Scintillator ECAL

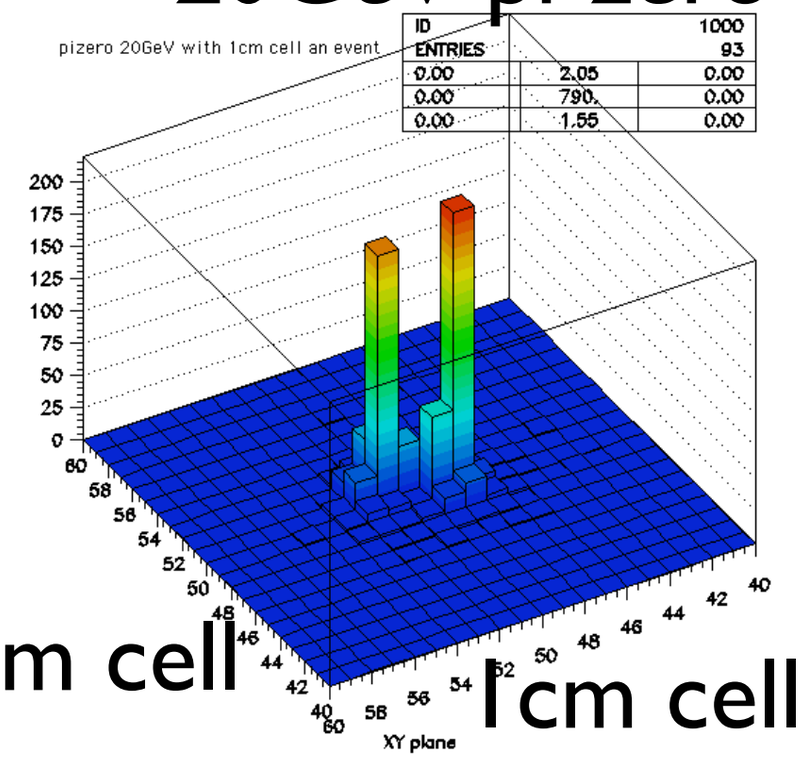
Tohru Takeshita (Shinshu)
for ILD

scintillator strip ECAL

- structure,granularity
- dead region
- calibration

R&D items

physics study



scintillator ECAL

GLD-ECAL-Scintillator-layer model

- strips in perpendicular directions

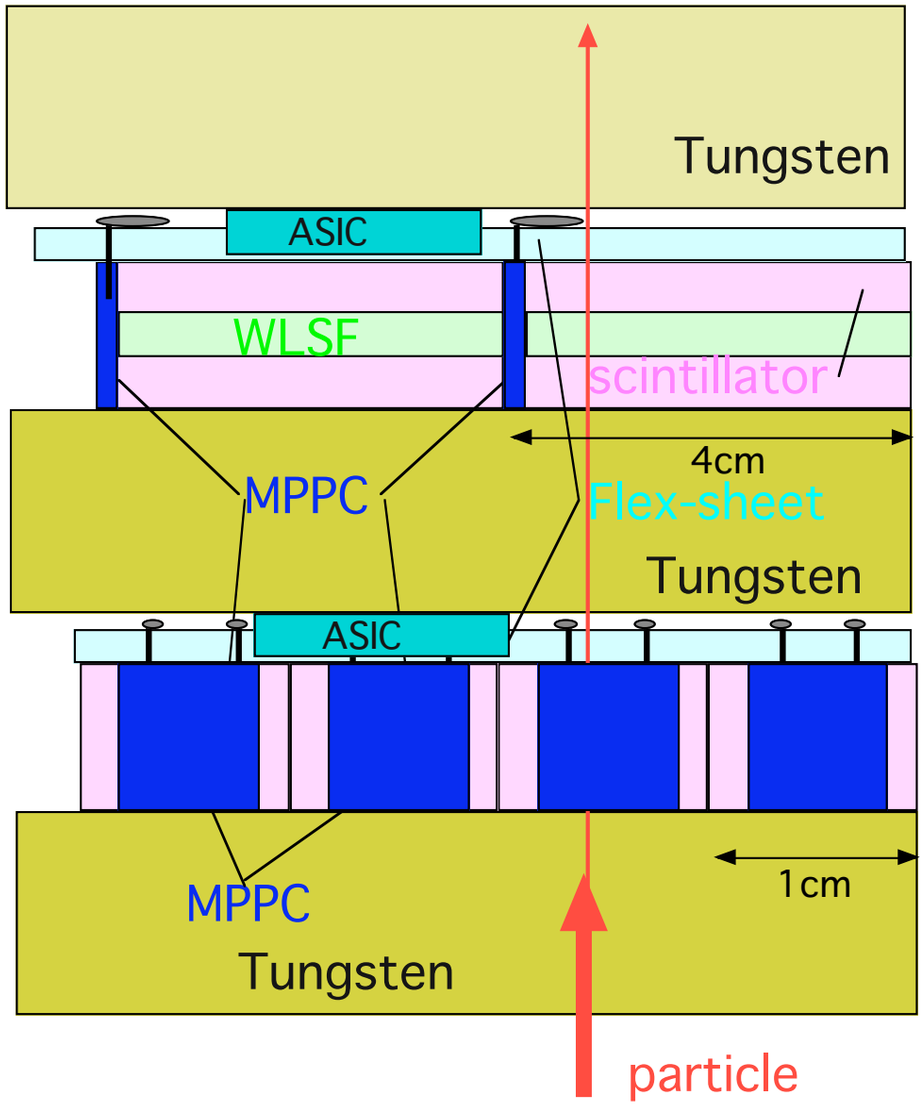
TT 1/April/06

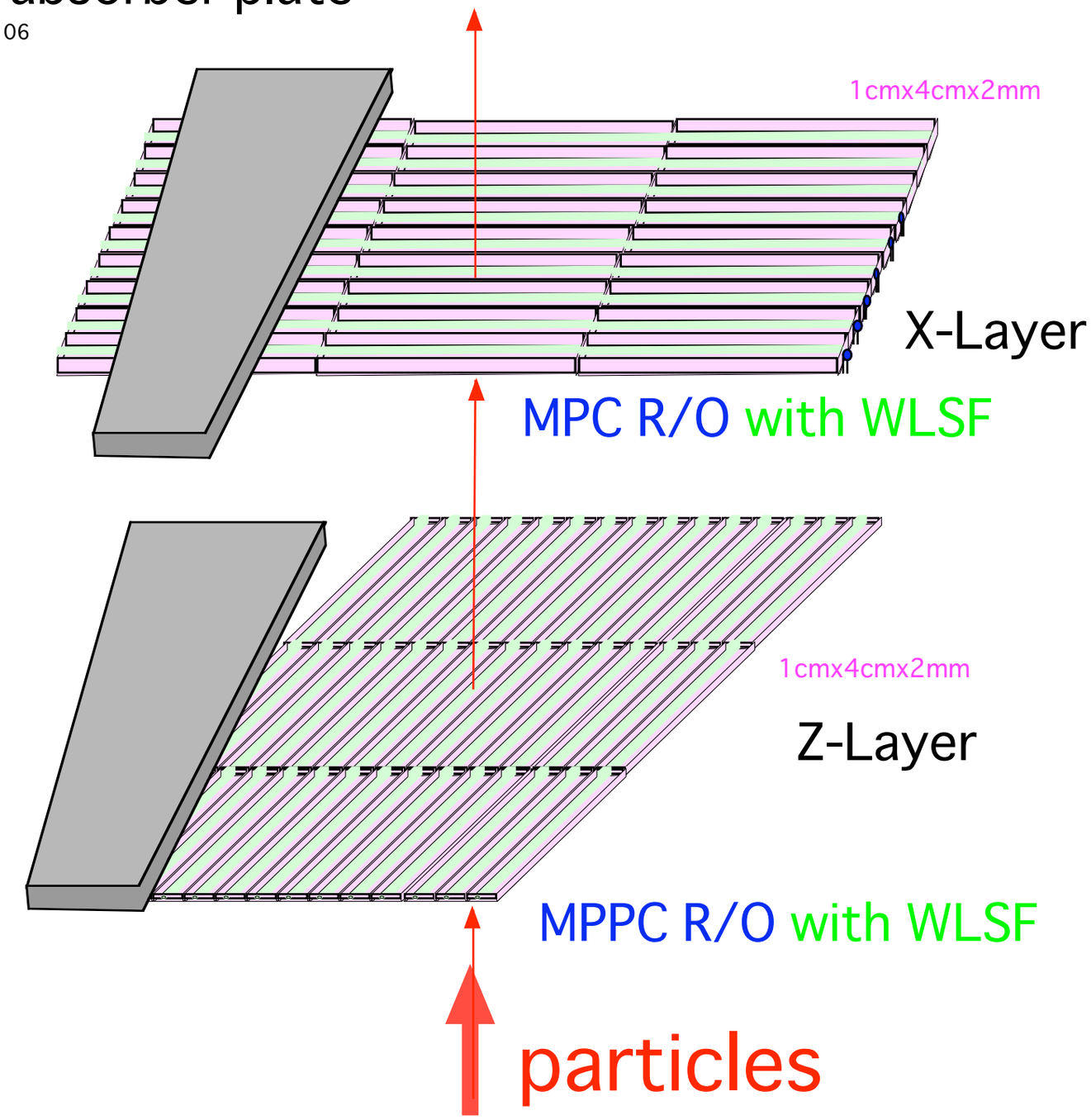
