

Summary of Calorimeter-Muon sessions

Daniel Jeans, LLR - Ecole polytechnique

21 presentations
impossible to cover everything in sufficient detail...

LCWS2010 Beijing

LCWS2010 Beijing



In2p3

Introduction

Calorimeters for PFA

- high granularity
- physically compact
- large active area

Muon system

- highly efficient muon ID
- multi-layer, large active area

Sampling detectors with thin, highly segmented active layers

strong focus on demonstrating
technological feasibility for DBD

Active layers

- gaseous: RPC, MPGD
- scintillator, with SiPM/MPPC... readout
- semi-conductors: Silicon, GaAs

Absorber

FE electronics

Physics/simulation results

- very forward electron reconstruction
- hadron shower models
- software compensation

Active layers

- gaseous: RPC, MPGD
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Absorber

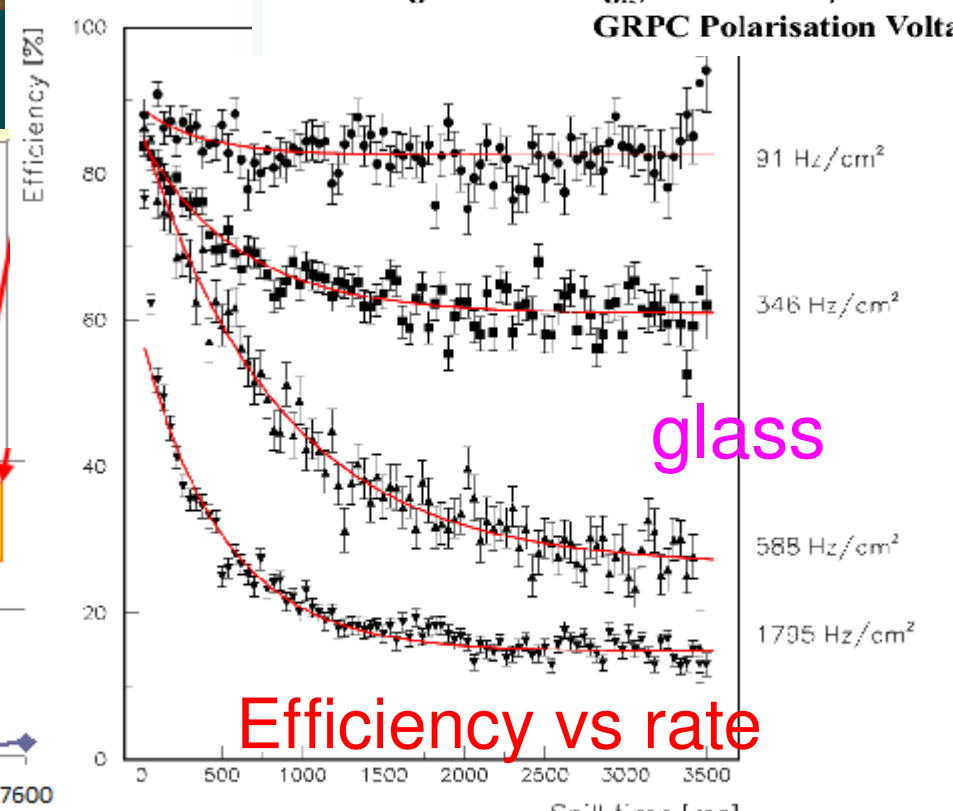
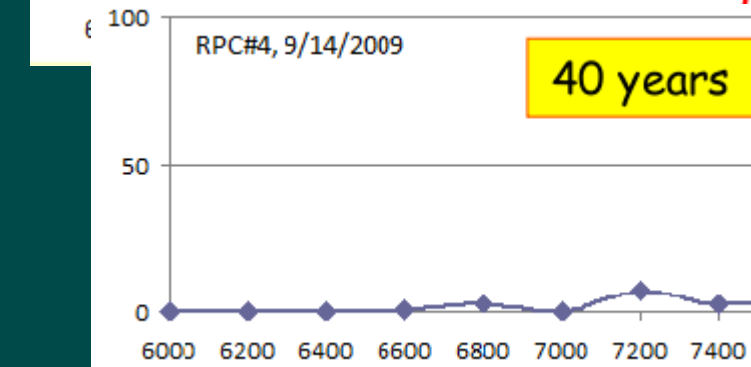
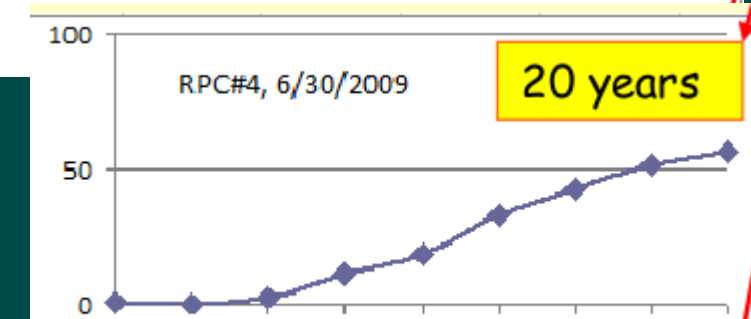
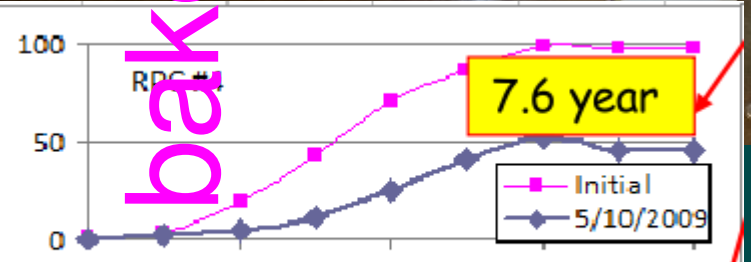
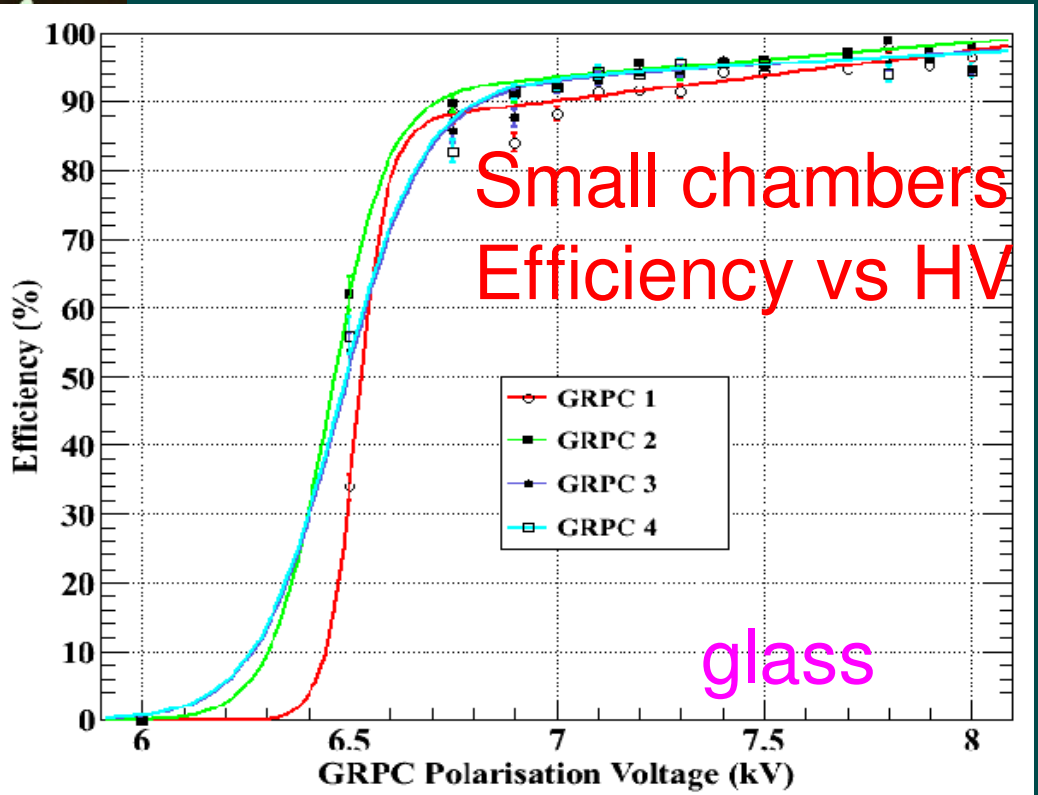
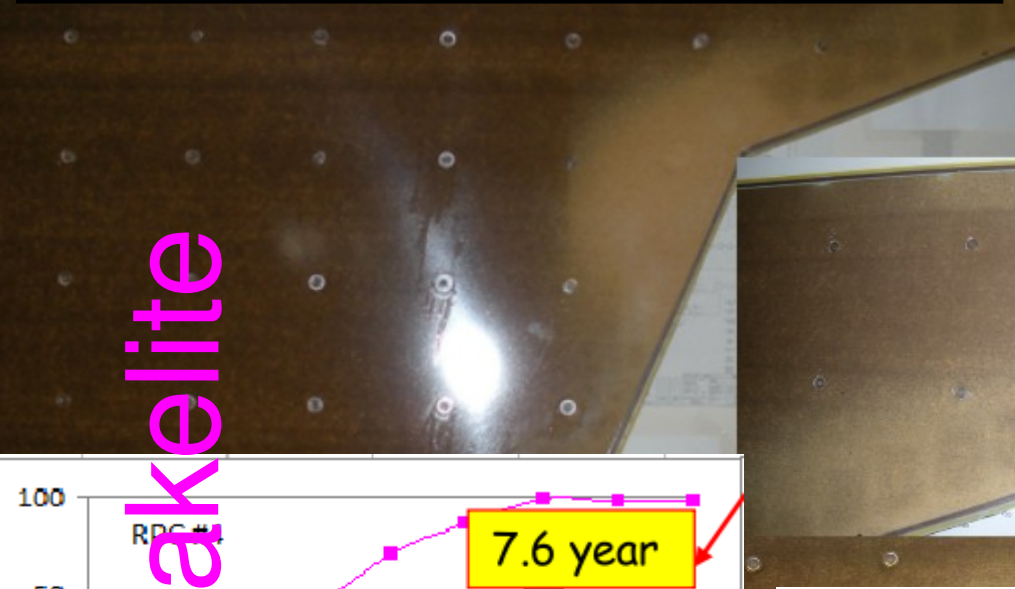
FE electronics

