

Analysis Status

Where are we in the sight of LCWS?

Niels Meyer
AHCAL Main Meeting
18. April 2007

Saturation – Simulation – Data

Outlook

ITEP SiPM parameters and saturation curve

Electromagnetic analysis of August data

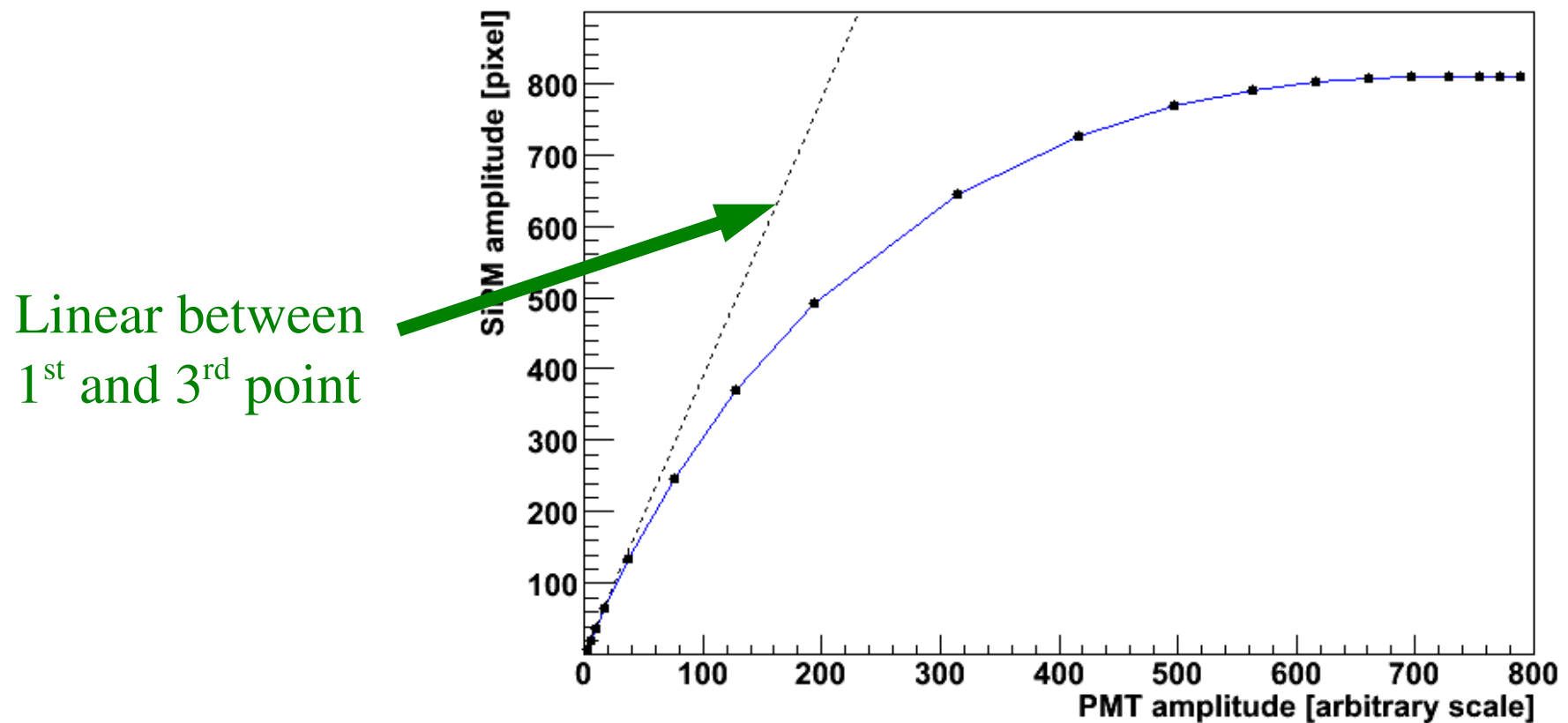
Digitization of MC and first comparison to EM data

Marius' analysis of pion data from October

Saturation Correction

Saturation curve measured at ITEP

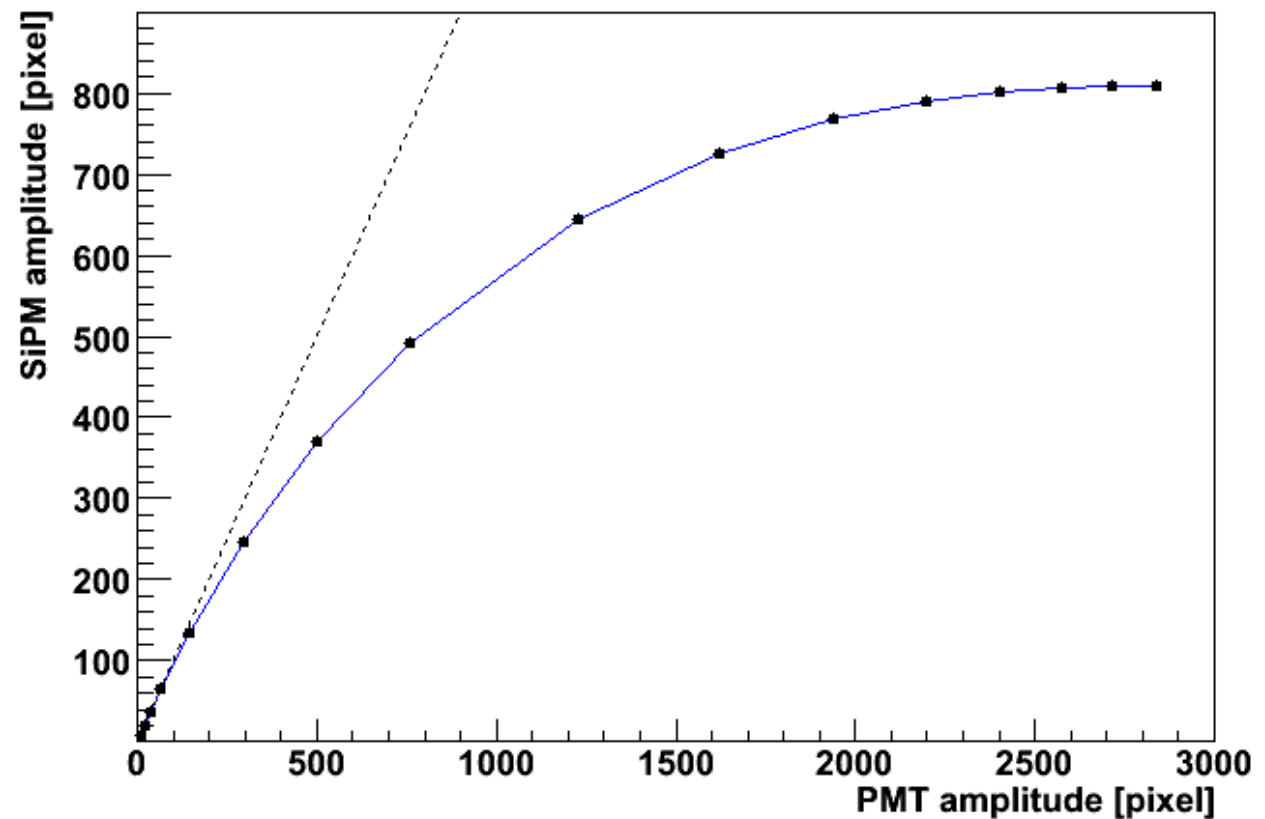
Measured by light on bare SiPM, monitored with (linear) PMT