absorber plate

EM-Scintillator-layer model

TT Oct 06

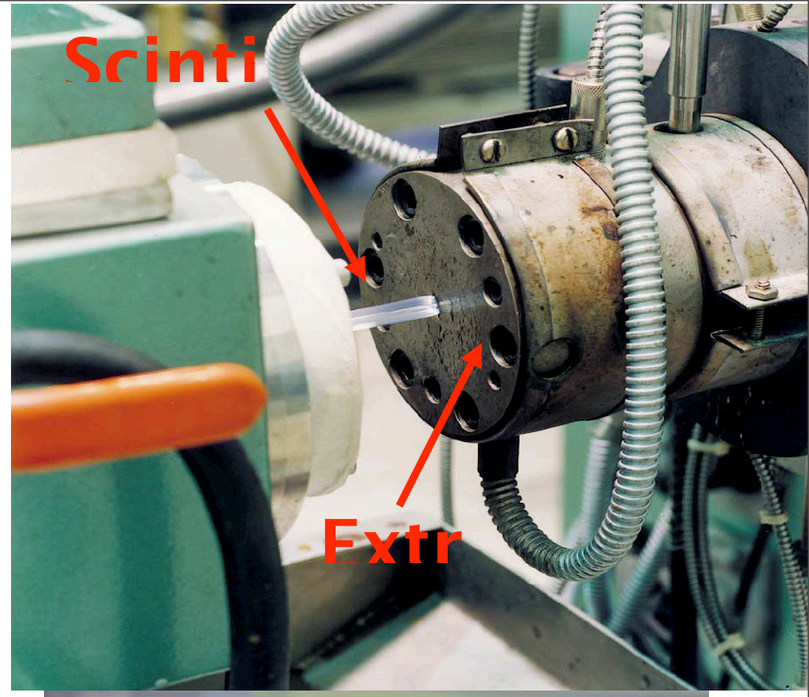
Cross section

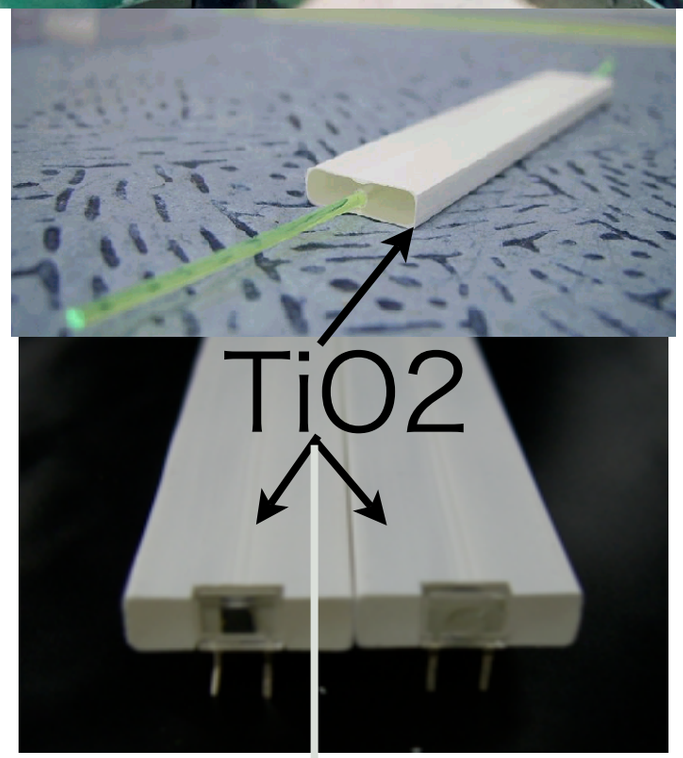


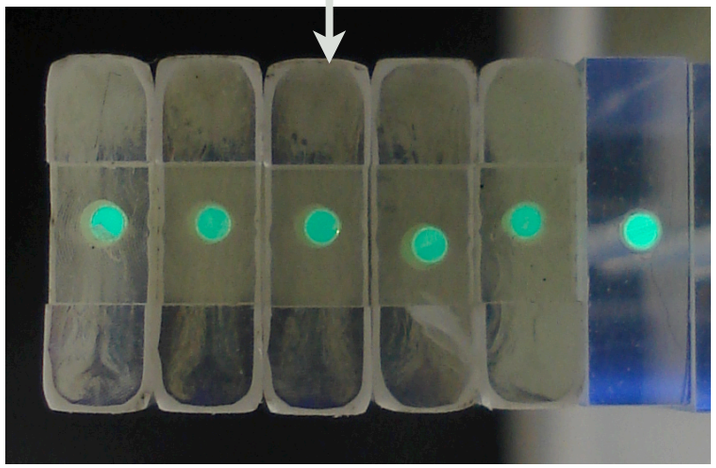


scintillator

- extruded scintillator
- fibre read out
- advantage
  - uniformity along the fiber
  - make a hole and outer light shield, simultaneously
- precision of hole size & location

