

## Muons in muscle-equivalent liquid without sucrose

| $\langle Z/A \rangle$ | $\rho$ [g/cm <sup>3</sup> ] | $I$ [eV]   | $a$     | $k = m_s$                             | $x_0$     | $x_1$   | $\bar{C}$                          | $\delta_0$ |
|-----------------------|-----------------------------|------------|---------|---------------------------------------|-----------|---------|------------------------------------|------------|
| 0.55014               | 1.070                       | 74.2       | 0.09143 | 3.4982                                | 0.2187    | 2.7680  | 3.4216                             | 0.00       |
| $T$                   | $p$<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              | $4.704 \times 10^1$         | 7.905      |         |                                       |           | 7.905   | $6.991 \times 10^{-1}$             |            |
| 14.0 MeV              | $5.616 \times 10^1$         | 6.166      |         |                                       |           | 6.166   | $1.278 \times 10^0$                |            |
| 20.0 MeV              | $6.802 \times 10^1$         | 4.815      |         |                                       |           | 4.815   | $2.392 \times 10^0$                |            |
| 30.0 MeV              | $8.509 \times 10^1$         | 3.735      |         |                                       |           | 3.735   | $4.783 \times 10^0$                |            |
| 40.0 MeV              | $1.003 \times 10^2$         | 3.189      |         |                                       |           | 3.189   | $7.699 \times 10^0$                |            |
| 80.0 MeV              | $1.527 \times 10^2$         | 2.394      |         |                                       |           | 2.394   | $2.264 \times 10^1$                |            |
| 100. MeV              | $1.764 \times 10^2$         | 2.251      |         |                                       |           | 2.252   | $3.127 \times 10^1$                |            |
| 140. MeV              | $2.218 \times 10^2$         | 2.096      |         |                                       |           | 2.097   | $4.977 \times 10^1$                |            |
| 200. MeV              | $2.868 \times 10^2$         | 2.007      |         |                                       |           | 2.007   | $7.913 \times 10^1$                |            |
| 300. MeV              | $3.917 \times 10^2$         | 1.973      |         |                                       | 0.000     | 1.973   | $1.295 \times 10^2$                |            |
| 318. MeV              | $4.105 \times 10^2$         | 1.973      |         |                                       | 0.000     | 1.973   | <i>Minimum ionization</i>          |            |
| 400. MeV              | $4.945 \times 10^2$         | 1.979      |         |                                       | 0.000     | 1.979   | $1.802 \times 10^2$                |            |
| 800. MeV              | $8.995 \times 10^2$         | 2.054      | 0.000   |                                       | 0.000     | 2.054   | $3.786 \times 10^2$                |            |
| 1.00 GeV              | $1.101 \times 10^3$         | 2.088      | 0.000   |                                       | 0.000     | 2.088   | $4.751 \times 10^2$                |            |
| 1.40 GeV              | $1.502 \times 10^3$         | 2.143      | 0.000   |                                       | 0.001     | 2.144   | $6.641 \times 10^2$                |            |
| 2.00 GeV              | $2.103 \times 10^3$         | 2.204      | 0.001   | 0.000                                 | 0.001     | 2.206   | $9.397 \times 10^2$                |            |
| 3.00 GeV              | $3.104 \times 10^3$         | 2.273      | 0.001   | 0.001                                 | 0.001     | 2.277   | $1.386 \times 10^3$                |            |
| 4.00 GeV              | $4.104 \times 10^3$         | 2.322      | 0.001   | 0.001                                 | 0.002     | 2.326   | $1.820 \times 10^3$                |            |
| 8.00 GeV              | $8.105 \times 10^3$         | 2.432      | 0.004   | 0.003                                 | 0.004     | 2.443   | $3.493 \times 10^3$                |            |
| 10.0 GeV              | $1.011 \times 10^4$         | 2.466      | 0.005   | 0.005                                 | 0.005     | 2.480   | $4.305 \times 10^3$                |            |
| 14.0 GeV              | $1.411 \times 10^4$         | 2.515      | 0.007   | 0.008                                 | 0.007     | 2.536   | $5.899 \times 10^3$                |            |
