

## Status of Validation of Geant4 Version 6.1

- Experimental data: beam tests of HEC serial modules
- Time of simulations
- Simulations of electrons
  - scan over the Geant4 range cut
  - energy scan
- Simulations of hadrons (preliminary)

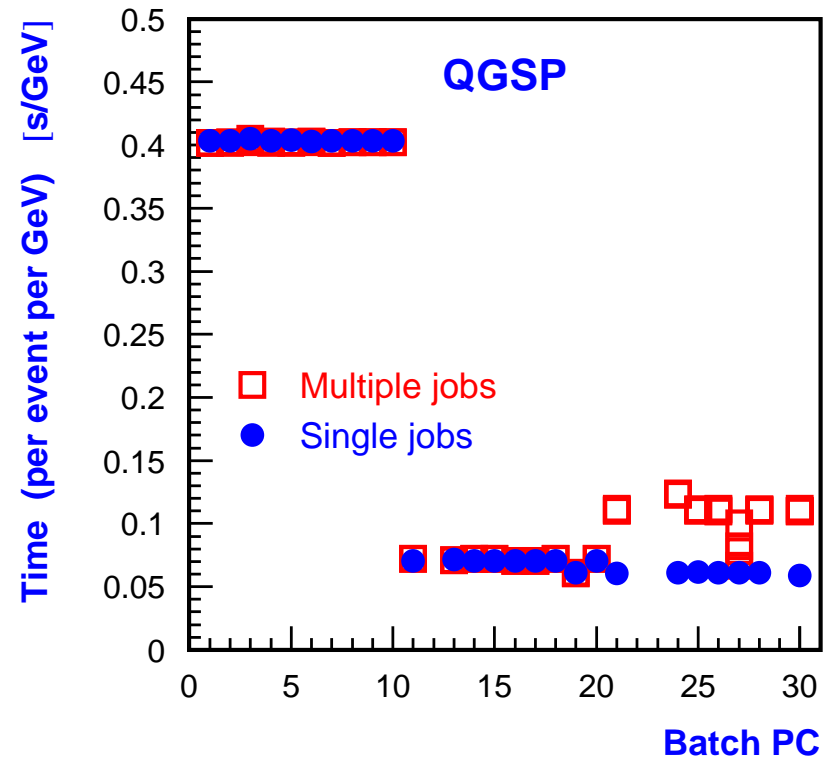
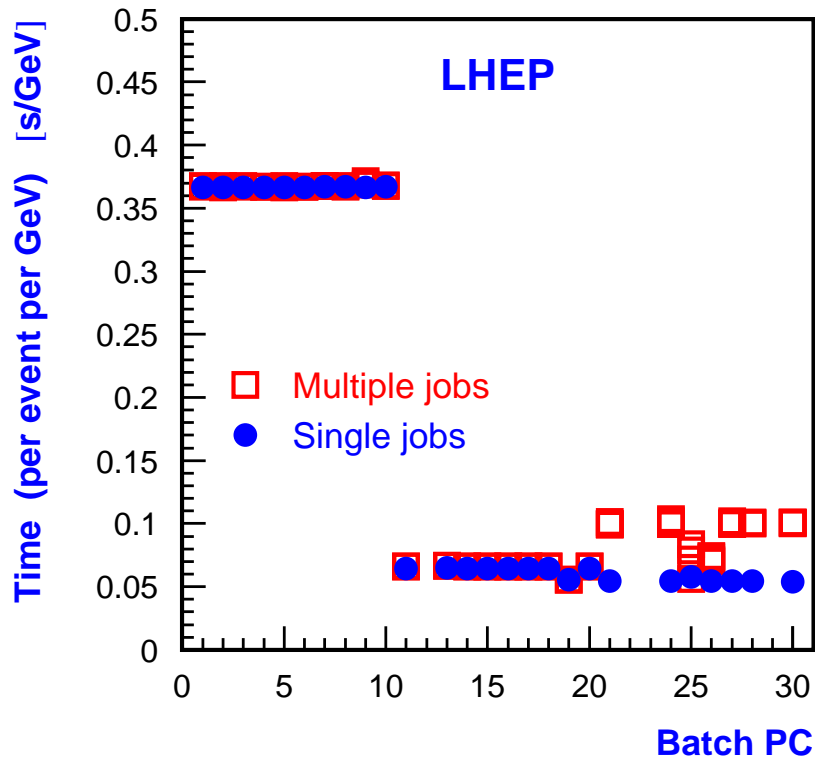