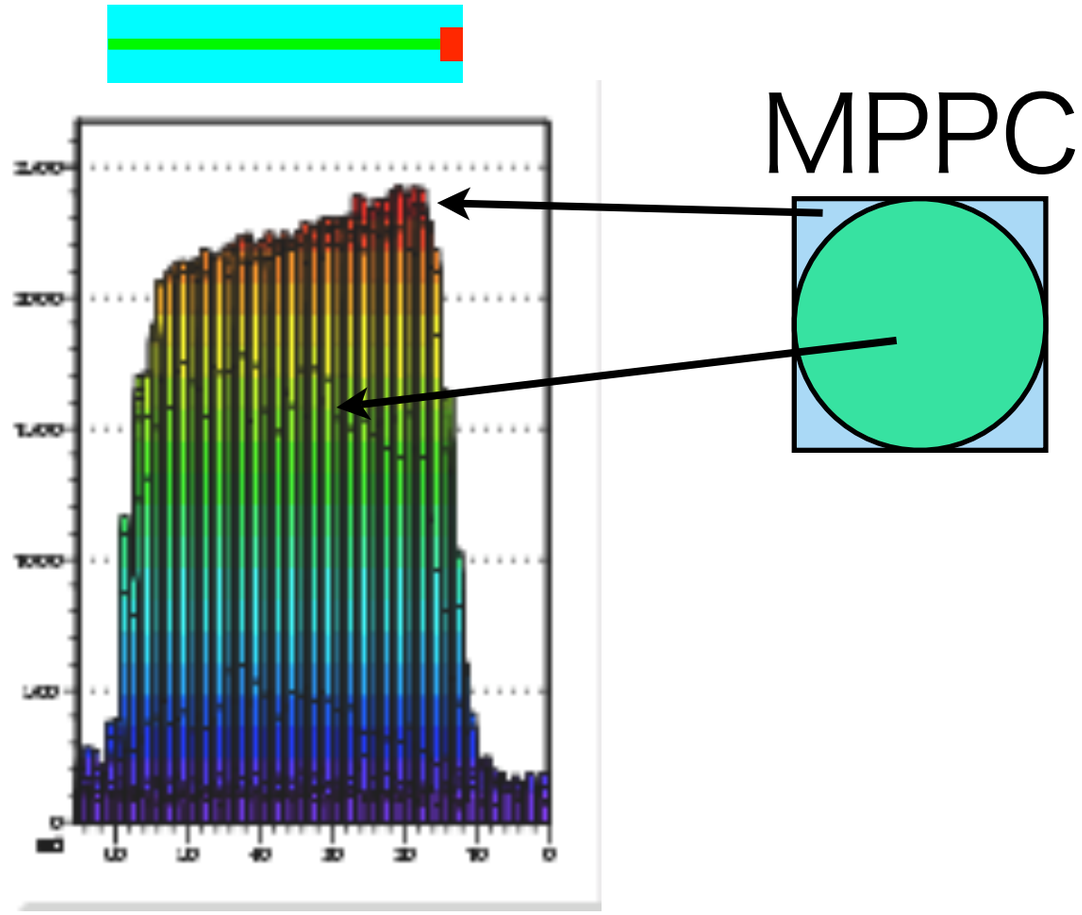


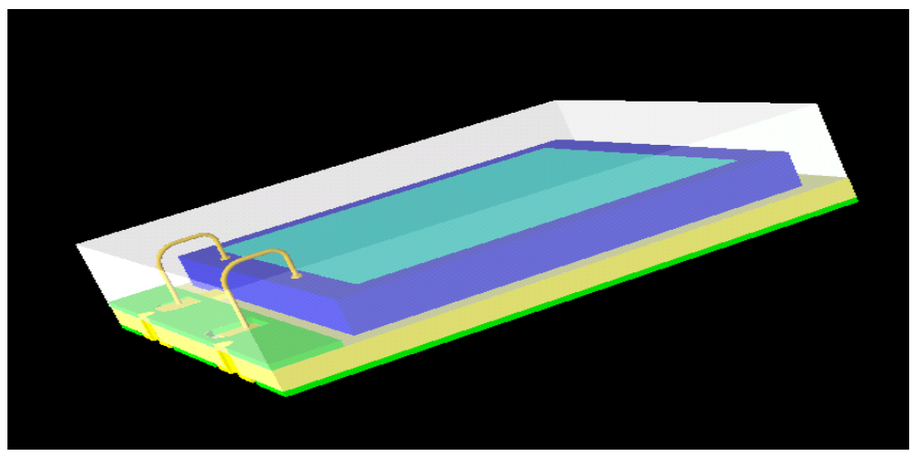




scintillator R&D

- uniformity
  - MPPC matching
- limitation
  - thickness/width
  - 2mm(t)/5mm(w) : mechanical constraint



