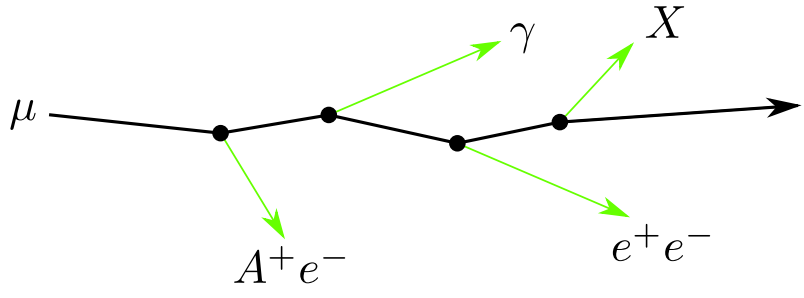
technische universität
dortmund



Updates from LPM showers

Jean-Marco Alameddine, Alexander Sandrock

2023-01-26

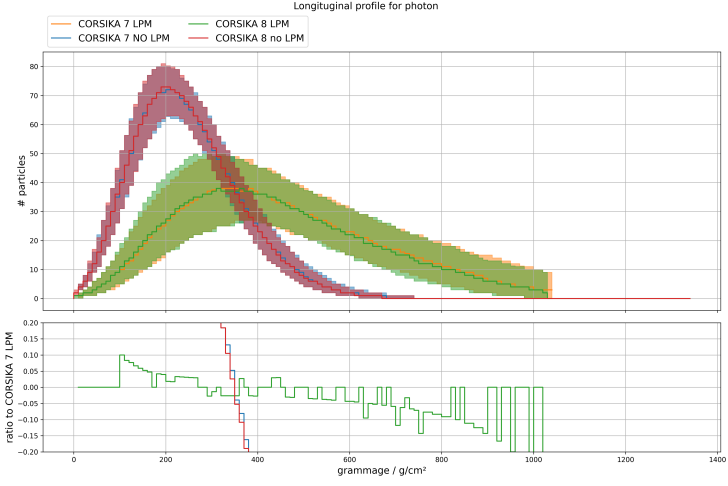
Theory and Methodology

- The LPM effect describes a suppression of the bremsstrahlung and pair production cross sections at very-high energies
  - → Effect becomes noticable for interactions in air (at normal temperature and pressure) at energies above $\approx 10^{16}$ eV[1]
- Current methodology:
  1. Check if interaction is a bremsstrahlungs or pair production interaction
  2. Calculate LPM suppression factor $s(E, v, \rho) \in [0, 1]$
  3. Sample random number ξ
  4. If $\xi > s$, discard particle interaction

[1] see: Heck, D. and J. Knapp (1998), Tech rep. FZKA 6097

First simulations

- Simulation of 10^{11} GeV EM showers, cut at **100** PeV, statistics of 1000 showers.



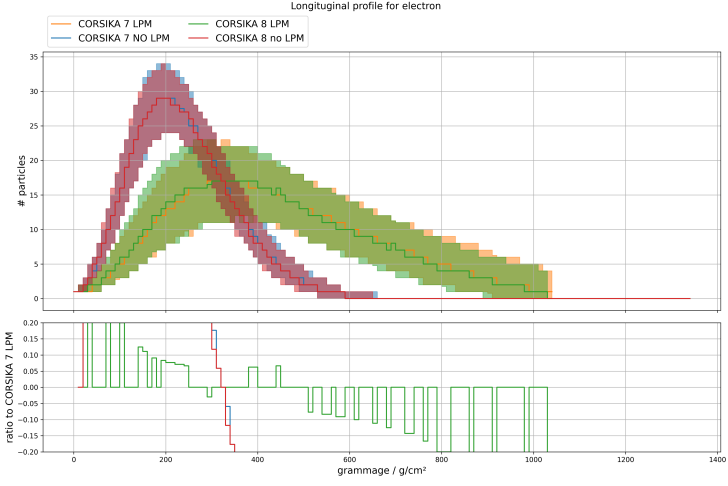
Next steps

- First results look promising
- Implementation on CORSIKA 8 branch `lpm_effect` (here)
  - → Requires PROPOSAL version `v7.5.0`
  - → I will open a draft PR when official conan package of `proposal/v7.5.0` is available ($\mathcal{O}$(hours))
- What would be good/necessary cross checks to further verify results?

Backup slides

First simulations

- Simulation of 10^{11} GeV EM showers, cut at **100** PeV, statistics of 1000 showers.



First simulations

- Simulation of 10^{11} GeV EM showers, cut at **100** PeV, statistics of 1000 showers.