SCintillator ECAL Beam Test @ DESY

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May-10 2007 CALICE collaboration meeting

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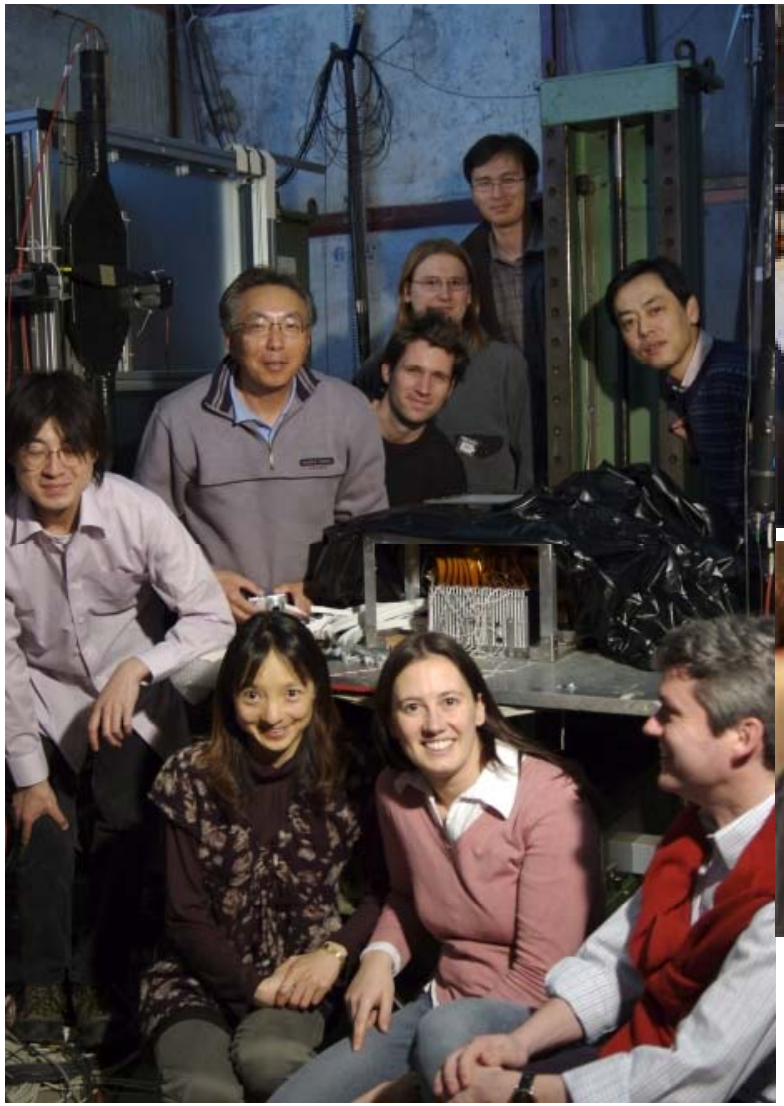
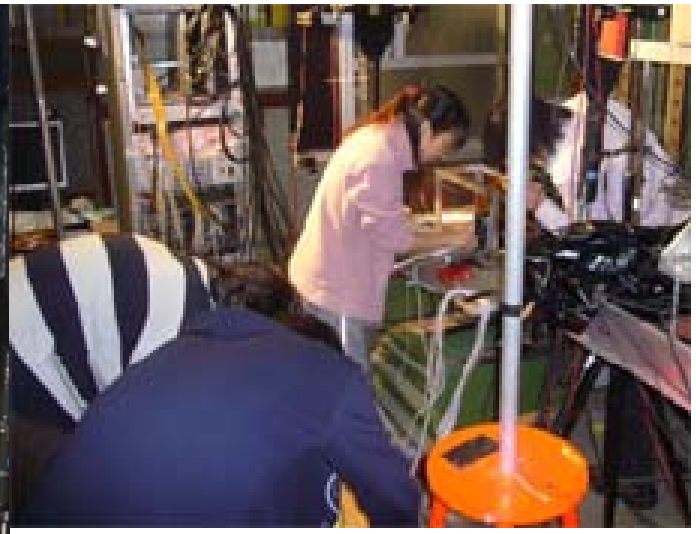
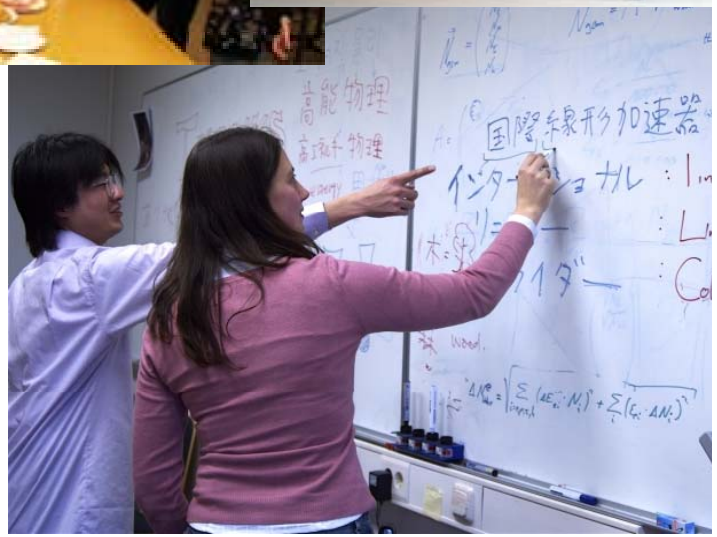
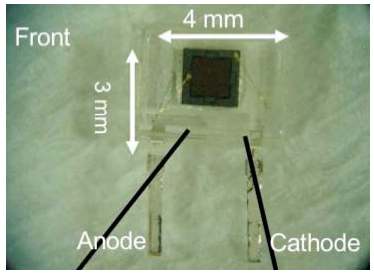


