# Results from electromagnetic analysis of AHCAL

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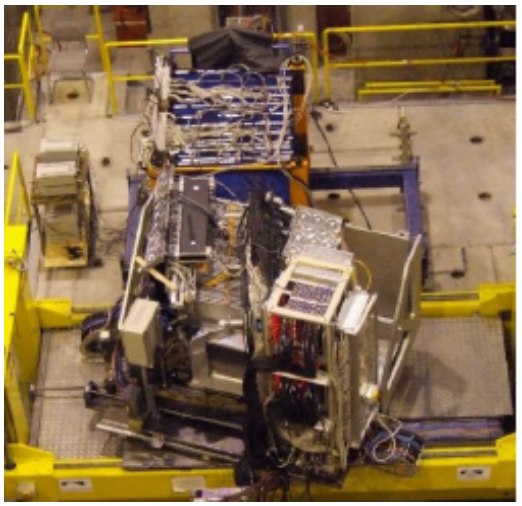
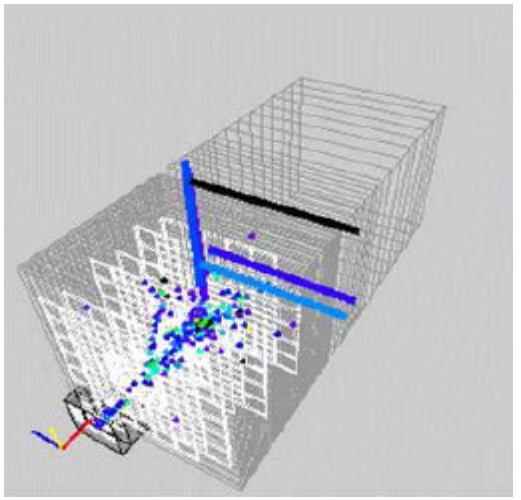




Universität Hamburg

Calorimeter for ILC

# Resutls form electromagnetic analysis of AHCAL

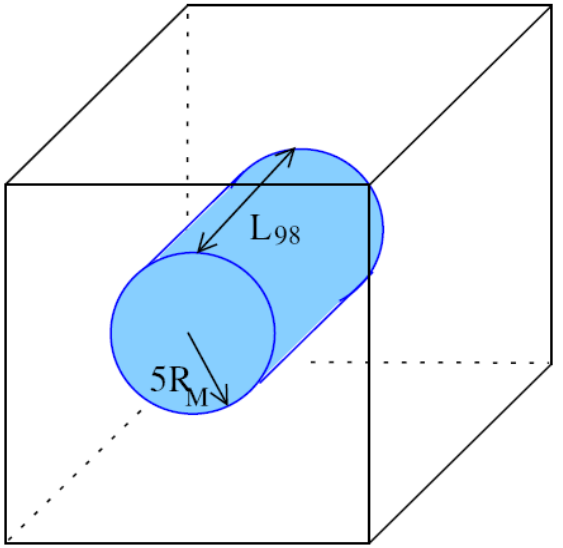
Outline

Electromagnetic analysis of AHCAL:

- AHCAL response to positron, linearity and saturation effects
- angular dependence of reconstructed energies
- shower development profile
- uniformity of AHCAL response

