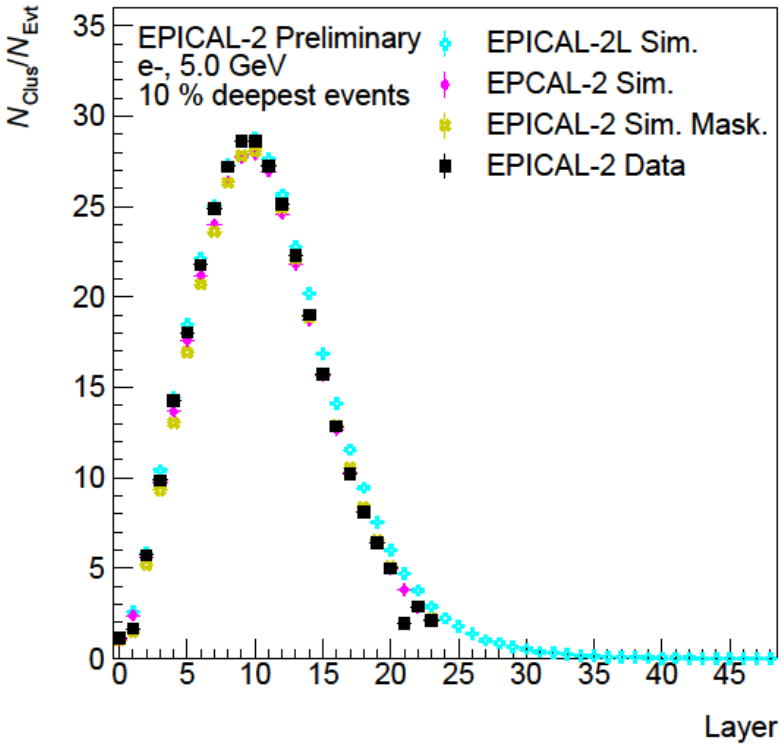
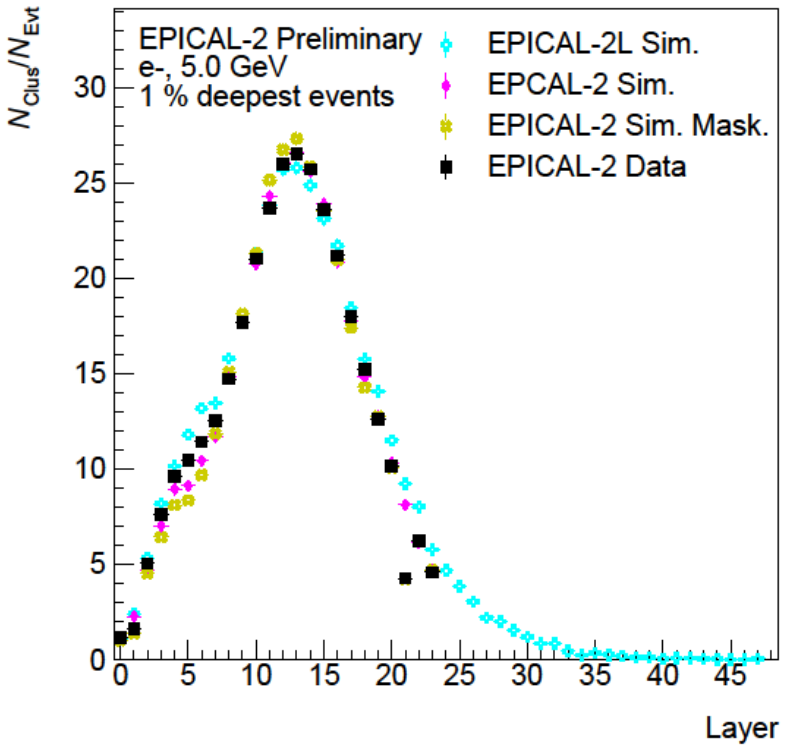
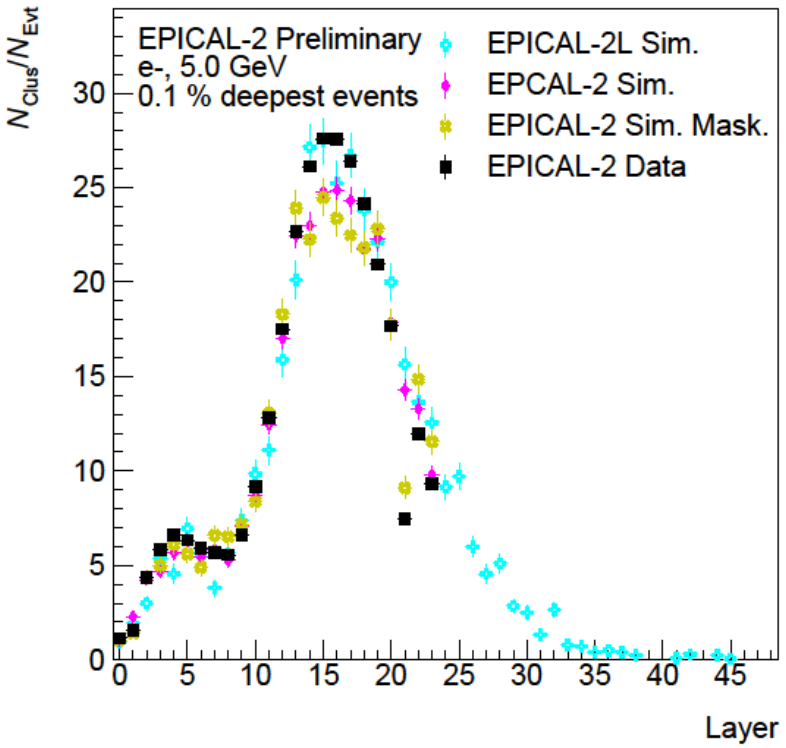
Elongated Events in the EPICAL-2, Update