## Time of simulations

- Three batch farms:
  1. 10 PCs with **two** processors (batch01-batch10)
  2. 9 PCs with **two** processors (batch11-batch20)
  3. 7 PCs with **“four”** processors (batch21-batch30)
- Special test-simulations:
  - Geant4, version 6.1, 20  $\mu\text{m}$  cut
  - 100 events with 100 GeV negative pions
  - same initial random numbers
- Submission via condor:
  - simultaneous submission of all jobs
  - one and only one job per PC



# Time of simulations



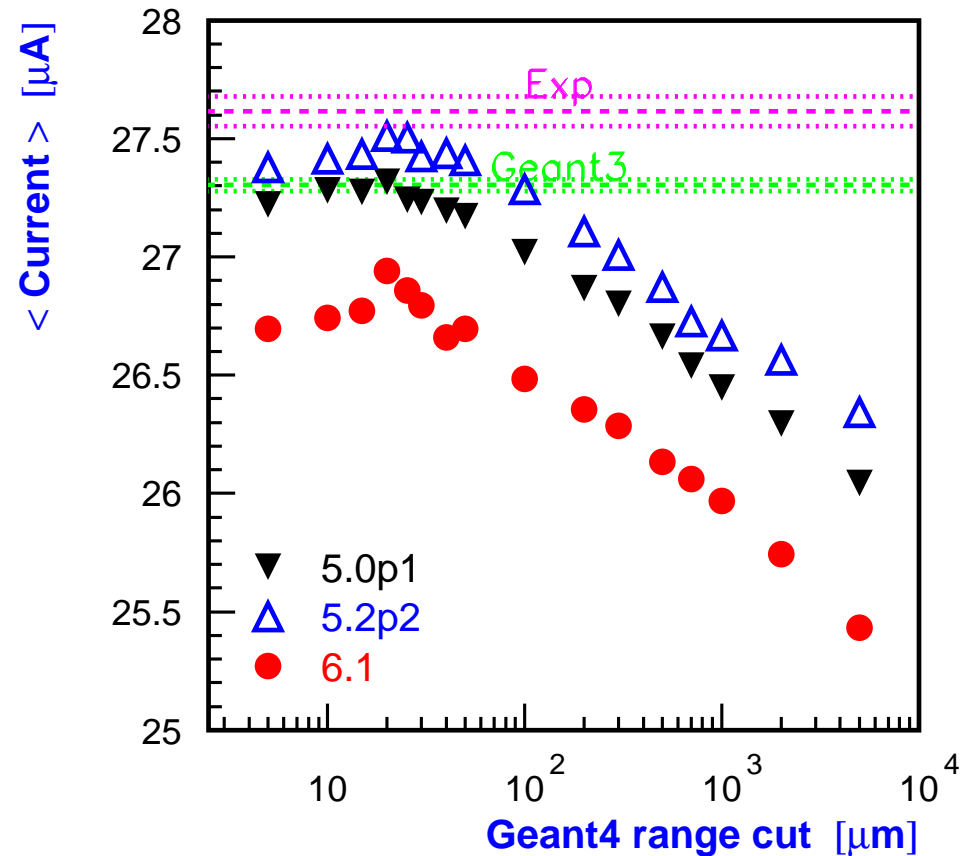
## Current simulations

- Geant4:
  - versions 5.0p1, 5.2p2 and 6.1
  - scan over the range cut (5  $\mu\text{m}$  - 5 mm) with 100 GeV electrons
  - energy scans with 20  $\mu\text{m}$  cut
    - \* electrons
    - \* negative pions
    - \* positive pions
    - \* protons
  - LHEP
- Geant3 (3.21)
  - 100 keV transport and 1 MeV production cuts