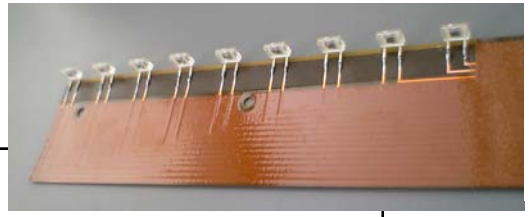


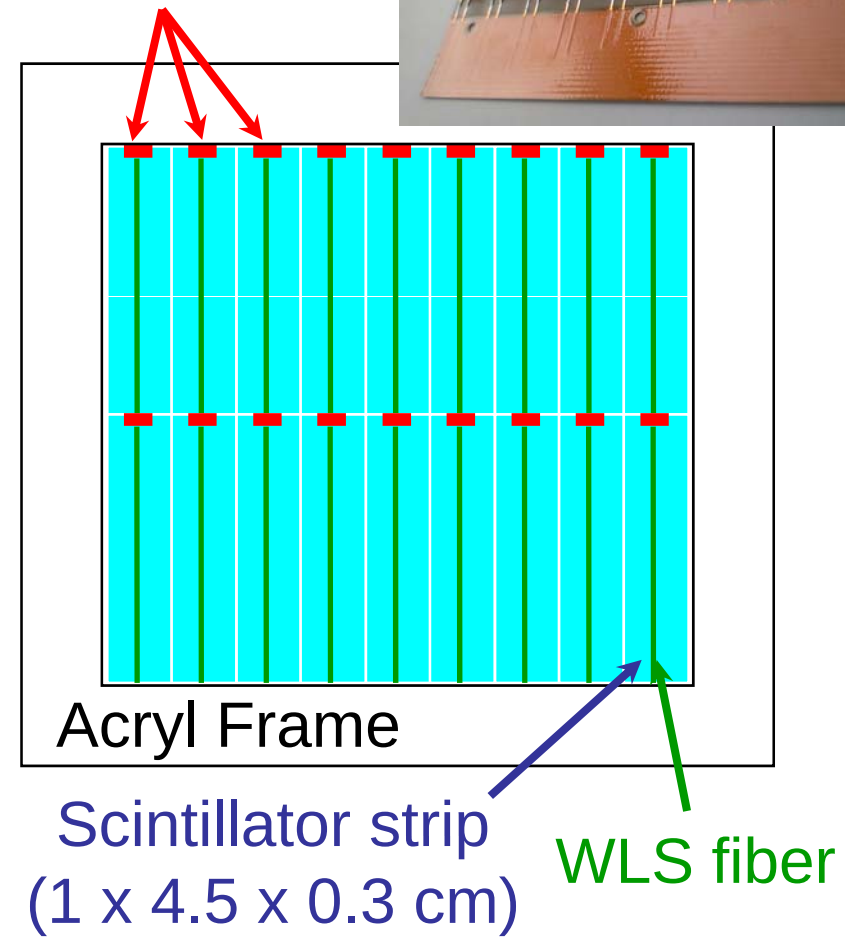


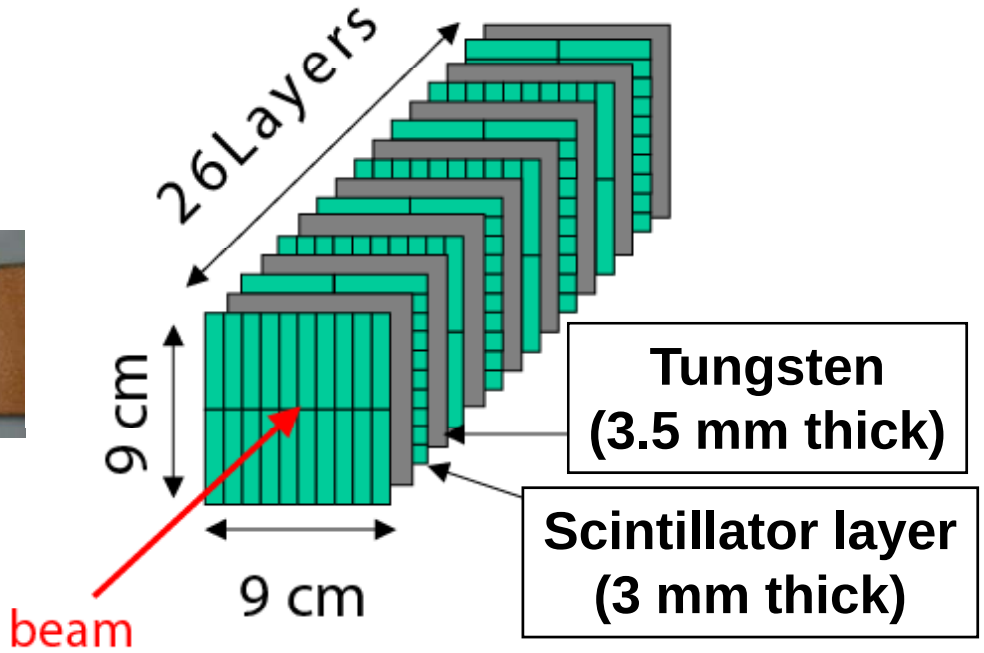
- 9 people from Japan and Korea
- Lots of great helps from DESY-CALICE people.
- We really enjoyed the beam test very much !

