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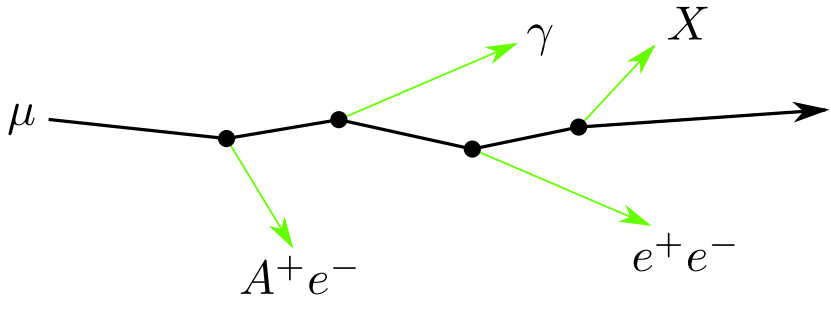
e5 experimentelle physik 5
astroteilchenphysik



PROPOSAL Status

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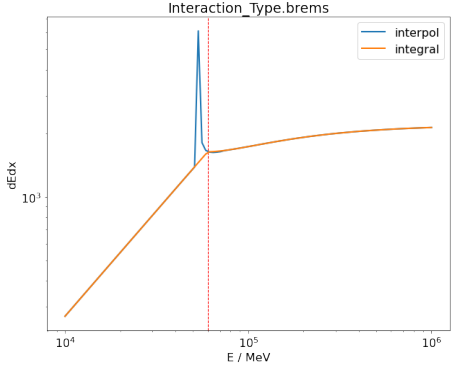
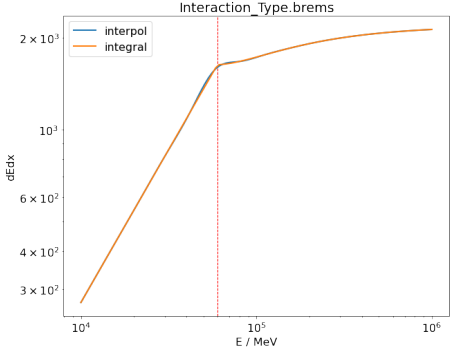
Technische Universität Dortmund

Interpolant issues

- Previous implementation of PROPOSAL interpolant was unreliable when function was not differentiable
  (due to energy cuts)



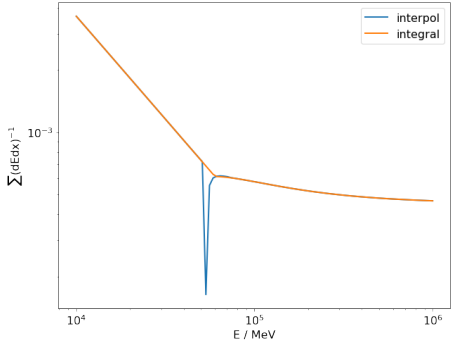
Old PROPOSAL interpolant implementation



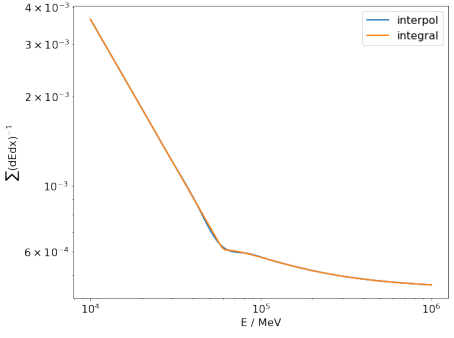
New PROPOSAL interpolant implementation

Interpolant issues

- PROPOSAL threw errors due to particles ”propagating backwards”
- Further inconsistencies in physics were possible and observed...



Old PROPOSAL interpolant implementation



New PROPOSAL interpolant implementation

Energy cuts

- Distinguish between **continous** and **stochastic** energy losses using the *cut*:

$$\text{cut} = \min(e_{\text{cut}}, v_{\text{cut}} \cdot E)$$
$$v := \text{relative energy loss}$$

- Next to the cut for the energy losses, there is the particle energy cut, specified for each particle type, up to which energy the particle gets propagated, in case it didn't stop earlier due to decay, annihilation, ...

Continuous loss

Energy loss for $v \in [v_{\text{min}}, v_{\text{cut}}]$

$$\frac{\mathrm{d}E}{\mathrm{d}X} = E \cdot \sum_{\text{processes}} \sum_{\substack{\text{atom} \\ \text{in medium}}} \frac{N_i}{A_i} \int_{v_{\text{min}}}^{v_{\text{cut}}} v \frac{\mathrm{d}\sigma}{\mathrm{d}v} \mathrm{d}v$$

Stochastic loss

Interaction probability for $v \in [v_{\text{cut}}, v_{\text{max}}]$

$$\sigma(E) = \sum_{\text{processes}} \sum_{\substack{\text{atom} \\ \text{in medium}}} \frac{N_i}{A_i} \int_{v_{\text{cut}}}^{v_{\text{max}}} \frac{\mathrm{d}\sigma}{\mathrm{d}v} \mathrm{d}v$$

Conferences 2021

- 25th International Conference on Computing in High Energy & Nuclear Physics (CHEP)
- May 17–21, 2021
- technically oriented talk
- transformation from an underground (mainly) muon propagator to a general lepton and photon propagation program

- 37th International Cosmic Ray Conference (ICRC)
- July 12–23, 2021
- physically oriented talk
- electromagnetic interactions in C8 in general
- systematic comparisons of electromagnetic cascades in old and new CORSIKA