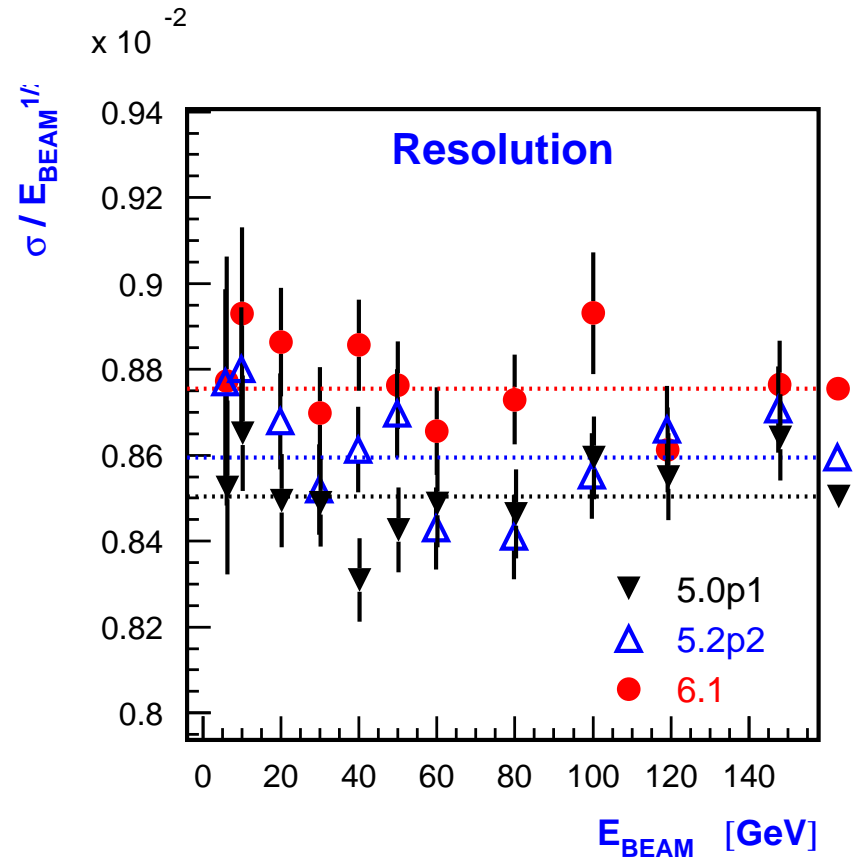
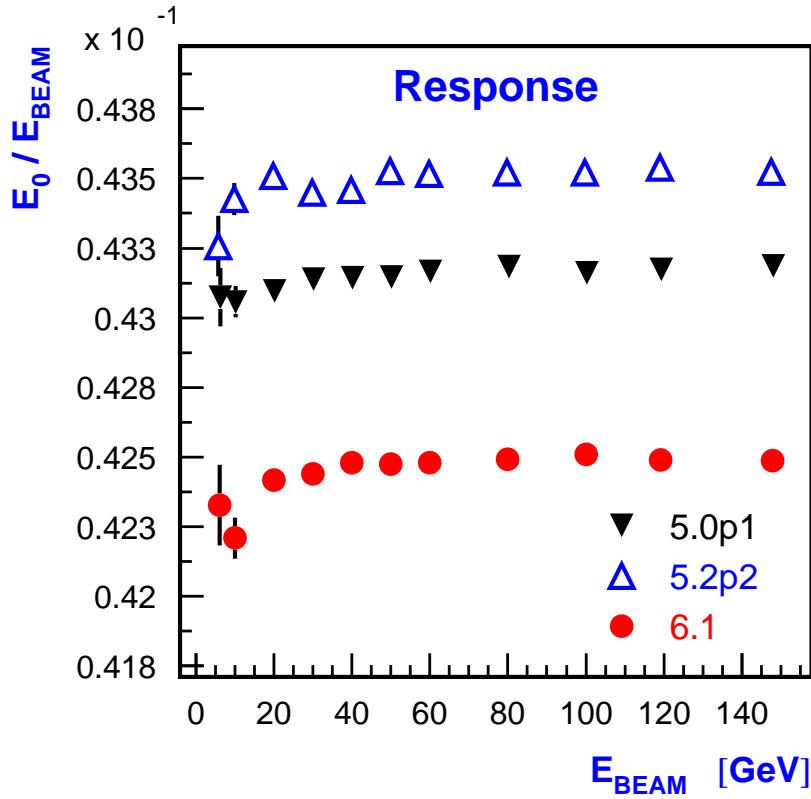