Saturation Correction

Saturation curve measured at ITEP

Rescale PMT scale to pixels at linear beginning of SiPM response



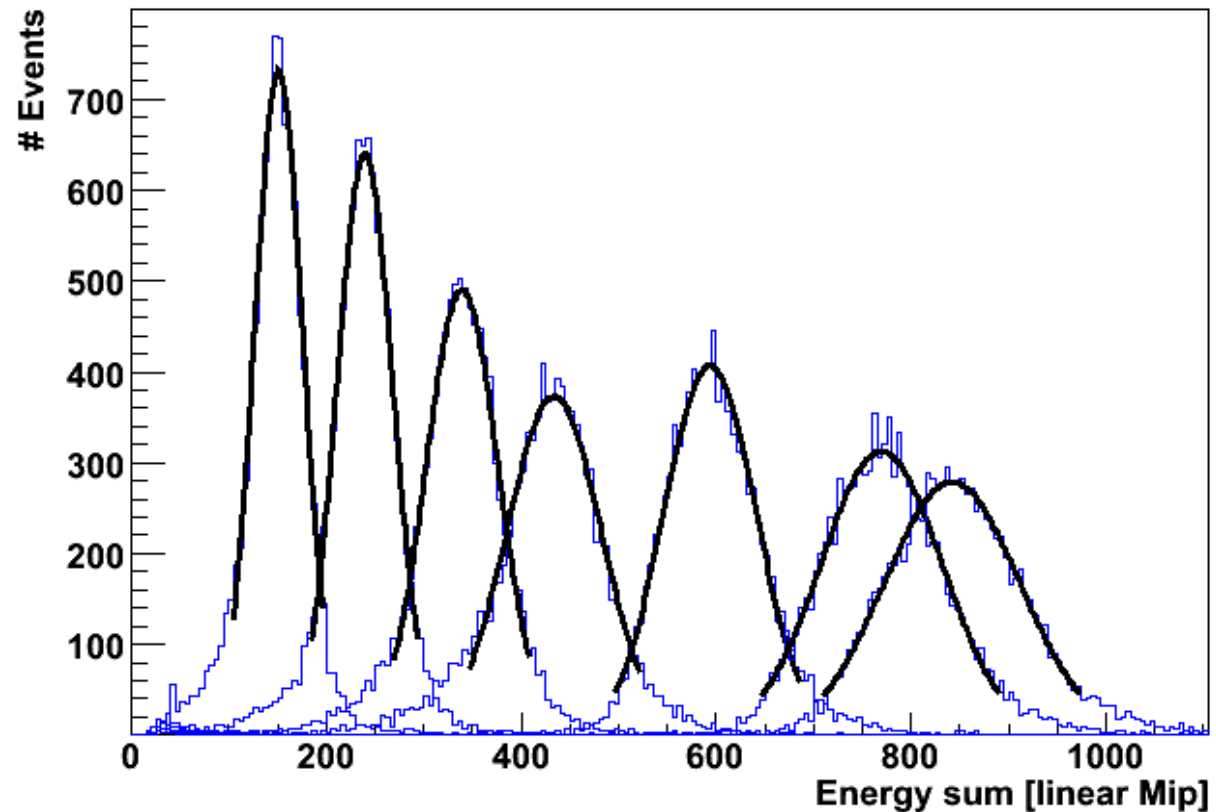
EM Data August

Best effort:

3x3 cm trigger plus veto on 1x1 m

channel-by-channel non-linearity correction with ITEP curve

320605 6 GeV
320603 10 GeV
320585 15 GeV
320668 20 GeV
320665 30 GeV
320664 40 GeV
320660 45 GeV



