EPICAL-2 Meeting - 04.02.25

FWHM With Systematics

Jan Schöngarth

Idea

Just 2 methods available

Idea:

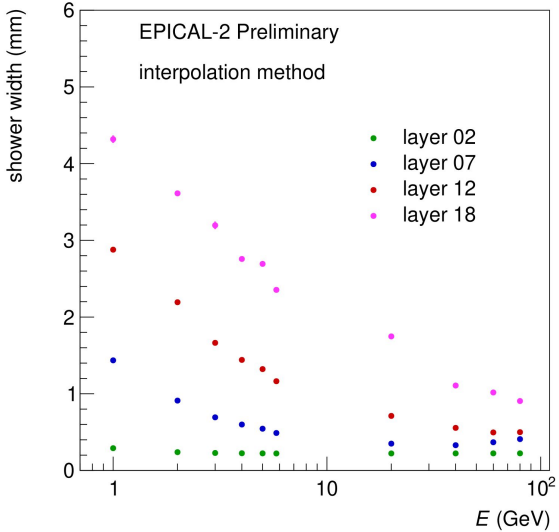
- get weighted mean FWHM from both methods

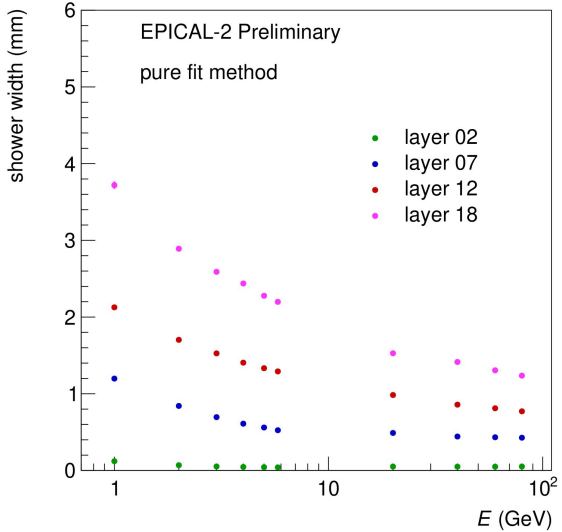
$$\mu = \frac{y_1/\sigma_1^2 + y_2/\sigma_2^2}{1/\sigma_1^2 + 1/\sigma_2^2} \qquad \sigma_{\text{stat}} = \sqrt{\frac{1}{1/\sigma_1^2 + 1/\sigma_2^2}}$$

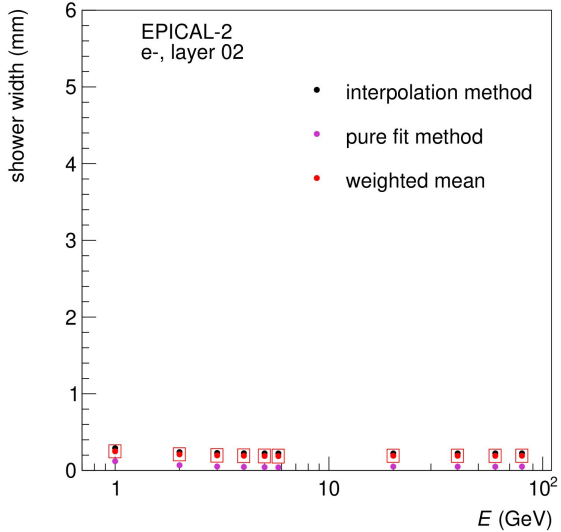
- average difference to both methods ➔ systematic error

$$\sigma_{\text{sys}} = \frac{1}{2}(|y_1 - \mu| + |y_2 - \mu|)$$

FWHM Systematics - Data







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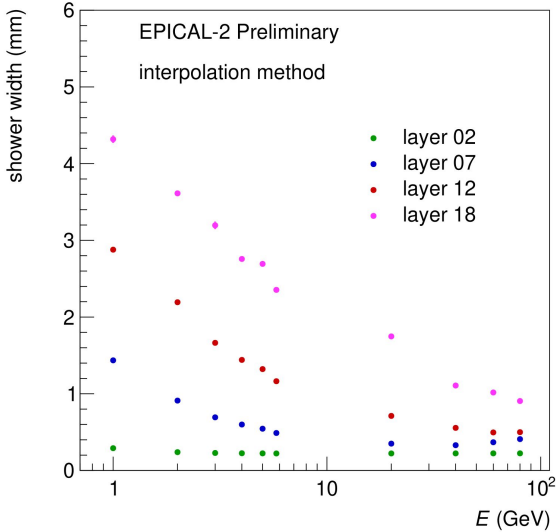