Johannes Keul

Reminder: Longitudinal profile for deep events

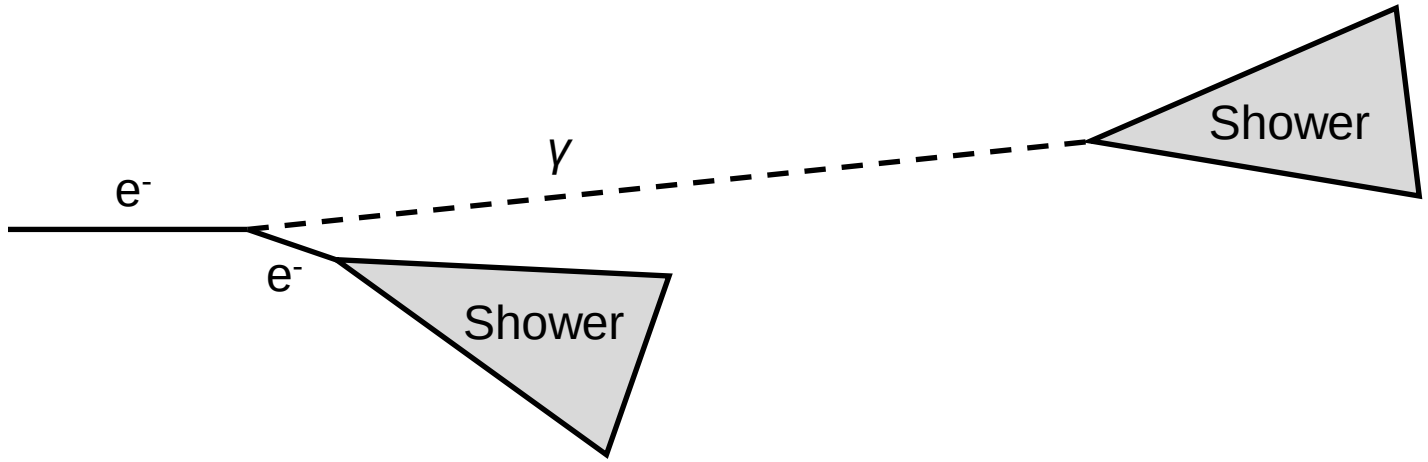


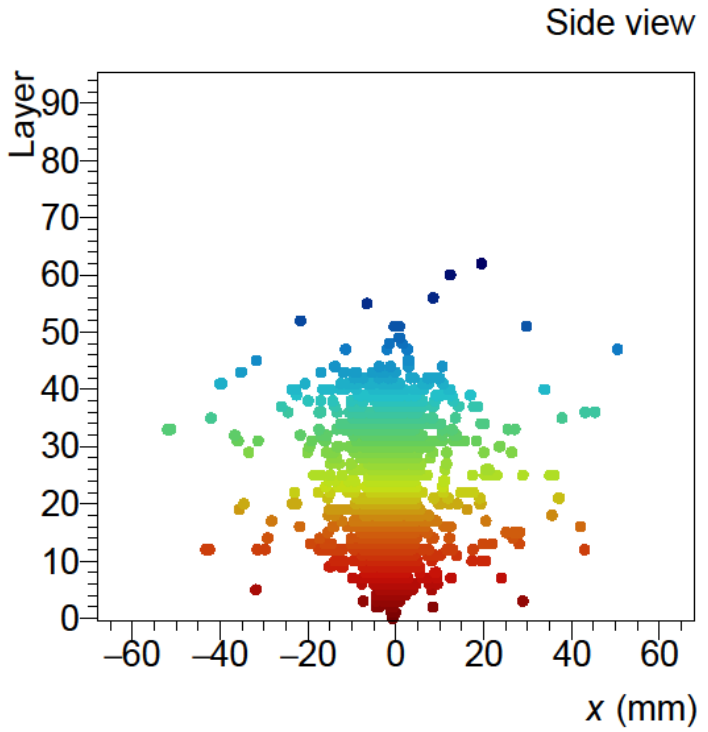




- For the 0.1% sample for clusters, the longitudinal profile shows a double peak, this feature is present in both simulation and data