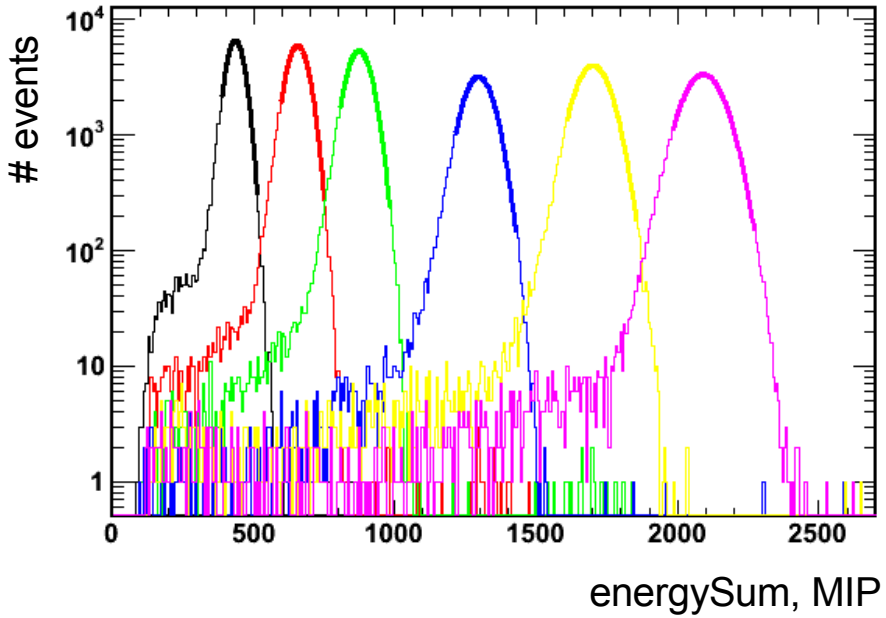
CERN 2007 e+ data:

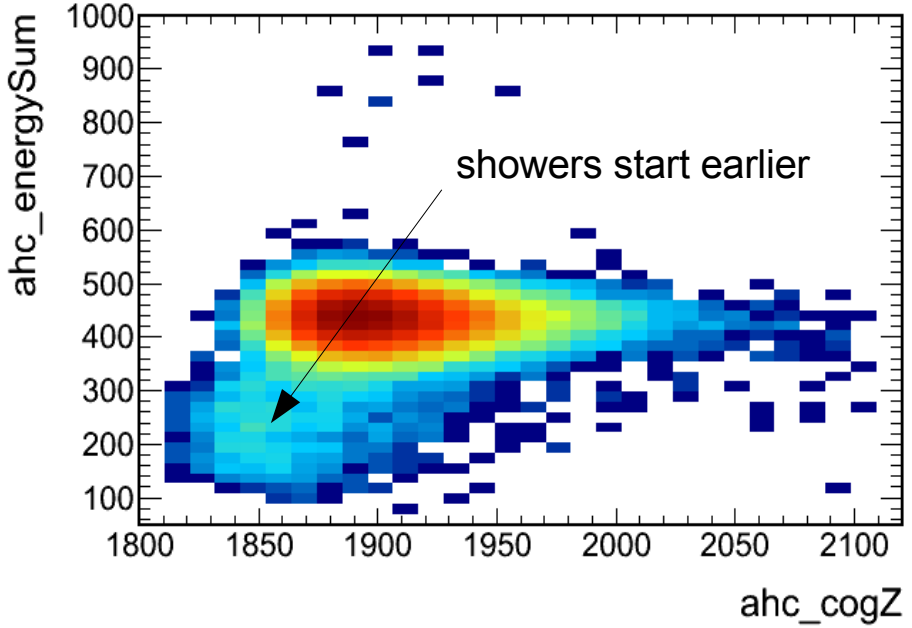
- 0.5 MIP cut, nHits > 65, weighted Z position of shower cut (to reject muons)
- the energy sum: inside the 5 Moliere radii and 98% of a lateral shower containment




Monte Carlo simulation:

- 0.816 MeV/MIP conversion factor
- 10% optical x-talk between tiles

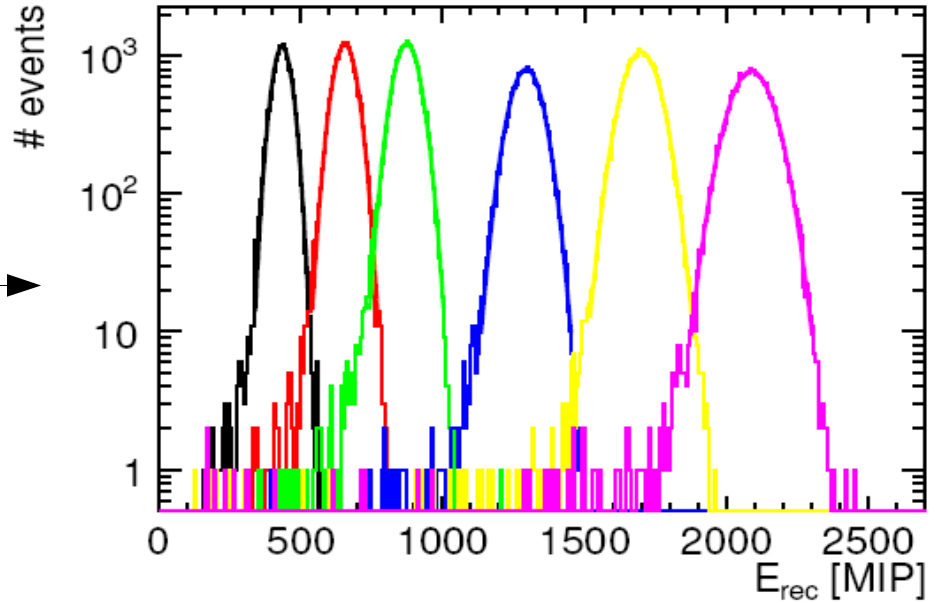



New event selection for e+ data:

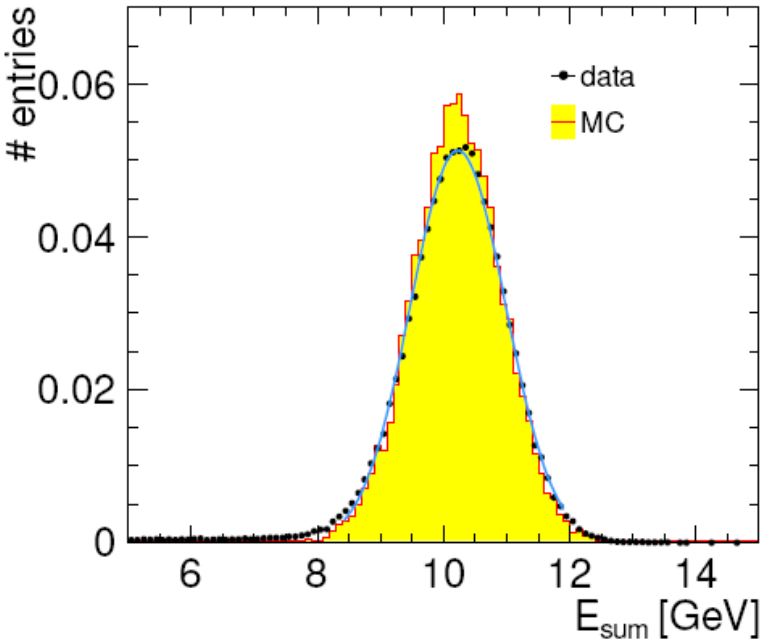
- add TBRack data to define the good one-particle tracks

