

## Muons in lead fluoride (PbF<sub>2</sub>)

|          | $\langle Z/A \rangle$ | $\rho$ [g/cm <sup>3</sup> ] | $I$ [eV] | $a$                      | $k = m_s$ | $x_0$    | $x_1$                              | $\bar{C}$           | $\delta_0$                  |
|----------|-----------------------|-----------------------------|----------|--------------------------|-----------|----------|------------------------------------|---------------------|-----------------------------|
|          | 0.40784               | 7.770                       | 635.4    | 0.23890                  | 3.0000    | 0.4668   | 3.0000                             | 6.0333              | 0.00                        |
| $T$      | $p$<br>[MeV/c]        | Ionization                  | Brems    | Pair prod                | Photonucl | Total    | CSDA range<br>[g/cm <sup>2</sup> ] |                     |                             |
|          |                       |                             |          | [MeV cm <sup>2</sup> /g] |           |          |                                    |                     |                             |
| 10.0 MeV | $4.704 \times 10^1$   | 4.234                       |          |                          |           | 4.235    |                                    | $1.343 \times 10^0$ |                             |
| 14.0 MeV | $5.616 \times 10^1$   | 3.350                       |          |                          |           | 3.350    |                                    | $2.416 \times 10^0$ |                             |
| 20.0 MeV | $6.802 \times 10^1$   | 2.652                       |          |                          |           | 2.652    |                                    | $4.450 \times 10^0$ |                             |
| 30.0 MeV | $8.509 \times 10^1$   | 2.085                       |          |                          |           | 2.085    |                                    | $8.759 \times 10^0$ |                             |
| 40.0 MeV | $1.003 \times 10^2$   | 1.797                       |          |                          |           | 1.797    |                                    | $1.396 \times 10^1$ |                             |
| 80.0 MeV | $1.527 \times 10^2$   | 1.377                       |          |                          |           | 1.377    |                                    | $4.015 \times 10^1$ |                             |
| 100. MeV | $1.764 \times 10^2$   | 1.304                       |          |                          |           | 1.304    |                                    | $5.511 \times 10^1$ |                             |
| 140. MeV | $2.218 \times 10^2$   | 1.236                       |          |                          |           | 1.236    |                                    | $8.675 \times 10^1$ |                             |
| 200. MeV | $2.868 \times 10^2$   | 1.208                       |          |                          |           | 1.208    |                                    | $1.360 \times 10^2$ |                             |
| 223. MeV | $3.114 \times 10^2$   | 1.206                       |          |                          |           | 1.207    |                                    |                     | <i>Minimum ionization</i>   |
| 300. MeV | $3.917 \times 10^2$   | 1.216                       | 0.000    |                          | 0.000     | 1.216    |                                    | $2.187 \times 10^2$ |                             |
| 400. MeV | $4.945 \times 10^2$   | 1.239                       | 0.000    |                          | 0.000     | 1.240    |                                    | $3.002 \times 10^2$ |                             |
| 800. MeV | $8.995 \times 10^2$   | 1.330                       | 0.001    |                          | 0.000     | 1.331    |                                    | $6.109 \times 10^2$ |                             |
| 1.00 GeV | $1.101 \times 10^3$   | 1.365                       | 0.001    |                          | 0.000     | 1.366    |                                    | $7.592 \times 10^2$ |                             |
| 1.40 GeV | $1.502 \times 10^3$   | 1.419                       | 0.002    |                          | 0.001     | 1.421    |                                    | $1.046 \times 10^3$ |                             |
| 2.00 GeV | $2.103 \times 10^3$   | 1.476                       | 0.003    | 0.001                    | 0.001     | 1.482    |                                    | $1.459 \times 10^3$ |                             |
| 3.00 GeV | $3.104 \times 10^3$   | 1.540                       | 0.006    | 0.003                    | 0.001     | 1.551    |                                    | $2.117 \times 10^3$ |                             |
| 4.00 GeV | $4.104 \times 10^3$   | 1.584                       | 0.009    | 0.006                    | 0.002     | 1.600    |                                    | $2.752 \times 10^3$ |                             |
| 8.00 GeV | $8.105 \times 10^3$   | 1.681                       | 0.022    | 0.019                    | 0.003     | 1.725    |                                    | $5.150 \times 10^3$ |                             |
| 10.0 GeV | $1.011 \times 10^4$   | 1.709                       | 0.029    | 0.027                    | 0.004     | 1.770    |                                    | $6.294 \times 10^3$ |                             |