| 20.0 GeV              | $2.011 \times 10^4$         | 2.564      | 0.011   | 0.013                                 | 0.009     | 2.597   | $8.235 \times 10^3$                |            |
| 30.0 GeV              | $3.011 \times 10^4$         | 2.617      | 0.018   | 0.022                                 | 0.013     | 2.671   | $1.203 \times 10^4$                |            |
| 40.0 GeV              | $4.011 \times 10^4$         | 2.653      | 0.026   | 0.033                                 | 0.018     | 2.729   | $1.573 \times 10^4$                |            |
| 80.0 GeV              | $8.011 \times 10^4$         | 2.736      | 0.059   | 0.079                                 | 0.034     | 2.908   | $2.990 \times 10^4$                |            |
| 100. GeV              | $1.001 \times 10^5$         | 2.762      | 0.076   | 0.104                                 | 0.042     | 2.985   | $3.669 \times 10^4$                |            |
| 140. GeV              | $1.401 \times 10^5$         | 2.800      | 0.113   | 0.157                                 | 0.059     | 3.129   | $4.978 \times 10^4$                |            |
| 200. GeV              | $2.001 \times 10^5$         | 2.841      | 0.170   | 0.240                                 | 0.084     | 3.334   | $6.835 \times 10^4$                |            |
| 300. GeV              | $3.001 \times 10^5$         | 2.886      | 0.268   | 0.381                                 | 0.125     | 3.661   | $9.695 \times 10^4$                |            |
| 400. GeV              | $4.001 \times 10^5$         | 2.919      | 0.369   | 0.528                                 | 0.167     | 3.984   | $1.231 \times 10^5$                |            |
| 800. GeV              | $8.001 \times 10^5$         | 2.998      | 0.793   | 1.141                                 | 0.337     | 5.269   | $2.102 \times 10^5$                |            |
| 1.00 TeV              | $1.000 \times 10^6$         | 3.023      | 1.012   | 1.458                                 | 0.424     | 5.917   | $2.460 \times 10^5$                |            |
| 1.04 TeV              | $1.044 \times 10^6$         | 3.028      | 1.059   | 1.526                                 | 0.443     | 6.056   | <i>Muon critical energy</i>        |            |
| 1.40 TeV              | $1.400 \times 10^6$         | 3.062      | 1.453   | 2.088                                 | 0.601     | 7.204   | $3.071 \times 10^5$                |            |
| 2.00 TeV              | $2.000 \times 10^6$         | 3.104      | 2.131   | 3.054                                 | 0.870     | 9.159   | $3.808 \times 10^5$                |            |
| 3.00 TeV              | $3.000 \times 10^6$         | 3.152      | 3.267   | 4.661                                 | 1.334     | 12.414  | $4.743 \times 10^5$                |            |
| 4.00 TeV              | $4.000 \times 10^6$         | 3.187      | 4.423   | 6.292                                 | 1.805     | 15.706  | $5.457 \times 10^5$                |            |
| 8.00 TeV              | $8.000 \times 10^6$         | 3.272      | 9.104   | 12.858                                | 3.767     | 29.002  | $7.303 \times 10^5$                |            |
| 10.0 TeV              | $1.000 \times 10^7$         | 3.300      | 11.471  | 16.165                                | 4.778     | 35.715  | $7.924 \times 10^5$                |            |
| 14.0 TeV              | $1.400 \times 10^7$         | 3.343      | 16.197  | 22.754                                | 6.861     | 49.155  | $8.875 \times 10^5$                |            |
| 20.0 TeV              | $2.000 \times 10^7$         | 3.389      | 23.345  | 32.692                                | 10.062    | 69.488  | $9.896 \times 10^5$                |            |
| 30.0 TeV              | $3.000 \times 10^7$         | 3.443      | 35.247  | 49.229                                | 15.617    | 103.536 | $1.107 \times 10^6$                |            |
| 40.0 TeV              | $4.000 \times 10^7$         | 3.481      | 47.214  | 65.819                                | 21.319    | 137.834 | $1.190 \times 10^6$                |            |
| 80.0 TeV              | $8.000 \times 10^7$         | 3.576      | 95.214  | 132.233                               | 45.251    | 276.274 | $1.391 \times 10^6$                |            |
| 100. TeV              | $1.000 \times 10^8$         | 3.607      | 119.283 | 165.479                               | 57.657    | 346.027 | $1.456 \times 10^6$                |            |