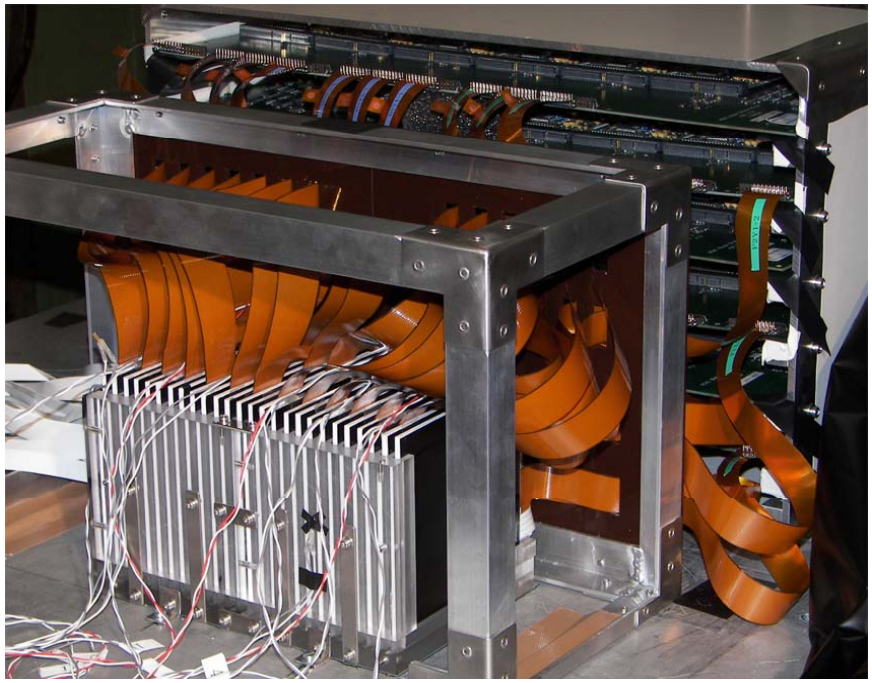
The SCECAL Test Module



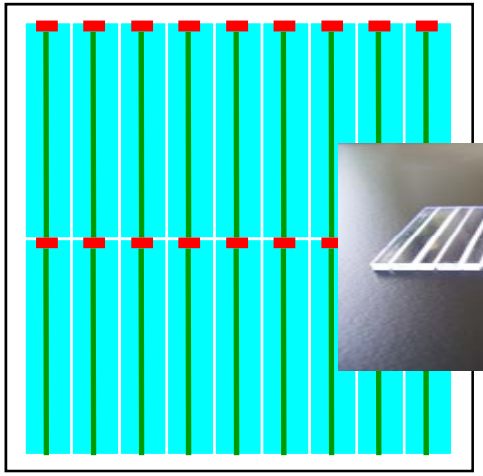






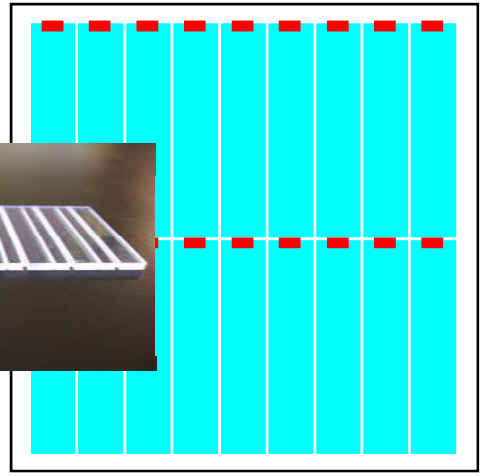


3 Types of Modules