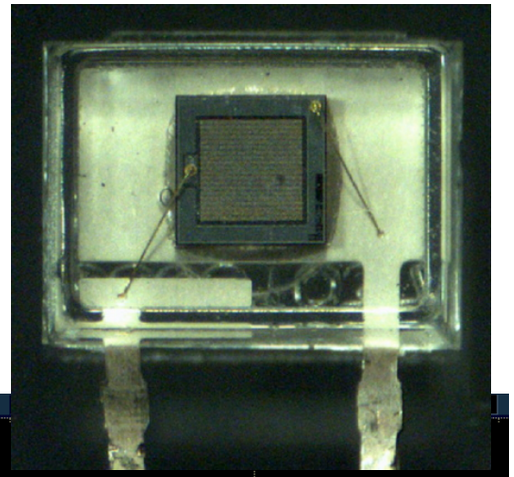


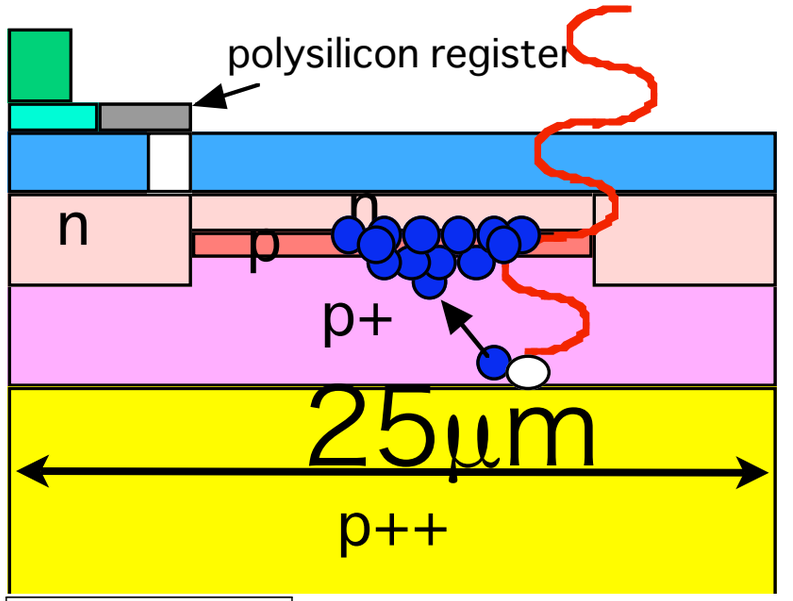
SMD MPPC 1.9mm x 2.4 mm

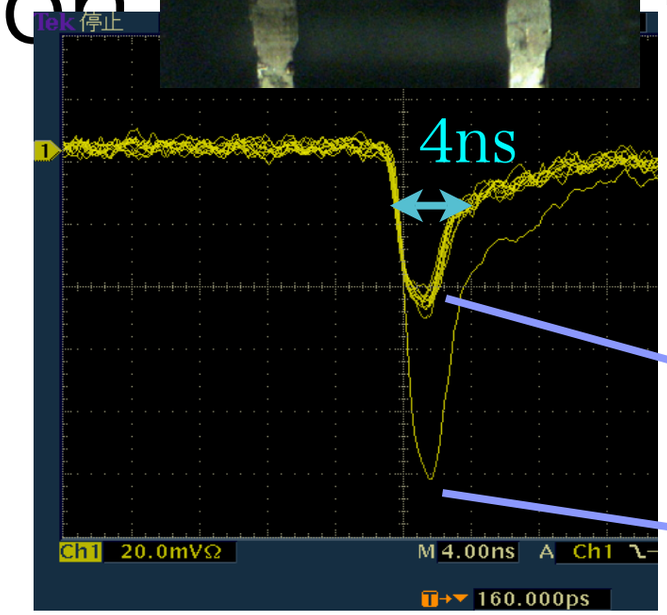
MPPC

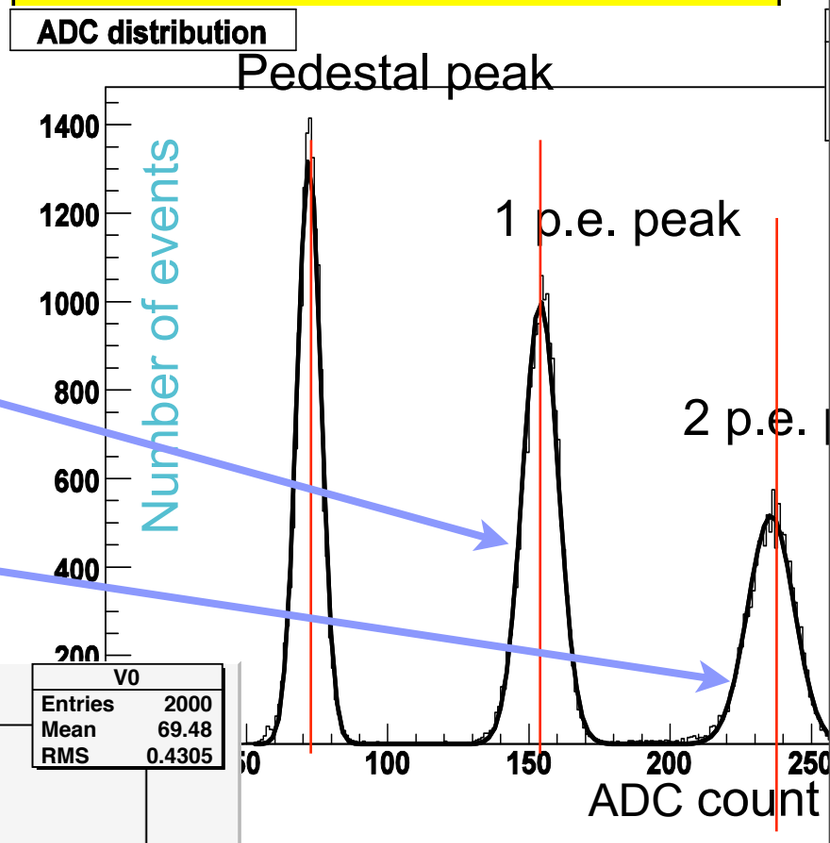
40x40=1600pixles

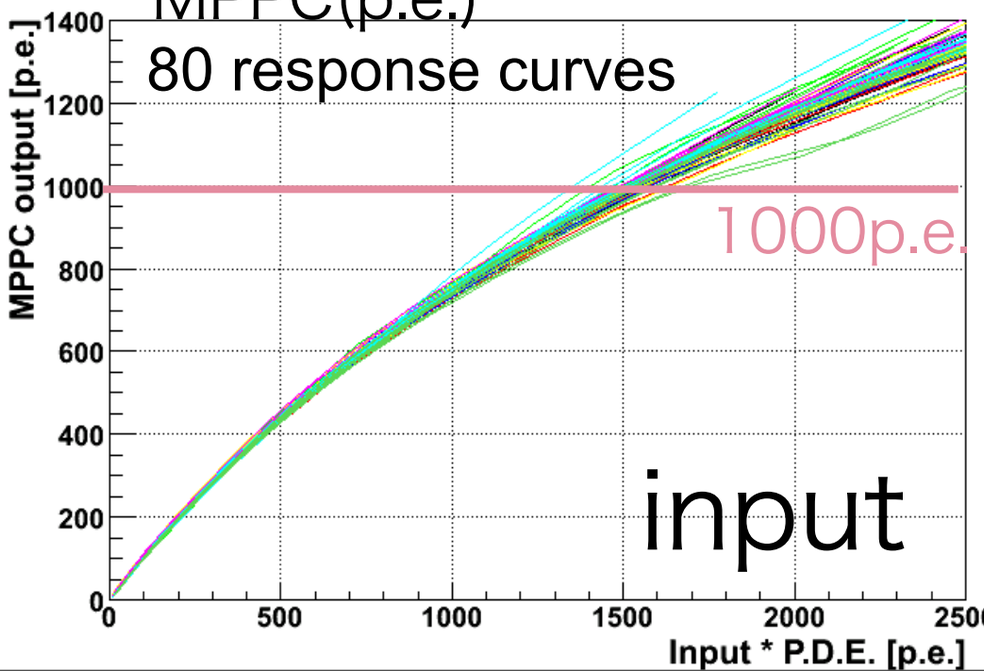
- novel photon sensor
- advantage
  - self gain calibration
- limitation
  - saturation
    - # of pixles