Physics/simulation results

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Barbar RPC autopsy

bakelite



RPC
chamber
studies

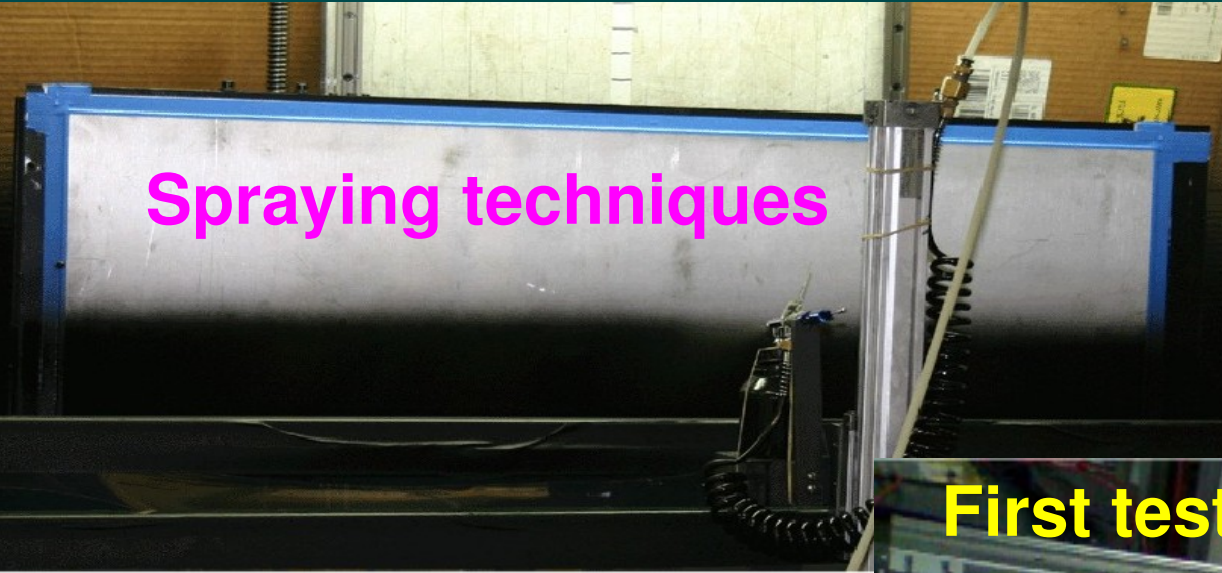
Band
Belkhadi
Lu
Repond

Development of large 1m-scale RPC-based detectors

(semi)-digital readout

Belkhadi, Lumb, Repond

Spraying techniques



First tests of 1m² RPC chamber



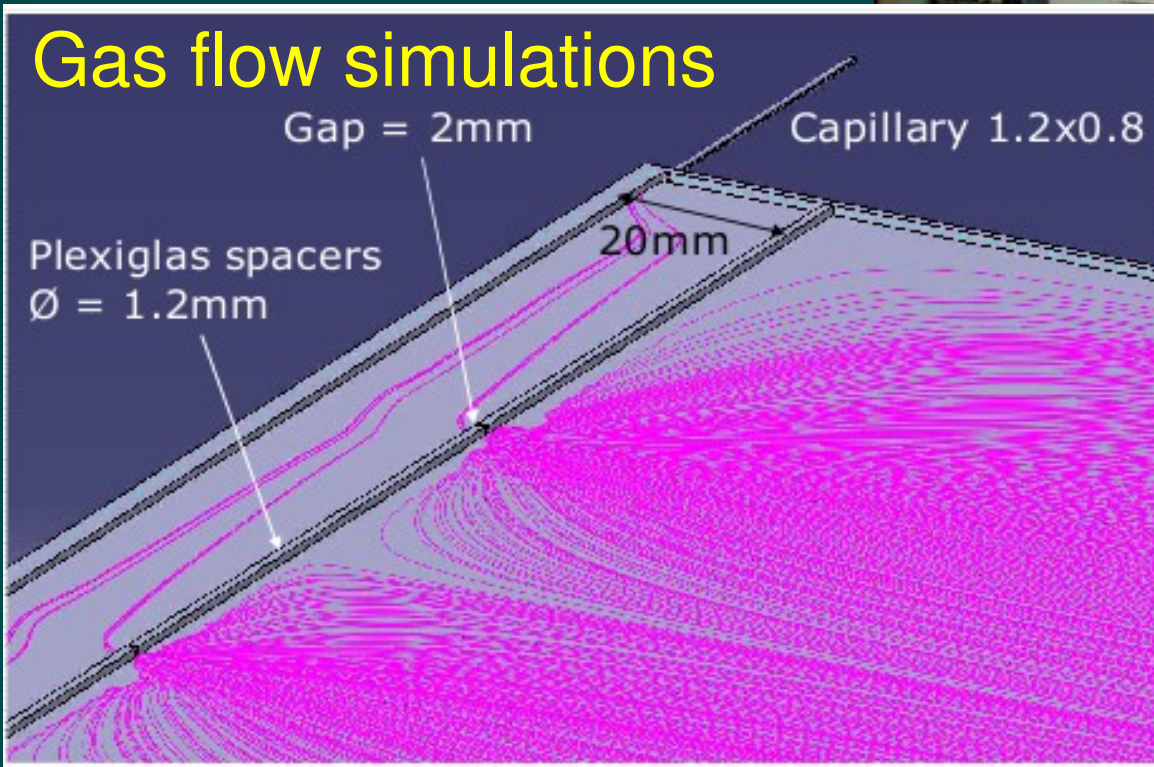
Gas flow simulations

Gap = 2mm

Capillary 1.2x0.8

Plexiglas spacers
Ø = 1.2mm

20mm

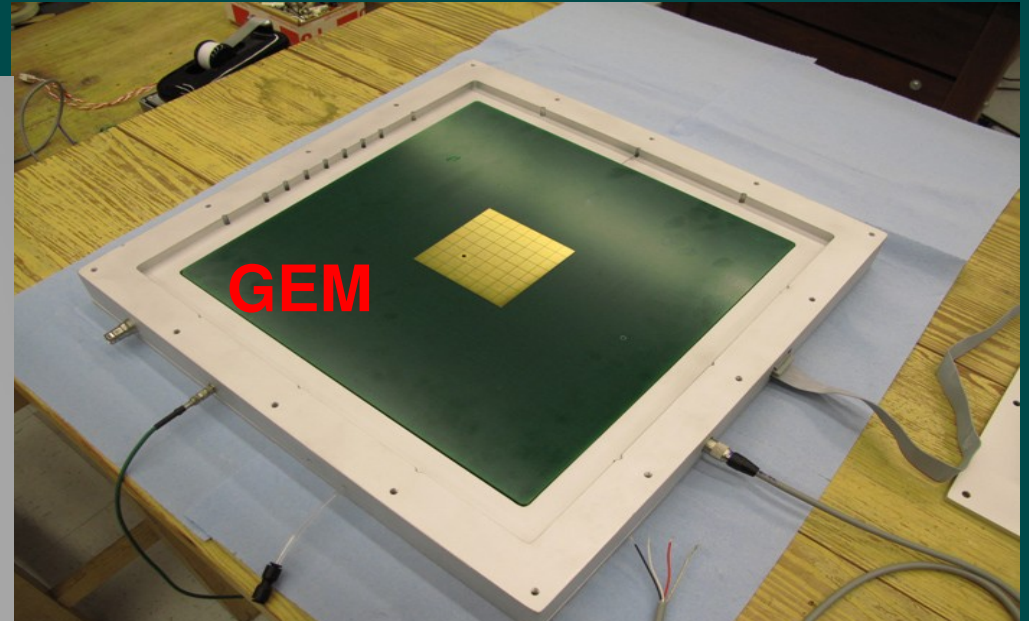
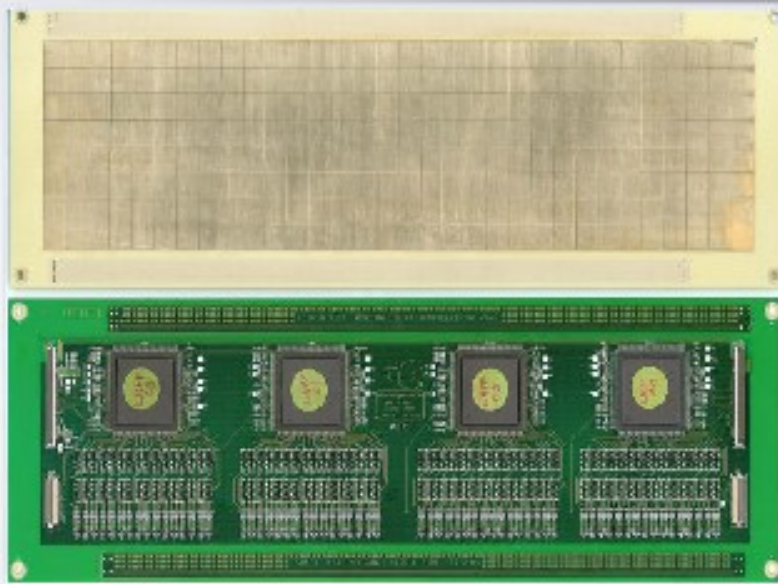


GEMs and Micromegas - preparing m² detectors

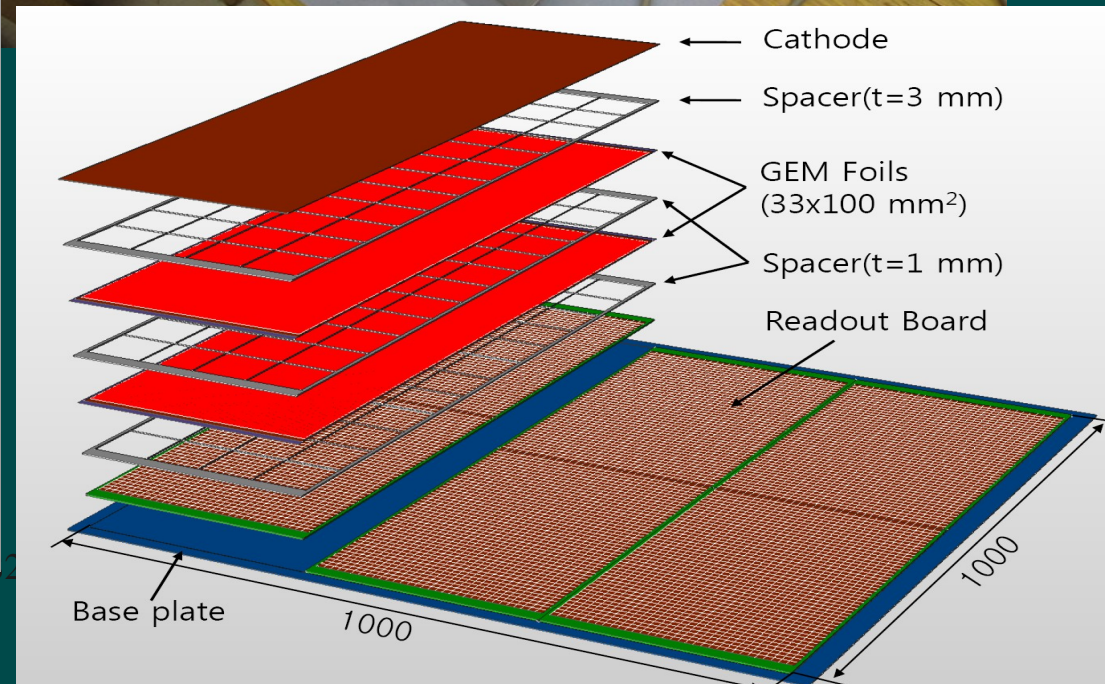
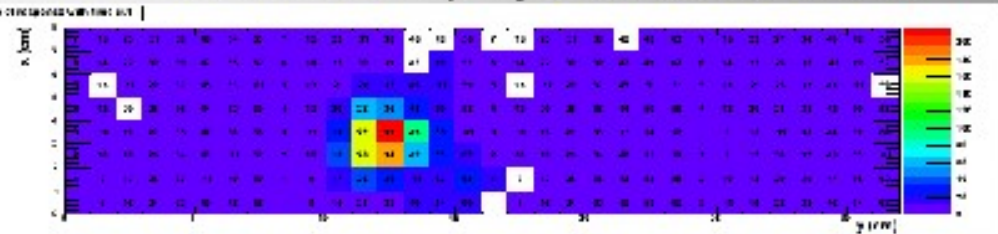
Chefdeville, White