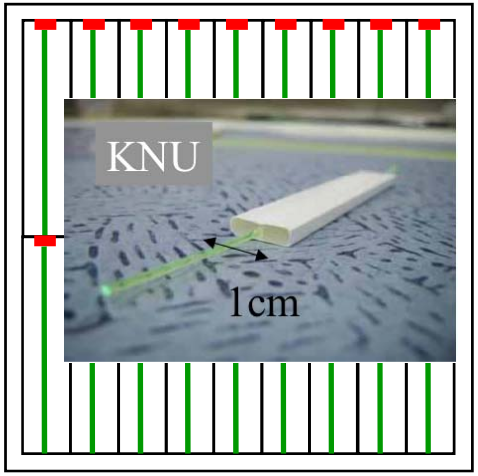
① **WLSF readout**

13 layers



② **Direct readout**

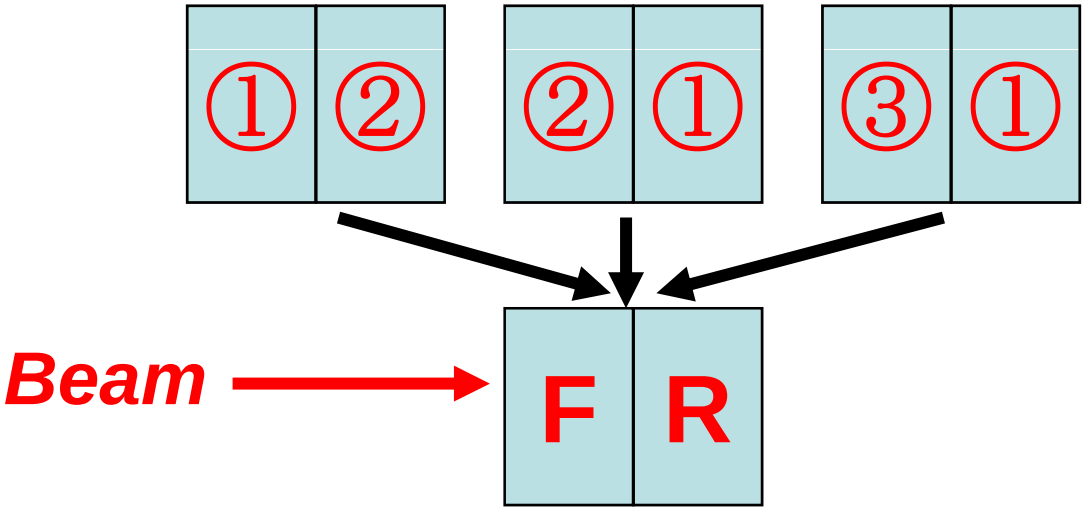
13 layers



③ **WLSF readout**

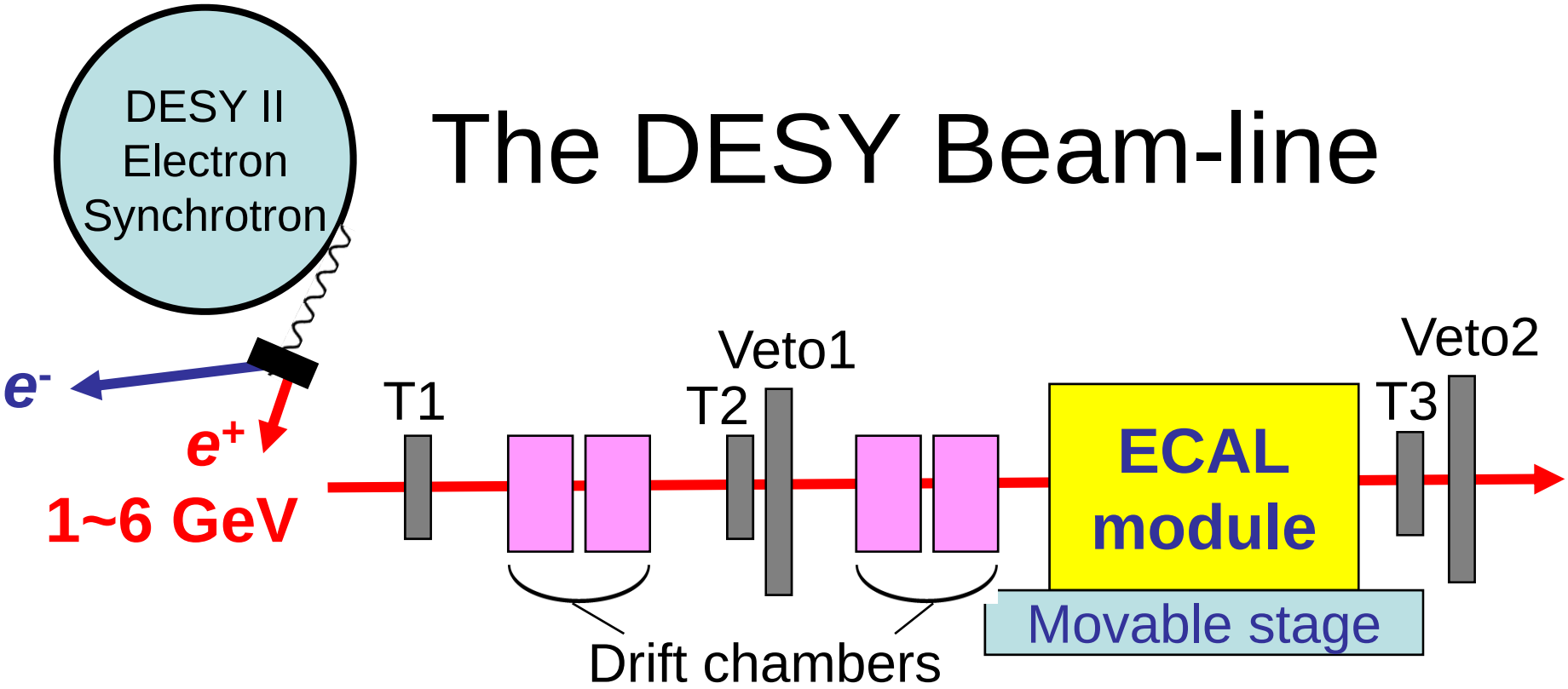
