

## Muons in lutetium (Lu)

| Z        | A [g/mol]           | $\rho$ [g/cm <sup>3</sup> ] | I [eV]  | $a$                                   | $k = m_s$ | $x_0$    | $x_1$                              | $\bar{C}$ | $\delta_0$ |
|----------|---------------------|-----------------------------|---------|---------------------------------------|-----------|----------|------------------------------------|-----------|------------|
| 71 (Lu)  | 174.9668(1)         | 9.841                       | 694.0   | 0.24033                               | 2.5643    | 0.1560   | 3.5218                             | 5.9784    | 0.14       |
| $T$      | $p$<br>[MeV/c]      | Ionization                  | Brems   | Pair prod<br>[MeV cm <sup>2</sup> /g] | Photonucl | Total    | CSDA range<br>[g/cm <sup>2</sup> ] |           |            |
| 10.0 MeV | $4.704 \times 10^1$ | 4.072                       |         |                                       |           | 4.072    | $1.417 \times 10^0$                |           |            |
| 14.0 MeV | $5.616 \times 10^1$ | 3.240                       |         |                                       |           | 3.240    | $2.529 \times 10^0$                |           |            |
| 20.0 MeV | $6.802 \times 10^1$ | 2.575                       |         |                                       |           | 2.575    | $4.628 \times 10^0$                |           |            |
| 30.0 MeV | $8.509 \times 10^1$ | 2.030                       |         |                                       |           | 2.030    | $9.058 \times 10^0$                |           |            |
| 40.0 MeV | $1.003 \times 10^2$ | 1.751                       |         |                                       |           | 1.751    | $1.439 \times 10^1$                |           |            |
| 80.0 MeV | $1.527 \times 10^2$ | 1.339                       |         |                                       |           | 1.339    | $4.130 \times 10^1$                |           |            |
| 100. MeV | $1.764 \times 10^2$ | 1.266                       |         |                                       |           | 1.266    | $5.669 \times 10^1$                |           |            |
| 140. MeV | $2.218 \times 10^2$ | 1.196                       |         |                                       |           | 1.197    | $8.933 \times 10^1$                |           |            |
| 200. MeV | $2.868 \times 10^2$ | 1.164                       |         |                                       |           | 1.164    | $1.403 \times 10^2$                |           |            |
| 237. MeV | $3.260 \times 10^2$ | 1.160                       | 0.000   |                                       |           | 1.161    | <i>Minimum ionization</i>          |           |            |
| 300. MeV | $3.917 \times 10^2$ | 1.165                       | 0.000   |                                       | 0.000     | 1.166    | $2.264 \times 10^2$                |           |            |
| 400. MeV | $4.945 \times 10^2$ | 1.185                       | 0.000   |                                       | 0.000     | 1.185    | $3.115 \times 10^2$                |           |            |
| 800. MeV | $8.995 \times 10^2$ | 1.268                       | 0.001   |                                       | 0.000     | 1.269    | $6.372 \times 10^2$                |           |            |
| 1.00 GeV | $1.101 \times 10^3$ | 1.301                       | 0.001   |                                       | 0.000     | 1.303    | $7.927 \times 10^2$                |           |            |
| 1.40 GeV | $1.502 \times 10^3$ | 1.354                       | 0.002   | 0.000                                 | 0.001     | 1.357    | $1.093 \times 10^3$                |           |            |
| 2.00 GeV | $2.103 \times 10^3$ | 1.412                       | 0.004   | 0.001                                 | 0.001     | 1.417    | $1.525 \times 10^3$                |           |            |
| 3.00 GeV | $3.104 \times 10^3$ | 1.477                       | 0.006   | 0.003                                 | 0.001     | 1.488    | $2.213 \times 10^3$                |           |            |
| 4.00 GeV | $4.104 \times 10^3$ | 1.522                       | 0.009   | 0.006                                 | 0.002     | 1.539    | $2.873 \times 10^3$                |           |            |
| 8.00 GeV | $8.105 \times 10^3$ | 1.625                       | 0.023   | 0.021                                 | 0.003     | 1.672    | $5.356 \times 10^3$                |           |            |
| 10.0 GeV | $1.011 \times 10^4$ | 1.657                       | 0.030   | 0.029                                 | 0.004     | 1.720    | $6.534 \times 10^3$                |           |            |
