

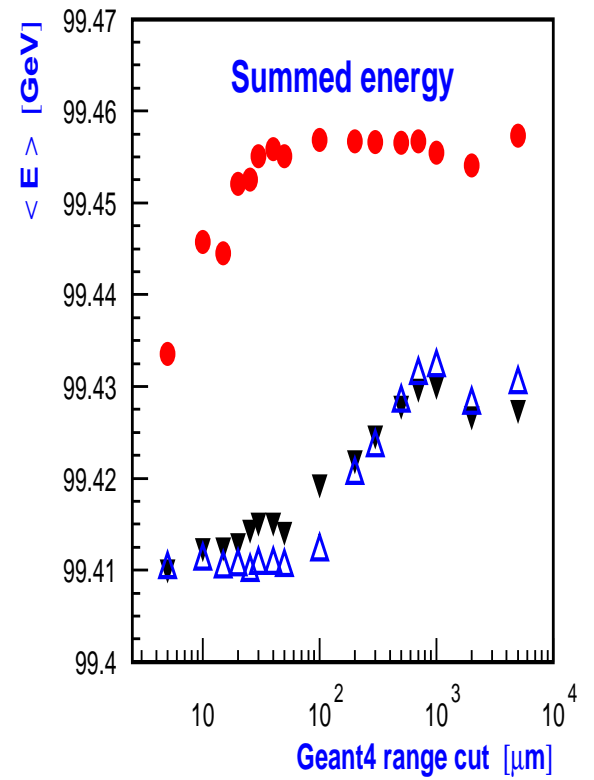
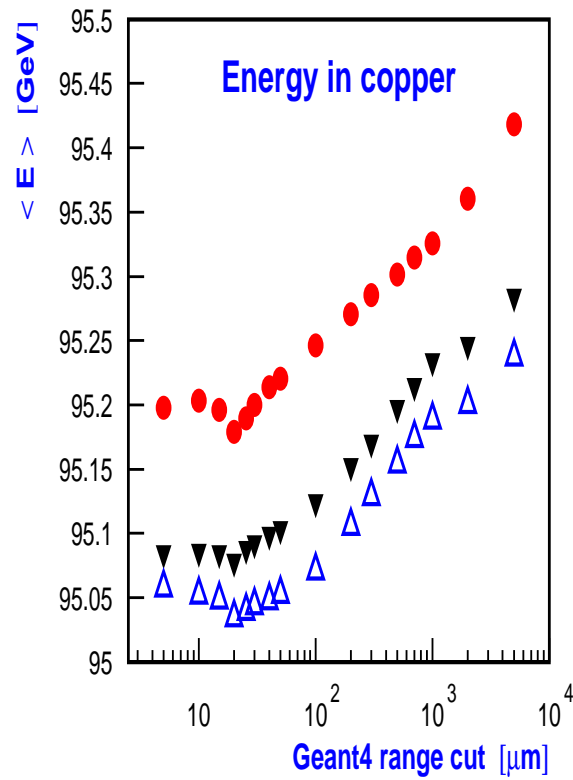
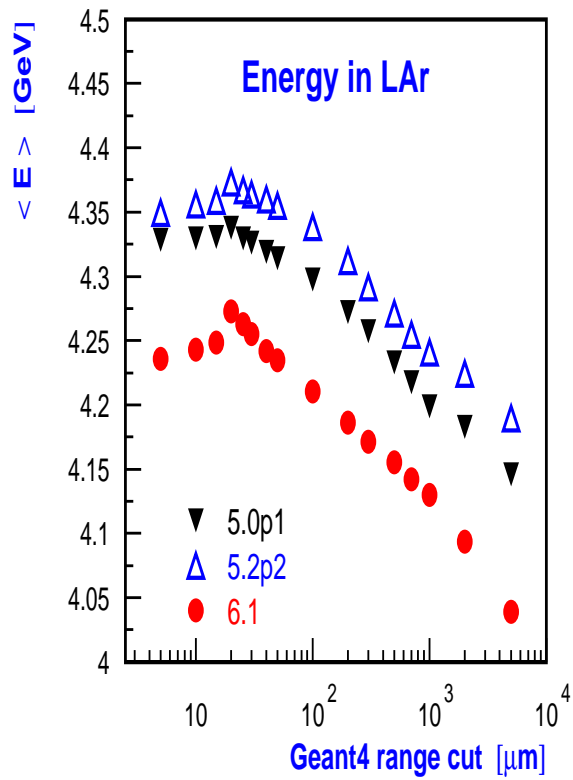
ATLAS HEC Stand-Alone Testbeam: First Results of Electron Simulations with Geant4-6.1