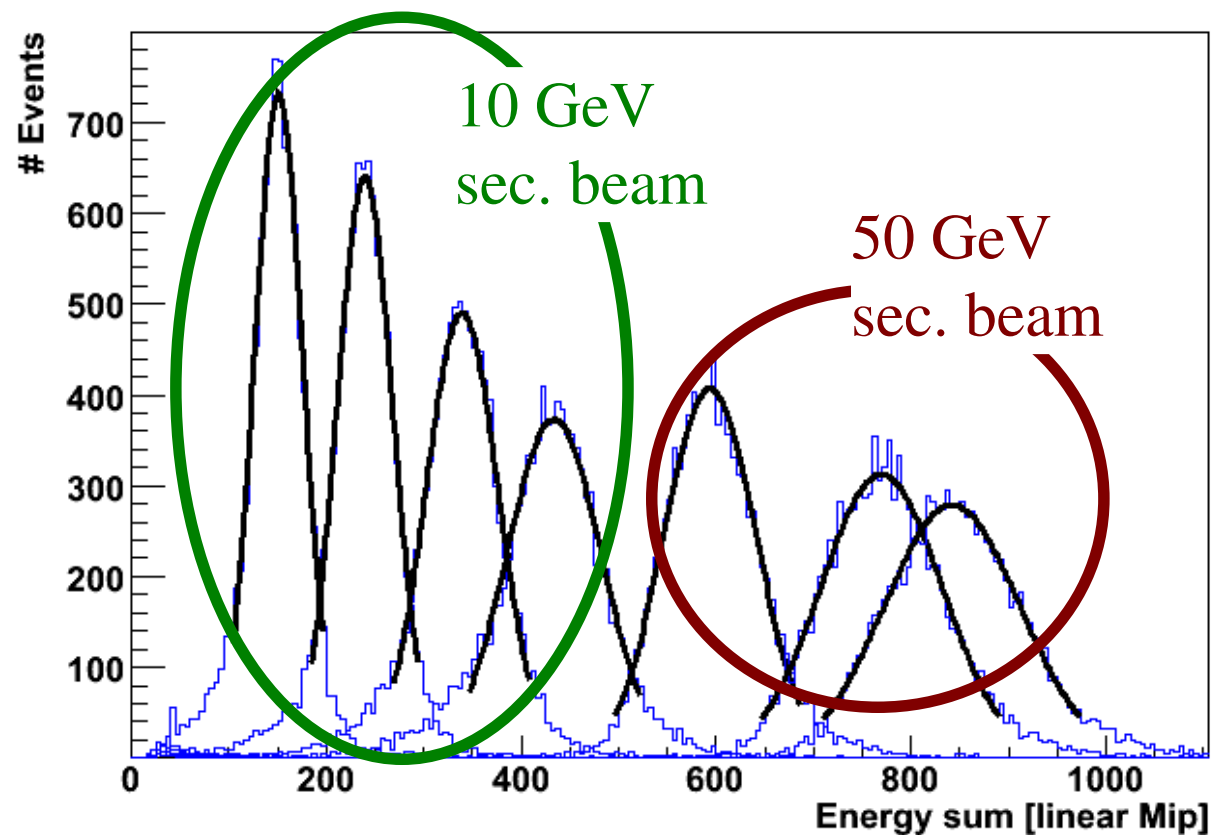
EM Data August

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| | |
|--------|--------|
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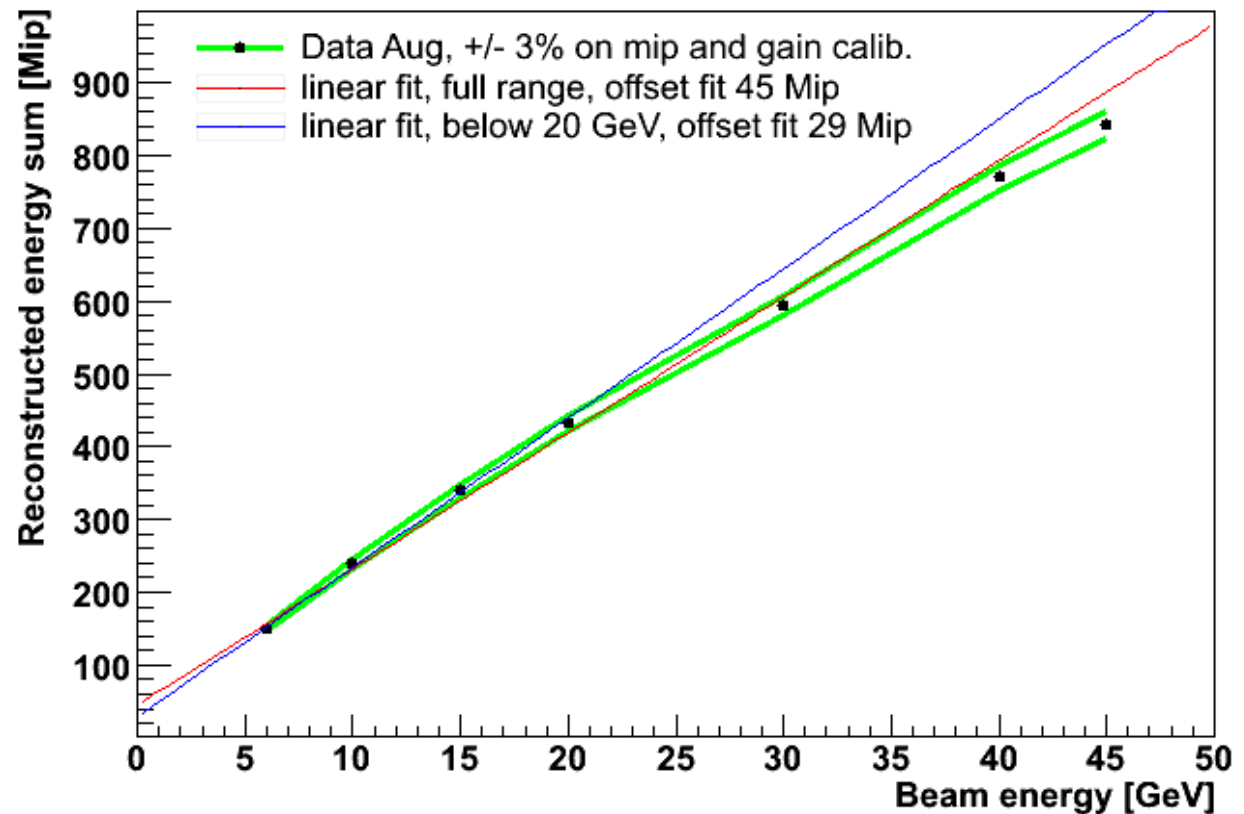
Linearity in Data

Corrected data appears linear only up to 20 GeV

Saturation curves valid, or working point off ITEP conditions?