Reminder: possible explanation



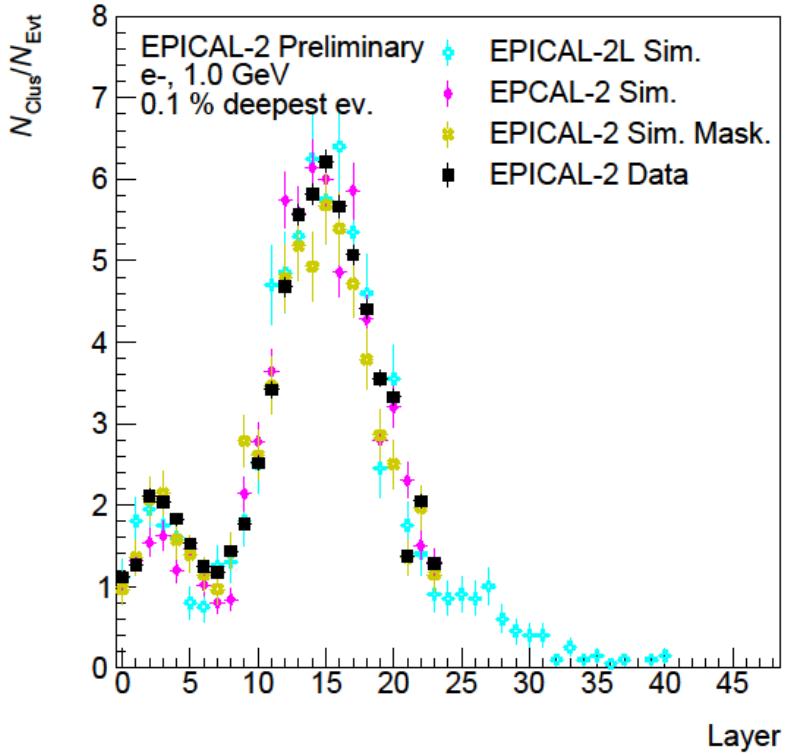


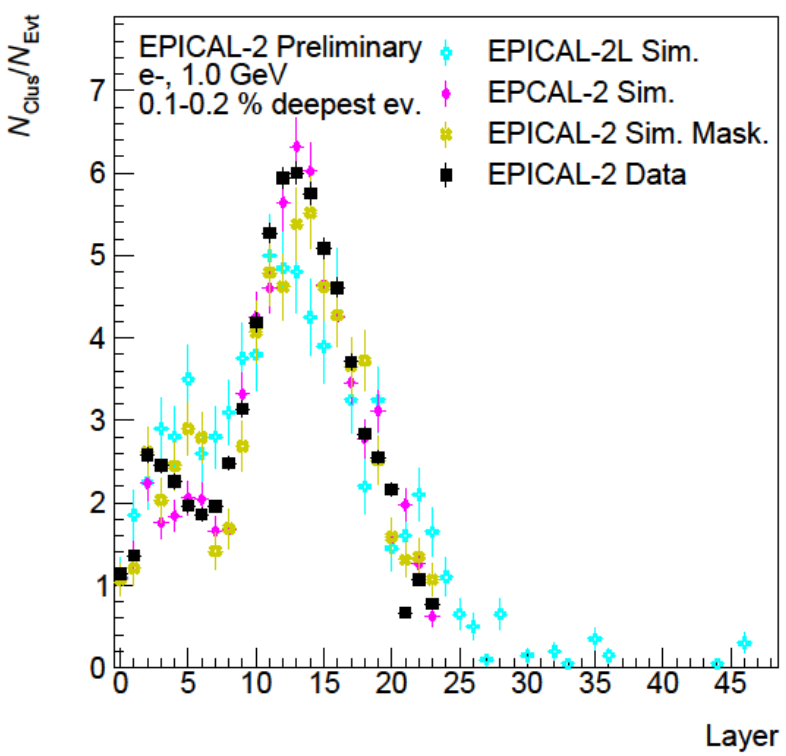
- In some cases, a significant part of the primary electron's energy is transferred to a single bremsstrahlungs photon