A. Kiryunin, D. Salihagić, P. Schacht, P. Strizenec

- Beam tests of HEC serial modules (2000, 2001)
- 100 GeV electrons (at impact point J)
- Compared samples
 - Geant4:
 - * versions 5.0p1, 5.2p2 and 6.1
 - * scan over the range cut (5 μm - 5 mm)
 - Geant3 (3.21)
 - * 100 keV transport and 1 MeV production cuts
 - Experiment

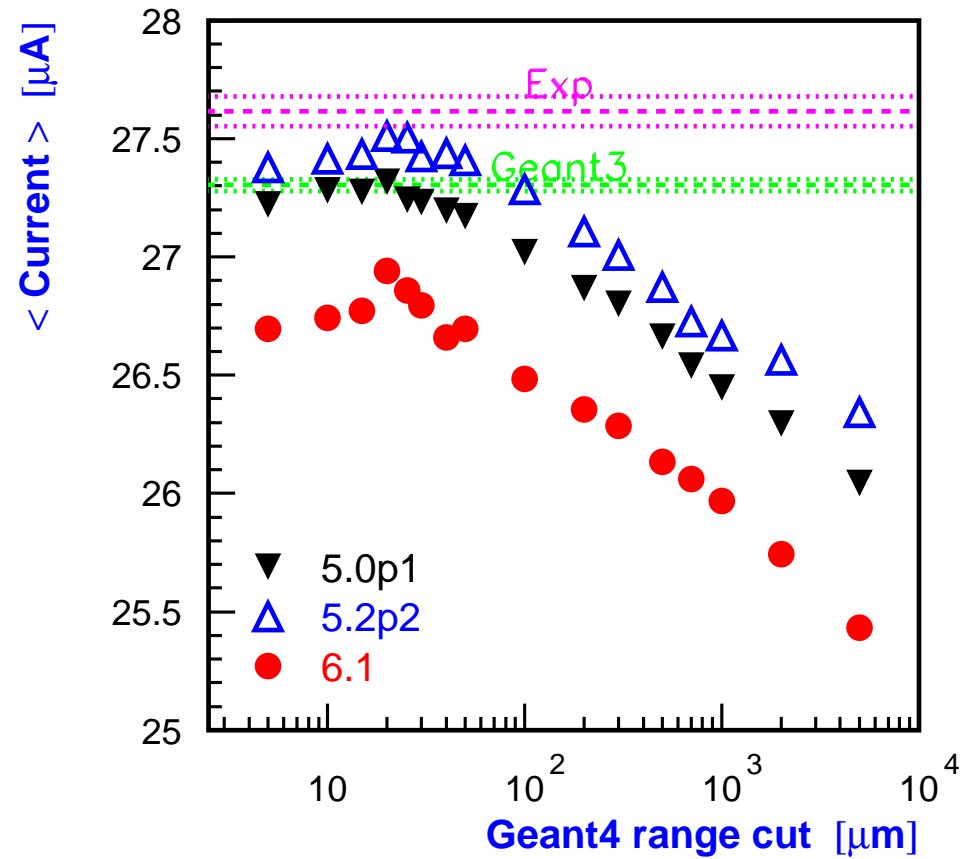


Average deposited energy