Is the Mip stable with time?

Influence of secondary beam?



Simulations

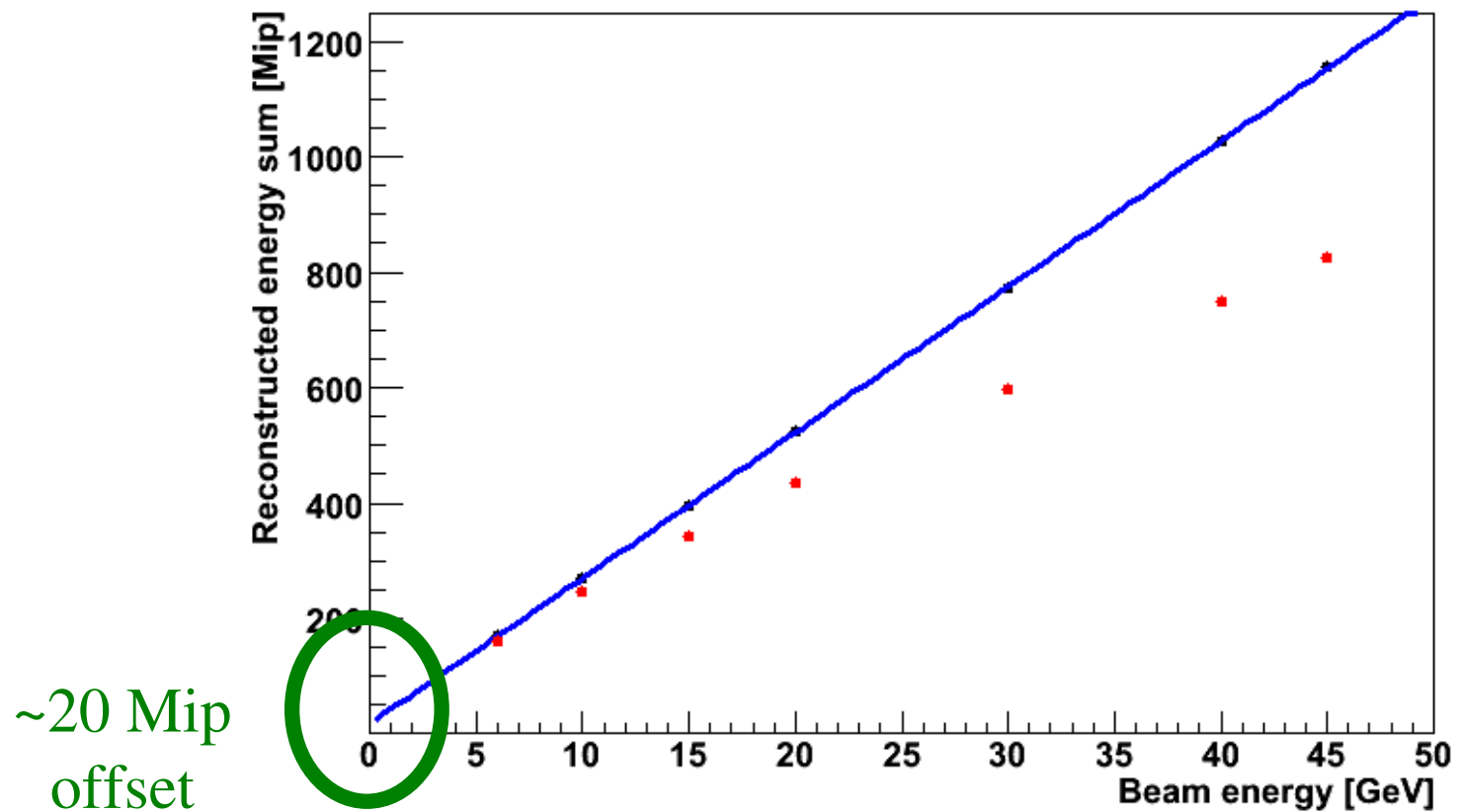
MOKKA Monte Carlo needs to be 'digitized', since it is/has
linear, homogeneous, no signal leakage, no thresholds

Corrections applied on the Mip scale, using actual channel positions:

- Light cross-talk: assign fractional energy to neighbouring cells
- SiPM and readout noise: add MIP-calibrated pedestal event
- Zero-suppression: remove hits below 0.5 MIPs
- Non-linearity: obtain correction factor on pixel scale
(using channel-by-channel lightyield)