## Electrons: Signal in the most loaded cell

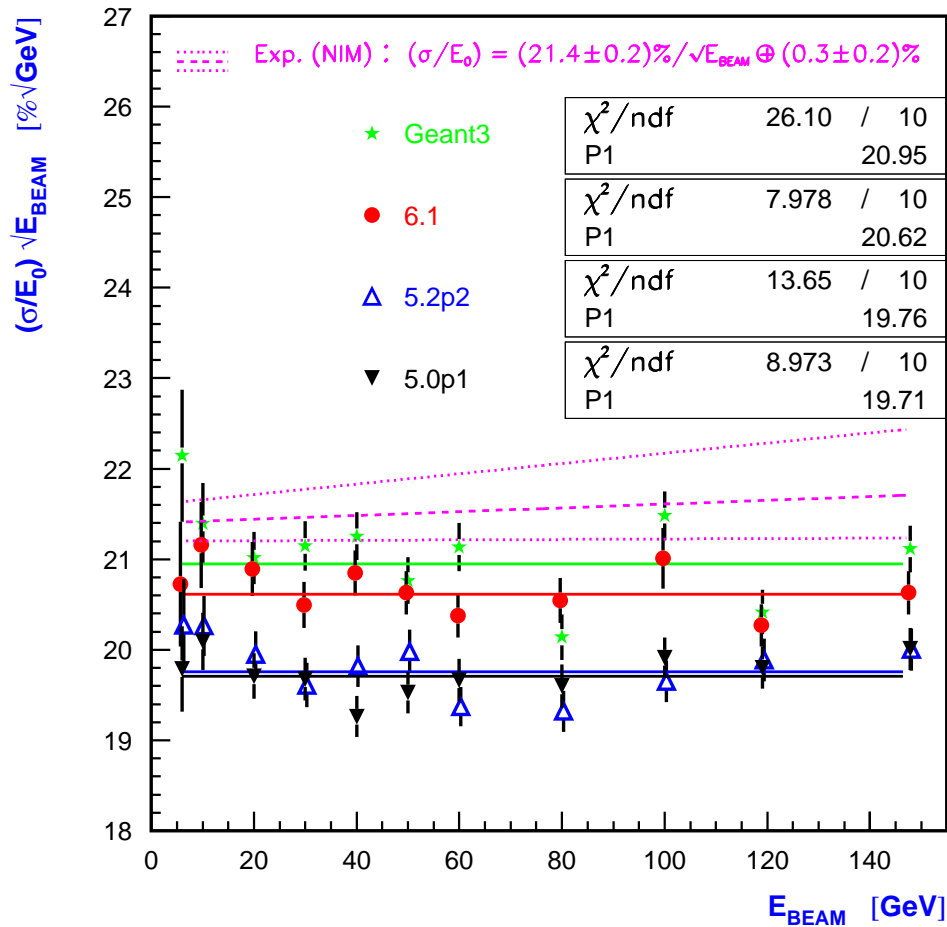
- Cell with the maximal average signal
- $\text{Current} = \text{Visible Energy} \times 7.135 \mu\text{A/GeV}$
- 20  $\mu\text{m}$  range cut selected for further simulations
- $\sim 2.5\%$  difference between experimental results and Geant4-6.1 predictions