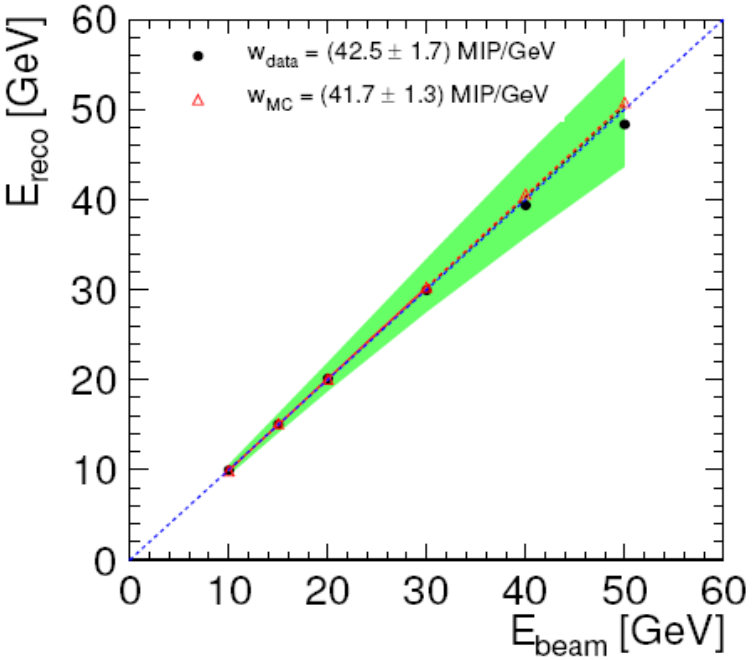
- add multiADC analogue value for clear multiparticle rejection



