PacSim Showering

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Fastsim particle propagation

- Particle interactions are computed per-element
  - based on particle species and element material
  - radiation length (electrons, γs)
  - Interaction length (hadrons)
- Discrete interactions are computed first
  - brems, conversion, nuclear, ...
  - parameterized cross sections
- >1 discrete interactions starts a shower
  - counting immediate daughter interactions too
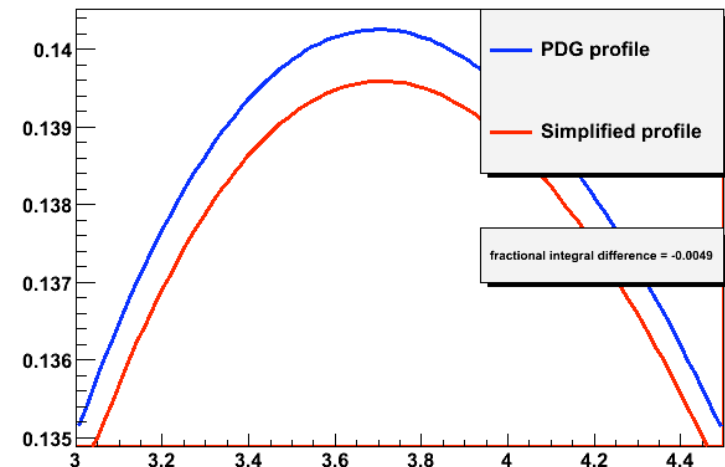
PacSim Showering

- Energy loss and deposition based on parameterized longitudinal shower profiles

- EM profile a simplified PDG gamma function

  - closed-form integral

  - no fluctuations

- Hadron profile a damped polynomial

  - Poissonian fluctuations based on energy quantum

- Shower propagates to subsequent elements

  - Assumes homogenous material (no transition radiation)

EM Shower Profile
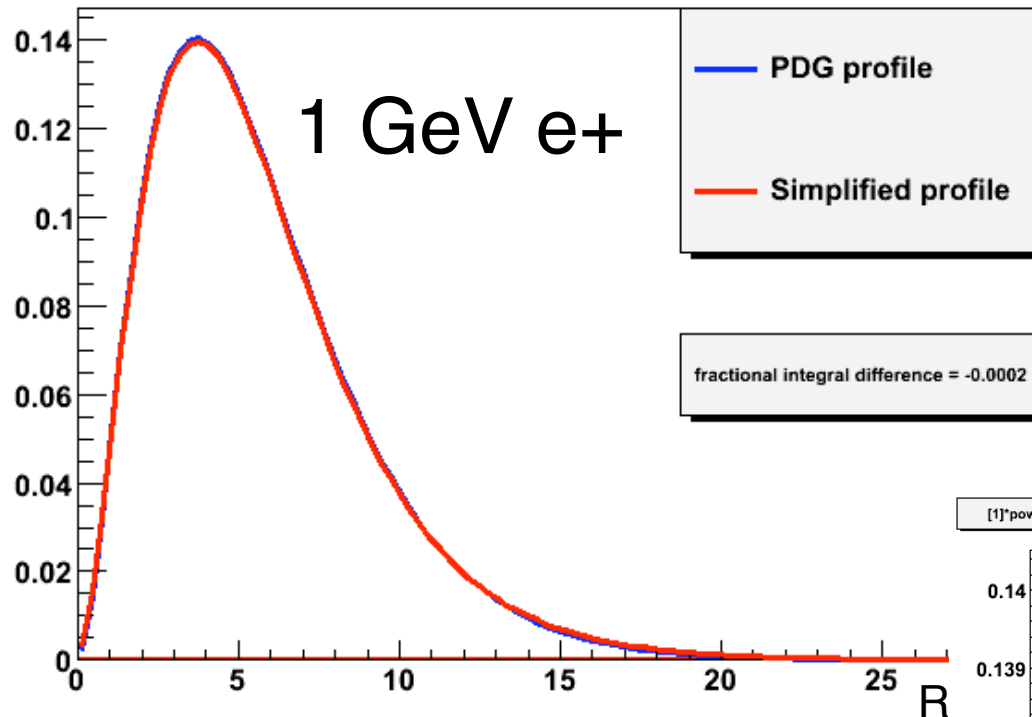
PacShowerInfo

- Stores shower info for a detector element
  - associated with PacSimHit
  - describes radiation length, energy, ...
  - transverse shower information (placeholder)
- Used for shower simulation bookkeeping
  - initial shower energy, length integral, ...

Open Issues

- EM shower material dependence (LYSO)?
- Hadron shower longitudinal profile
- Shower Fluctuations
  - needed for EM showers?
  - hadronic showers?
- Segmented detectors
  - transition radiation
- Transverse profiles
  - fluctuations?
  - asymmetries?

Information sources

- LELAPS (STDHEP)

- Grindhammer and Peters

  - http://arxiv.org/abs/hep-ex/0001020v1

- Bock etal

  - Nuclear Instruments and Methods 186 (1981) 533-539 533