by extrusion technique

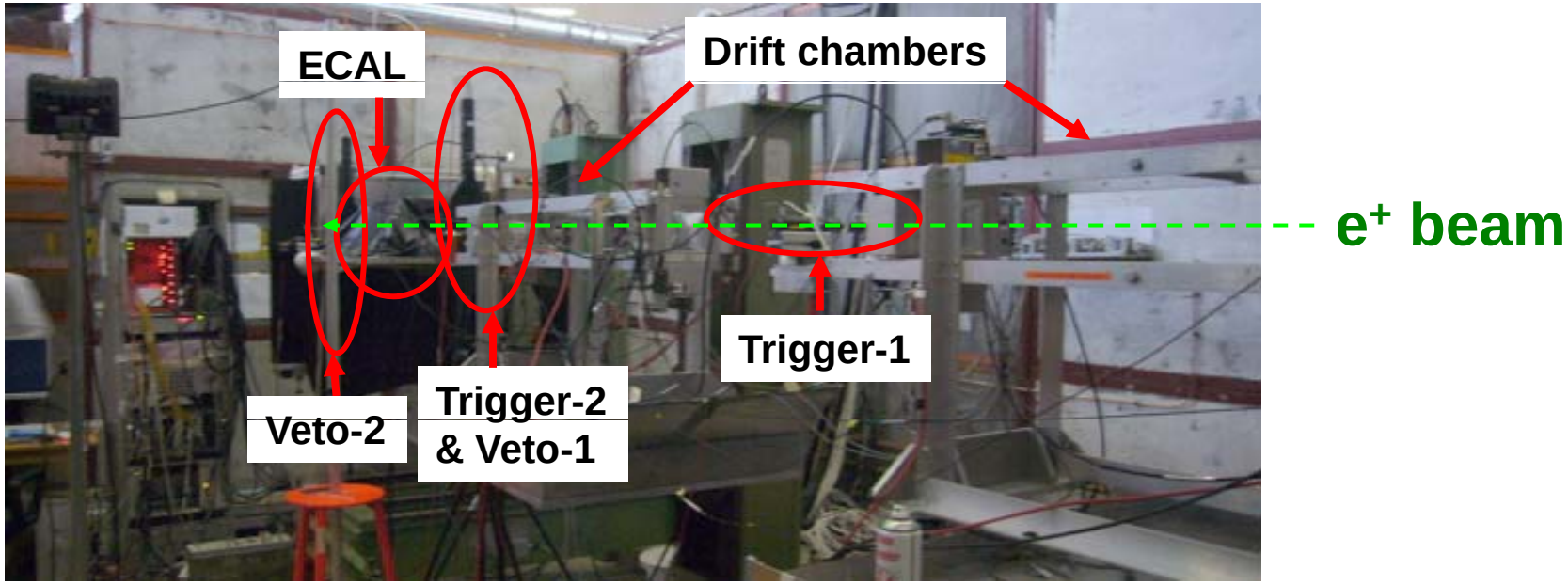
13 layers



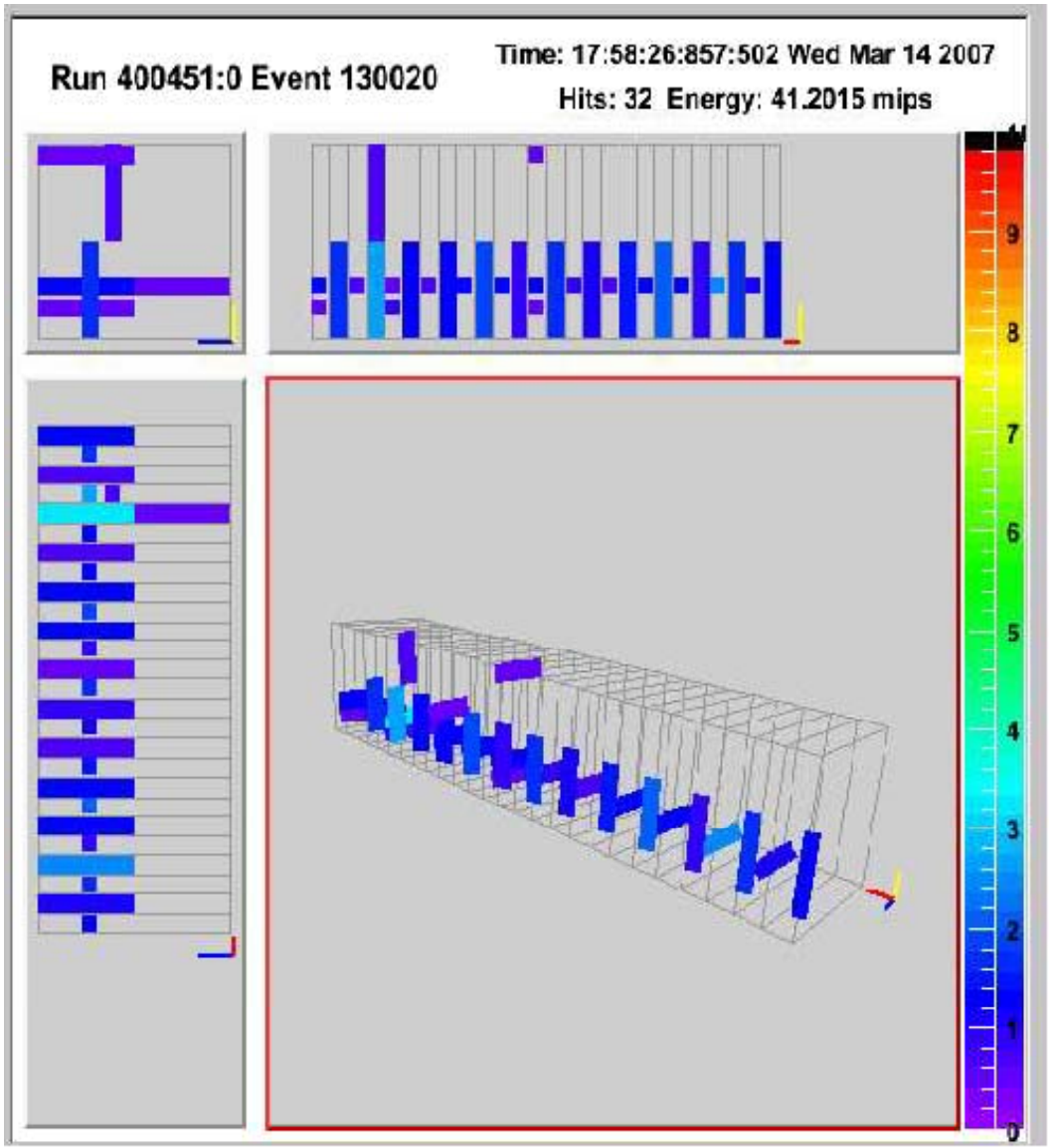
13 + 13 layers

The DESY Beam-line





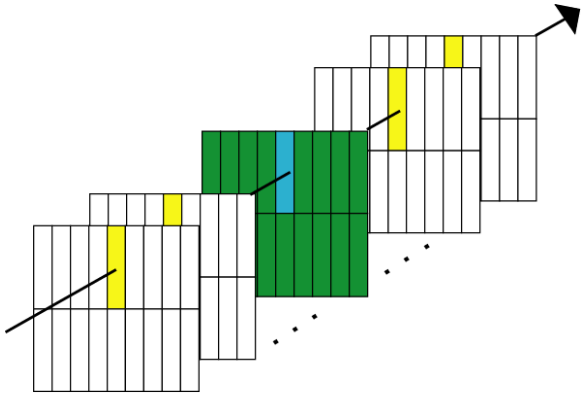
MIP Response Calibration



- Calibrate response of each strip using MIP signal.
- Positron beam events taken without tungsten.
- Center of all the strips has been scanned.