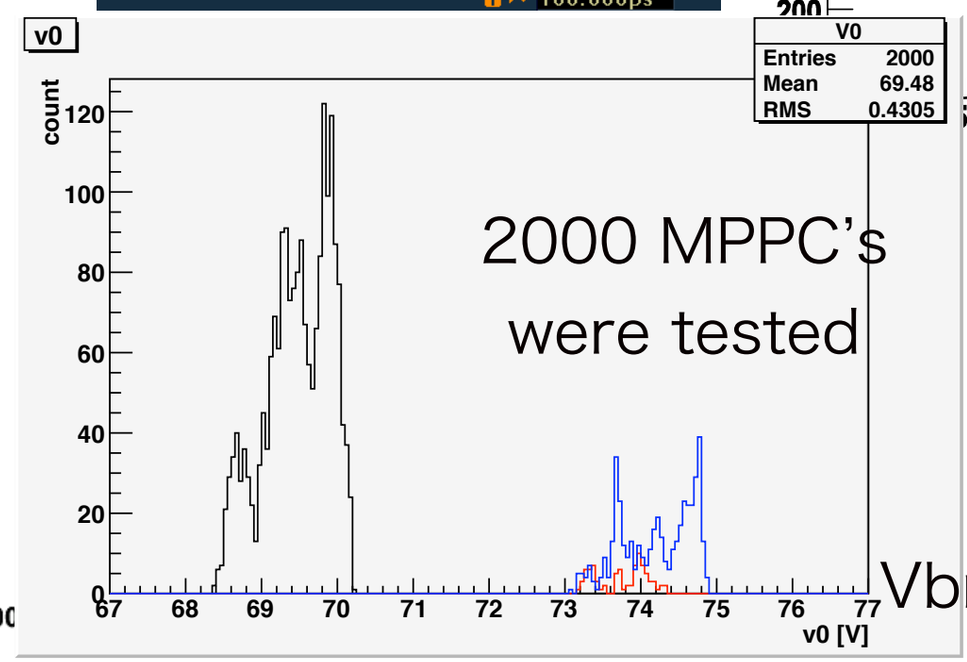






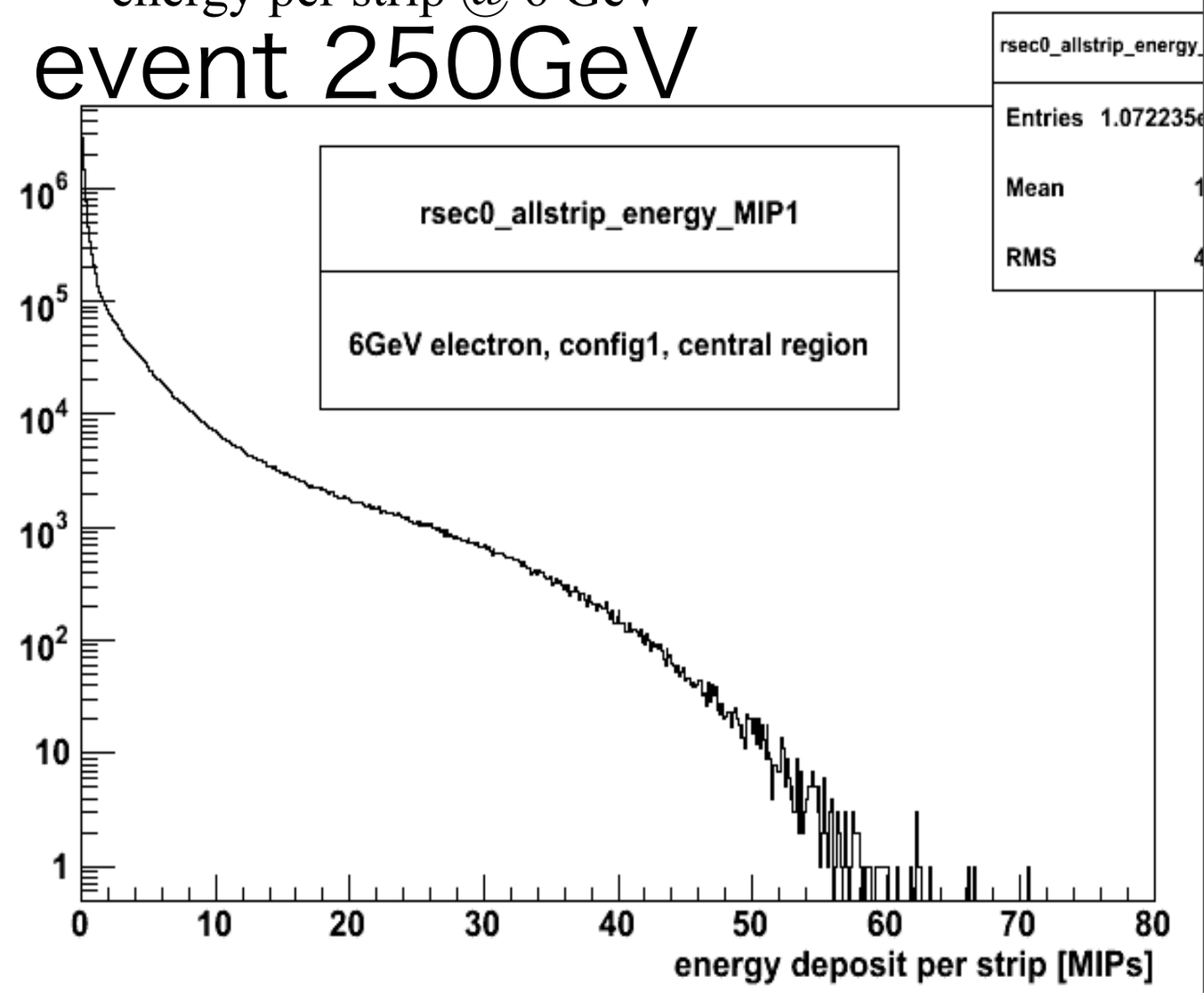






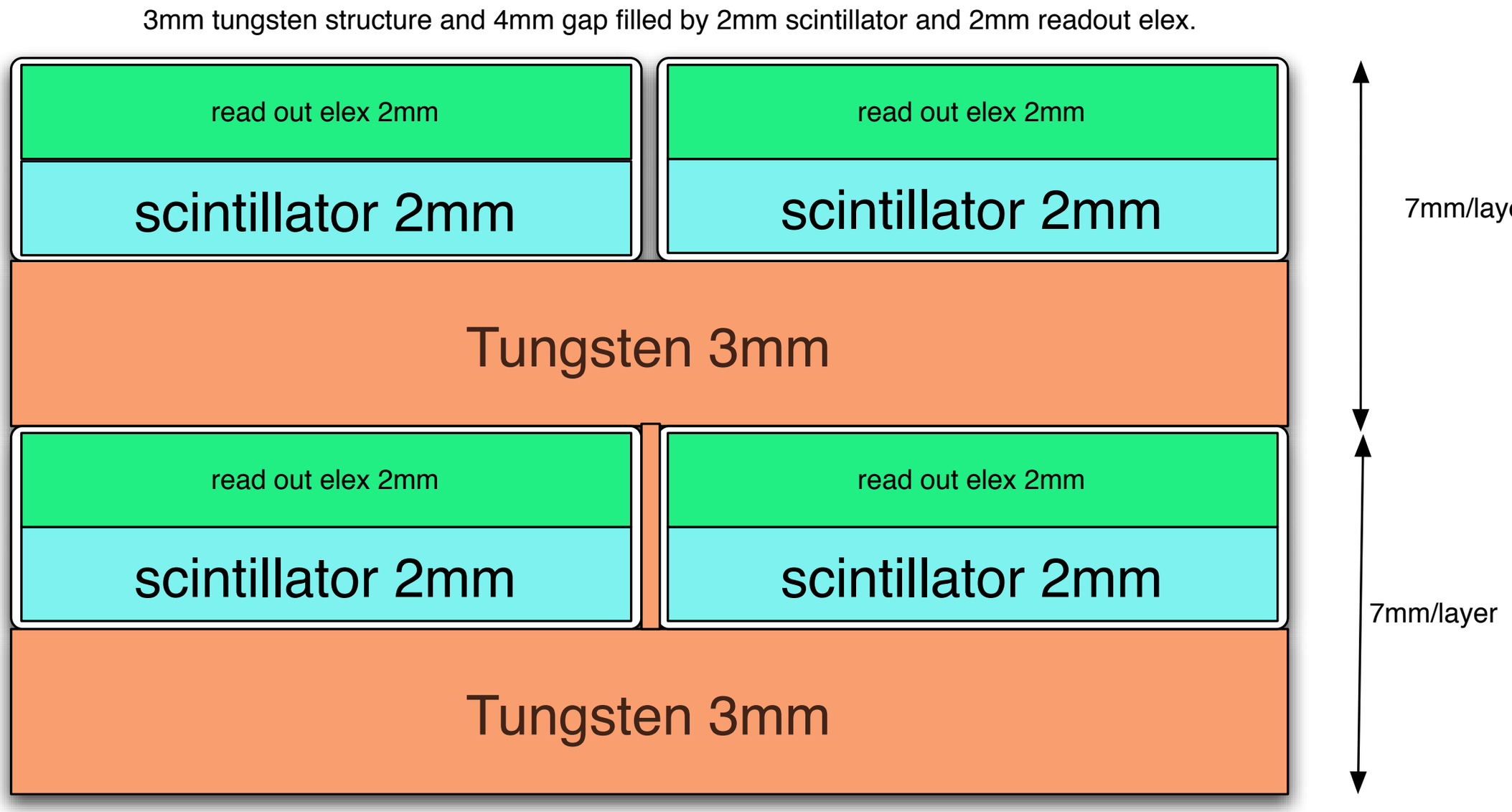
MPPC R&D

- dynamic range
- highest energy / strip
- in case of Bhabha event 250GeV
  - 2500 MIPs
    10p.e./MIP
  - need > 5000pix
  - increase surface