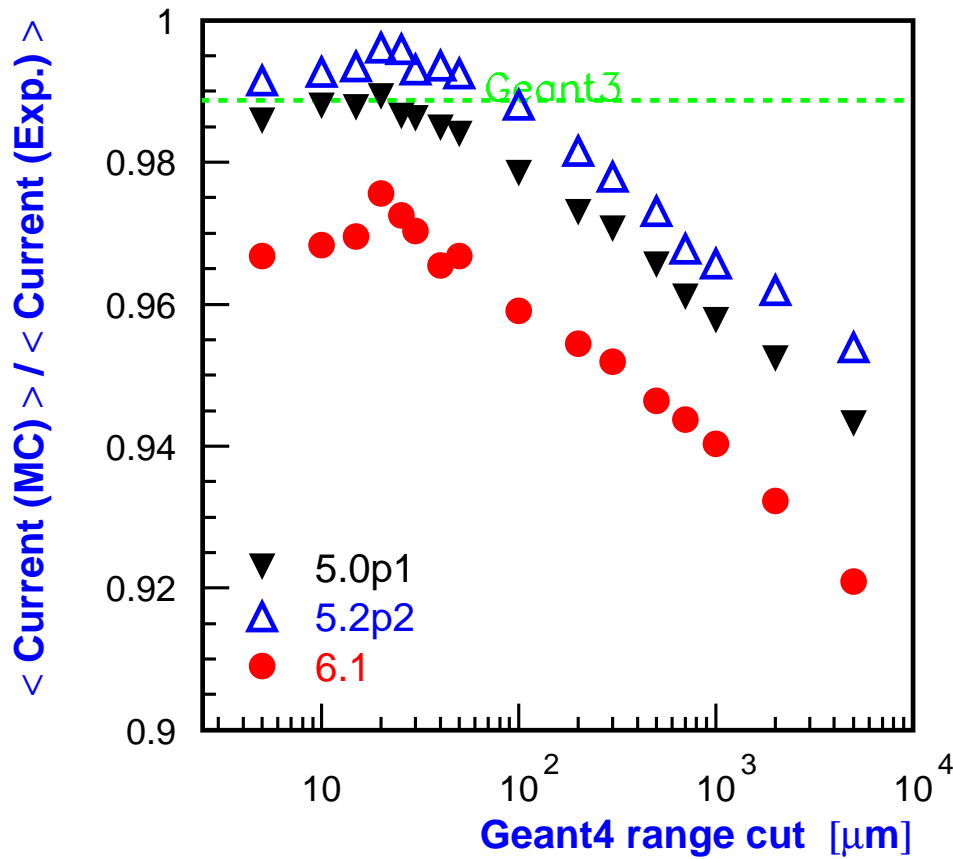


Signal in the most loaded cell

- Cell with the maximal average signal
- $\text{Current} = \text{Visible Energy} \times 7.135 \mu\text{A/GeV}$



Signal in the most loaded cell

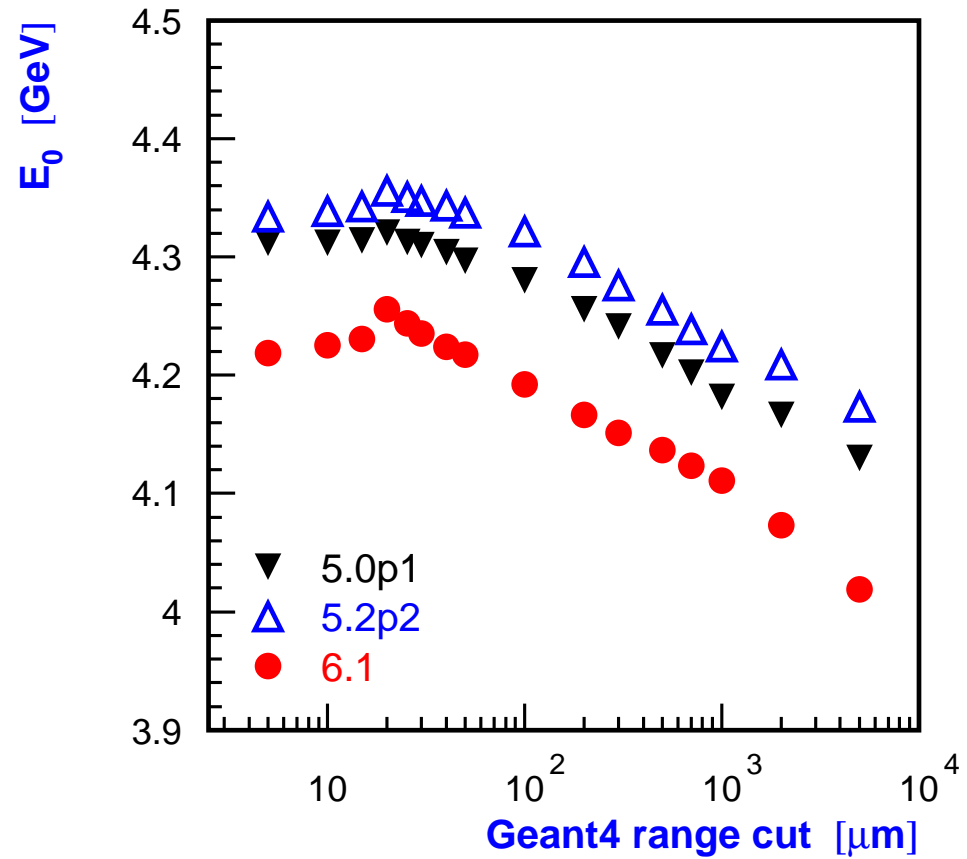


- 20 μm range cut selected for further simulations
- ~2.5 % difference between experimental results and Geant4-6.1 predictions