micromegas

32x8 cm² ASU with 4 HARDROC



Hadron beam profile in one chamber



Active layers

- gaseous: RPC, MPGD
- **scintillator, with G-APD readout**
- semi-conductors: Silicon, GaAs

Absorber

FE electronics

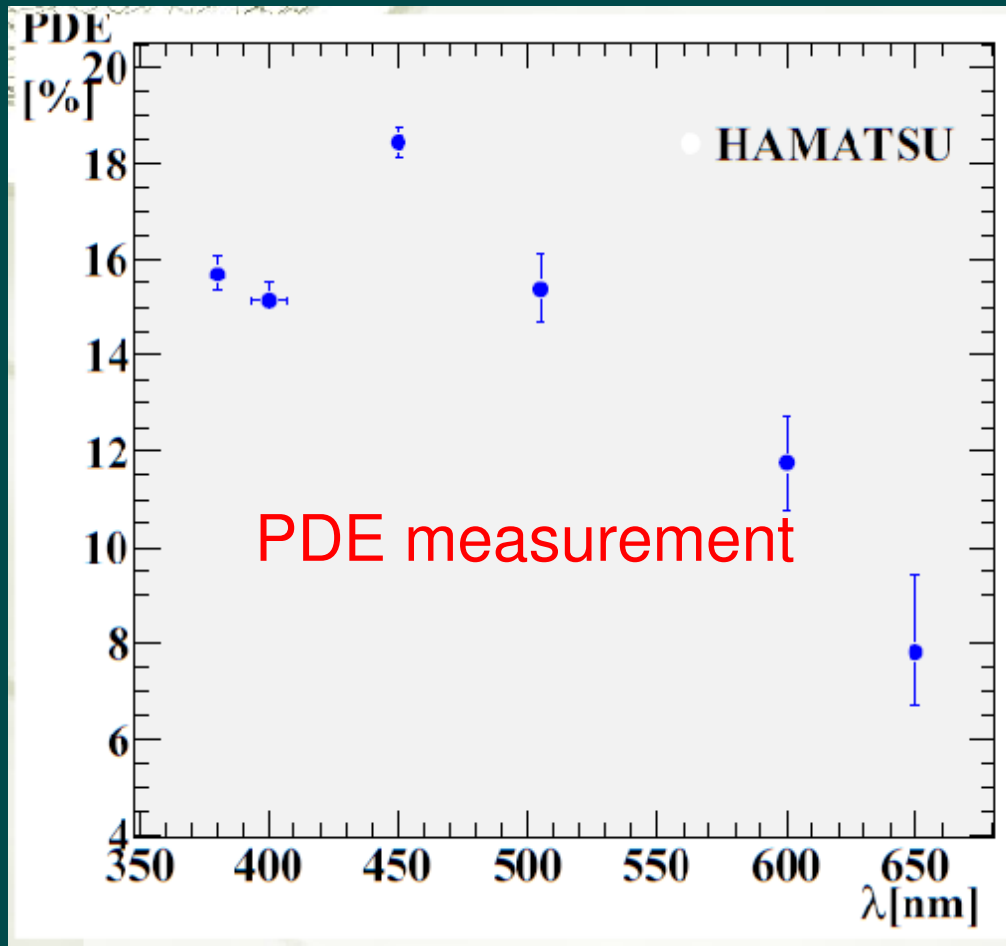
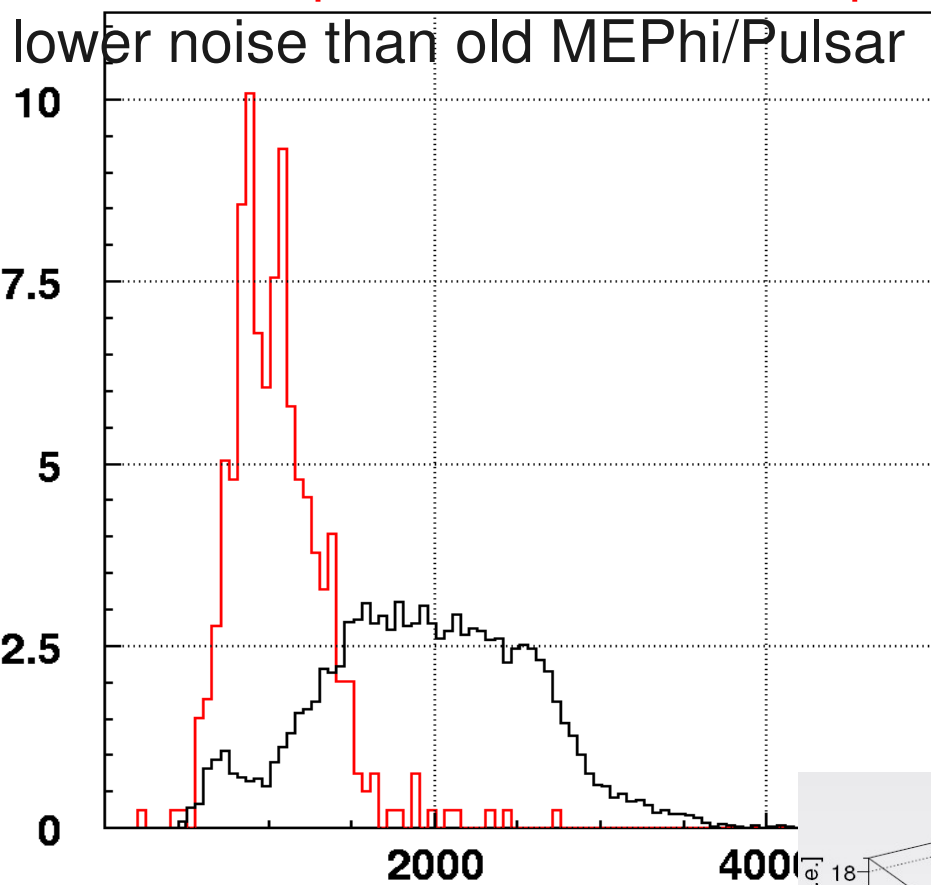
Physics/simulation results

- very forward electron reconstruction
- hadron shower models
- software compensation