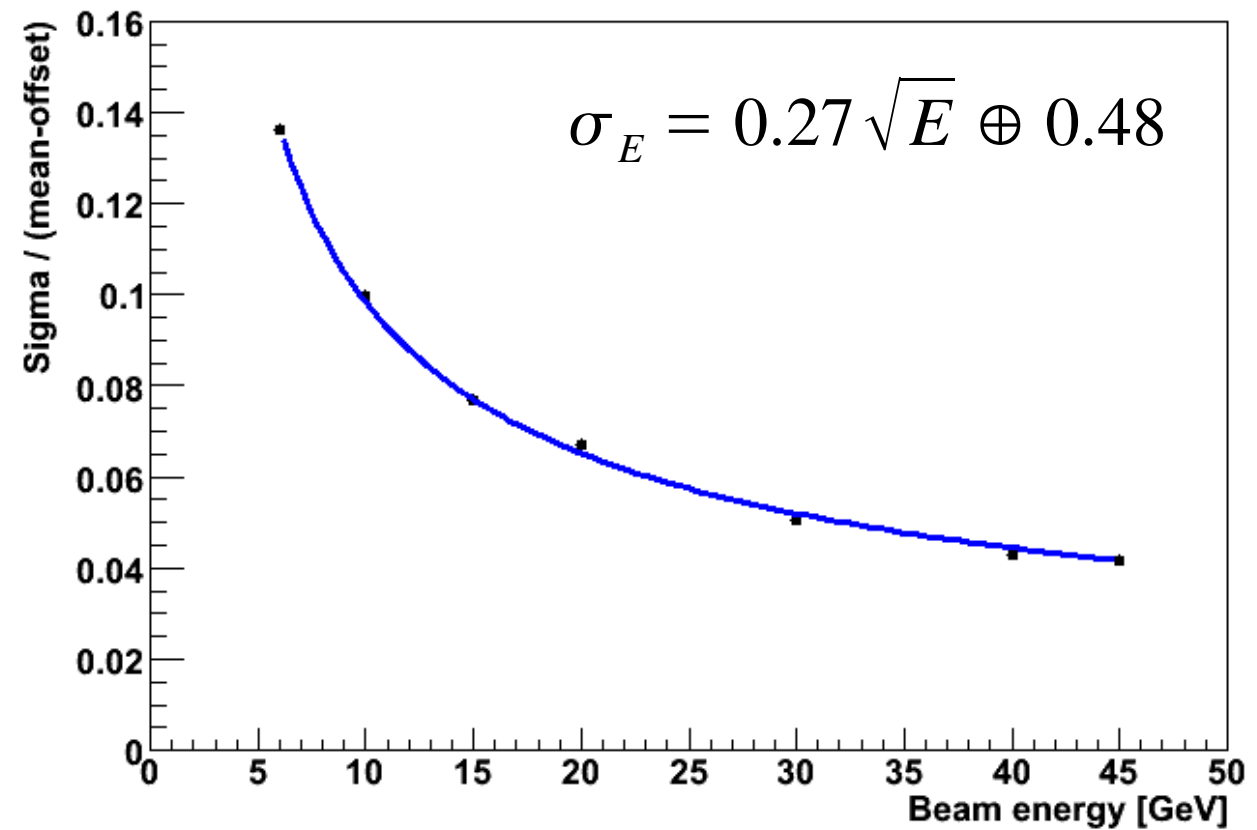
Simulations

With noise and thresholds, the MC w/o saturation simulation is still linear with an offset of ~ 20 Mip



Simulations

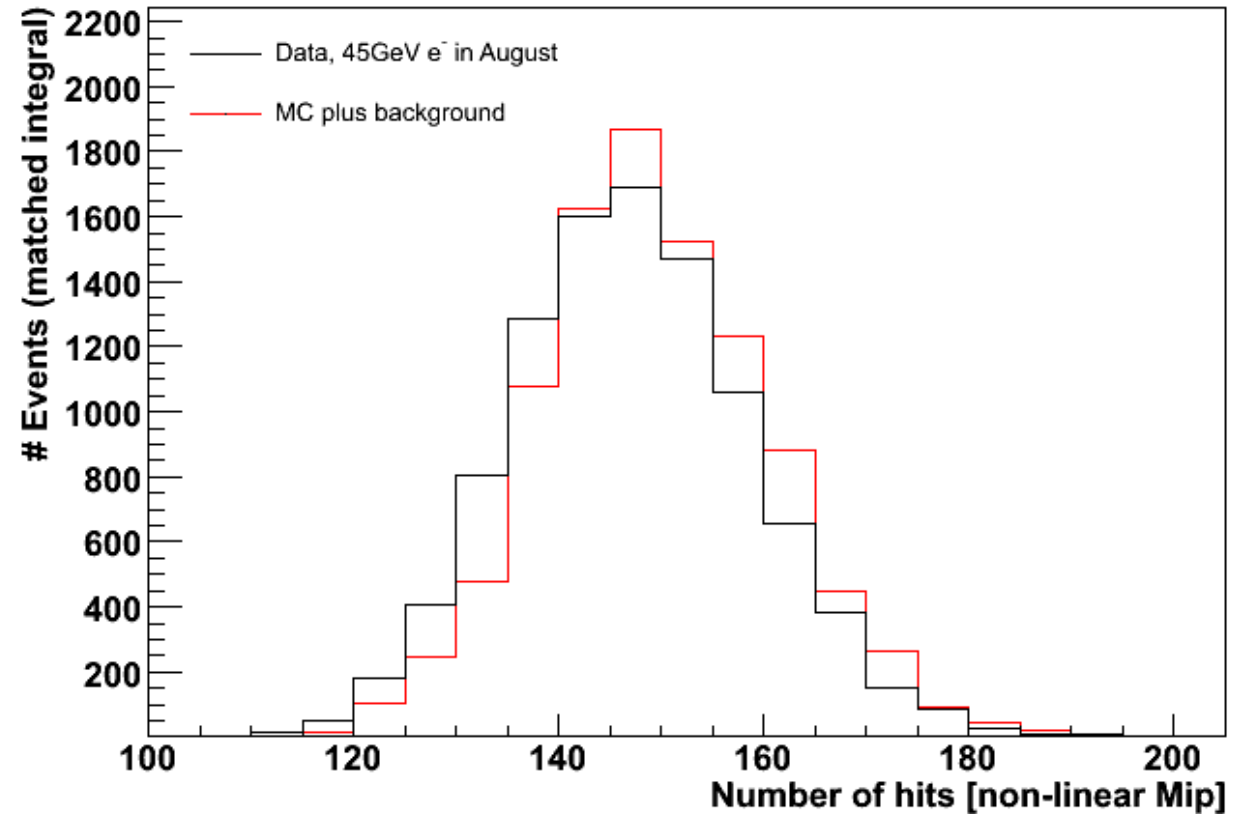
Theoretical resolution about 27% stochastic, 48% constant