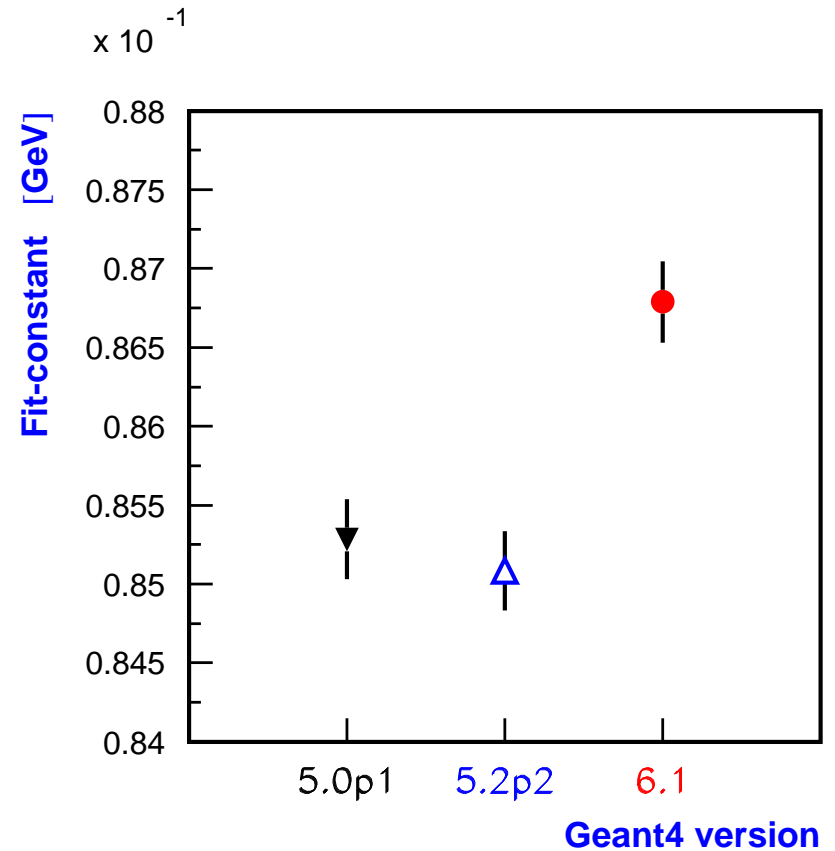
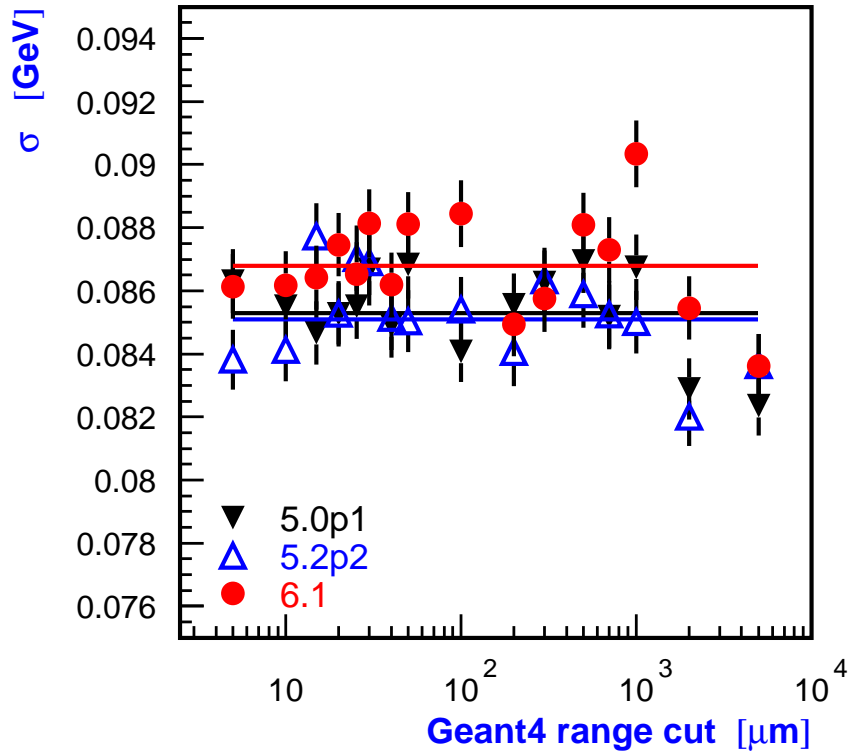