| 14.0 GeV | $1.411 \times 10^4$ | 1.701                       | 0.046   | 0.047                                 | 0.005     | 1.801    | $8.805 \times 10^3$                |           |            |
| 20.0 GeV | $2.011 \times 10^4$ | 1.746                       | 0.071   | 0.078                                 | 0.007     | 1.903    | $1.204 \times 10^4$                |           |            |
| 30.0 GeV | $3.011 \times 10^4$ | 1.793                       | 0.116   | 0.137                                 | 0.011     | 2.058    | $1.709 \times 10^4$                |           |            |
| 40.0 GeV | $4.011 \times 10^4$ | 1.825                       | 0.164   | 0.201                                 | 0.014     | 2.205    | $2.178 \times 10^4$                |           |            |
| 80.0 GeV | $8.011 \times 10^4$ | 1.894                       | 0.372   | 0.484                                 | 0.028     | 2.779    | $3.790 \times 10^4$                |           |            |
| 100. GeV | $1.001 \times 10^5$ | 1.915                       | 0.482   | 0.637                                 | 0.035     | 3.070    | $4.475 \times 10^4$                |           |            |
| 140. GeV | $1.401 \times 10^5$ | 1.945                       | 0.707   | 0.952                                 | 0.049     | 3.654    | $5.668 \times 10^4$                |           |            |
| 157. GeV | $1.575 \times 10^5$ | 1.955                       | 0.808   | 1.093                                 | 0.055     | 3.912    | <i>Muon critical energy</i>        |           |            |
| 200. GeV | $2.001 \times 10^5$ | 1.976                       | 1.060   | 1.450                                 | 0.069     | 4.556    | $7.137 \times 10^4$                |           |            |
| 300. GeV | $3.001 \times 10^5$ | 2.010                       | 1.661   | 2.282                                 | 0.104     | 6.058    | $9.035 \times 10^4$                |           |            |
| 400. GeV | $4.001 \times 10^5$ | 2.034                       | 2.283   | 3.144                                 | 0.139     | 7.601    | $1.051 \times 10^5$                |           |            |
| 800. GeV | $8.001 \times 10^5$ | 2.092                       | 4.849   | 6.677                                 | 0.280     | 13.900   | $1.434 \times 10^5$                |           |            |
| 1.00 TeV | $1.000 \times 10^6$ | 2.111                       | 6.166   | 8.485                                 | 0.352     | 17.115   | $1.564 \times 10^5$                |           |            |
| 1.40 TeV | $1.400 \times 10^6$ | 2.139                       | 8.806   | 12.089                                | 0.498     | 23.534   | $1.762 \times 10^5$                |           |            |
| 2.00 TeV | $2.000 \times 10^6$ | 2.170                       | 12.842  | 17.588                                | 0.720     | 33.323   | $1.976 \times 10^5$                |           |            |
| 3.00 TeV | $3.000 \times 10^6$ | 2.206                       | 19.578  | 26.726                                | 1.101     | 49.612   | $2.220 \times 10^5$                |           |            |
| 4.00 TeV | $4.000 \times 10^6$ | 2.231                       | 26.401  | 35.960                                | 1.488     | 66.082   | $2.394 \times 10^5$                |           |            |
| 8.00 TeV | $8.000 \times 10^6$ | 2.294                       | 53.901  | 73.075                                | 3.090     | 132.361  | $2.813 \times 10^5$                |           |            |
| 10.0 TeV | $1.000 \times 10^7$ | 2.315                       | 67.754  | 91.729                                | 3.912     | 165.712  | $2.948 \times 10^5$                |           |            |
| 14.0 TeV | $1.400 \times 10^7$ | 2.347                       | 95.386  | 128.951                               | 5.598     | 232.284  | $3.151 \times 10^5$                |           |            |
| 20.0 TeV | $2.000 \times 10^7$ | 2.381                       | 137.068 | 185.020                               | 8.182     | 332.652  | $3.366 \times 10^5$                |           |            |
| 30.0 TeV | $3.000 \times 10^7$ | 2.420                       | 206.458 | 278.307                               | 12.645    | 499.831  | $3.609 \times 10^5$                |           |            |
| 40.0 TeV | $4.000 \times 10^7$ | 2.448                       | 276.088 | 371.810                               | 17.211    | 667.559  | $3.782 \times 10^5$                |           |            |
| 80.0 TeV | $8.000 \times 10^7$ | 2.518                       | 554.989 | 746.078                               | 36.270    | 1339.857 | $4.196 \times 10^5$                |           |            |
| 100. TeV | $1.000 \times 10^8$ | 2.541                       | 694.660 | 933.380                               | 46.110    | 1676.693 | $4.330 \times 10^5$                |           |            |