Data-MC Comparison

Some comparisons of fully simulated MC with raw data

a) Number of hits for 45GeV electrons in good agreement

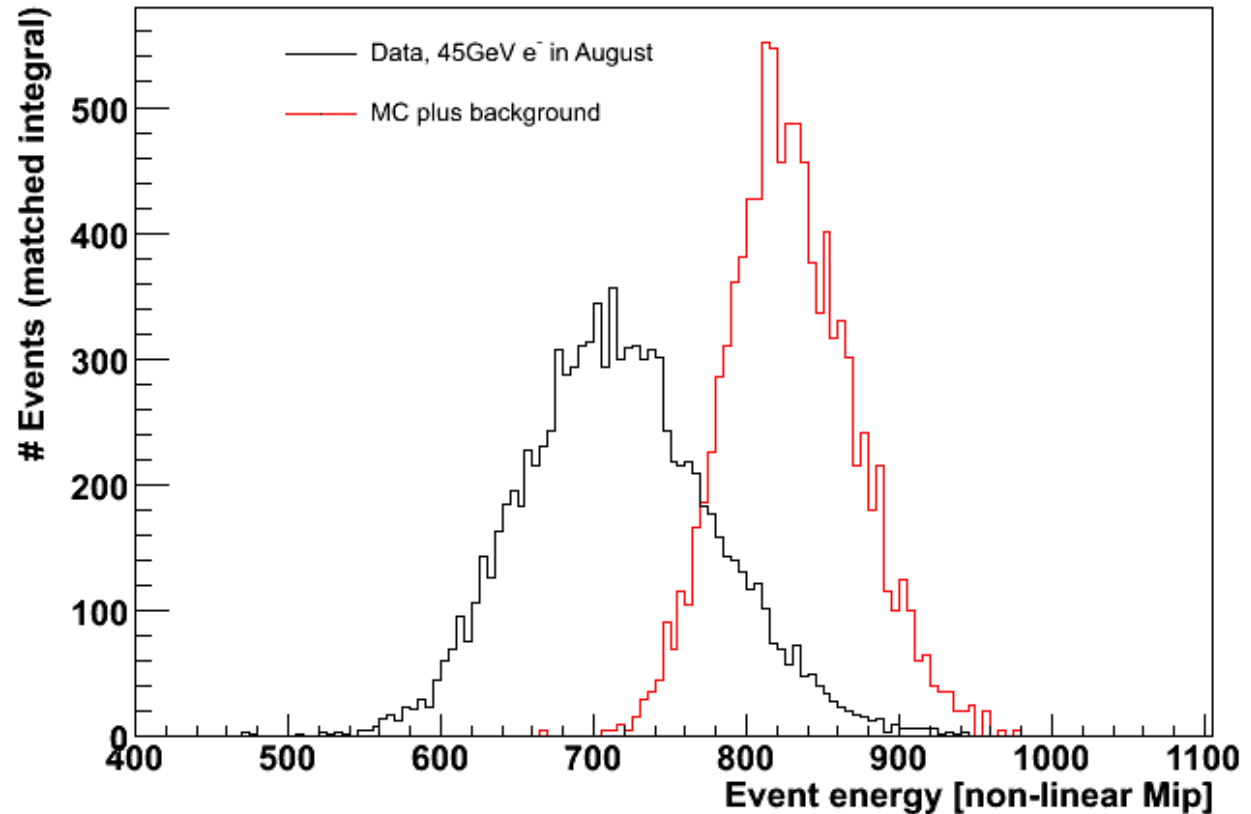


Data-MC Comparison

Some comparisons of fully simulated MC with raw data

b) Energy sum however wastely off in mean and width

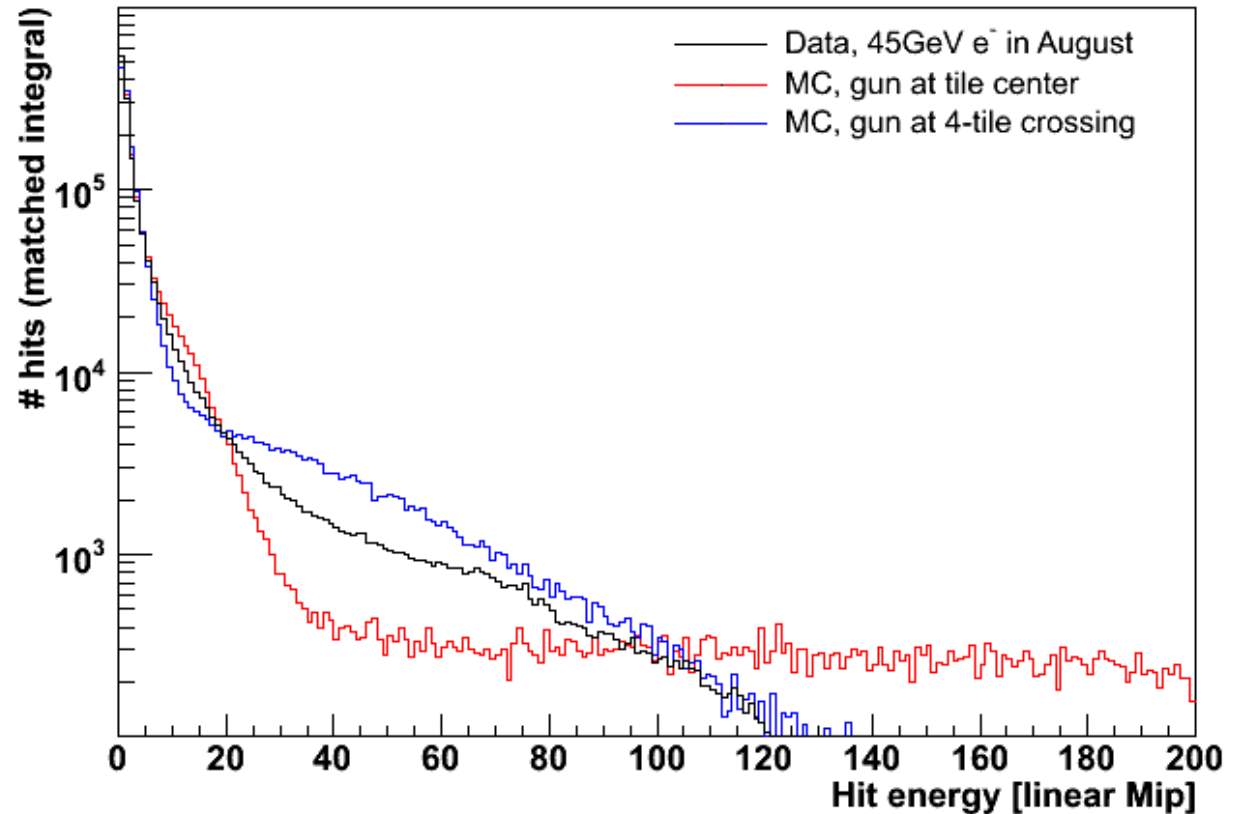
(wrong Mip scale expected to mainly affect mean only)