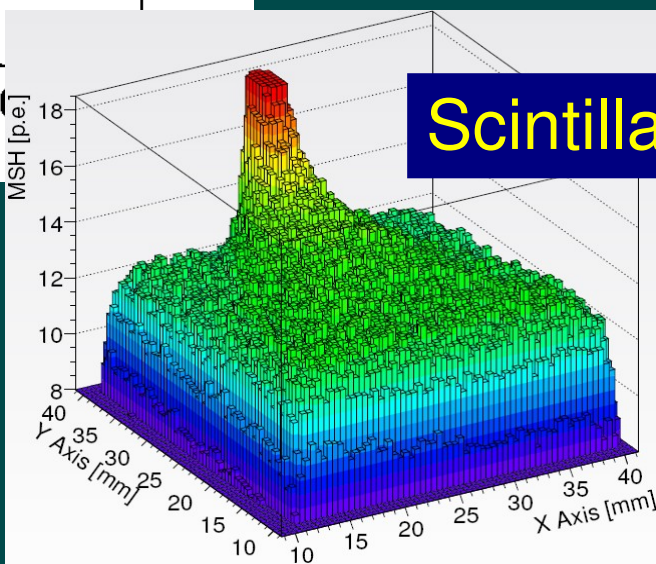
SiPM & scintillator

New CPTA photo-sensors ~800 pixels

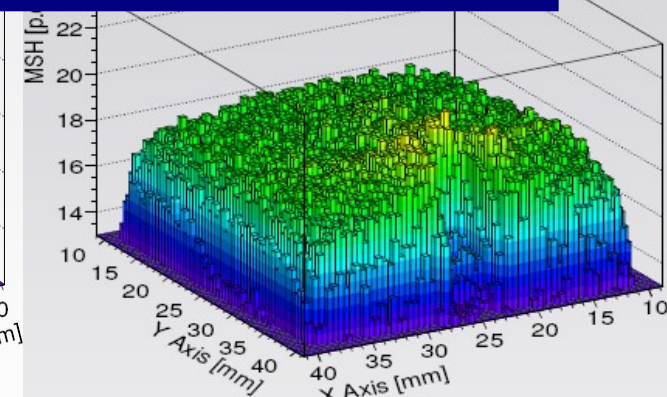
lower noise than old MEPhi/Pulsar



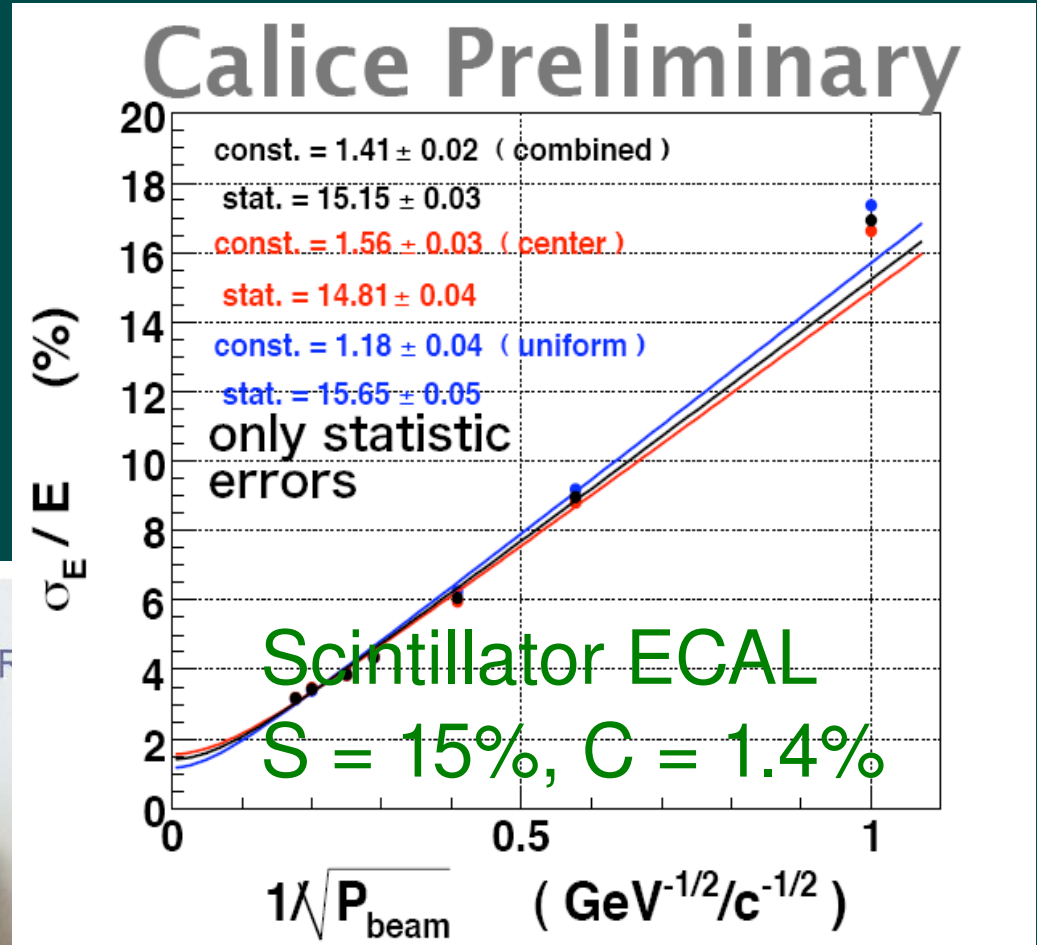
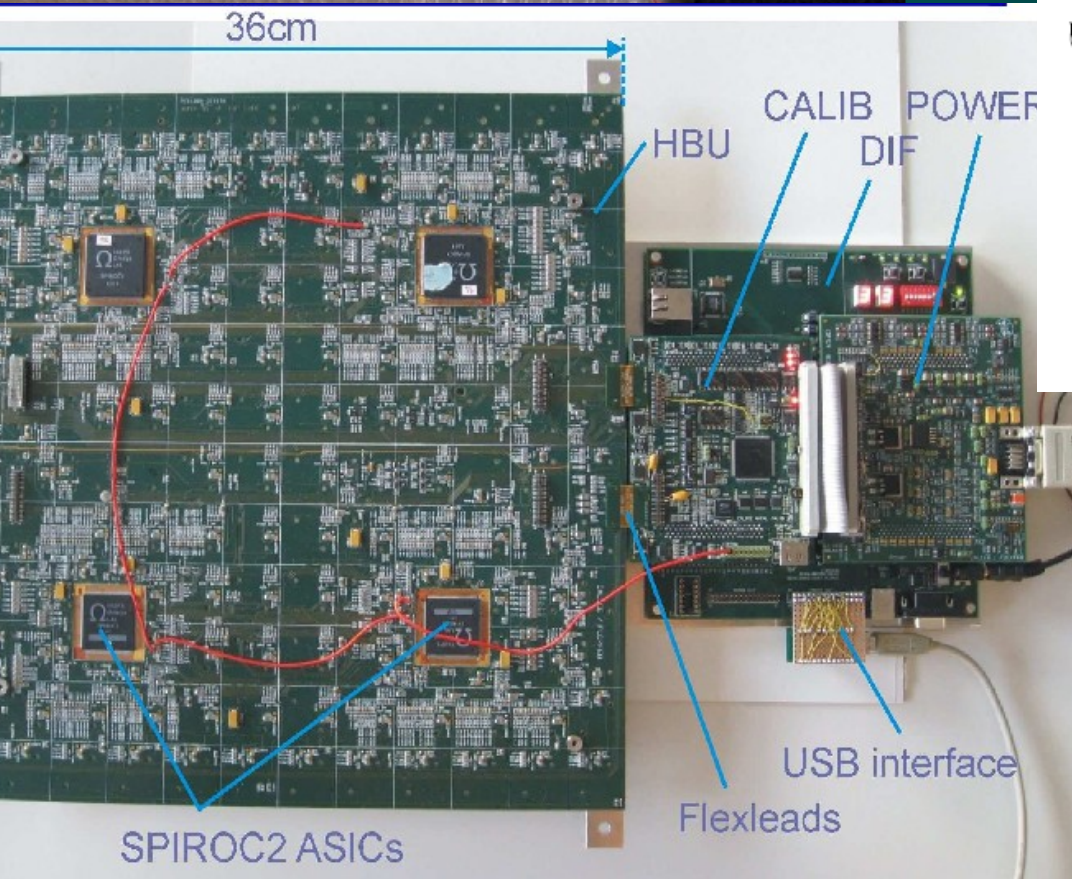
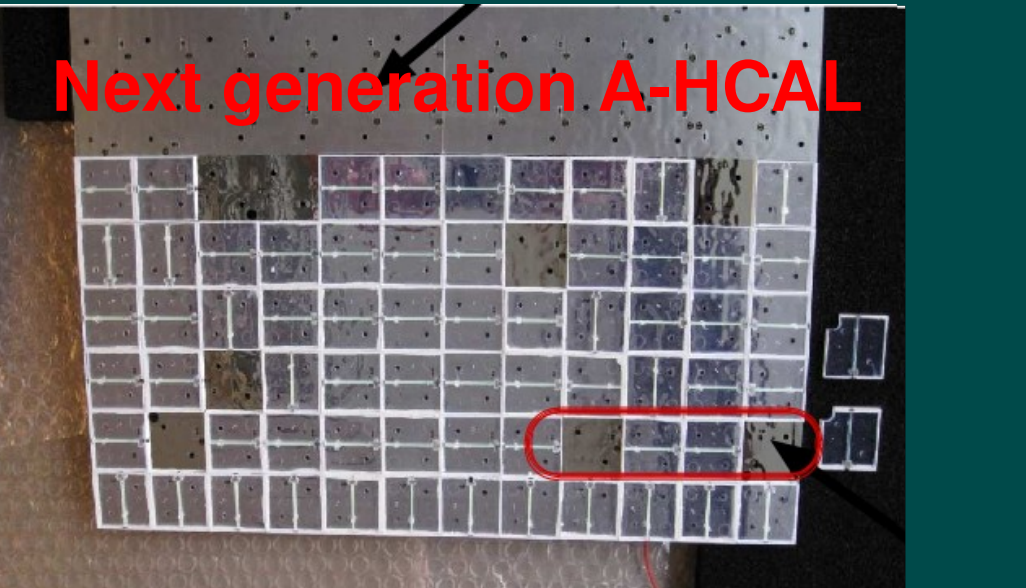
Danilov, Gentile



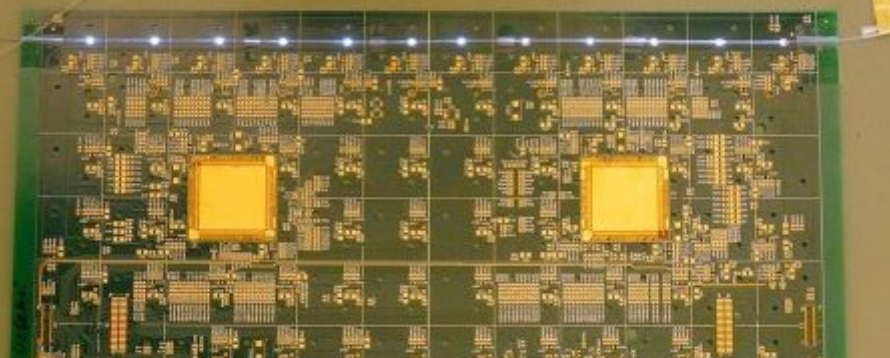
Scintillator tile uniformity



Next generation A-HCAL



Light distribution for calibration



Active layers

- gaseous: RPC, MPGD
- scintillator, with SiPM/MPPC... readout
- **semi-conductors: Silicon, GaAs**

