## Muons in vanadium (V)

| Z | $A$ [g/mol] | $\rho$ [g/cm$^3$] | $I$ [eV] | $a$ | $k = m_s$ | $x_0$ | $x_1$ | $\overline{C}$ | $\delta_0$ |
|---|---|---|---|---|---|---|---|---|---|
| 23 (V) | 50.9415 (1) | 6.110 | 245.0 | 0.15436 | 3.0163 | 0.0691 | 3.0322 | 4.2659 | 0.14 |

| $T$ | $p$ [MeV/$c$] | Ionization | Brems | Pair prod | Photonucl | Total | CSDA range [g/cm$^2$] |
|---|---|---|---|---|---|---|---|
| | | [MeV cm$^2$/g] | | | | | |
| 10.0 MeV | $4.704 \times 10^1$ | 5.463 | | | | 5.463 | $1.028 \times 10^0$ |
| 14.0 MeV | $5.616 \times 10^1$ | 4.292 | | | | 4.292 | $1.862 \times 10^0$ |
| 20.0 MeV | $6.802 \times 10^1$ | 3.372 | | | | 3.373 | $3.457 \times 10^0$ |
| 30.0 MeV | $8.509 \times 10^1$ | 2.631 | | | | 2.631 | $6.859 \times 10^0$ |
| 40.0 MeV | $1.003 \times 10^2$ | 2.253 | | | | 2.254 | $1.099 \times 10^1$ |
| 80.0 MeV | $1.527 \times 10^2$ | 1.700 | | | | 1.700 | $3.207 \times 10^1$ |
| 100. MeV | $1.764 \times 10^2$ | 1.600 | | | | 1.600 | $4.422 \times 10^1$ |
| 140. MeV | $2.218 \times 10^2$ | 1.501 | | | | 1.501 | $7.015 \times 10^1$ |
| 200. MeV | $2.868 \times 10^2$ | 1.449 | | | | 1.449 | $1.110 \times 10^2$ |
| 273. MeV | $3.633 \times 10^2$ | 1.436 | | | 0.000 | 1.437 | *Minimum ionization* |
| 300. MeV | $3.917 \times 10^2$ | 1.437 | | | 0.000 | 1.438 | $1.805 \times 10^2$ |
| 400. MeV | $4.945 \times 10^2$ | 1.451 | 0.000 | | 0.000 | 1.452 | $2.497 \times 10^2$ |
| 800. MeV | $8.995 \times 10^2$ | 1.529 | 0.000 | | 0.000 | 1.530 | $5.180 \times 10^2$ |
| 1.00 GeV | $1.101 \times 10^3$ | 1.561 | 0.001 | | 0.000 | 1.562 | $6.473 \times 10^2$ |
| 1.40 GeV | $1.502 \times 10^3$ | 1.613 | 0.001 | 0.000 | 0.001 | 1.615 | $8.990 \times 10^2$ |
| 2.00 GeV | $2.103 \times 10^3$ | 1.669 | 0.001 | 0.001 | 0.001 | 1.673 | $1.264 \times 10^3$ |
| 3.00 GeV | $3.104 \times 10^3$ | 1.733 | 0.003 | 0.002 | 0.001 | 1.739 | $1.849 \times 10^3$ |
| 4.00 GeV | $4.104 \times 10^3$ | 1.777 | 0.004 | 0.003 | 0.002 | 1.786 | $2.416 \times 10^3$ |
| 8.00 GeV | $8.105 \times 10^3$ | 1.877 | 0.009 | 0.009 | 0.003 | 1.899 | $4.581 \times 10^3$ |
| 10.0 GeV | $1.011 \times 10^4$ | 1.907 | 0.012 | 0.013 | 0.004 | 1.936 | $5.624 \times 10^3$ |
| 14.0 GeV | $1.411 \times 10^4$ | 1.950 | 0.018 | 0.020 | 0.006 | 1.995 | $7.658 \times 10^3$ |
| 20.0 GeV | $2.011 \times 10^4$ | 1.993 | 0.028 | 0.033 | 0.008 | 2.063 | $1.061 \times 10^4$ |