Data-MC Comparison

Solution: Hit energy spectrum crucially depends on impact point of beam w.r.t. tile grid

Clearly, realistic beam profiles in simulation necessary!

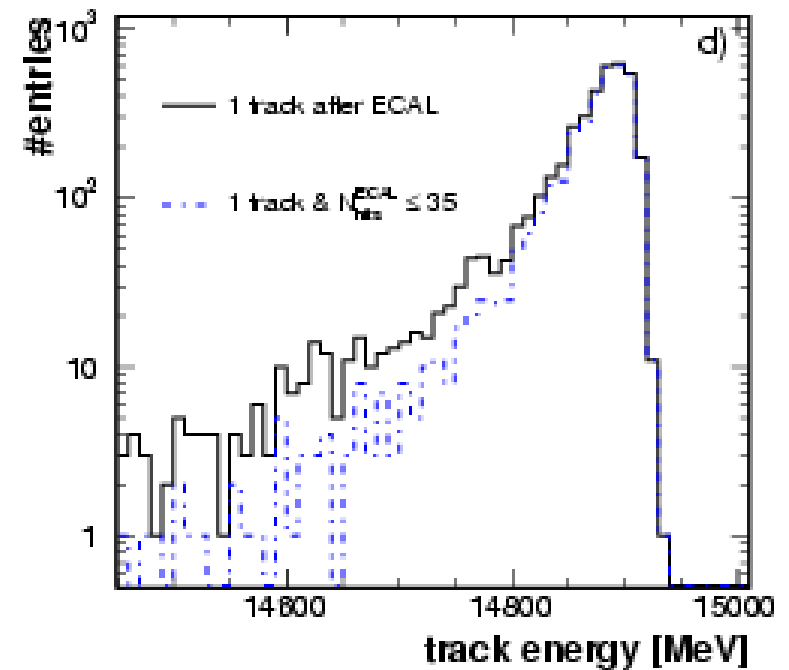
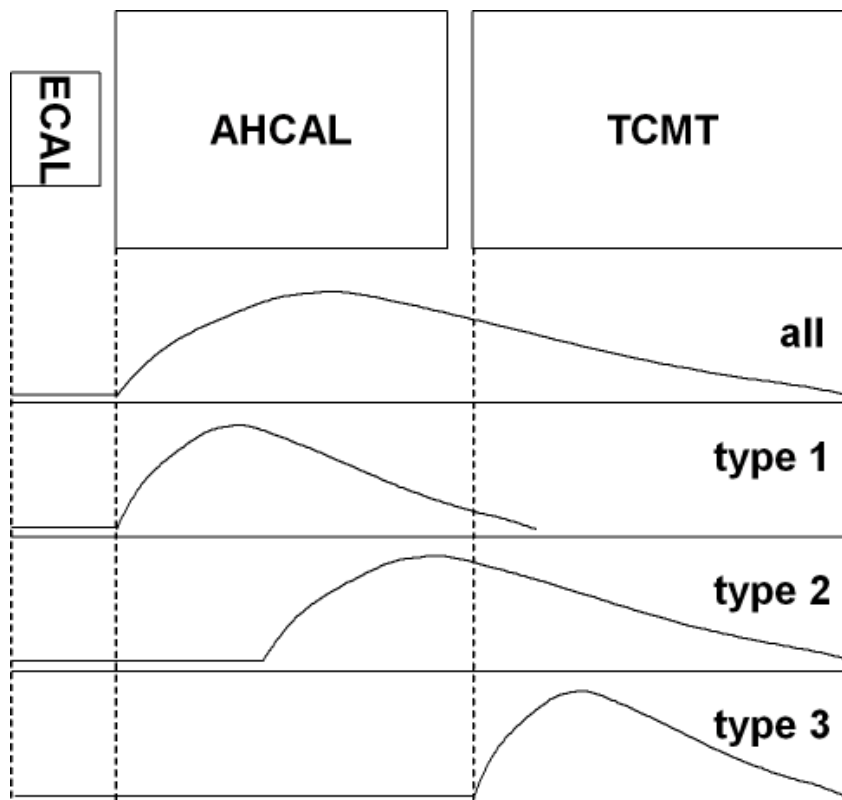