Absorber

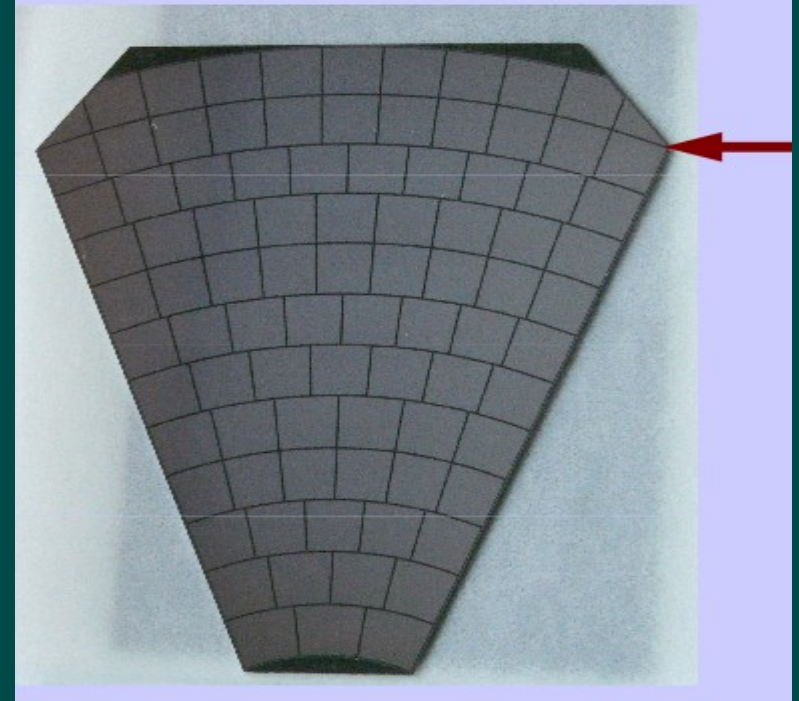
FE electronics

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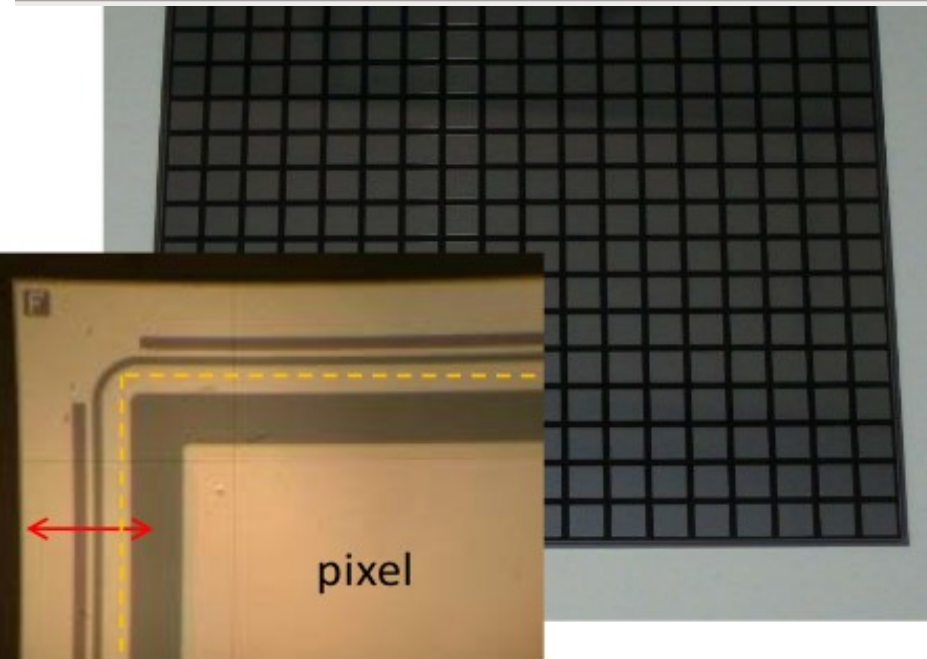
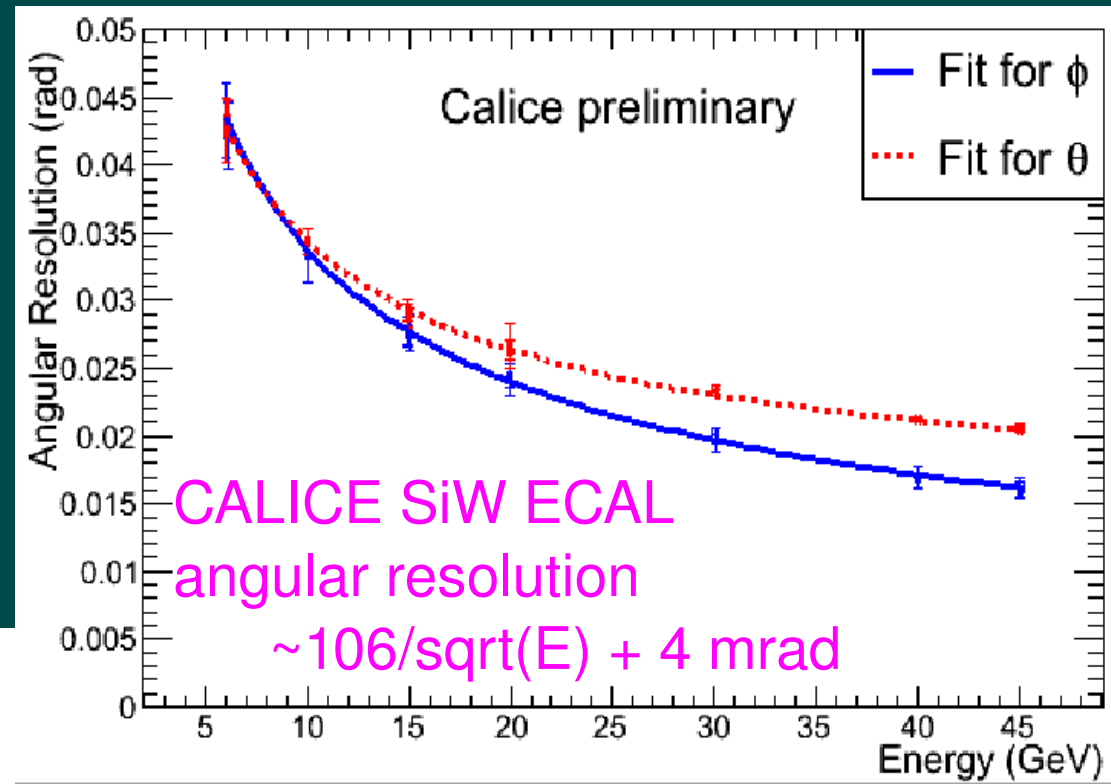
ECAL, forward calorimeters

GaAs sensors, delivered by JINR
(produced in Tomsk, Siberian
Academy of Science)



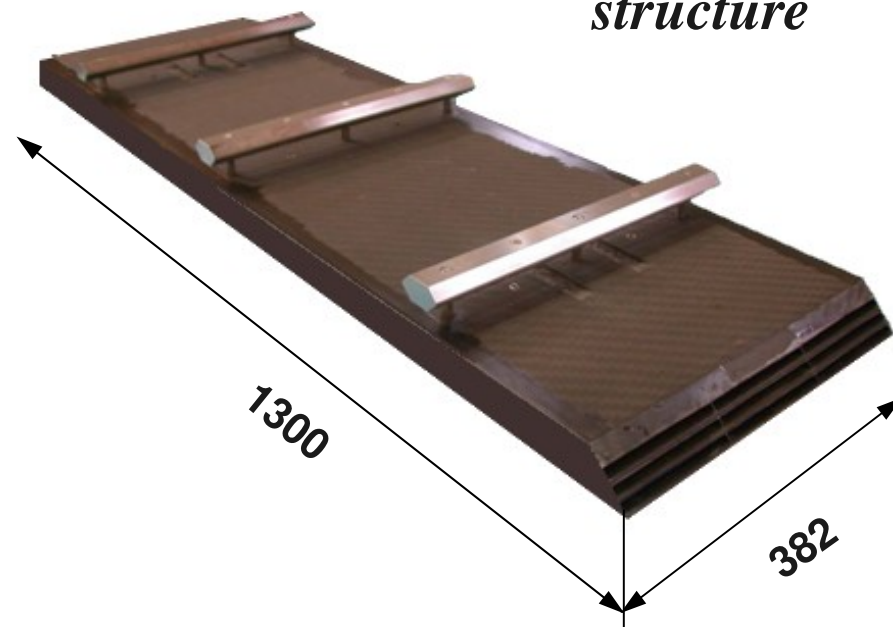
Rad-hard sensor
for beamCal

Prototype results &
sensor development

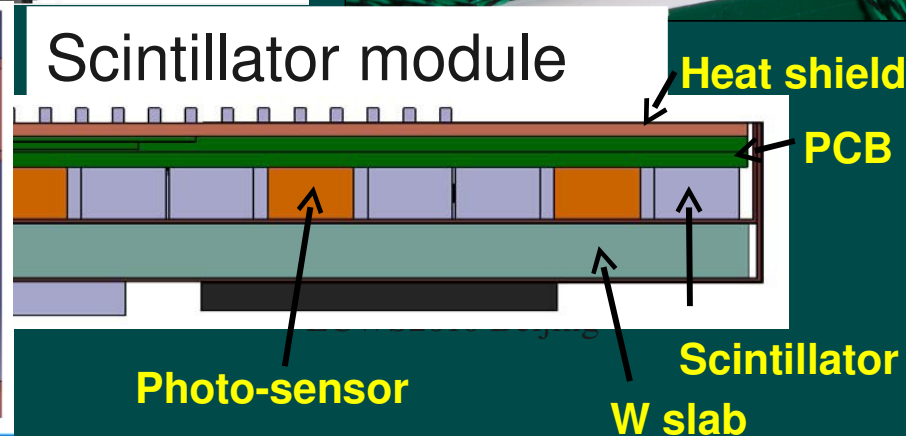
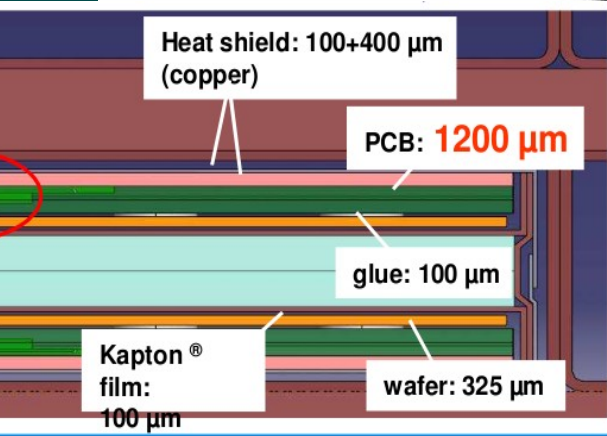
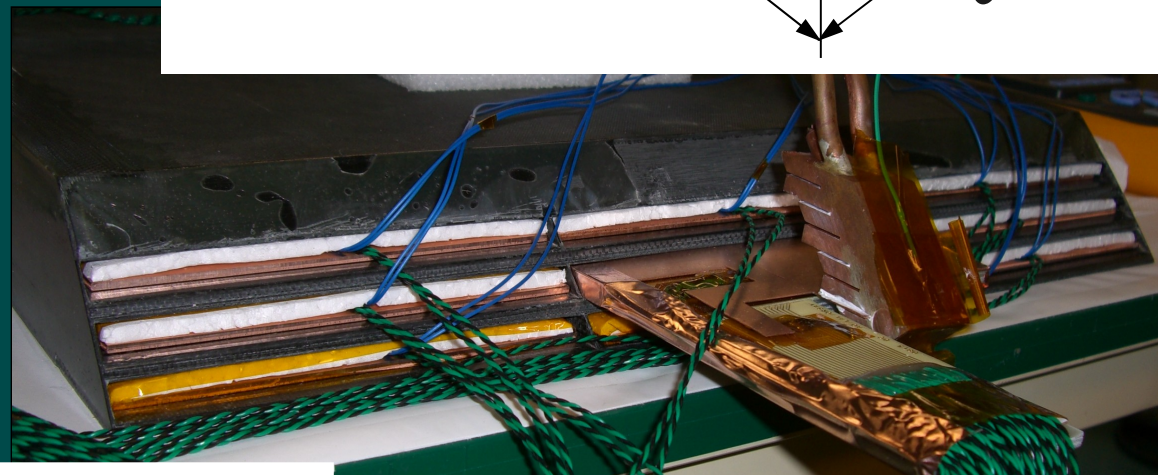
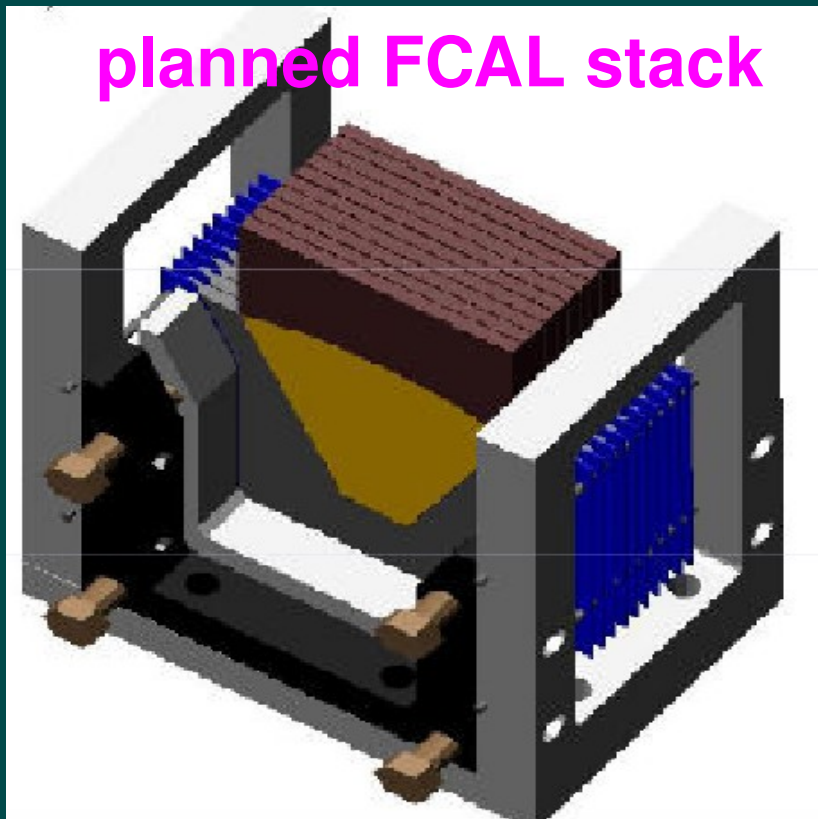