## Resutls form electromagnetic analysis of AHCAL

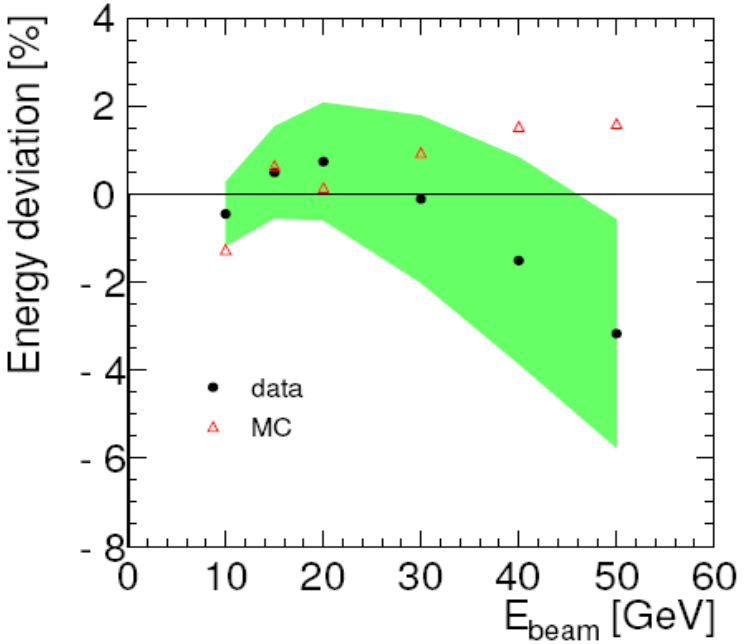
## AHCAL energy response



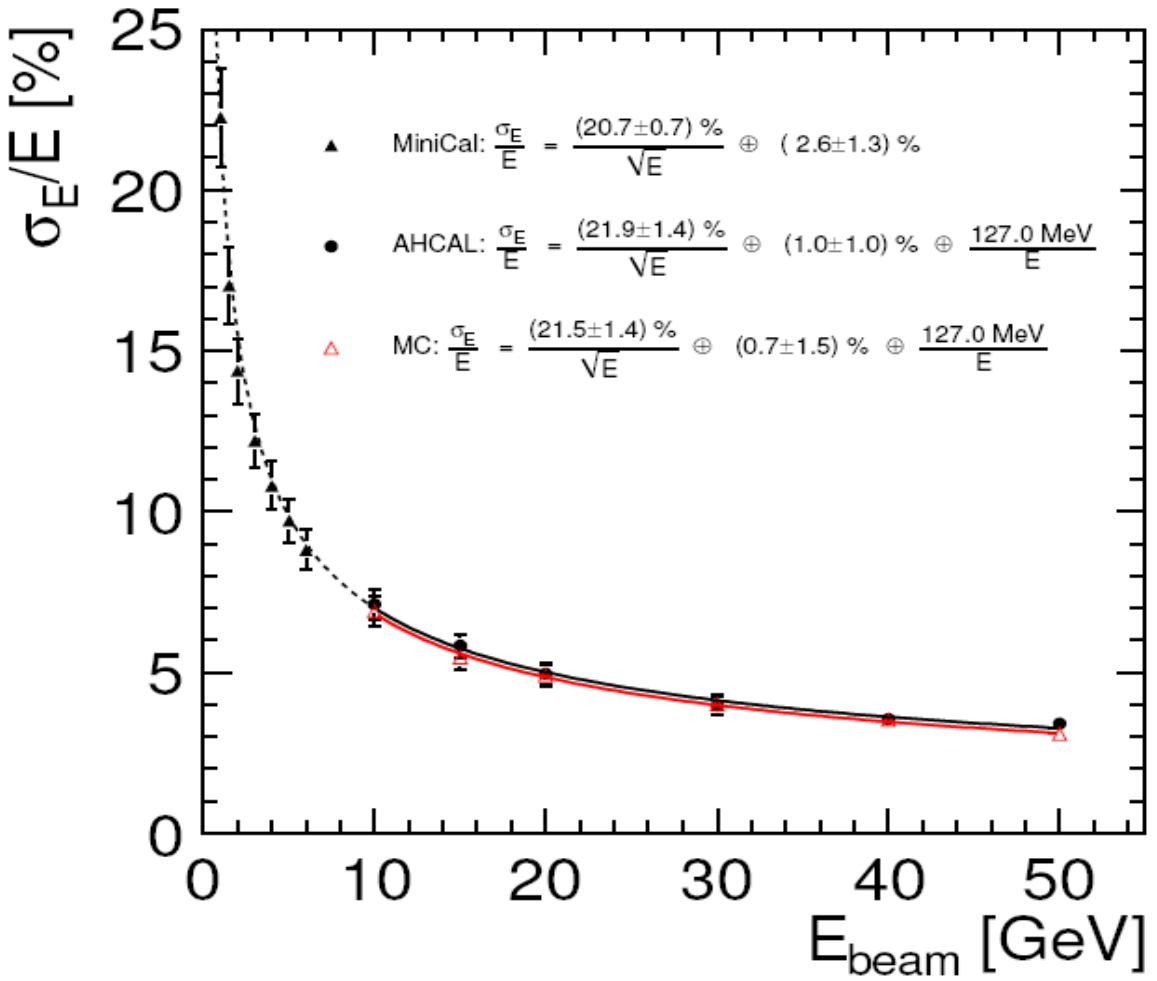

Systematics:

- 3% MIP calibration uncertainties
- 2% gain determination uncertainties
- 11.3% SiPM saturation level uncertainties