- This photon can travel quite far in the detector without interacting: mean free path for photons is approximately 1.5 layers
- Chance of a photon traveling through a certain number of layers:

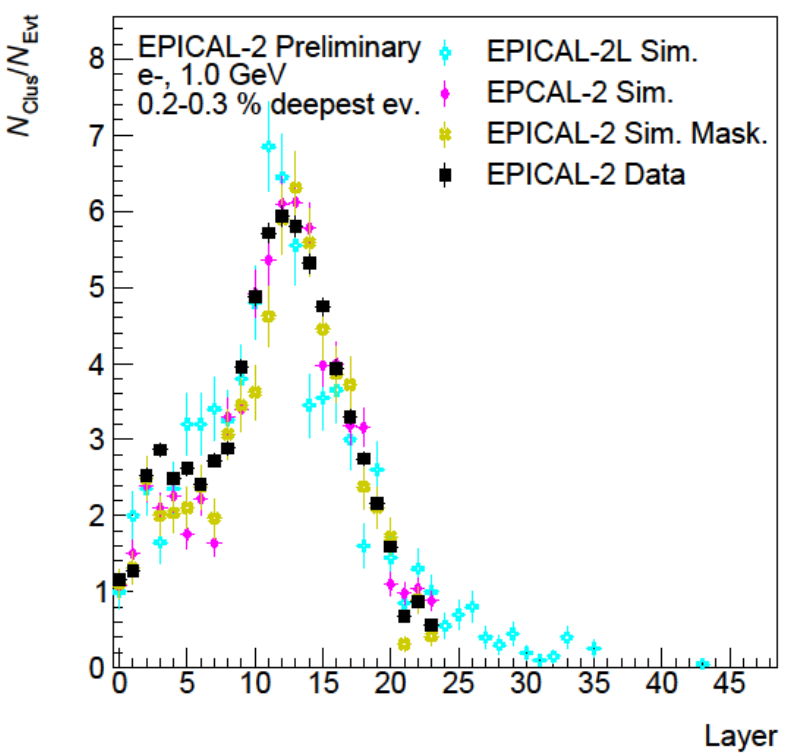
  6 layers: 1.9%
  12 layers: 0.035%
  18 layers: $6.6 * 10^{-6}$

  } Updated!