ECAL, FCAL – next generation closer to real detector modules

ECAL Demonstrator structure



planned FCAL stack



ECAL cooling

Grondin, Jeans,
Lohmann

Active layers

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Absorber

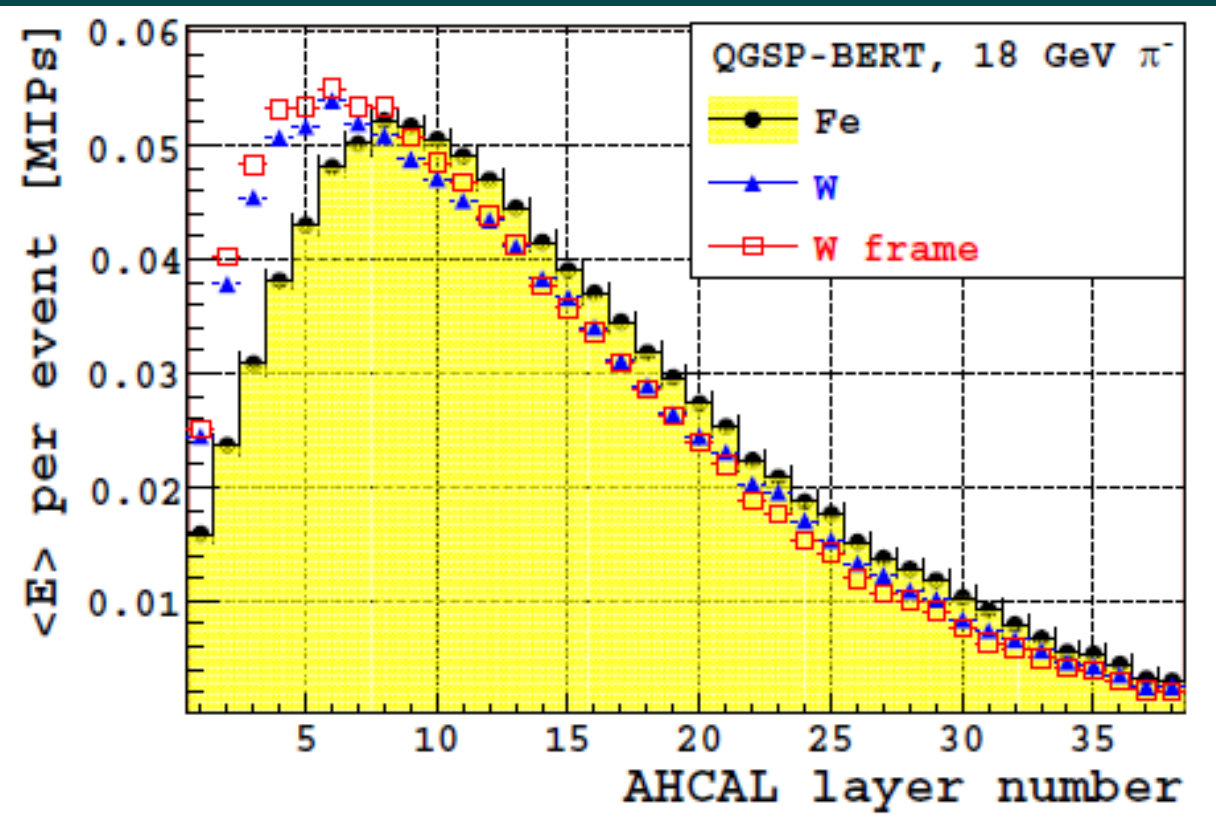
FE electronics

Physics/simulation results

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More compact HCAL for CLIC: W absorber

Speckmayer



Tungsten Absorber

Use existing m^2 HCAL planes
AHCAL for now
Later also gas

Test beam late 2010

Active layers

- gaseous: RPC, MPGD
- scintillator, with SiPM/MPPC... readout
- semi-conductors: Silicon, GaAs

Absorber

FE electronics

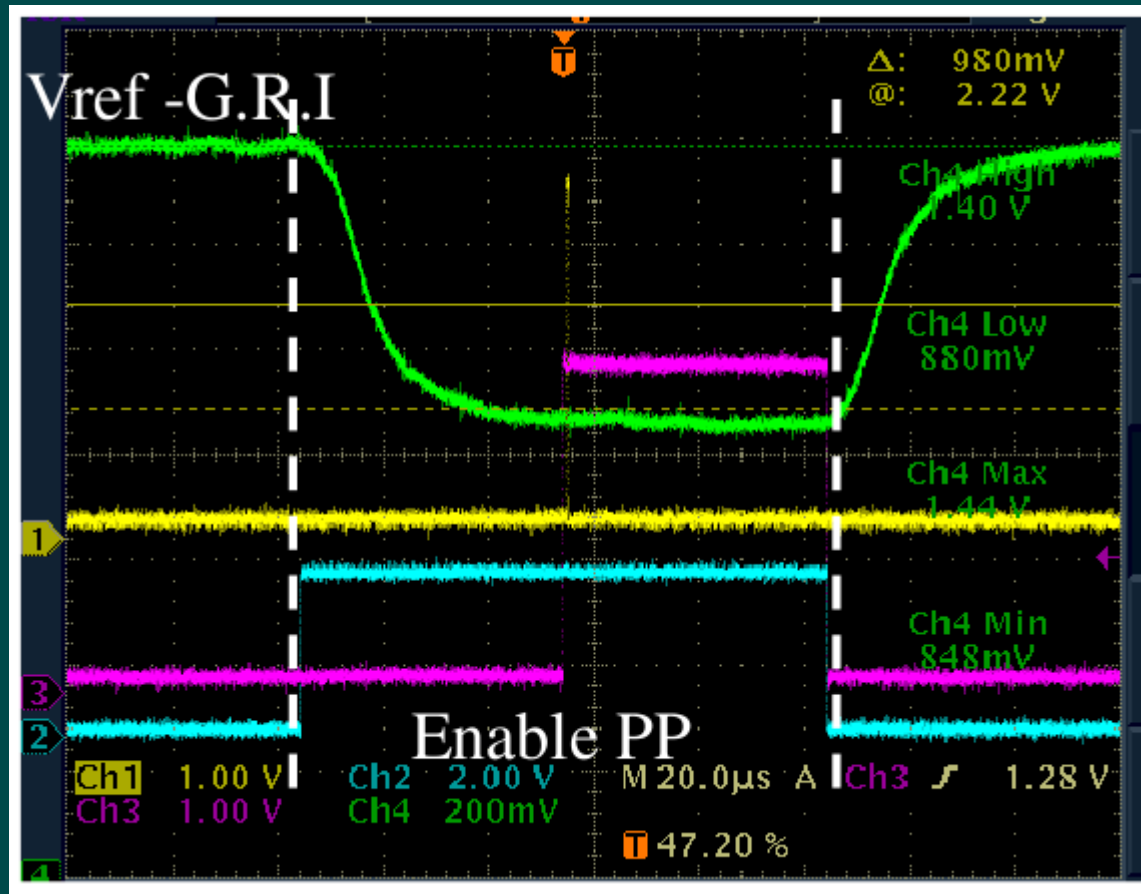
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Front-end ASICs

First tests of power pulsing underway

Typically integrated into detector volume

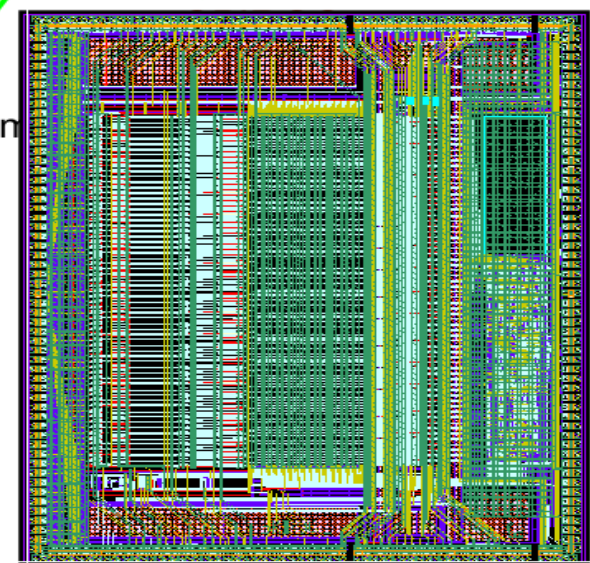
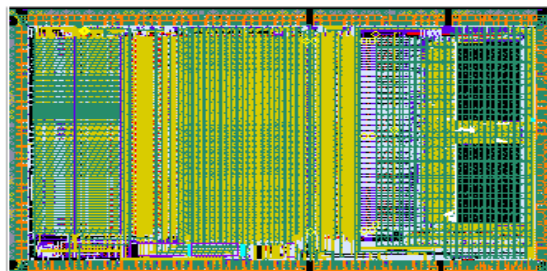
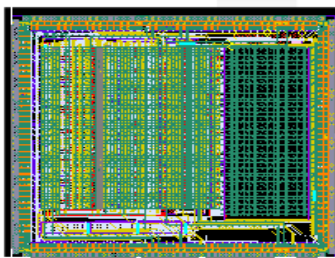