Energy in a cluster

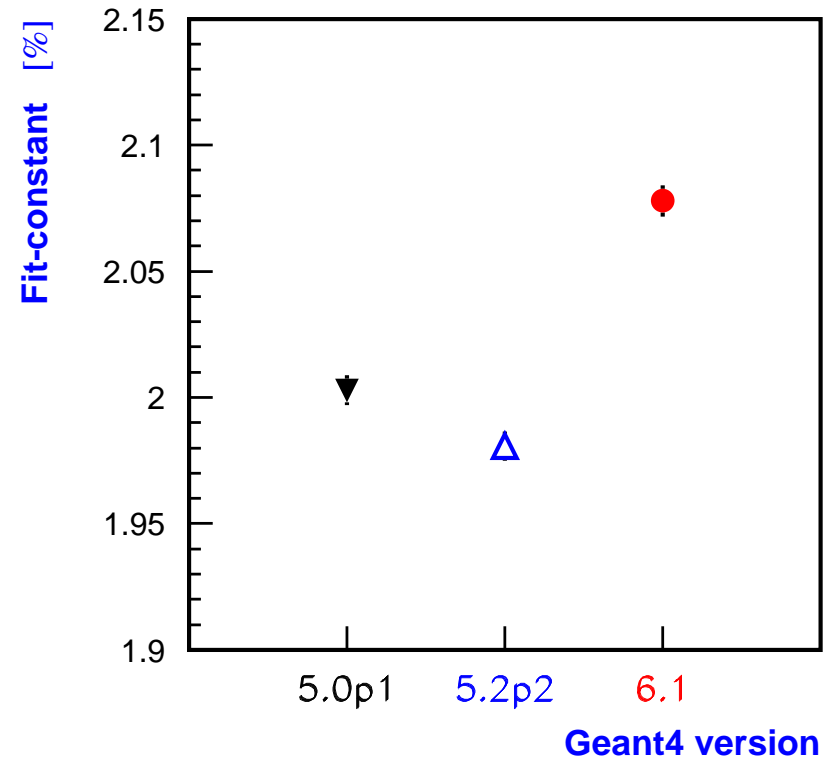
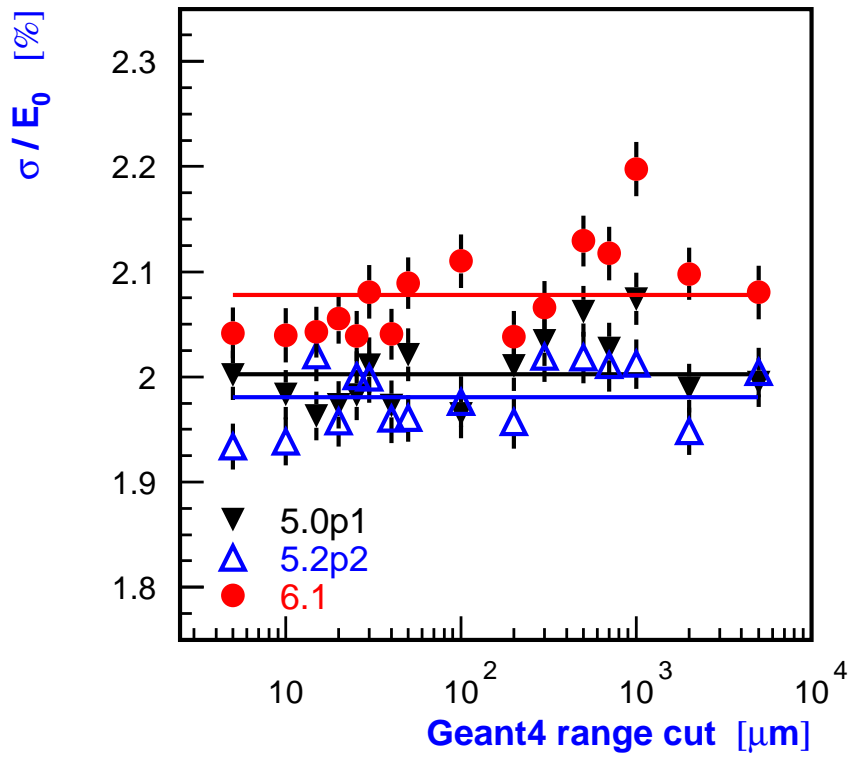
- “Visible energy” scale
- Energy reconstruction in a cluster
- Gaussian fit: E_0 and σ
- Energy resolution:
 - σ
 - σ/E_0