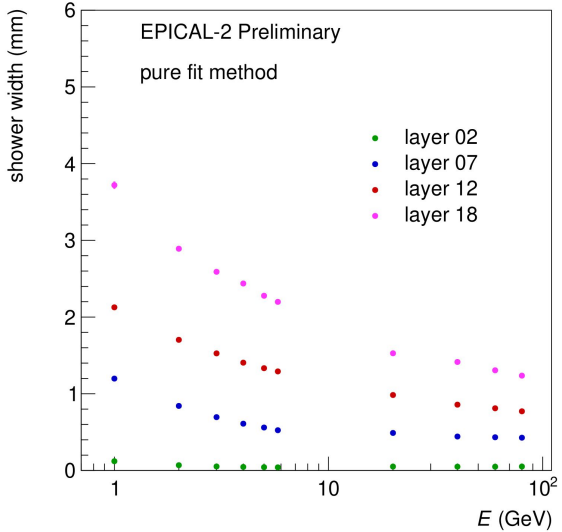

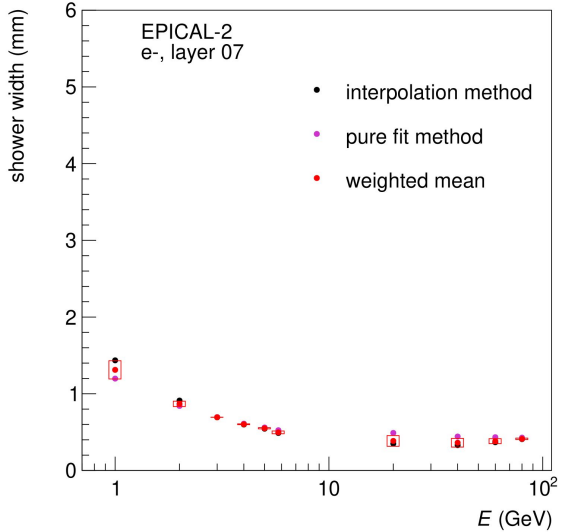

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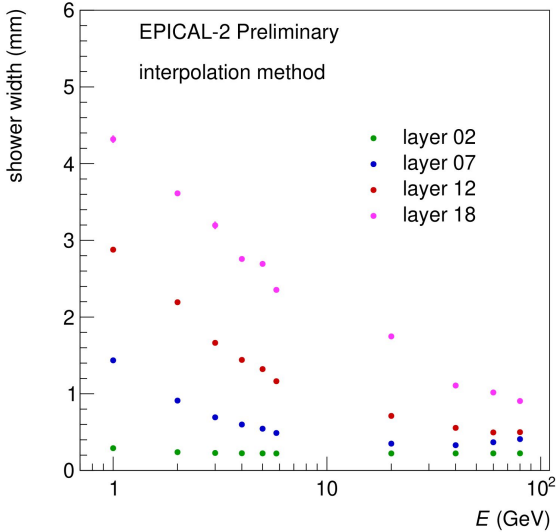

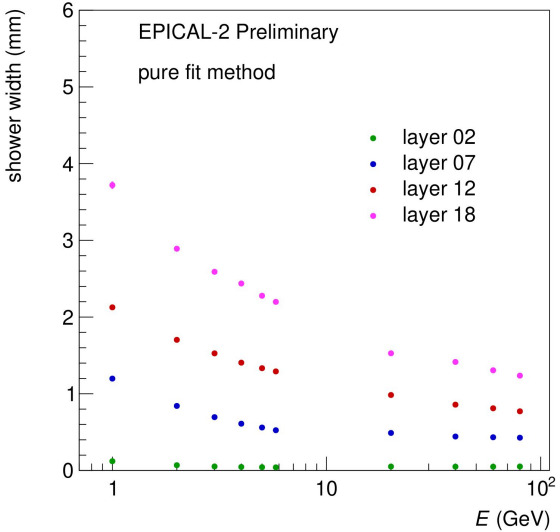

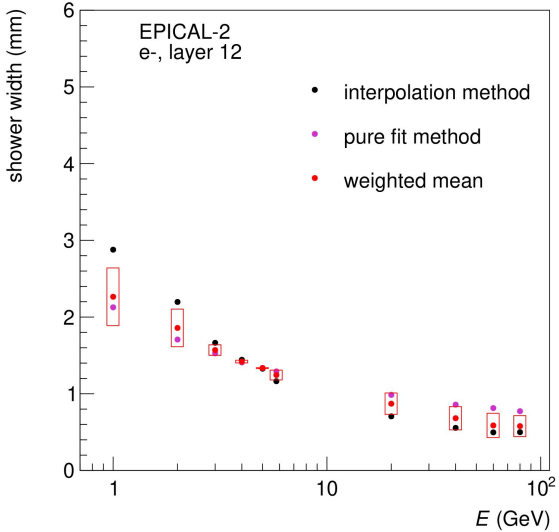

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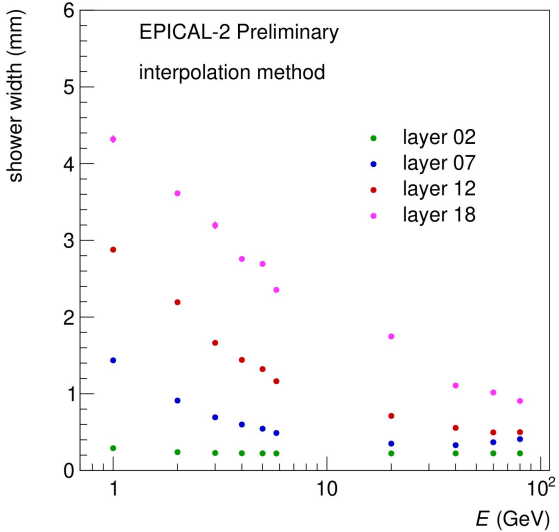

