^4$ | 2.446 | 0.007 | 0.007 | 0.007 | 2.467 | $6.063 \times 10^3$ |
| 20.0 GeV | $2.011 \times 10^4$ | 2.494 | 0.010 | 0.012 | 0.009 | 2.525 | $8.465 \times 10^3$ |
| 30.0 GeV | $3.011 \times 10^4$ | 2.546 | 0.017 | 0.021 | 0.014 | 2.597 | $1.237 \times 10^4$ |
| 40.0 GeV | $4.011 \times 10^4$ | 2.581 | 0.024 | 0.030 | 0.018 | 2.654 | $1.617 \times 10^4$ |
| 80.0 GeV | $8.011 \times 10^4$ | 2.663 | 0.055 | 0.074 | 0.034 | 2.826 | $3.076 \times 10^4$ |
| 100. GeV | $1.001 \times 10^5$ | 2.688 | 0.071 | 0.097 | 0.043 | 2.899 | $3.774 \times 10^4$ |
| 140. GeV | $1.401 \times 10^5$ | 2.726 | 0.105 | 0.146 | 0.059 | 3.036 | $5.122 \times 10^4$ |
| 200. GeV | $2.001 \times 10^5$ | 2.765 | 0.158 | 0.224 | 0.084 | 3.231 | $7.037 \times 10^4$ |
| 300. GeV | $3.001 \times 10^5$ | 2.810 | 0.250 | 0.355 | 0.126 | 3.541 | $9.992 \times 10^4$ |
| 400. GeV | $4.001 \times 10^5$ | 2.842 | 0.345 | 0.493 | 0.167 | 3.847 | $1.270 \times 10^5$ |
| 800. GeV | $8.001 \times 10^5$ | 2.919 | 0.740 | 1.065 | 0.338 | 5.063 | $2.174 \times 10^5$ |
| 1.00 TeV | $1.000 \times 10^6$ | 2.944 | 0.945 | 1.361 | 0.425 | 5.676 | $2.546 \times 10^5$ |
| 1.08 TeV | $1.076 \times 10^6$ | 2.953 | 1.022 | 1.472 | 0.458 | 5.906 | *Muon critical energy* |
| 1.40 TeV | $1.400 \times 10^6$ | 2.983 | 1.357 | 1.950 | 0.603 | 6.892 | $3.185 \times 10^5$ |
| 2.00 TeV | $2.000 \times 10^6$ | 3.024 | 1.990 | 2.853 | 0.873 | 8.740 | $3.957 \times 10^5$ |
| 3.00 TeV | $3.000 \times 10^6$ | 3.071 | 3.052 | 4.357 | 1.337 | 11.817 | $4.937 \times 10^5$ |
| 4.00 TeV | $4.000 \times 10^6$ | 3.105 | 4.132 | 5.882 | 1.810 | 14.929 | $5.688 \times 10^5$ |
| 8.00 TeV | $8.000 \times 10^6$ | 3.189 | 8.507 | 12.024 | 3.778 | 27.498 | $7.633 \times 10^5$ |
| 10.0 TeV | $1.000 \times 10^7$ | 3.216 | 10.721 | 15.118 | 4.791 | 33.847 | $8.288 \times 10^5$ |
| 14.0 TeV | $1.400 \times 10^7$ | 3.258 | 15.138 | 21.283 | 6.881 | 46.559 | $9.291 \times 10^5$ |
| 20.0 TeV | $2.000 \times 10^7$ | 3.304 | 21.820 | 30.581 | 10.091 | 65.795 | $1.037 \times 10^6$ |
| 30.0 TeV | $3.000 \times 10^7$ | 3.356 | 32.947 | 46.052 | 15.664 | 98.019 | $1.161 \times 10^6$ |
| 40.0 TeV | $4.000 \times 10^7$ | 3.394 | 44.135 | 61.573 | 21.384 | 130.486 | $1.249 \times 10^6$ |
| 80.0 TeV | $8.000 \times 10^7$ | 3.487 | 88.997 | 123.711 | 45.395 | 261.590 | $1.461 \times 10^6$ |
| 100. TeV | $1.000 \times 10^8$ | 3.517 | 111.489 | 154.818 | 57.843 | 327.667 | $1.529 \times 10^6$ |