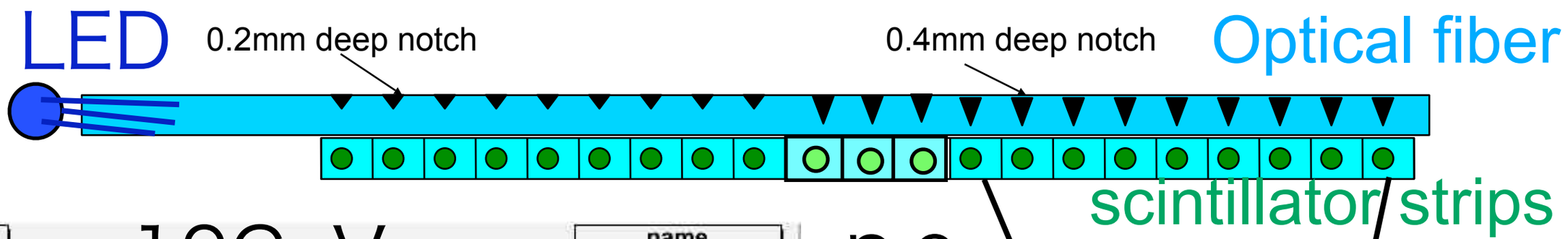
ECAL layer for ILD

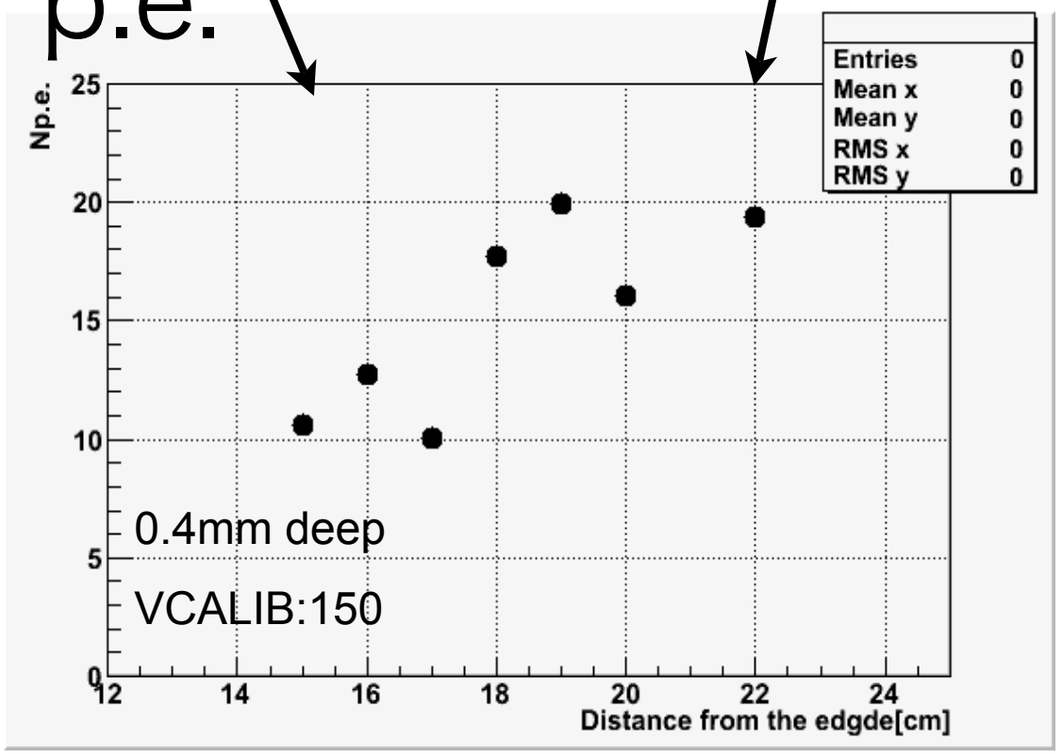
- model layer



calibration

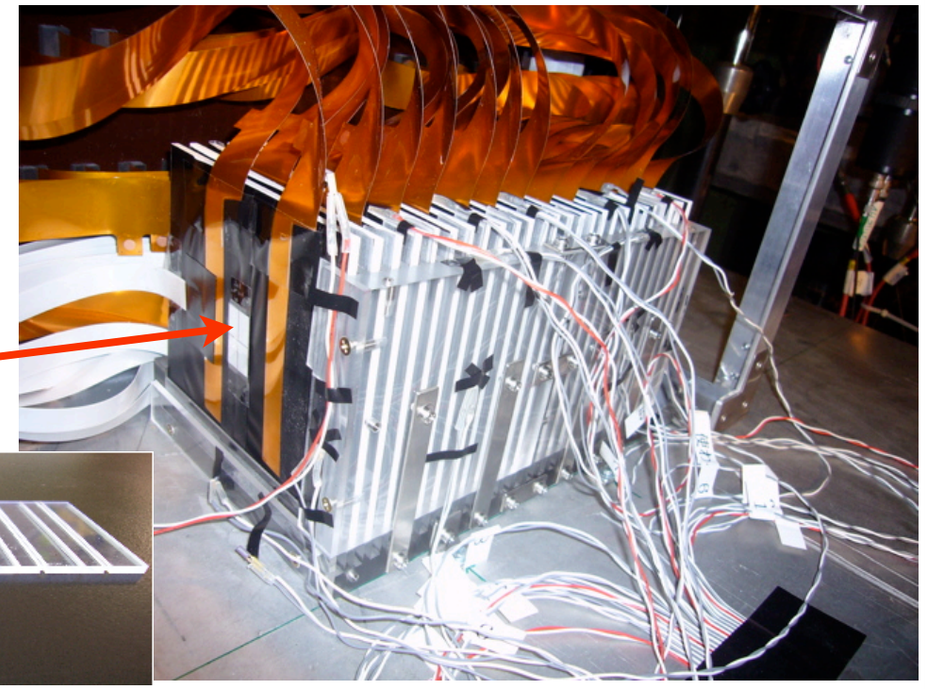
- in situ : MIP calib. with charged hadron
- light injection though fiber

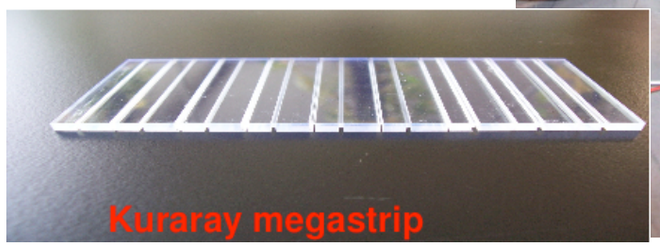


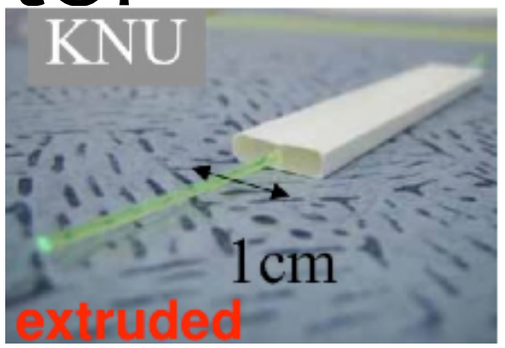


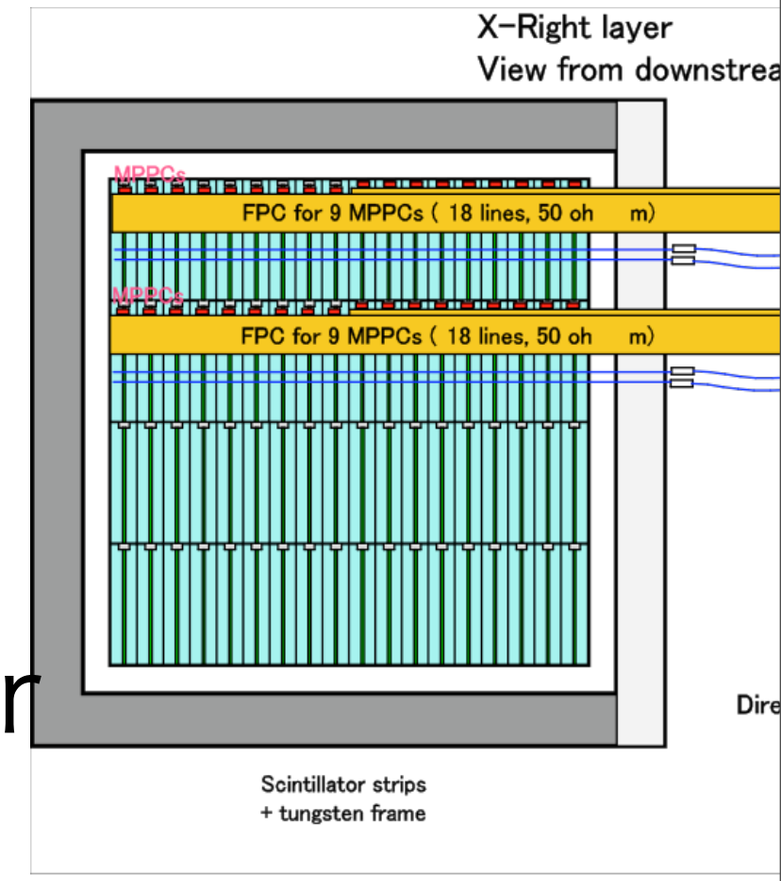
prototype ECAL

- small prototype for DESY
  - mega-scintillator
  - extruded scintillator
  - direct read out
    without fibre
- large prototype for FNAL
  - improved extruded scintillator