Different depth bins



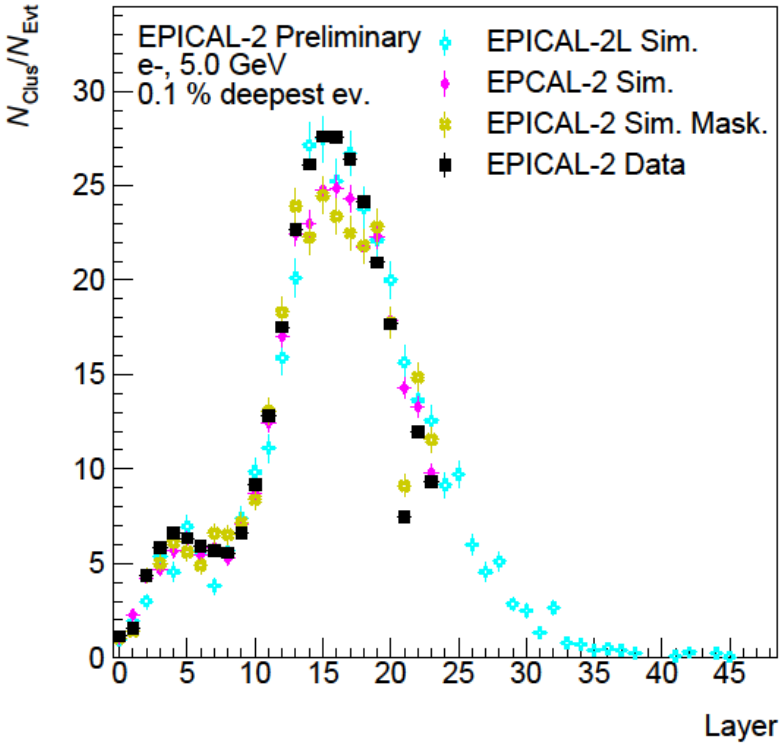


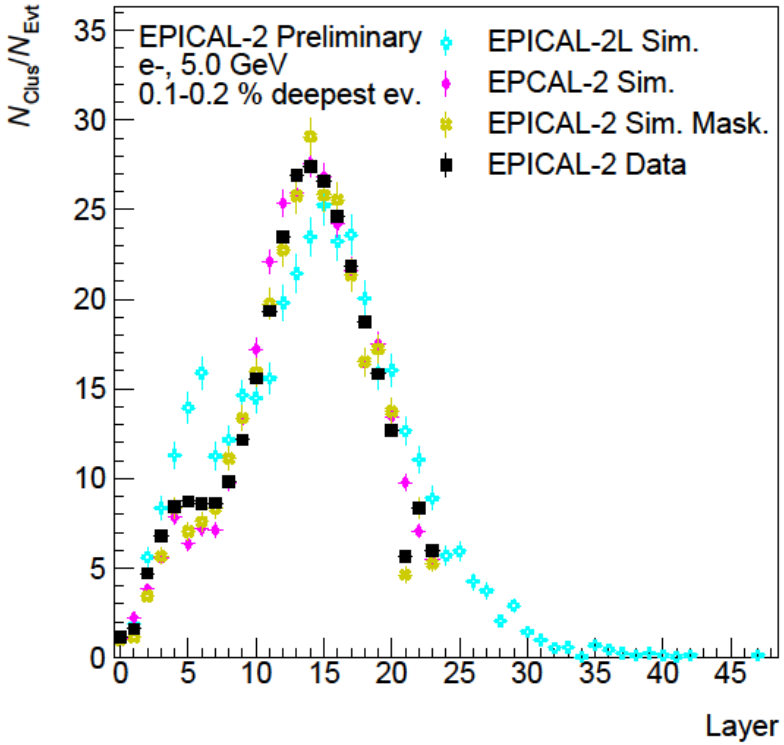


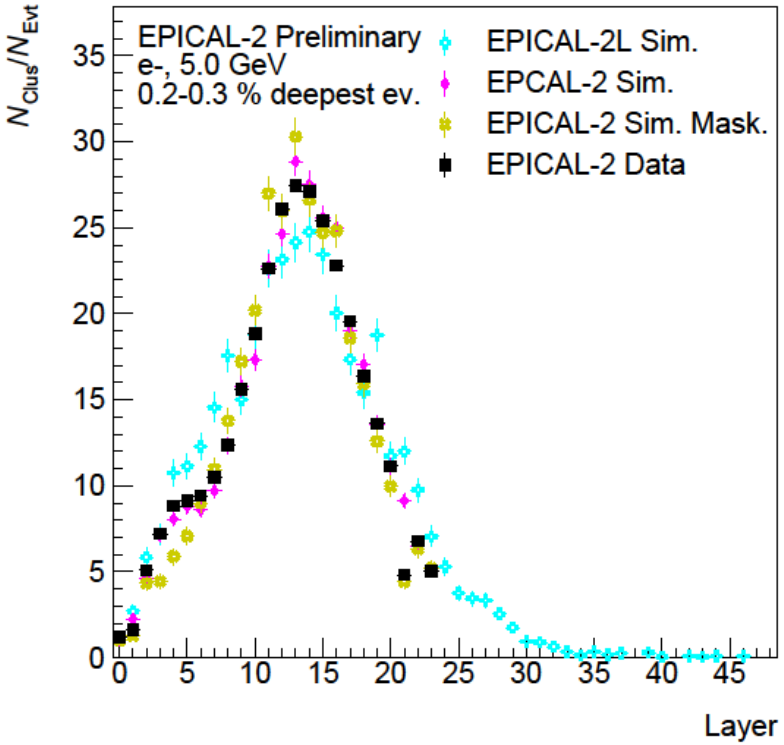
With decreasing depth

- the maximum value of the first peak increases. → The primary electron transfers less energy to a single photon
- the second peak moves towards lower layers. → The photon showers earlier
- the minimum between both peaks vanishes, the peaks merge.