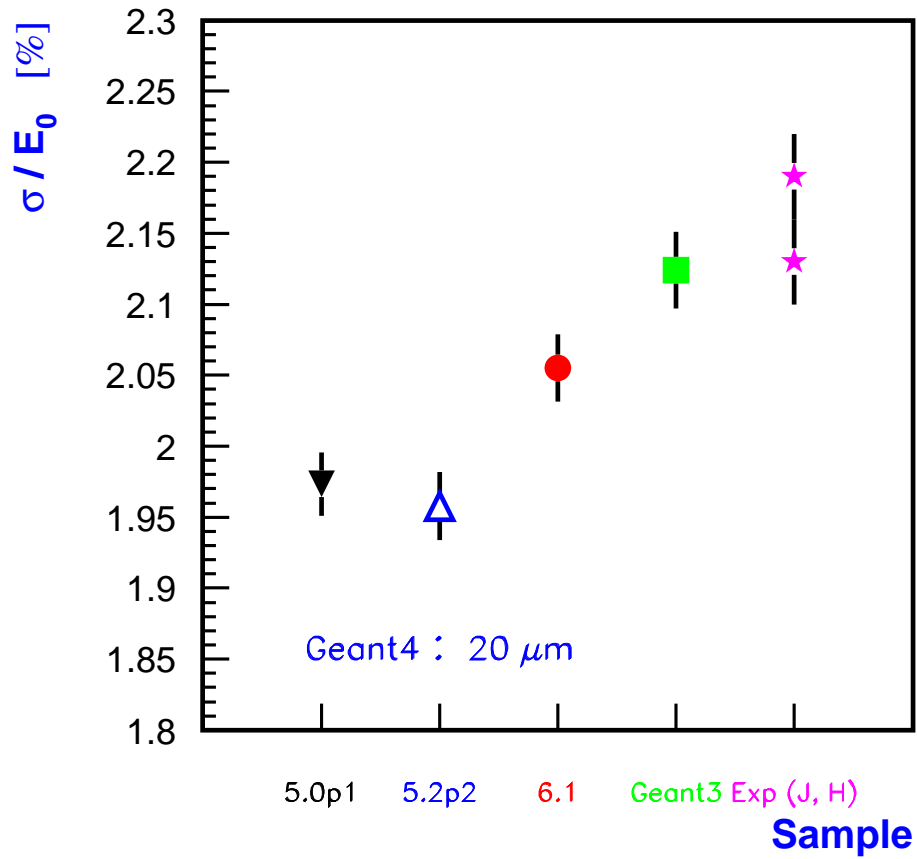
Energy in a cluster



Energy in a cluster



Energy in a cluster



- Energy resolution, as predicted by Geant4 version 6.1, is closer to experiment (w.r.t previous Geant4 versions)
 - increase of fluctuations in LAr (σ)
 - decrease of visible energy (E_0)



Current conclusions, plans

- Scan over the range cut for 100 GeV electrons with Geant4 version 6.1 was simulated
- First results show:
 - amount of visible energy is smaller than expected from the experiment ($\sim 2.5\%$ difference)
 - energy resolution becomes closer to experimental values
- Range cut of $20\ \mu\text{m}$ is selected for further simulations
- Further simulations (with Geant4 version 6.1):
 - energy scan for electrons (6 - 147.8 GeV)
 - energy scan for charged pions (10 - 200 GeV) with LHEP and QGSP hadronic physics lists