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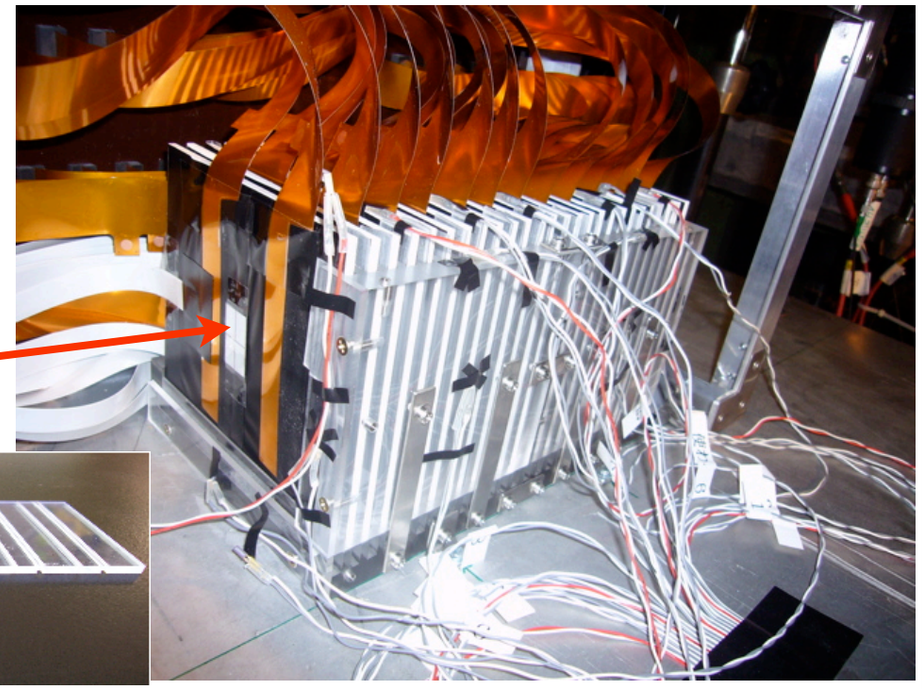
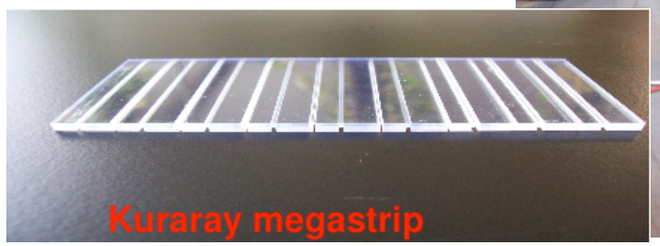
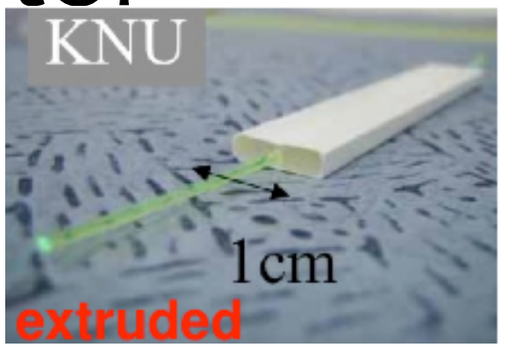
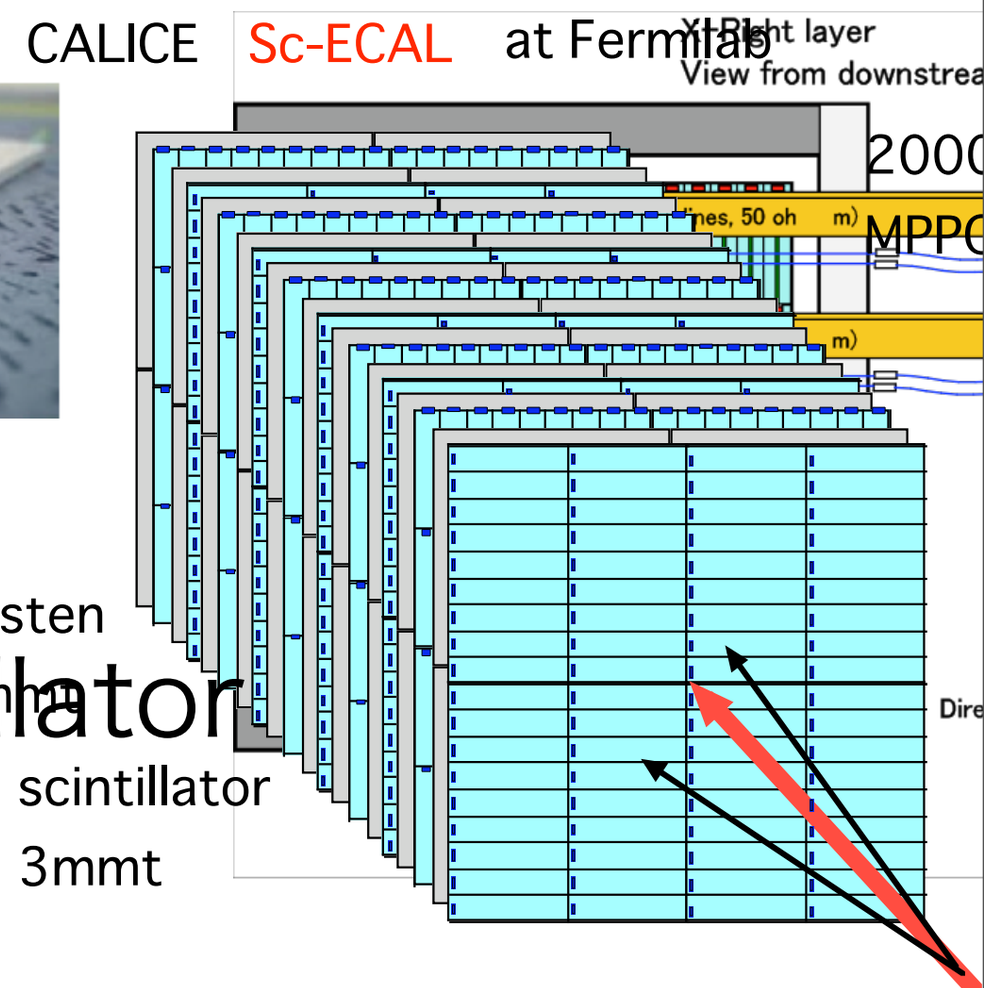


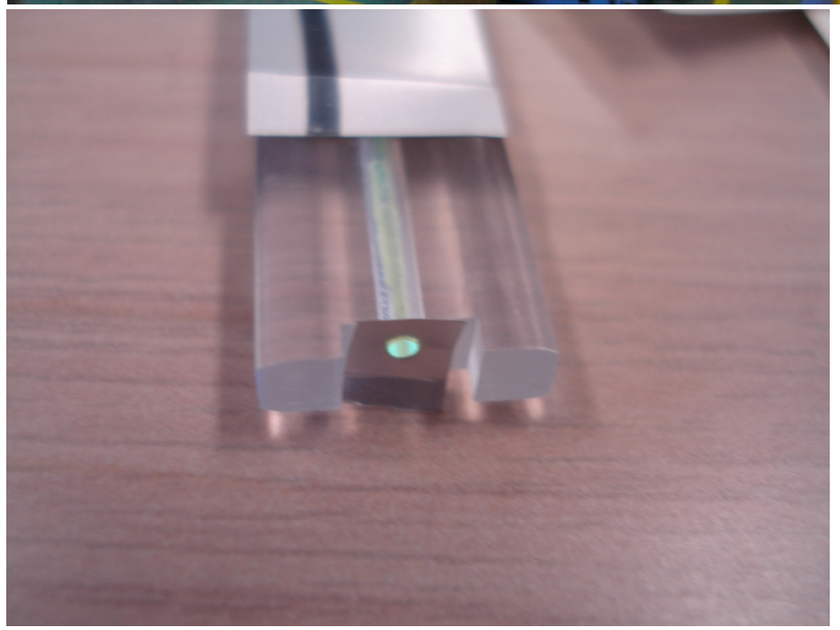






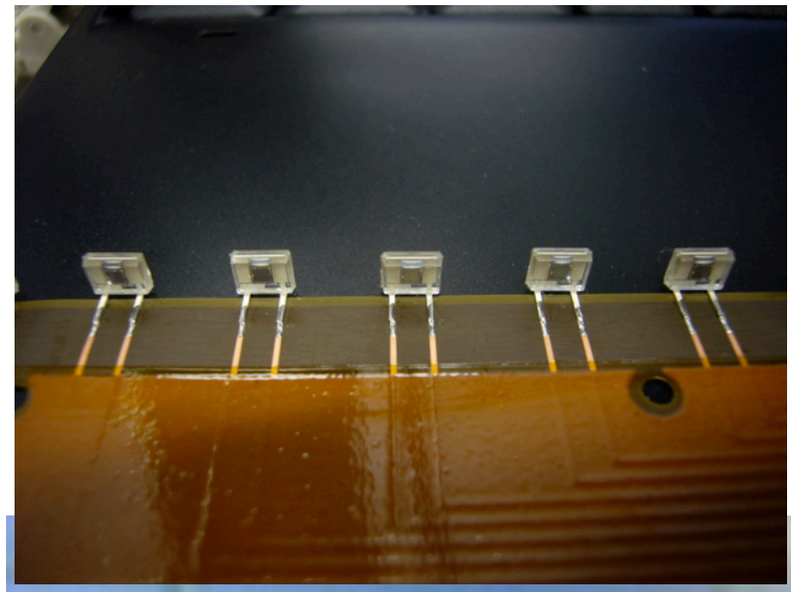
R&D

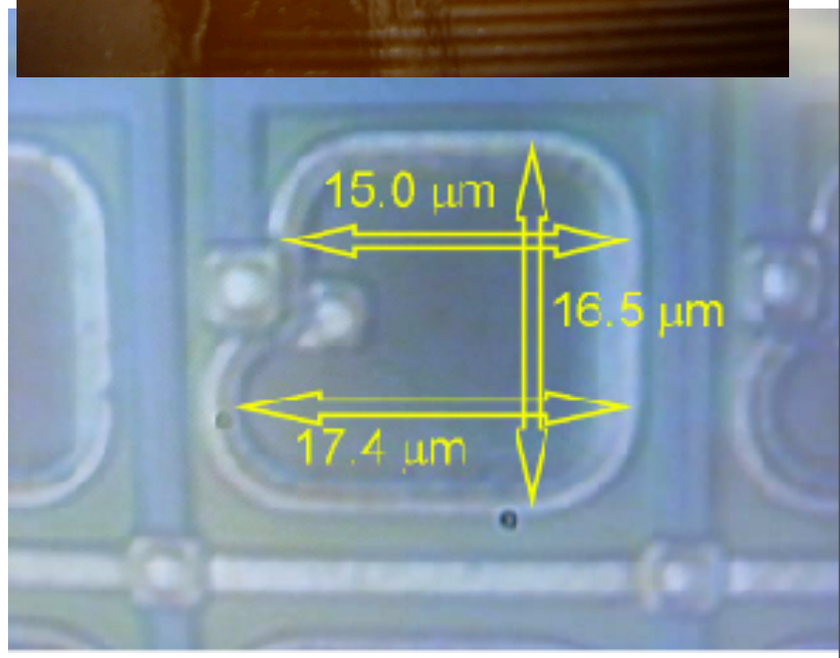
- scintillator at KNU
- mechanical precisions (Misung Chemical Co.)
  - hole size
  - hole location
  - outer dimensions
- wrapping method
- timing resolution with TDC



R&D (cont.)