| 30.0 GeV | $3.011 \times 10^4$ | 2.039 | 0.046 | 0.058 | 0.012 | 2.155 | $1.535 \times 10^4$ |
| 40.0 GeV | $4.011 \times 10^4$ | 2.069 | 0.065 | 0.084 | 0.016 | 2.236 | $1.991 \times 10^4$ |
| 80.0 GeV | $8.011 \times 10^4$ | 2.138 | 0.148 | 0.202 | 0.031 | 2.520 | $3.673 \times 10^4$ |
| 100. GeV | $1.001 \times 10^5$ | 2.160 | 0.192 | 0.266 | 0.039 | 2.656 | $4.446 \times 10^4$ |
| 140. GeV | $1.401 \times 10^5$ | 2.191 | 0.282 | 0.397 | 0.054 | 2.925 | $5.880 \times 10^4$ |
| 200. GeV | $2.001 \times 10^5$ | 2.224 | 0.423 | 0.606 | 0.077 | 3.330 | $7.802 \times 10^4$ |
| 300. GeV | $3.001 \times 10^5$ | 2.262 | 0.664 | 0.956 | 0.115 | 3.997 | $1.054 \times 10^5$ |
| 385. GeV | $3.848 \times 10^5$ | 2.285 | 0.875 | 1.263 | 0.147 | 4.570 | *Muon critical energy* |
| 400. GeV | $4.001 \times 10^5$ | 2.288 | 0.913 | 1.319 | 0.153 | 4.674 | $1.285 \times 10^5$ |
| 800. GeV | $8.001 \times 10^5$ | 2.353 | 1.947 | 2.812 | 0.309 | 7.421 | $1.959 \times 10^5$ |
| 1.00 TeV | $1.000 \times 10^6$ | 2.374 | 2.478 | 3.577 | 0.388 | 8.818 | $2.205 \times 10^5$ |
| 1.40 TeV | $1.400 \times 10^6$ | 2.406 | 3.546 | 5.104 | 0.550 | 11.607 | $2.600 \times 10^5$ |
| 2.00 TeV | $2.000 \times 10^6$ | 2.440 | 5.181 | 7.437 | 0.797 | 15.856 | $3.040 \times 10^5$ |
| 3.00 TeV | $3.000 \times 10^6$ | 2.480 | 7.914 | 11.316 | 1.219 | 22.930 | $3.562 \times 10^5$ |
| 4.00 TeV | $4.000 \times 10^6$ | 2.508 | 10.687 | 15.239 | 1.648 | 30.084 | $3.942 \times 10^5$ |
| 8.00 TeV | $8.000 \times 10^6$ | 2.578 | 21.882 | 31.019 | 3.431 | 58.910 | $4.875 \times 10^5$ |
| 10.0 TeV | $1.000 \times 10^7$ | 2.601 | 27.529 | 38.955 | 4.347 | 73.433 | $5.178 \times 10^5$ |
| 14.0 TeV | $1.400 \times 10^7$ | 2.637 | 38.795 | 54.786 | 6.230 | 102.448 | $5.637 \times 10^5$ |
| 20.0 TeV | $2.000 \times 10^7$ | 2.674 | 55.806 | 78.644 | 9.118 | 146.243 | $6.125 \times 10^5$ |
| 30.0 TeV | $3.000 \times 10^7$ | 2.718 | 84.125 | 118.339 | 14.115 | 219.298 | $6.680 \times 10^5$ |
| 40.0 TeV | $4.000 \times 10^7$ | 2.750 | 112.559 | 158.138 | 19.235 | 292.682 | $7.073 \times 10^5$ |
| 80.0 TeV | $8.000 \times 10^7$ | 2.828 | 226.515 | 317.459 | 40.647 | 587.449 | $8.019 \times 10^5$ |
| 100. TeV | $1.000 \times 10^8$ | 2.853 | 283.610 | 397.200 | 51.720 | 735.384 | $8.322 \times 10^5$ |