# Electrons: Signal in the tower



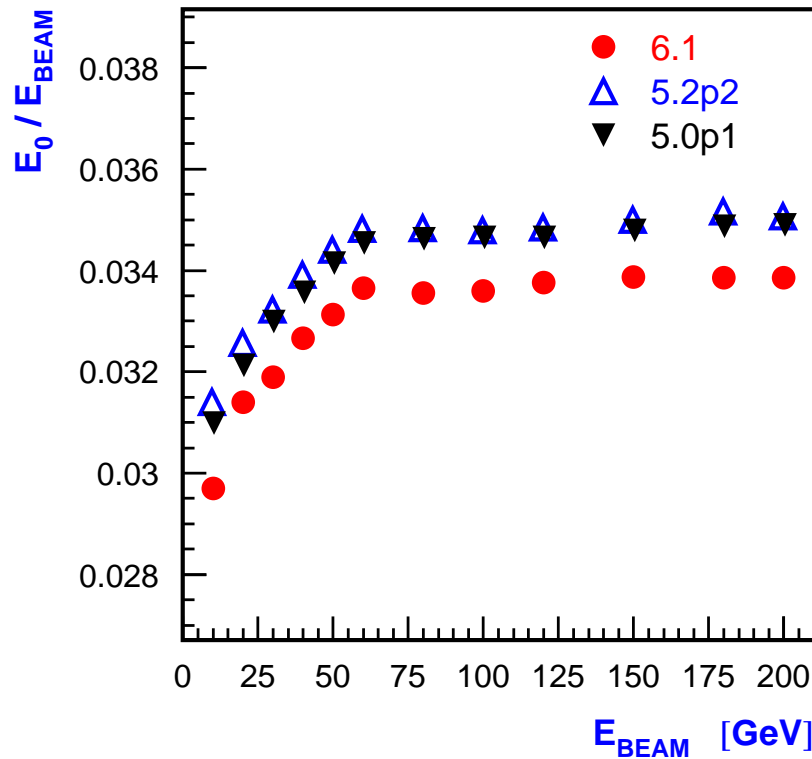
# Electrons: Signal in the tower



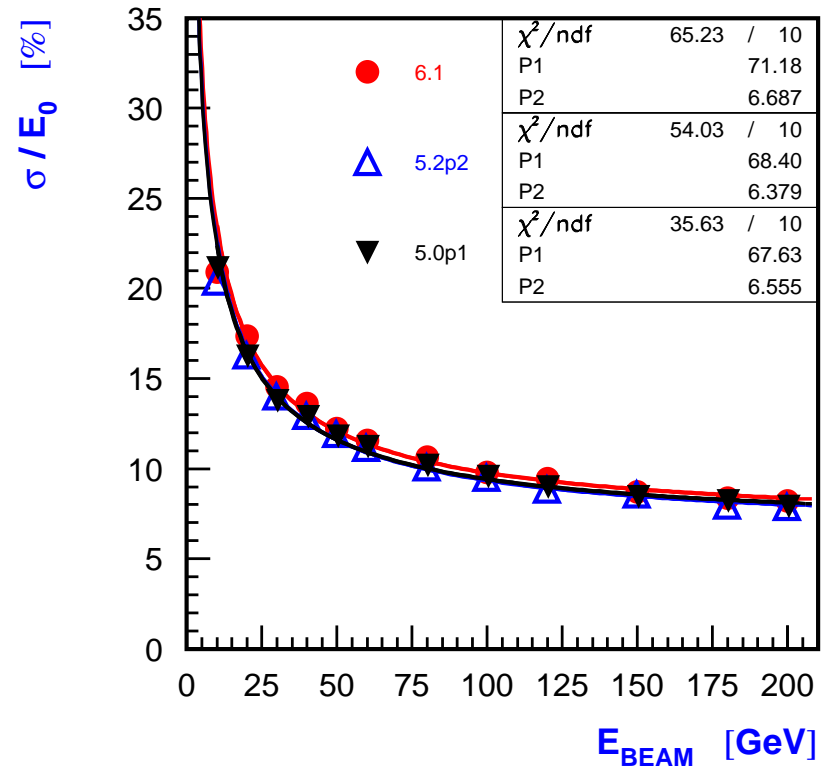
- Energy resolution, as predicted by Geant4 version 6.1, is closer to experiment (w.r.t previous Geant4 versions)
  - increase of fluctuations in LAr ( $\sigma$ )
  - decrease of visible energy ( $E_0$ )