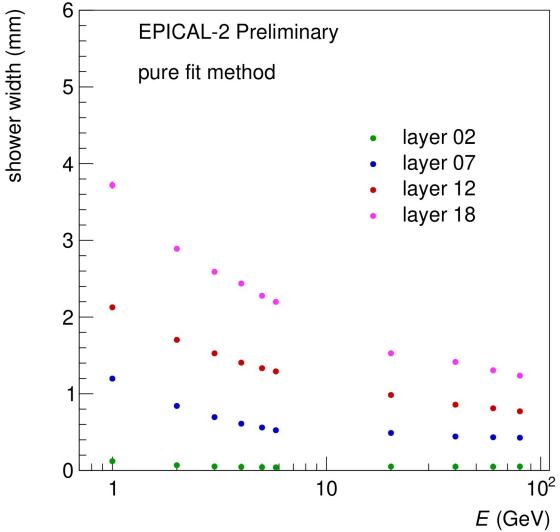

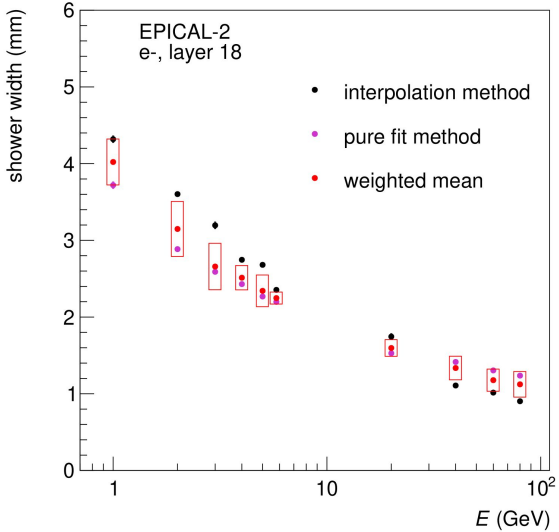

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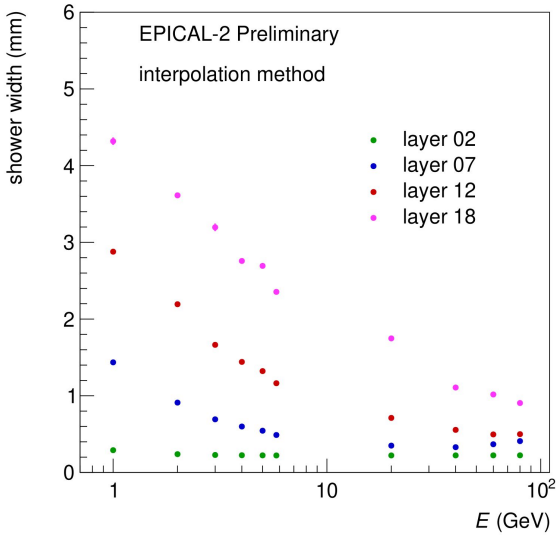
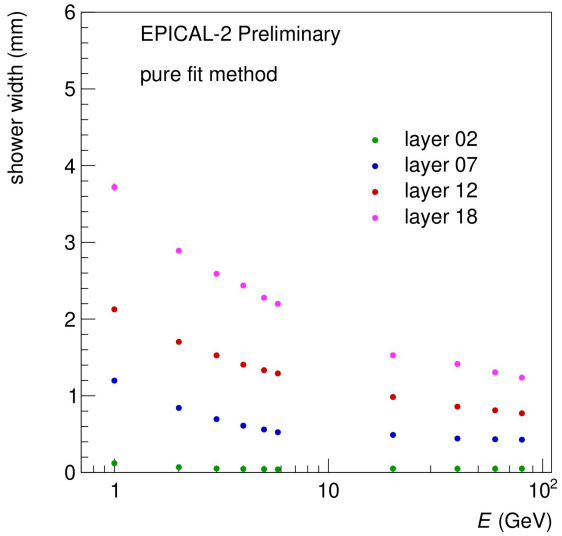
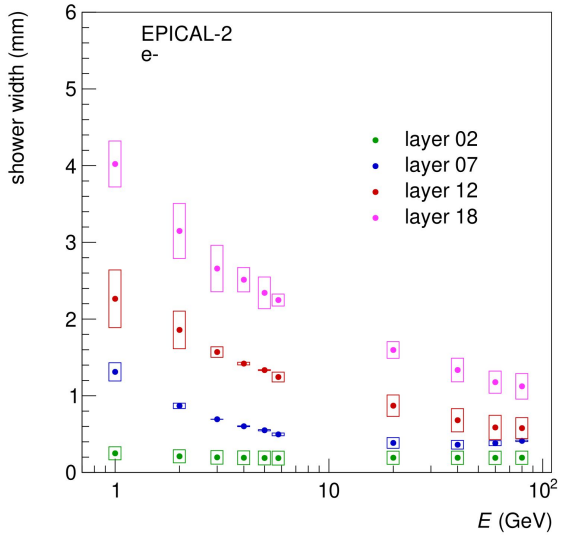
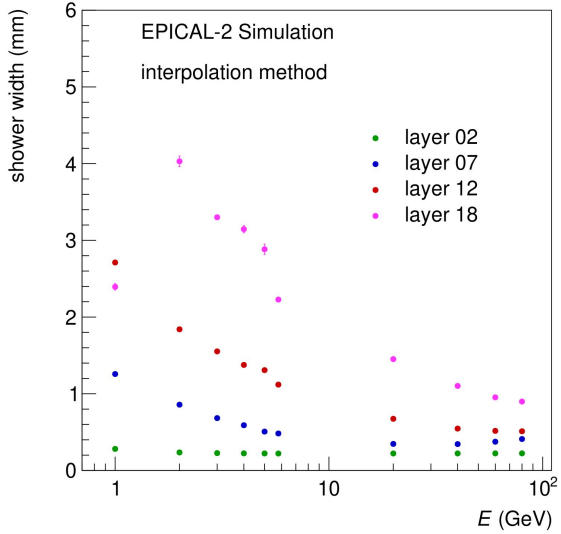
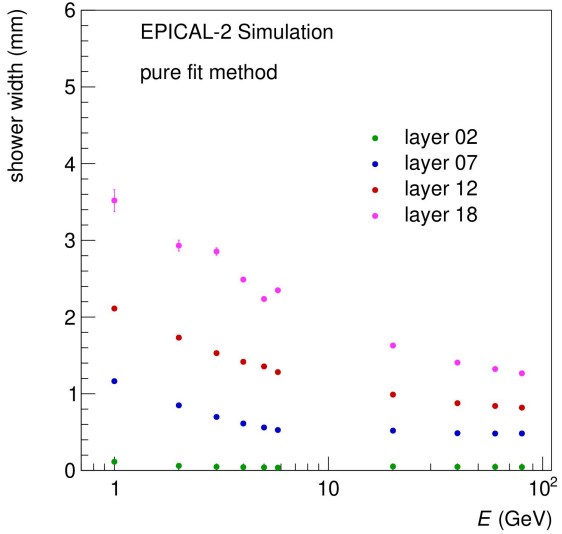