Different depth bins







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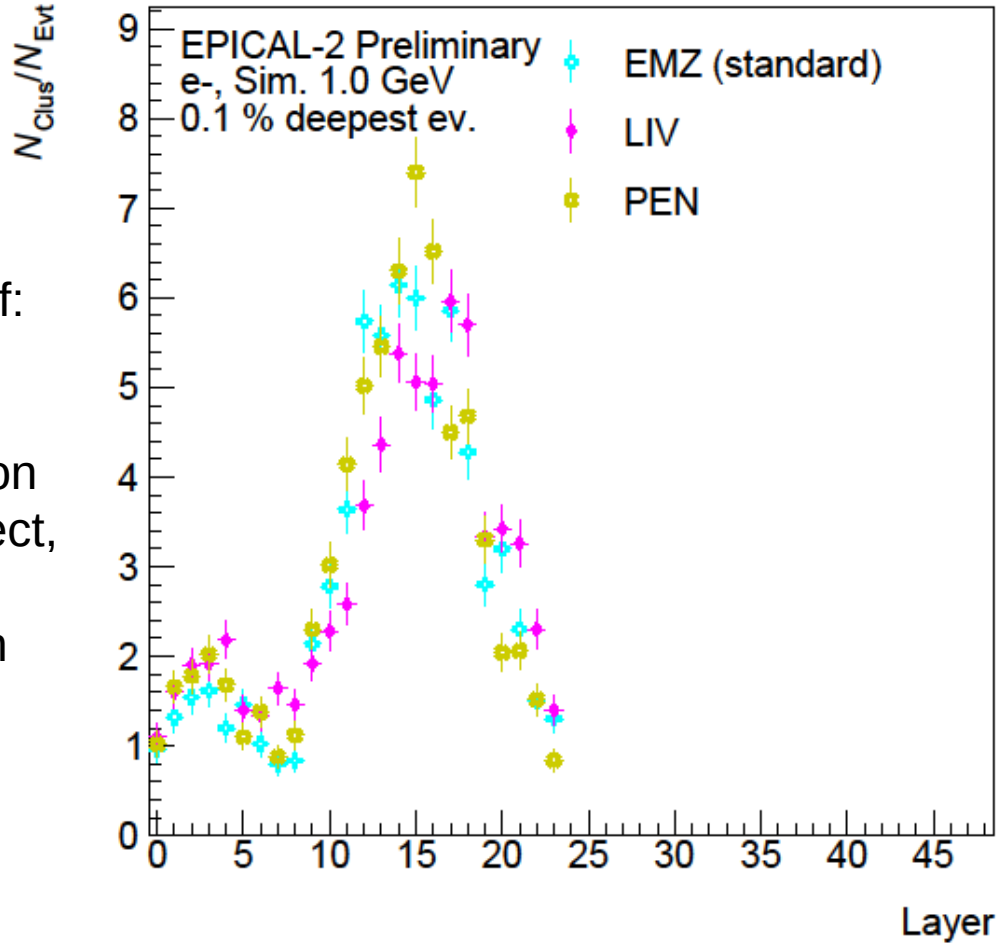
Different physics lists

Compared to EMZ, there are differences in the description of:

- LIV: Compton scattering, ionization (positron)
- PEN: Rayleigh- and Compton scattering, photoelectric effect, pair production, ionization, bremsstrahlung, annihilation



- Large fluctuations due to limited statistics
- All physics lists show similar behavior

Paper Structure

Johannes Keul

Paper structure

1. Introduction
2. EPICAL-2 Beam-Test, Analysis and Simulation Setup
3. SPS beam composition and electron-hadron discrimination
   3.1 SPS beam composition
4. Calorimeter response to electrons
   4.1 Definition of the shower energy response
   4.2 Response in Simulation
   4.3 Energy linearity
   4.4 Energy resolution
5. Electromagnetic shower shape
   5.1 Lateral distribution
   5.2 Moliere radius
   5.3 Position resolution
   5.4 Longitudinal distribution
   5.5 Electron-hadron discrimination from shower shape
   5.6 Effect of shower shape discrimination

Current plan: Using standard detector response throughout the paper and introducing alternative (radially cut) detector response in one section