Hadron Data October

Negative pion runs up to 20 GeV

Require no shower development in Ecal

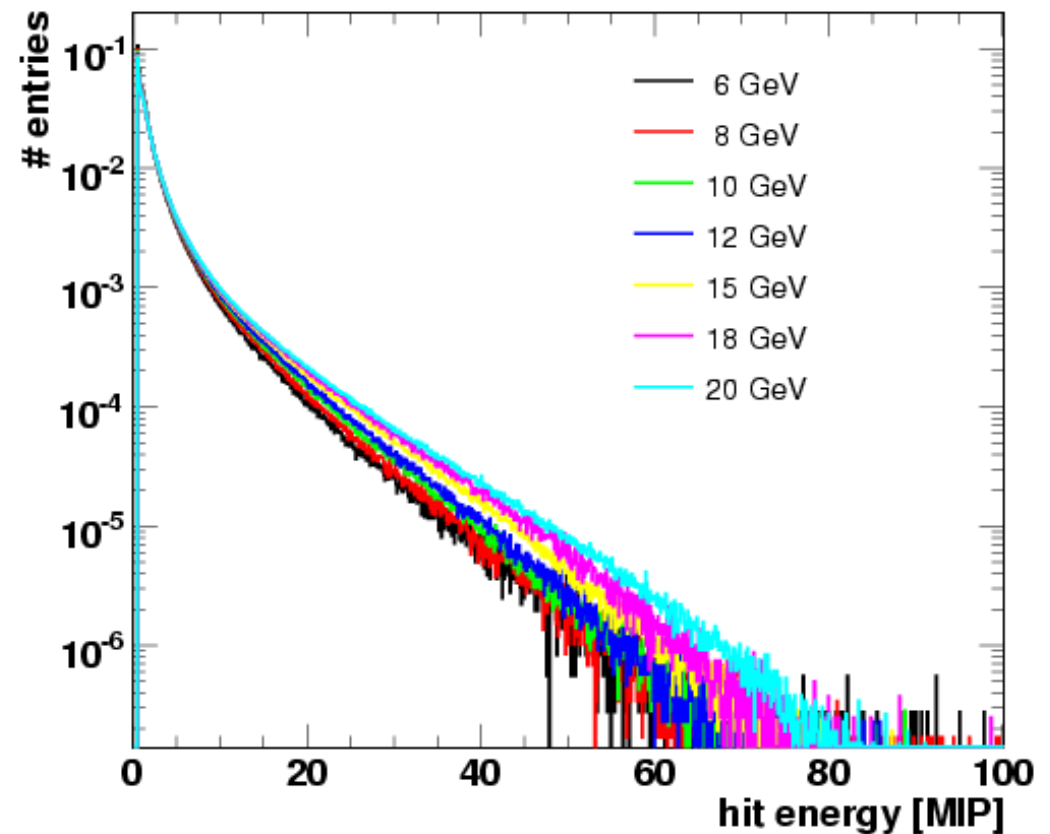
Apply event-by-event correction of beam-energy



Hadron Data October

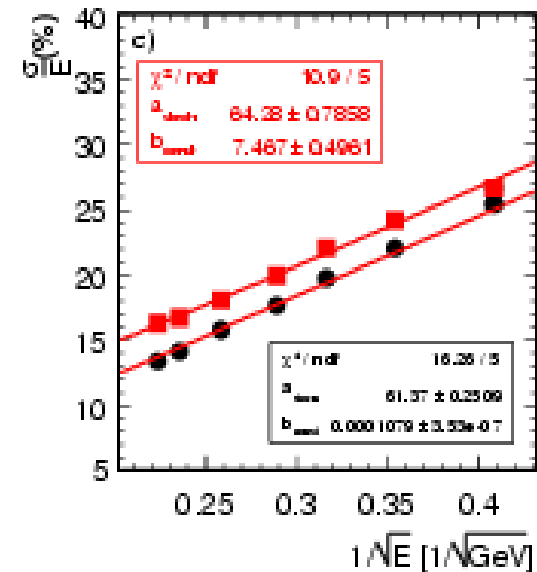
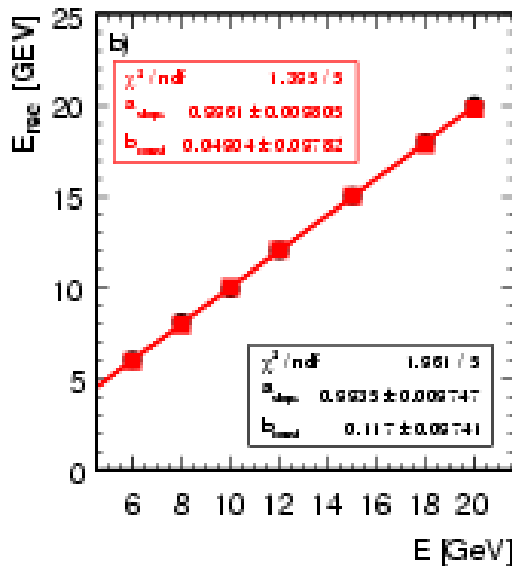
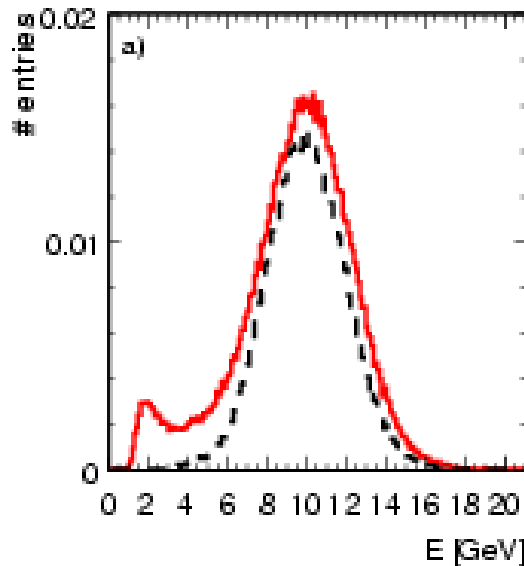
Hit energy much lower than in electron data, saturation does not have a big impact. Especially, all corrections give similar results.

In addition, many more cross checks like Mip and pedestal stability done, not covered here



Hadron Data October

Besides longitudinal and lateral shower shapes, Marius obtains linearity and resolution information for contained showers and showers with leakage to TCMT



Ongoing work: Applying hit classification and clustering with the goal of software compensation and resolution improvement