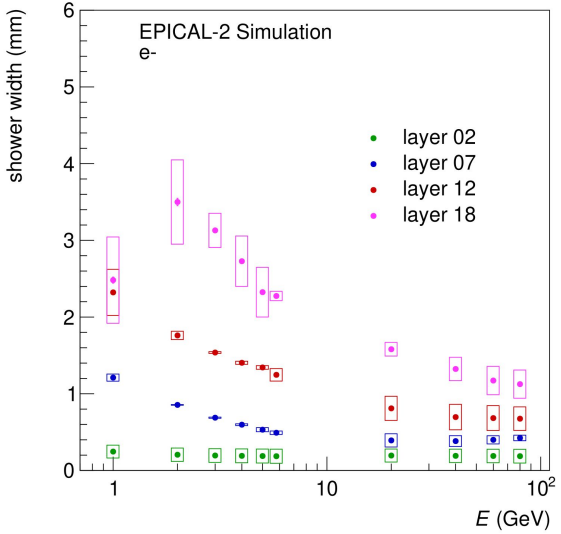




FWHM Systematics - Sim







To-Do List

- try FWHM event-by-event
- simple GEANT4 simulation based on examples/extended/electromagnetic/TestEm3
- long-term: systematic FWHM simulation study (difference physics lists)

Backup

Updated Simulation

With energy spread, broken chip is masked

Previously:

- DESY: 20k events
- SPS: 10k events

Now:

- DESY 50k events
- SPS 50k events

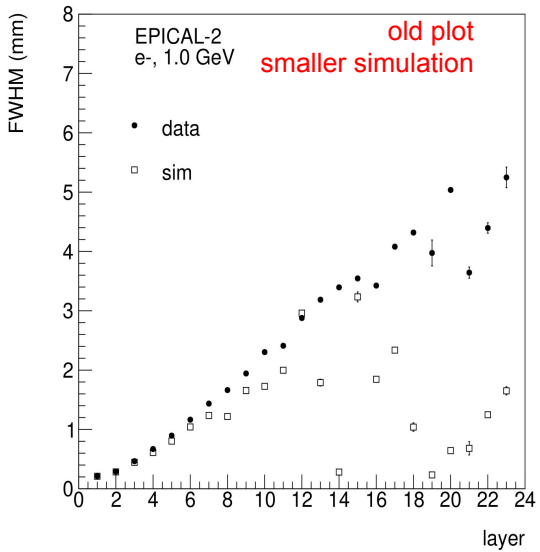
Event Selection for lateral profiles:

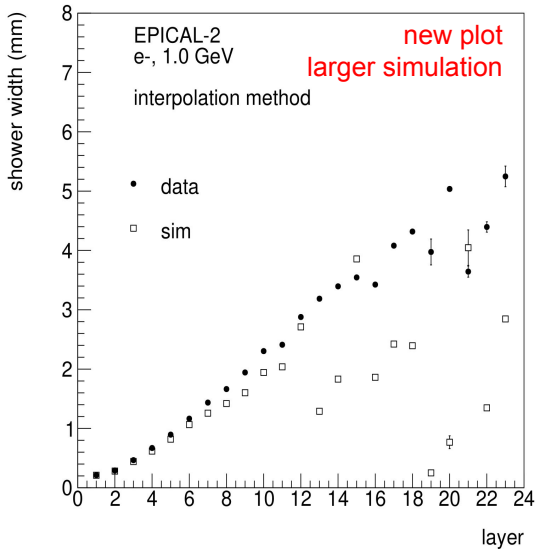
- DESY: Fastjet + single cluster in layer 0
  - on average 27k events selected

- SPS: 5σ cut + single cluster in layer 0
  - on average 40k events selected

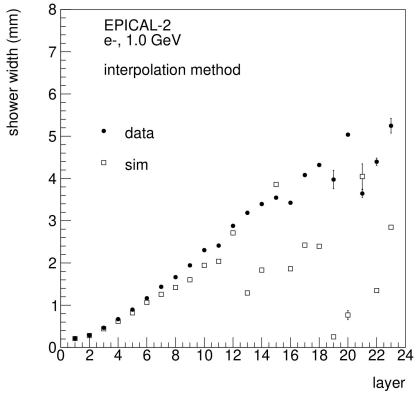
FWHM Layer Dependence

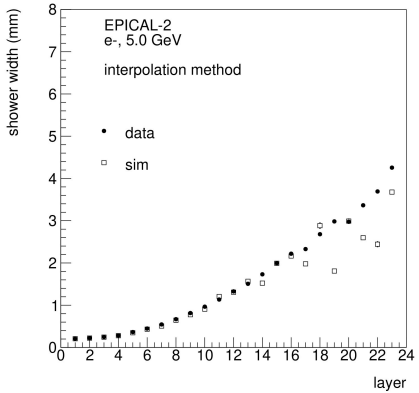
- FWHM at 1 GeV in simulation:
  - FWHM distribution now smoother before layer 12
  - method still unstable in late layers due to low densities