# Resutls form electromagnetic analysis of AHCAL

## Energy resolution




- noise term is determined from random trigger events

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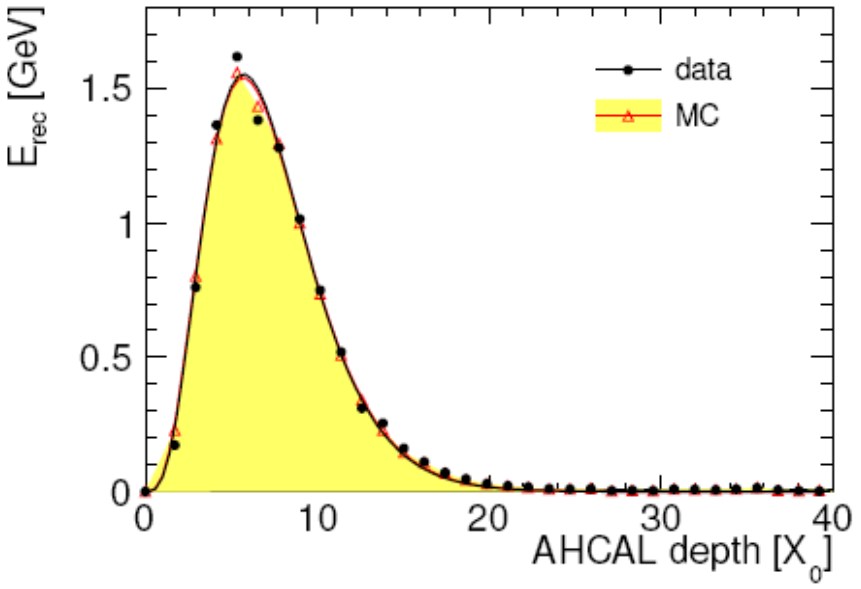
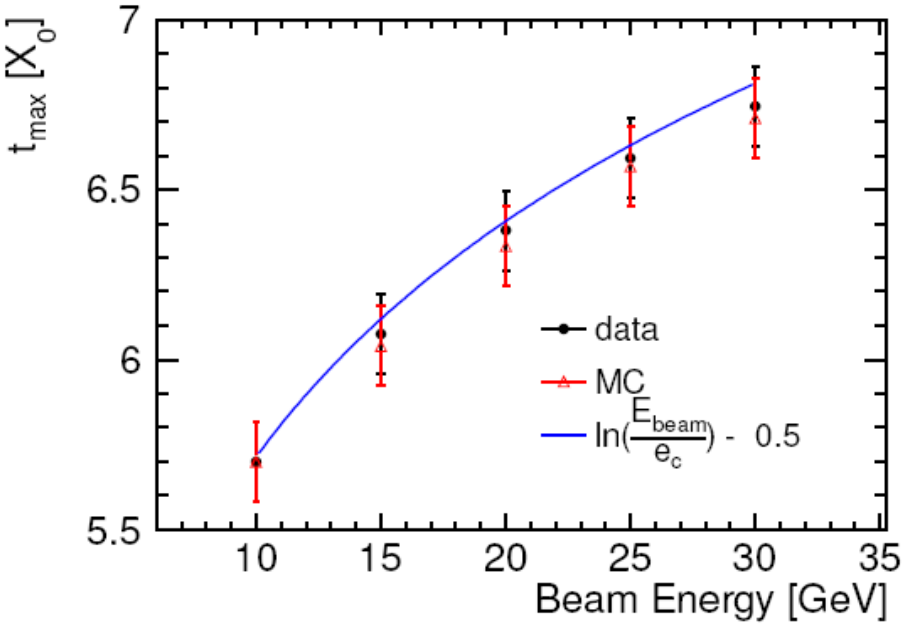
## Shower profile



