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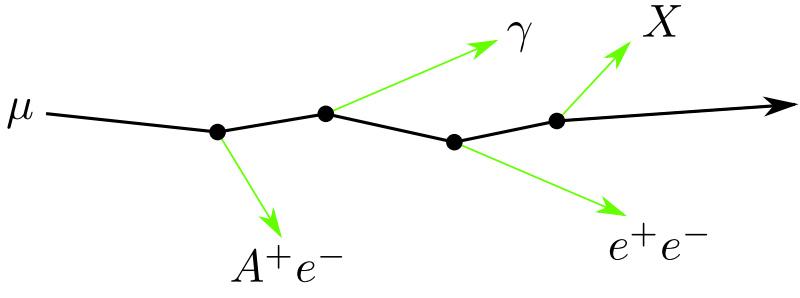

Muon numbers in EM showers - first results

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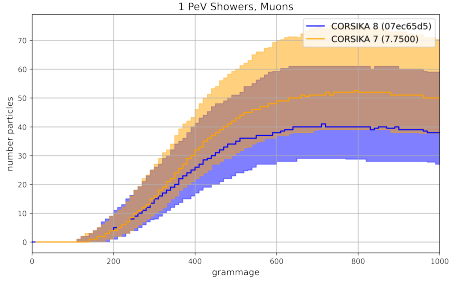
EM shower call

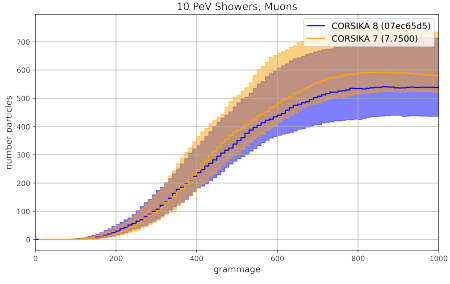
General information

- C8 simulations based on the current `corsika.cpp` example and the `411-connection-between-proposal-and-hadronic-interaction-models` branch
- 100 EM-showers for each energy, induced by e^-
  - → 1 PeV, 10 PeV
- Energy cut settings: 10 GeV (for electromagnetic, hadronic, muonic component)
- Electromagnetic/muonic interaction model: *PROPOSAL v7.3.0*
- Hadronic interaction model: *UrQMD* (low-energy) / *SIBYLL* (high-energy) (C8: $E_{\text{thres}} = 63.1$ GeV)
  - → Hadronic interface in C8 from PR 430
  - → **Note:** In C8, the hadronic interface currently discards all hadronic interactions of photons/leptons with Argon and all low-energy interactions (i.e. for $E_{\text{i}} < E_{\text{thres}}$)
- **Note:** Cascade issues not yet fixed!

Muon numbers

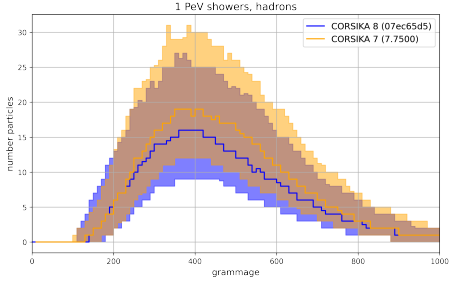
All following plots show the median muon numbers and the first/third quartiles:

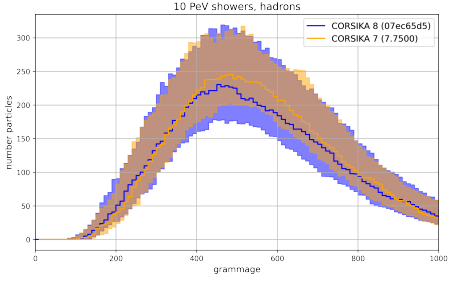




- Muon numbers already agree within $\approx 10\,\%$, muon number fluctuations also appear resonable
- More muons in CORSIKA 7 than in CORSIKA 8. Possible reasons?
  - → These plots show simulations without $\gamma \to \mu^+\mu^-$. However, simulations with $\gamma \to \mu^+\mu^-$ don't show different muon numbers (tested for 1 PeV showers).
  - → As mentioned, we currently discard hadronic interactions with Argon and hadronic interactions below $E_{\text{thres}} = 63.1$ GeV

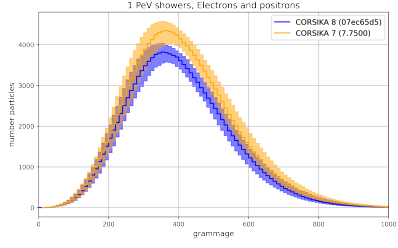
Hadron numbers

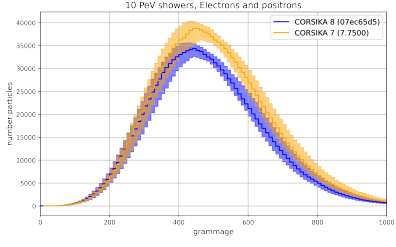


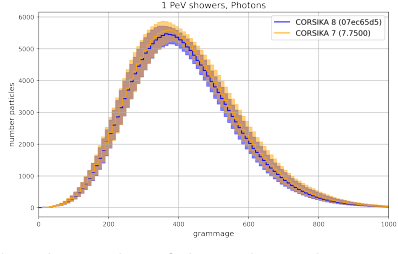


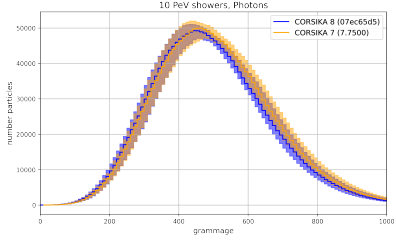
- Similar level of agreement for hadrons
  - → Slightly more hadrons for CORSIKA 7
  - → No direct comparisons of the "$\gamma \rightarrow$ Hadrons" crosssections used in CORSIKA 7/CORSIKA 8 (yet)
  - → We can see that the hadronic interface produces reasonable results

Electron/positron and photon numbers









→ Mismatch in the number of charged particles, more investigation necessary...