Option 1

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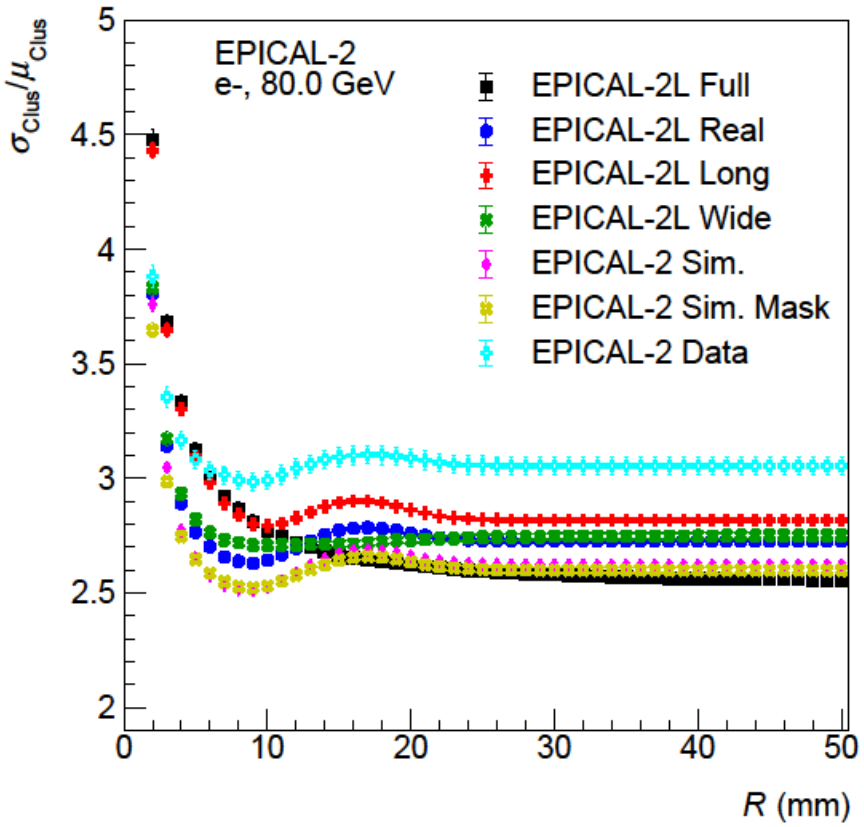
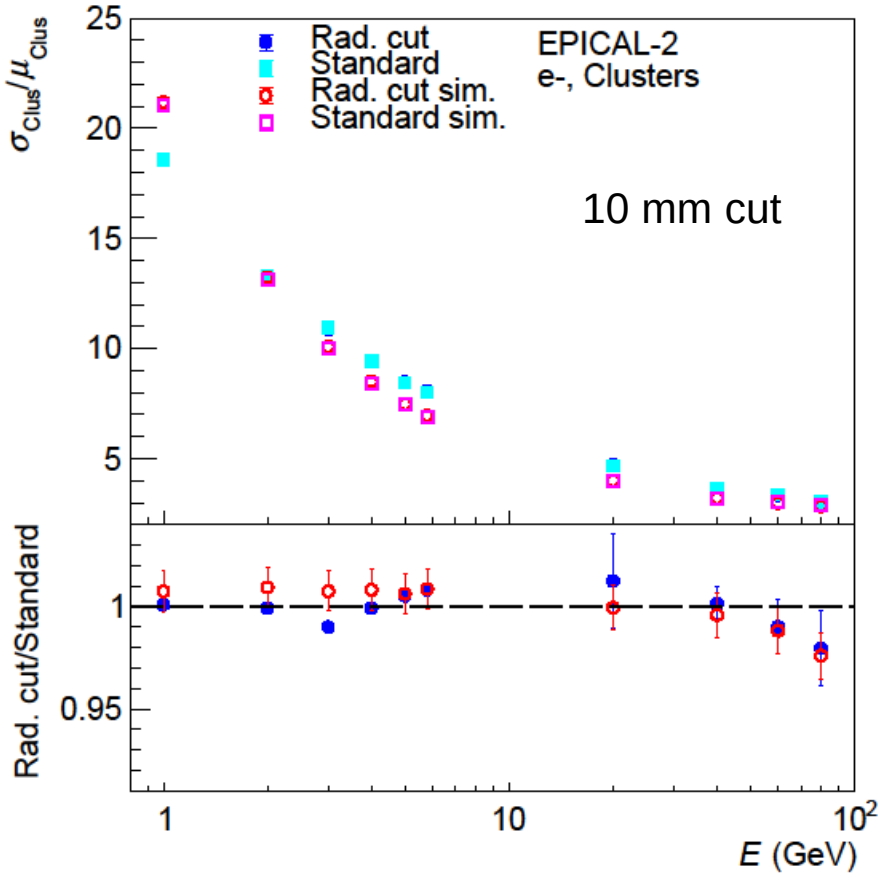
   - 5.6 Effect of shower shape discrimination
6. Alternative detector response
   - 4.1 Definition
   - 4.2 Energy linearity
   - 4.3 Energy resolution

Plots for alternative detector response





Which data points should be shown?
Probably only (standard) simulation and data,
since EPICAL-2L is not introduced in this paper.