# Negative pions: Energy in the whole module



Response

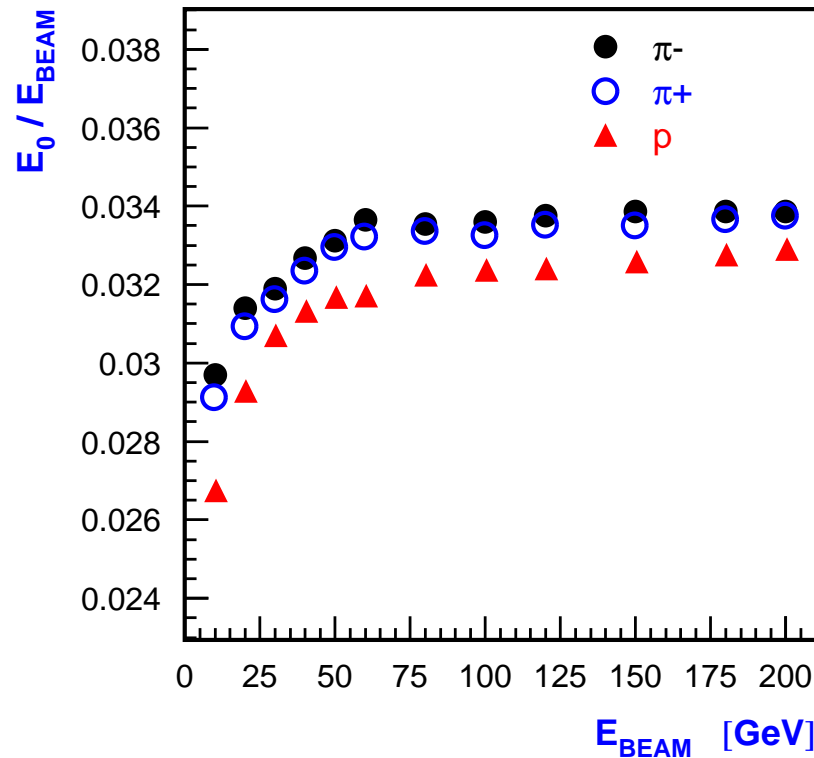


Resolution

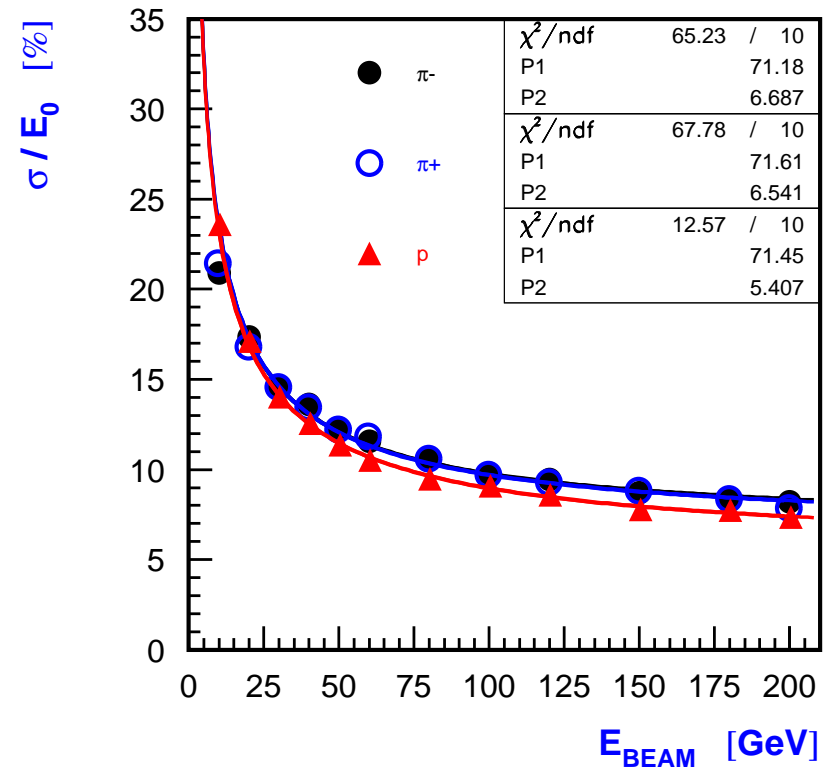




# Hadrons: Energy in the whole module (Geant4 version 6.1)



Response



Resolution



## Current conclusions, plans

- Scan over the range cut and energy scan for electrons with Geant4 version 6.1 were 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
- Energy scans for hadrons with Geant4 version 6.1 were simulated:
  - different physics lists
  - analysis is going on
- Still plan to prepare the article on Geant4 physics validation with HEC testbeam data (based on version 6.1)