| 14.0 GeV | $1.411 \times 10^4$   | 1.750                       | 0.044    | 0.044                    | 0.005     | 1.845    |                                    | $8.506 \times 10^3$ |                             |
| 20.0 GeV | $2.011 \times 10^4$   | 1.790                       | 0.069    | 0.073                    | 0.008     | 1.940    |                                    | $1.168 \times 10^4$ |                             |
| 30.0 GeV | $3.011 \times 10^4$   | 1.832                       | 0.113    | 0.129                    | 0.011     | 2.086    |                                    | $1.664 \times 10^4$ |                             |
| 40.0 GeV | $4.011 \times 10^4$   | 1.860                       | 0.159    | 0.190                    | 0.015     | 2.225    |                                    | $2.128 \times 10^4$ |                             |
| 80.0 GeV | $8.011 \times 10^4$   | 1.923                       | 0.360    | 0.460                    | 0.029     | 2.772    |                                    | $3.736 \times 10^4$ |                             |
| 100. GeV | $1.001 \times 10^5$   | 1.942                       | 0.466    | 0.605                    | 0.035     | 3.051    |                                    | $4.423 \times 10^4$ |                             |
| 140. GeV | $1.401 \times 10^5$   | 1.971                       | 0.685    | 0.905                    | 0.049     | 3.611    |                                    | $5.627 \times 10^4$ |                             |
| 165. GeV | $1.652 \times 10^5$   | 1.984                       | 0.826    | 1.101                    | 0.058     | 3.970    |                                    |                     | <i>Muon critical energy</i> |
| 200. GeV | $2.001 \times 10^5$   | 2.001                       | 1.026    | 1.380                    | 0.070     | 4.478    |                                    | $7.117 \times 10^4$ |                             |
| 300. GeV | $3.001 \times 10^5$   | 2.034                       | 1.609    | 2.174                    | 0.105     | 5.923    |                                    | $9.054 \times 10^4$ |                             |
| 400. GeV | $4.001 \times 10^5$   | 2.058                       | 2.211    | 2.996                    | 0.141     | 7.407    |                                    | $1.056 \times 10^5$ |                             |
| 800. GeV | $8.001 \times 10^5$   | 2.117                       | 4.695    | 6.368                    | 0.284     | 13.465   |                                    | $1.451 \times 10^5$ |                             |
| 1.00 TeV | $1.000 \times 10^6$   | 2.136                       | 5.970    | 8.093                    | 0.357     | 16.557   |                                    | $1.585 \times 10^5$ |                             |
| 1.40 TeV | $1.400 \times 10^6$   | 2.165                       | 8.525    | 11.533                   | 0.506     | 22.730   |                                    | $1.790 \times 10^5$ |                             |
| 2.00 TeV | $2.000 \times 10^6$   | 2.196                       | 12.432   | 16.782                   | 0.731     | 32.142   |                                    | $2.011 \times 10^5$ |                             |
| 3.00 TeV | $3.000 \times 10^6$   | 2.231                       | 18.951   | 25.504                   | 1.118     | 47.805   |                                    | $2.265 \times 10^5$ |                             |
| 4.00 TeV | $4.000 \times 10^6$   | 2.257                       | 25.555   | 34.318                   | 1.511     | 63.642   |                                    | $2.445 \times 10^5$ |                             |
| 8.00 TeV | $8.000 \times 10^6$   | 2.320                       | 52.167   | 69.746                   | 3.139     | 127.374  |                                    | $2.881 \times 10^5$ |                             |
| 10.0 TeV | $1.000 \times 10^7$   | 2.341                       | 65.573   | 87.553                   | 3.975     | 159.444  |                                    | $3.021 \times 10^5$ |                             |
| 14.0 TeV | $1.400 \times 10^7$   | 2.373                       | 92.310   | 123.084                  | 5.691     | 223.460  |                                    | $3.232 \times 10^5$ |                             |
| 20.0 TeV | $2.000 \times 10^7$   | 2.407                       | 132.642  | 176.605                  | 8.322     | 319.978  |                                    | $3.455 \times 10^5$ |                             |
| 30.0 TeV | $3.000 \times 10^7$   | 2.447                       | 199.787  | 265.651                  | 12.866    | 480.752  |                                    | $3.708 \times 10^5$ |                             |
| 40.0 TeV | $4.000 \times 10^7$   | 2.475                       | 267.162  | 354.904                  | 17.518    | 642.060  |                                    | $3.888 \times 10^5$ |                             |
| 80.0 TeV | $8.000 \times 10^7$   | 2.546                       | 537.024  | 712.167                  | 36.946    | 1288.684 |                                    | $4.319 \times 10^5$ |                             |
| 100. TeV | $1.000 \times 10^8$   | 2.569                       | 672.164  | 890.961                  | 46.983    | 1612.679 |                                    | $4.457 \times 10^5$ |                             |