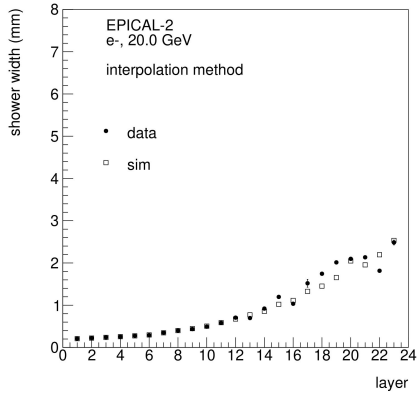


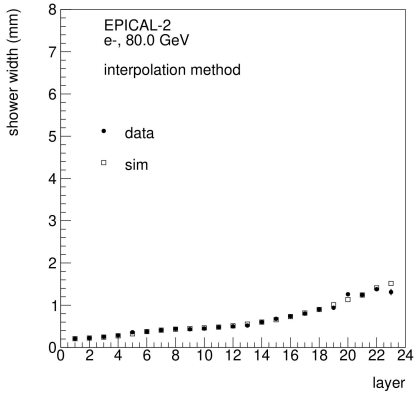


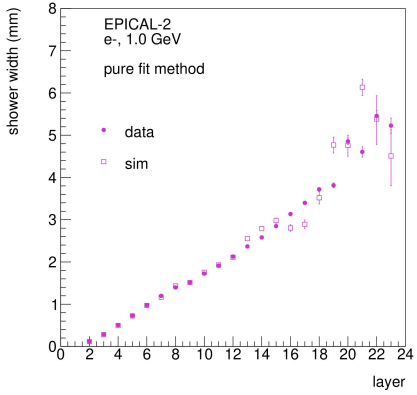
FWHM Layer Dependence

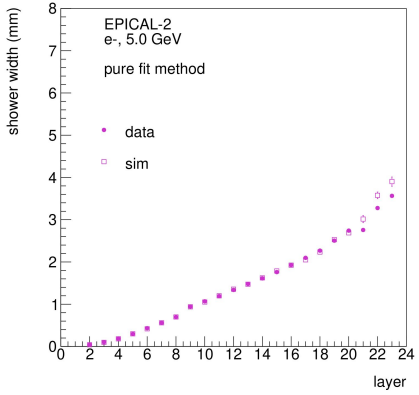


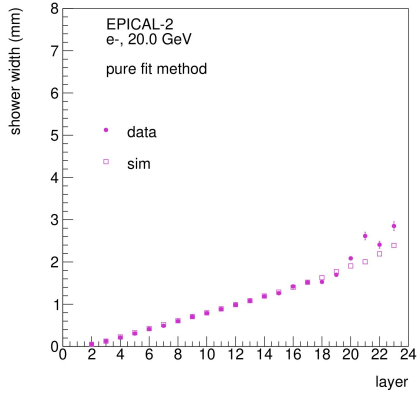


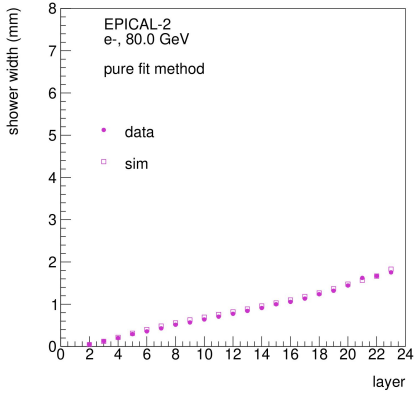






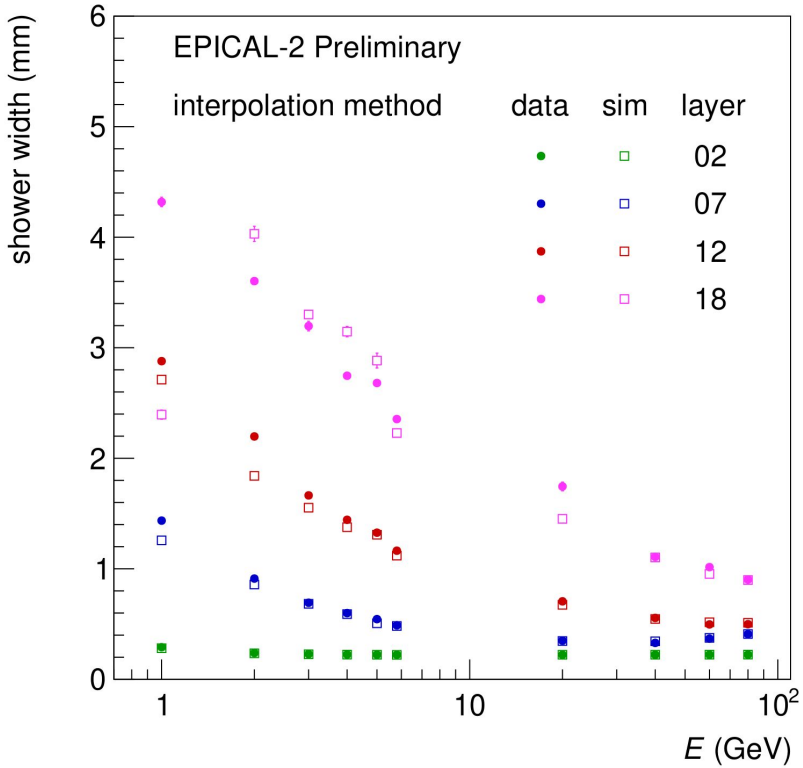


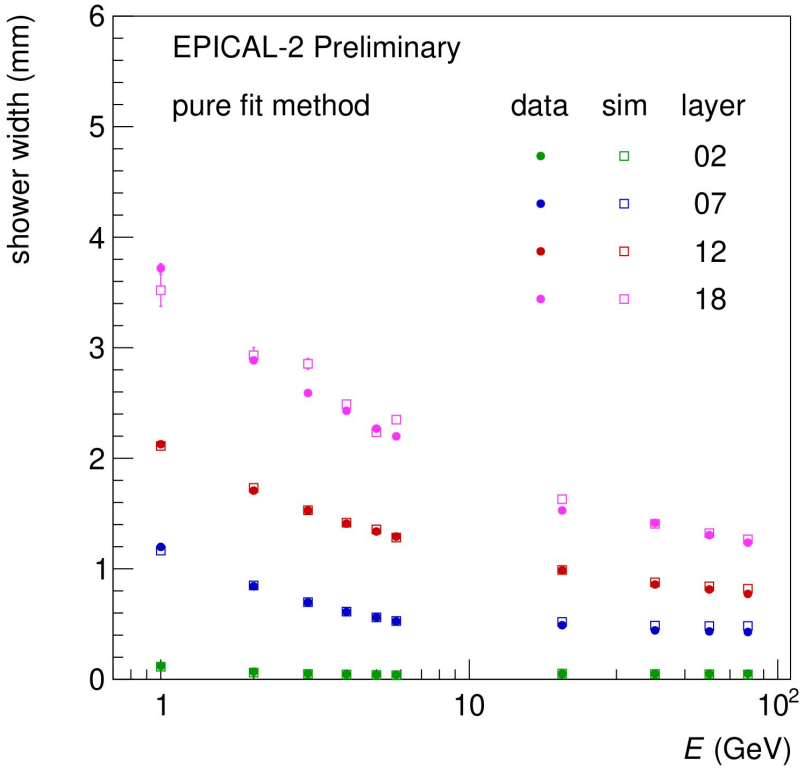




- good match between data and simulation