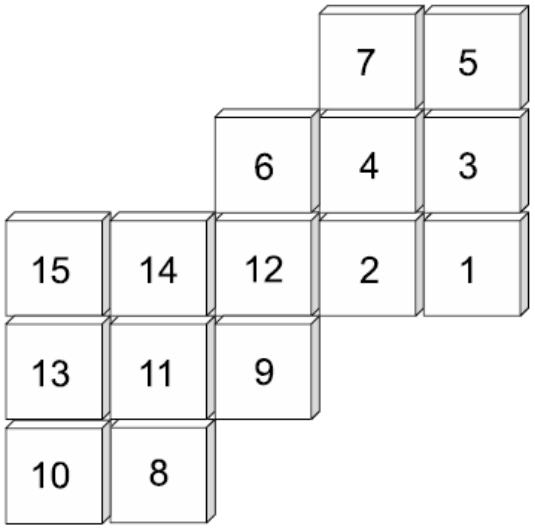



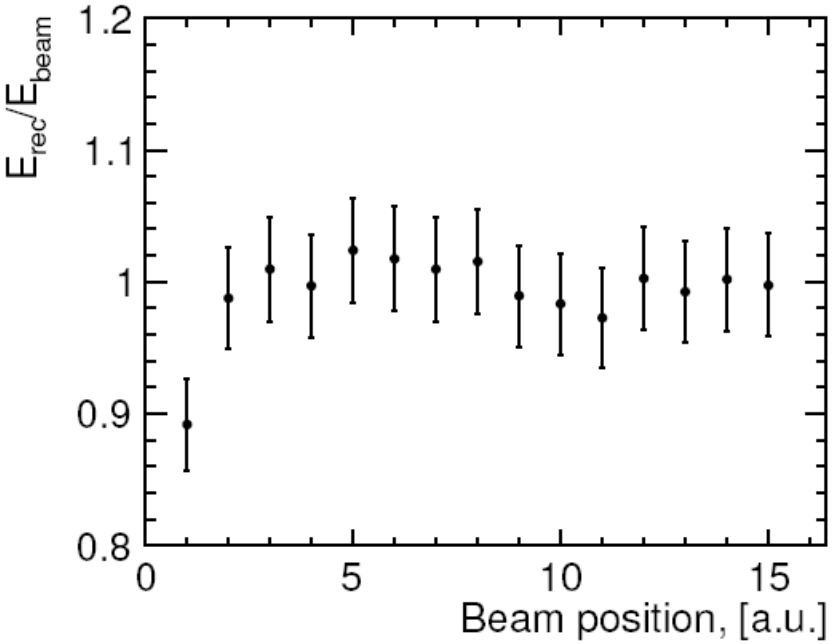

$$f(t) = \frac{dE}{dt} = at^{\omega} \cdot e^{-bt}$$

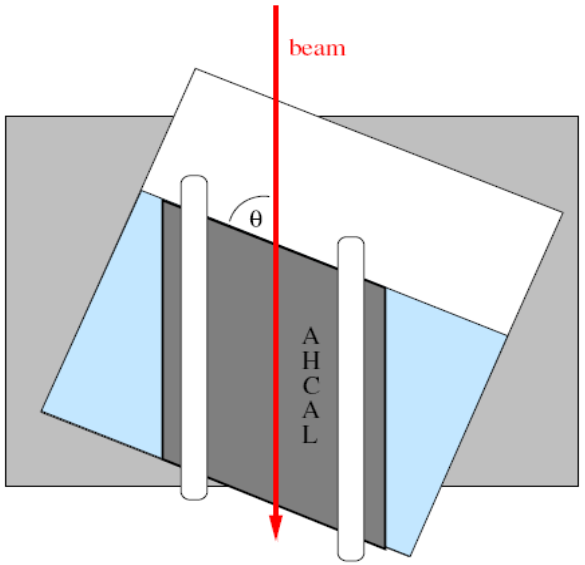
$$t_{\max} = \frac{\omega}{b} = \left[\ln \frac{E_0}{\varepsilon_c} - 0.5\right]$$

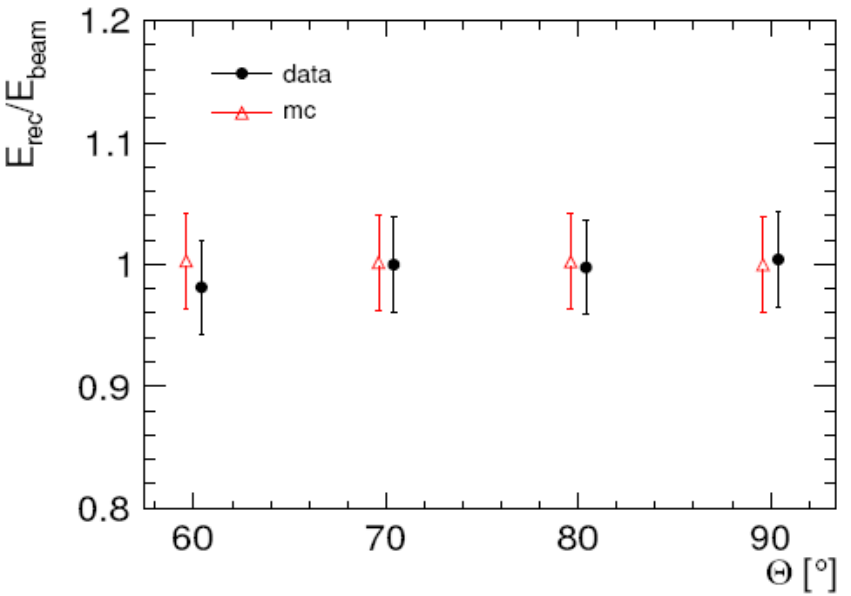
The transversal shower development is under investigation and will be reported later