Next generation of *ROC chips

HARDROC2
SDHCAL RPC
64 ch 16 mm²

SPIROC2
AHCAL SiPM
36 ch 30 mm²

SKIROC2
ECAL Si
64 ch. 70 mm²



de la Taille

Active layers

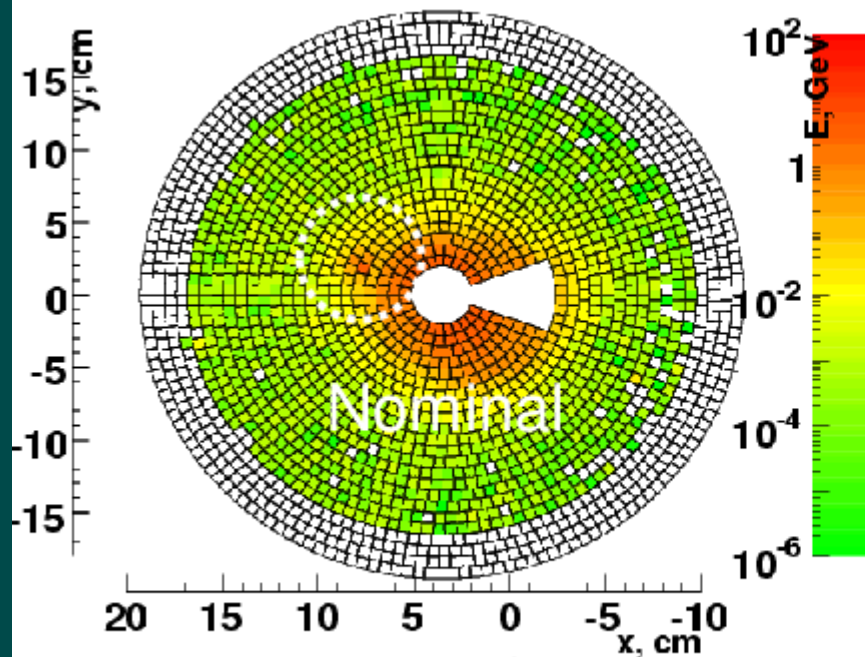
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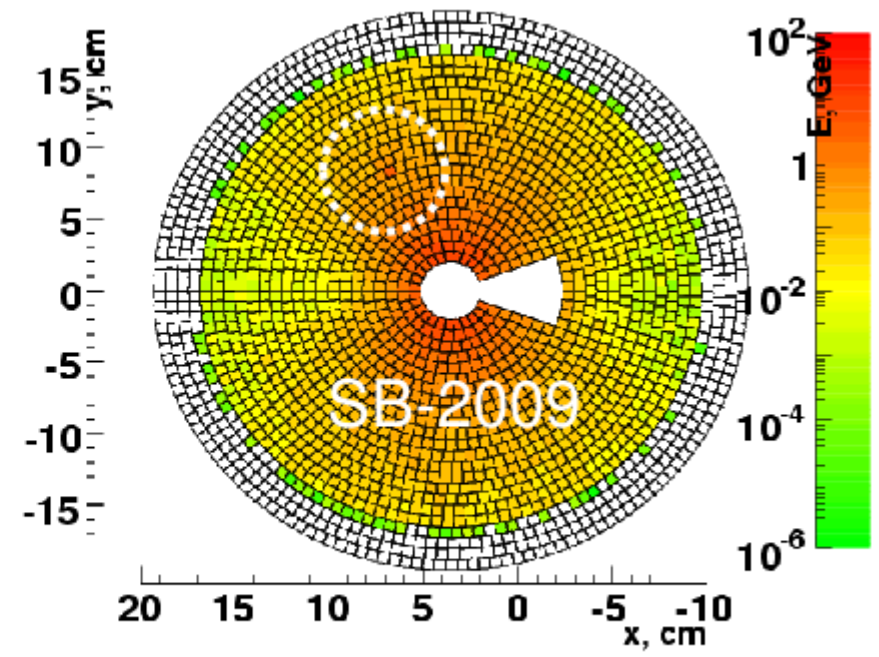
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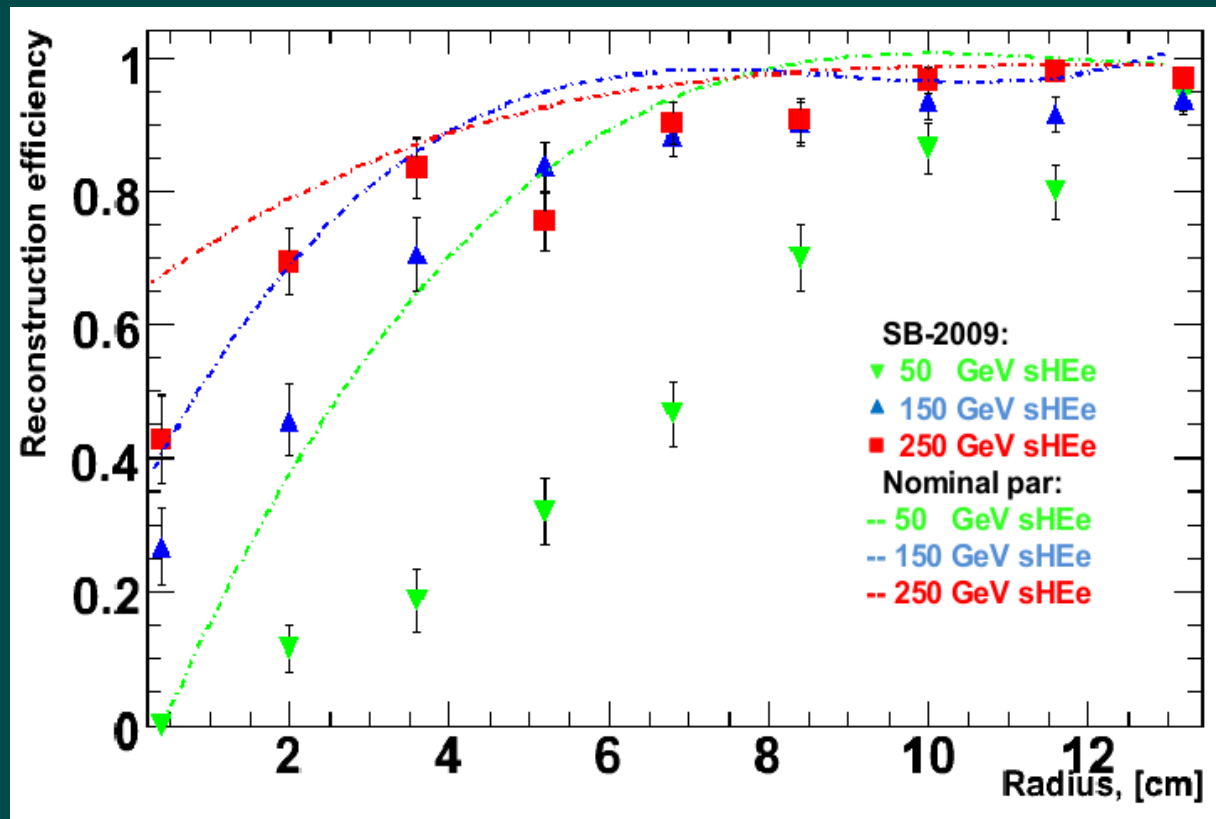