- fwhm from lateral fits less sensitive to fluctuations

FWHM Energy Dependence





- good match between data and simulation

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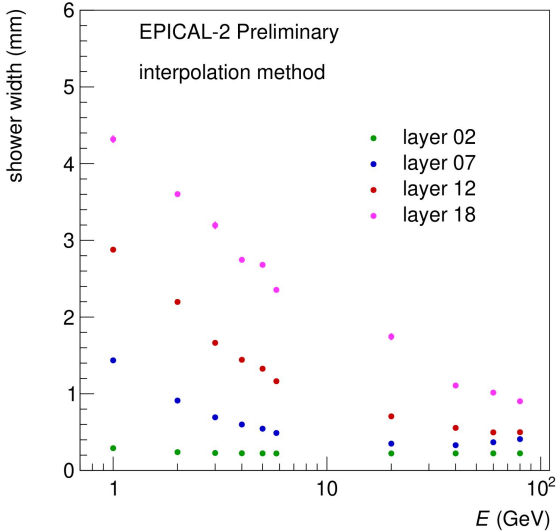

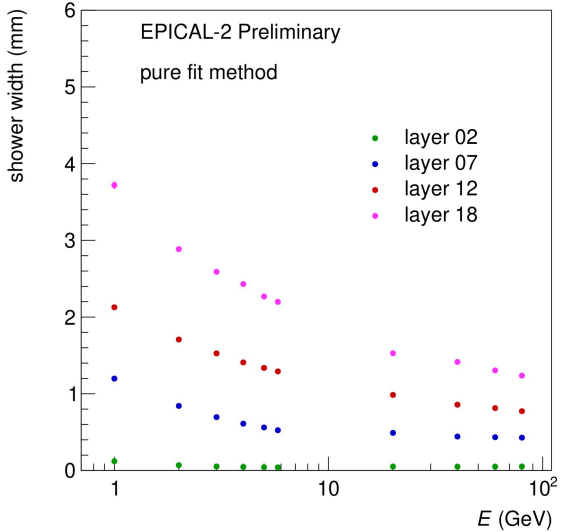

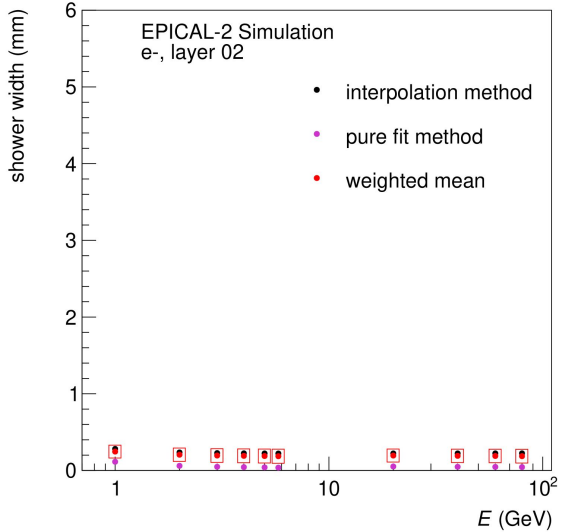

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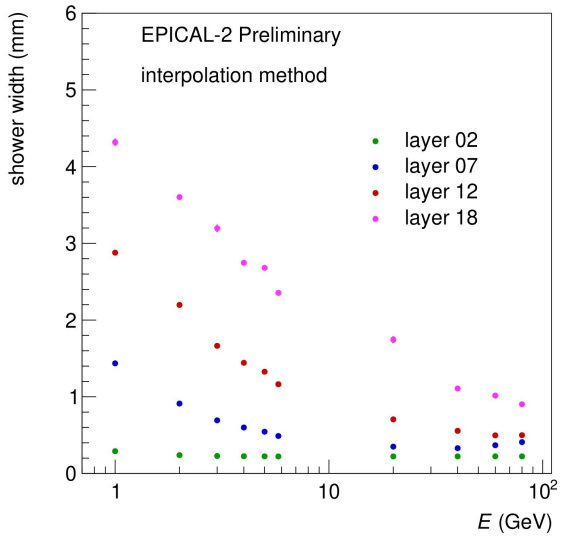