# Resutls form electromagnetic analysis of AHCAL  Uniformity and angular dependence



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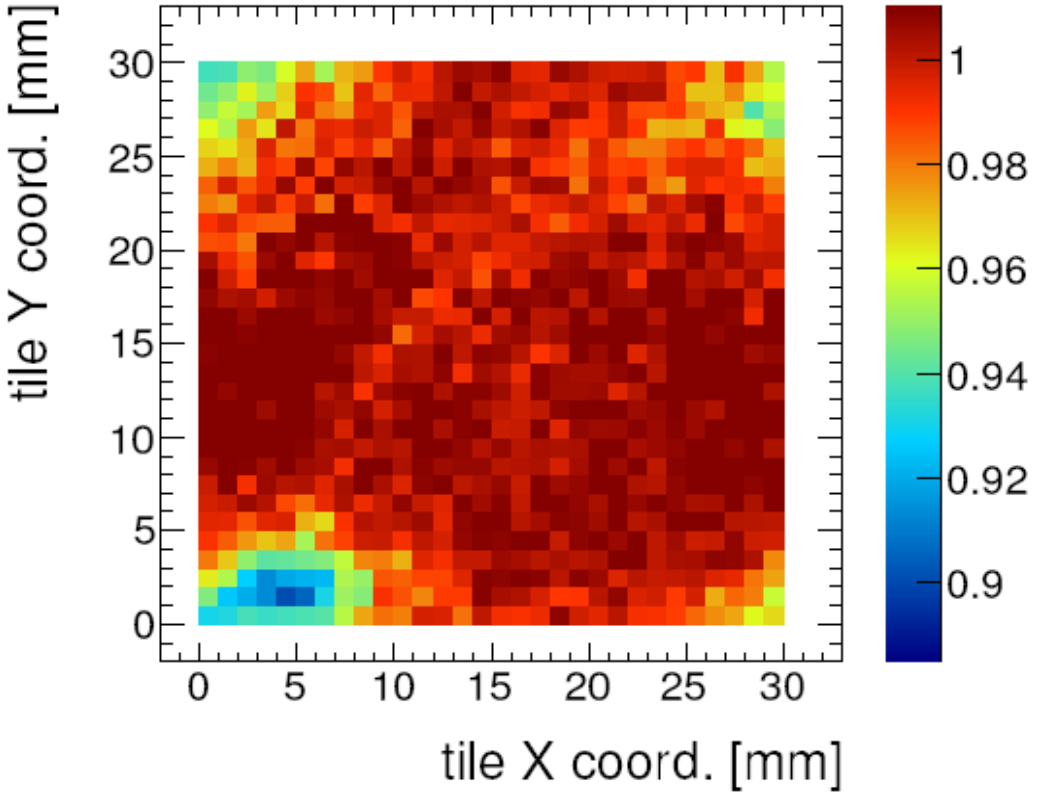
## Influence of cell structure




## Resutls form electromagnetic analysis of AHCAL

Conclusions:

- the response to normally incident positrons of the CALICE analog hadron calorimeter was measured for energies between 10 and 50 GeV, using the data recorded at CERN in summer 2007

- the calorimeter response is linear to within approximately 5 %

- the energy resolution has a stochastic term of (21.9 ± 1.4) % /$\sqrt{E}$ [GeV], whereas the constant term is (1.0 ± 1.0) %

- the agreement between data and simulation is reasonably good for all investigated observables and gives us enough in our detector understanding to further investigation of hadronic showers