Nominal



SB-2009

An example of 1background event with 250GeV single high energetic electron



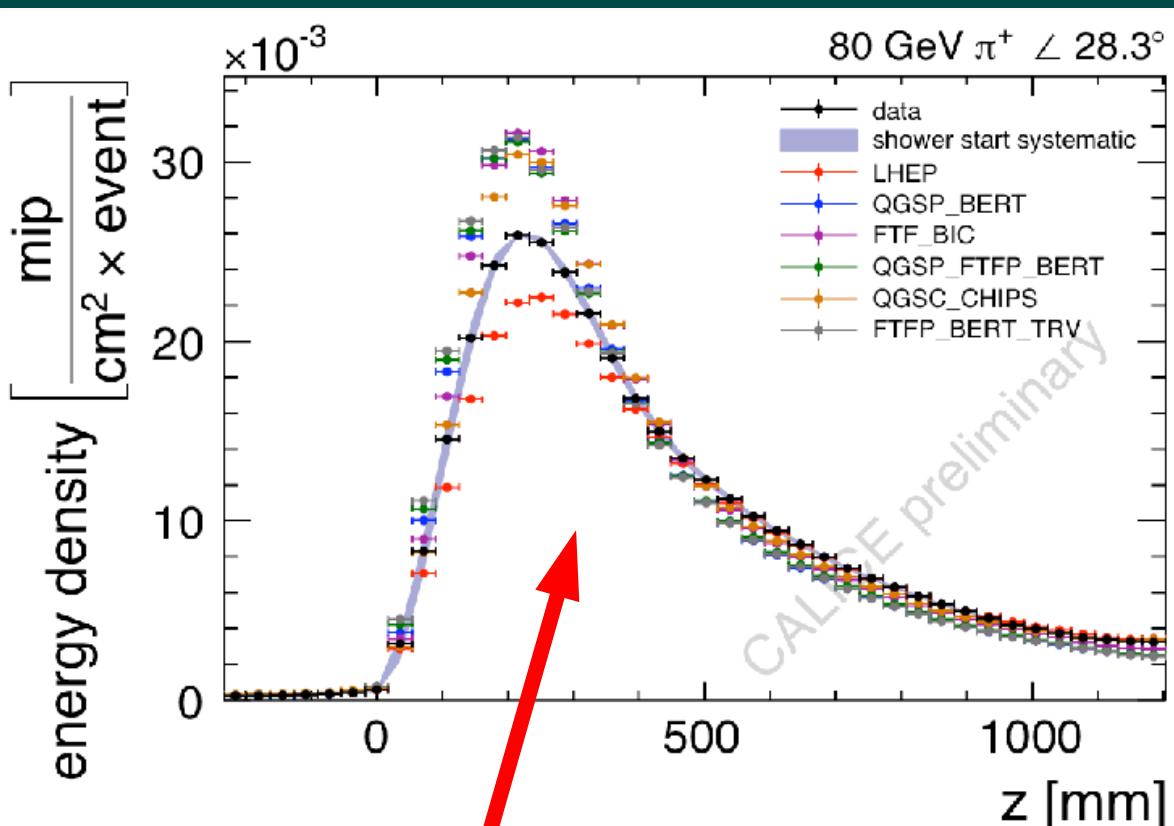
O. Novgorodova

Electron reconstruction
in BeamCal

Stau background rejection

Less efficient for SB2009

Test-beam results of current detector prototypes



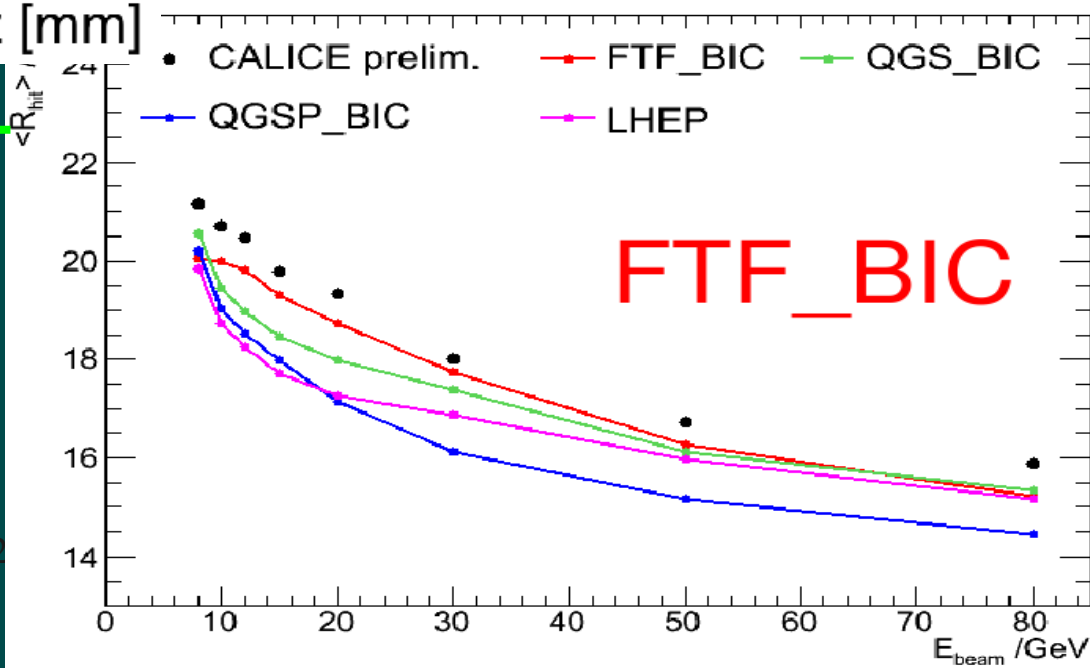
Test hadronic models in GEANT

Compare shower shapes of TB data models

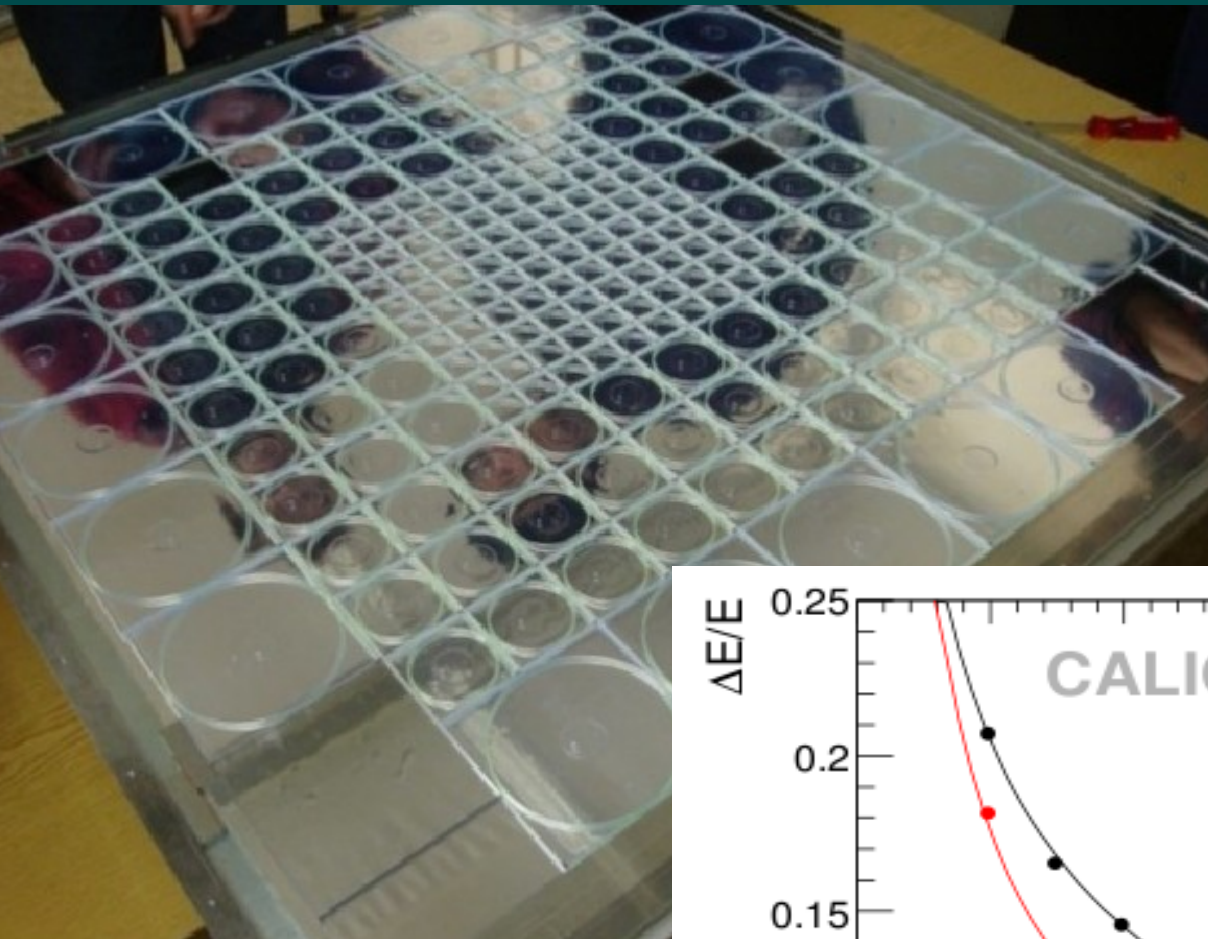
Large differences
some models better than others
none perfect

Pi+- shower width in SiW ECAL

Pi+- longitudinal profile in AHCAL



Fauci Giannelli, Lu

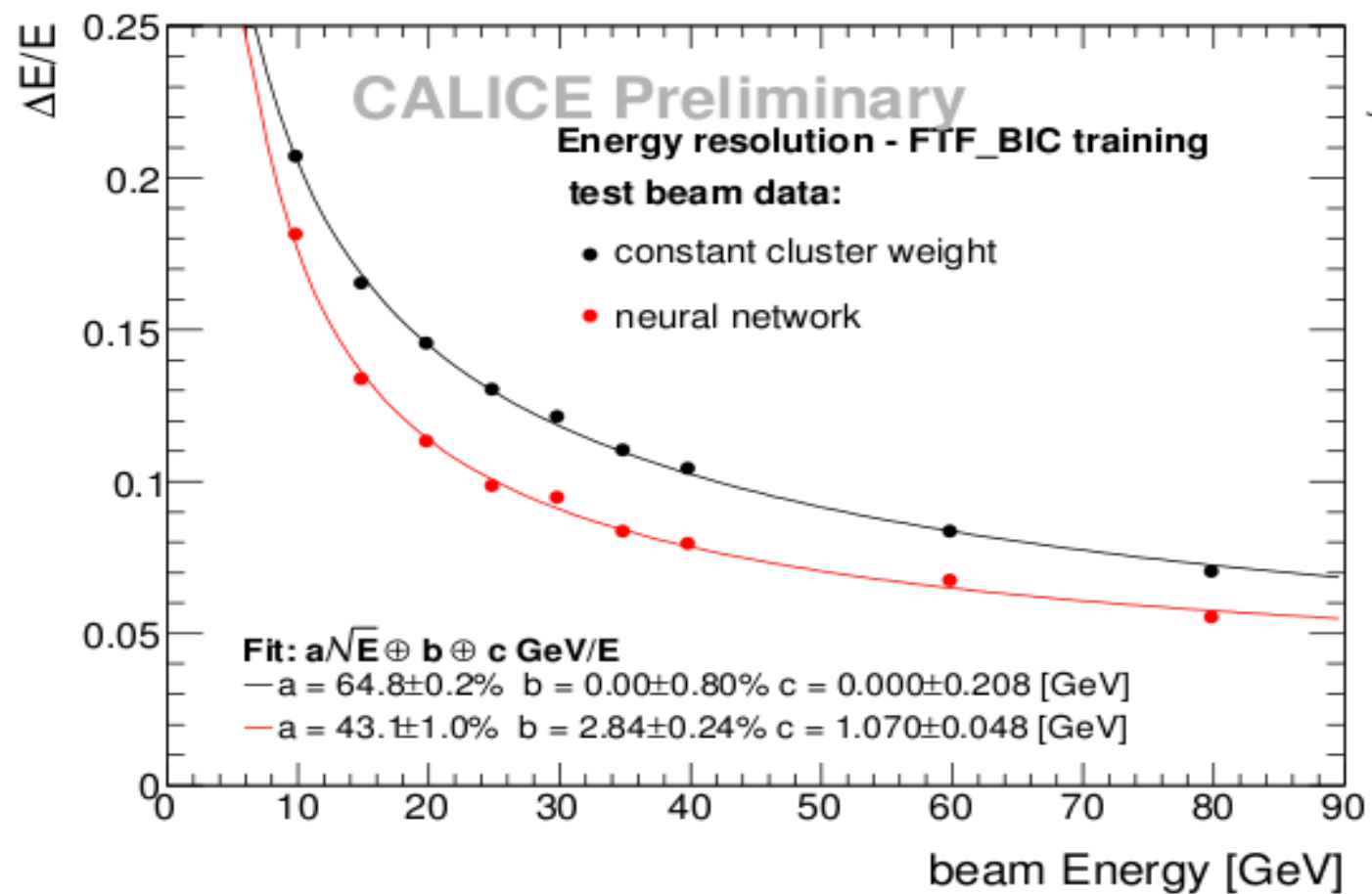


Software compensation in scintillator AHCAL

- use high granularity

Energy resolution
improved by ~25%

Better linearity



Summary

Several technologies under study
gas, scintillator, semi-conductor

Previous calorimeter prototypes

- understood performance
- detector reconstruction
- testing hadronic models

Producing prototypes with

- close to size of detector modules
- integrated electronics, services