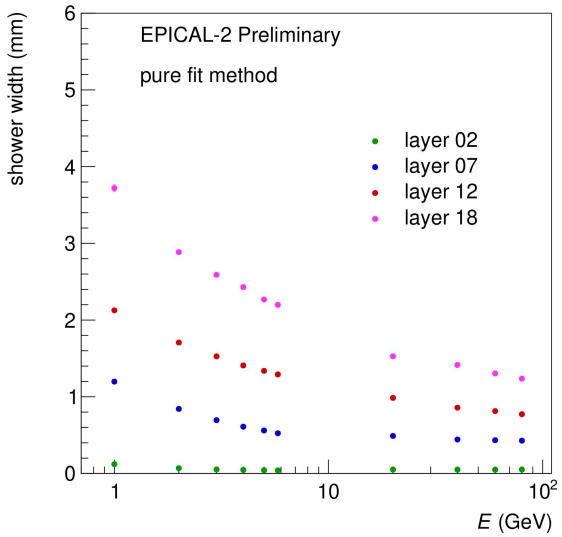

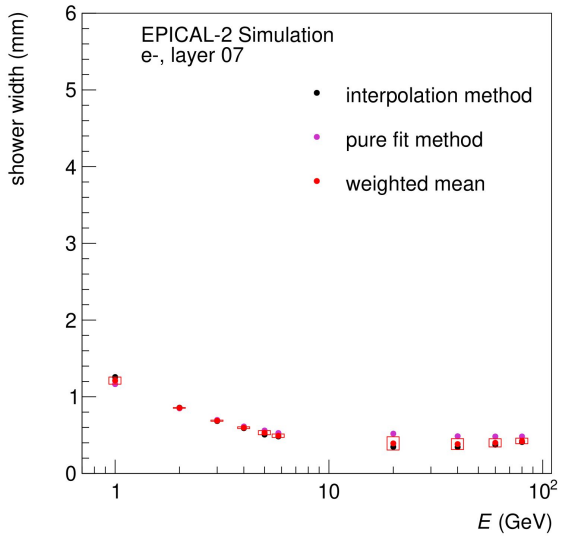

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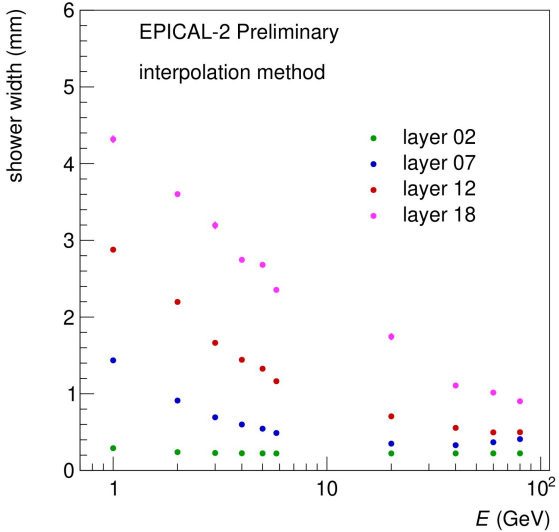

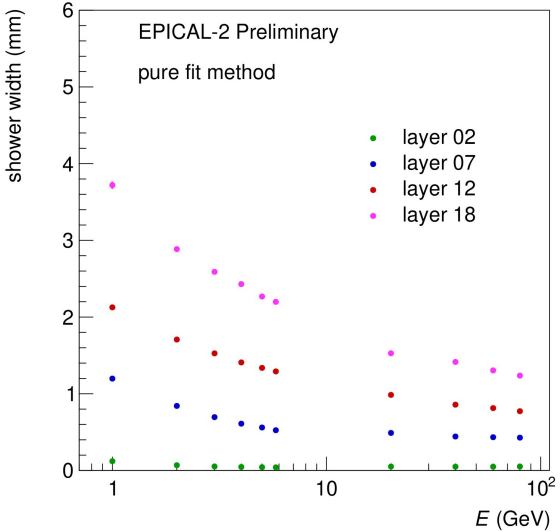

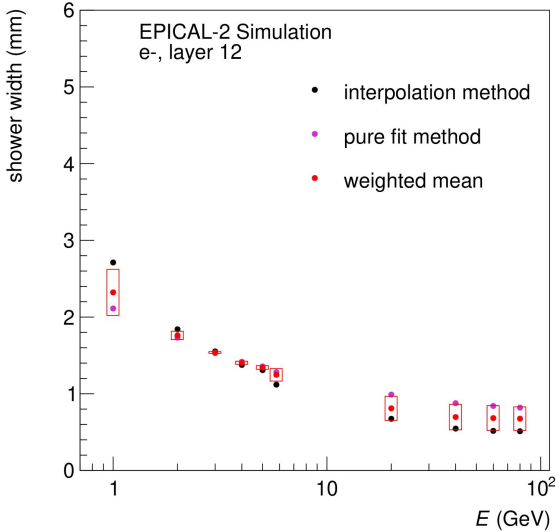

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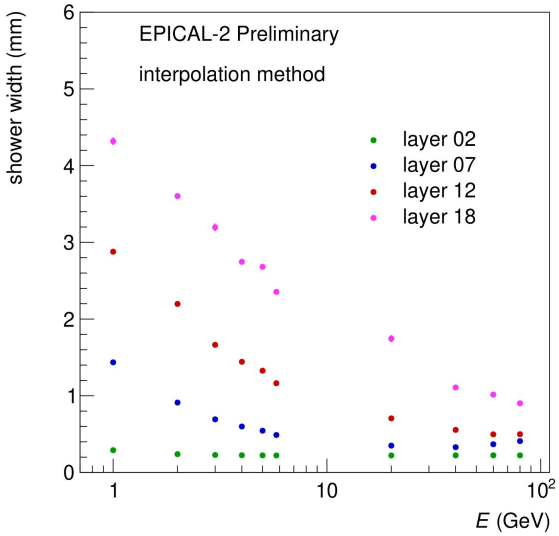