- MPPC by Hamamatsu
- increase number of pixels
  - 2500 pixels in 1mm x 1mm
    - 20μm pixel size
- expand surface up to
  - 2mm x 2mm to fit scintillator
  - 10000 pix

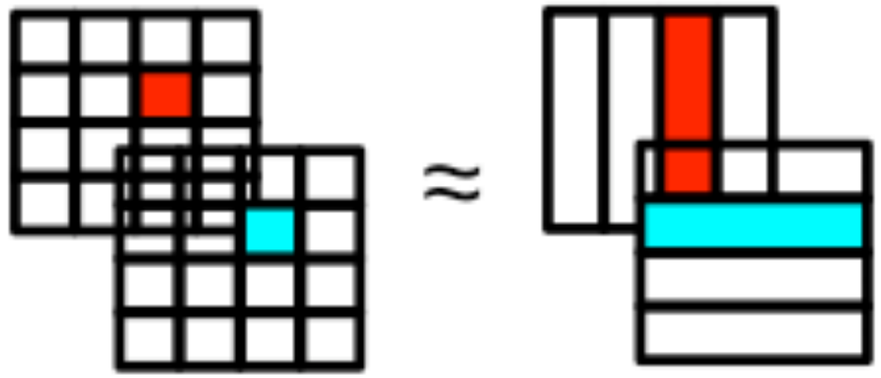


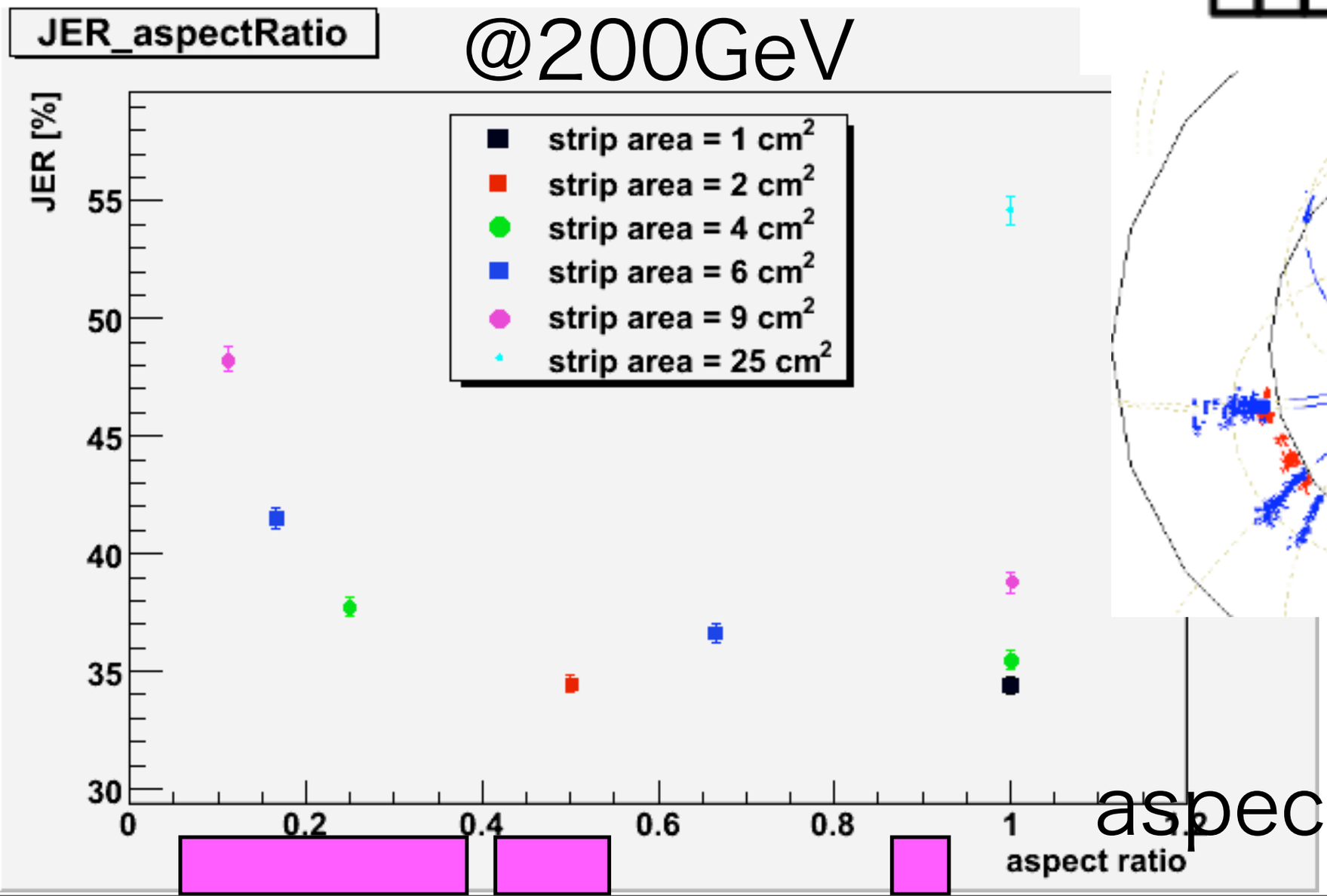


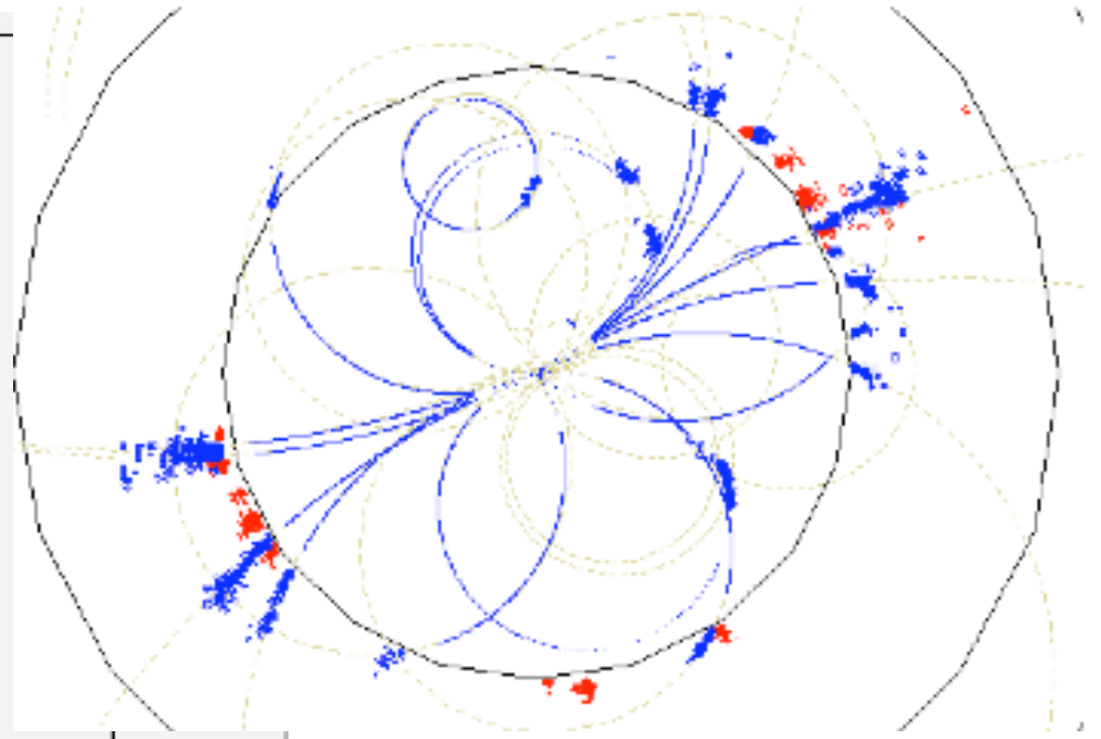
S10362-11-025U (2006.12)

physics performance

- strip clustering
- combined with PFA







aspect ratio

conclusion

- scintillator ECAL for flexible and realistic small segmentation
- prototype achievement
- need more R&D
  - scintillator (width, direct r/o)
  - MPPC(# of pix)
- communication with physics study
- modify detector according to physics performance