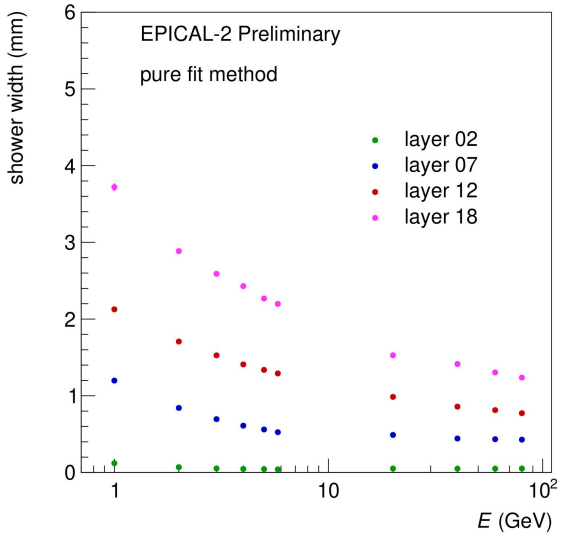

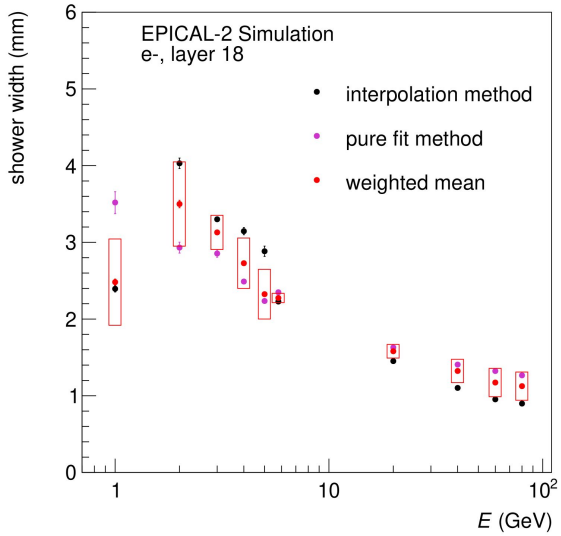
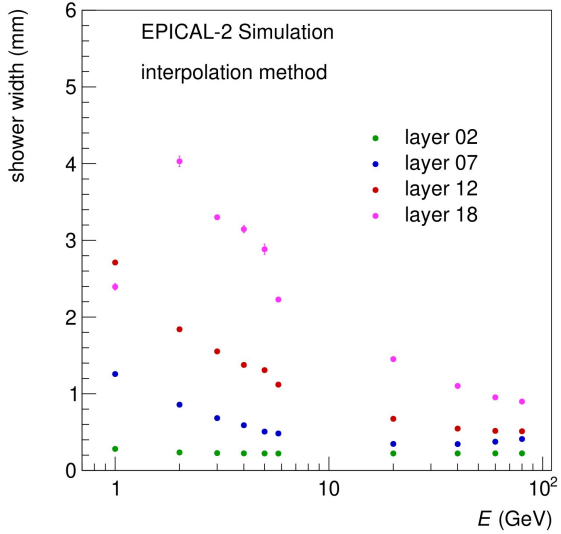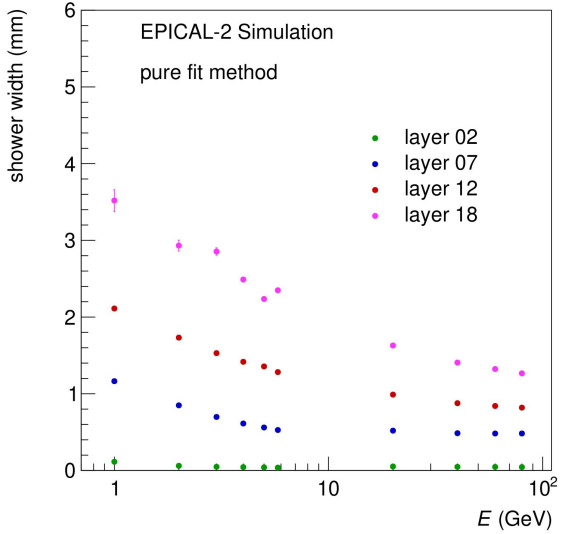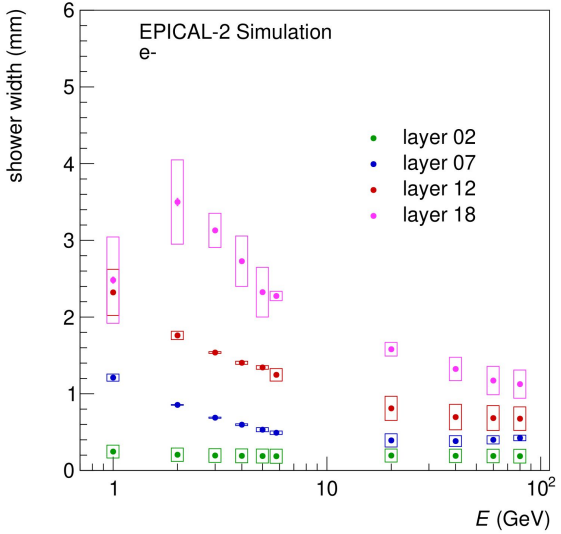
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