Calibration of Detector Response with MIP events

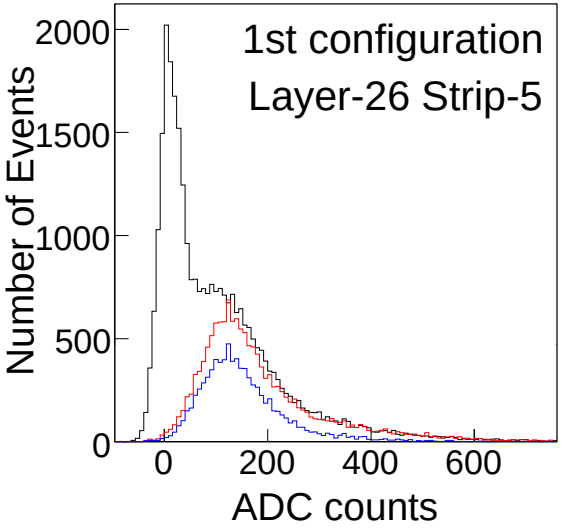
(The MIP events have been taken without tungsten plates)



Black … trigger/veto cuts

Red … Yellow strips have non-pedestal signal

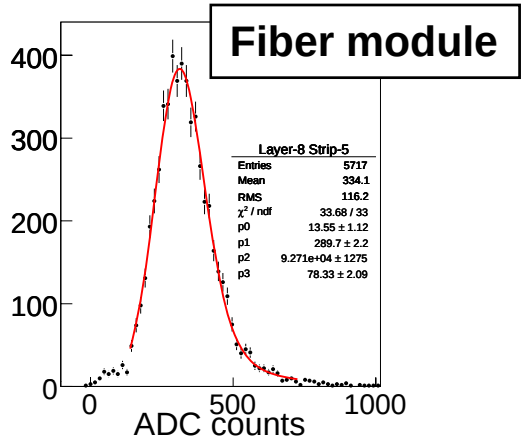
Blue … Green strips have no signal

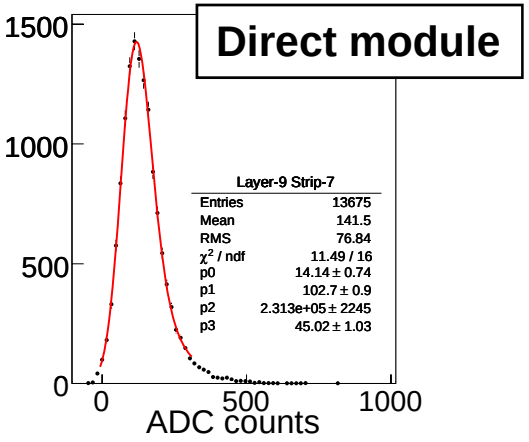


Fitting function : Gaussian convoluted Landau

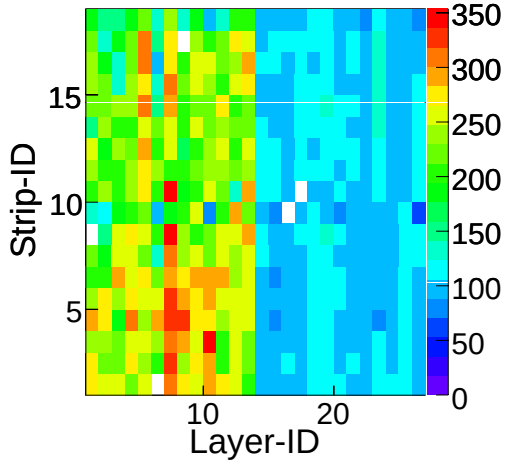
$$f(x;a,m,w,\sigma) = \int_{-\infty}^{\infty} \mathrm{Landau}(x-y;a,m,w)\ \mathrm{Gauss}(y;\sigma)\ dy$$

Mean value of Landau distribution is used as calib. constant.

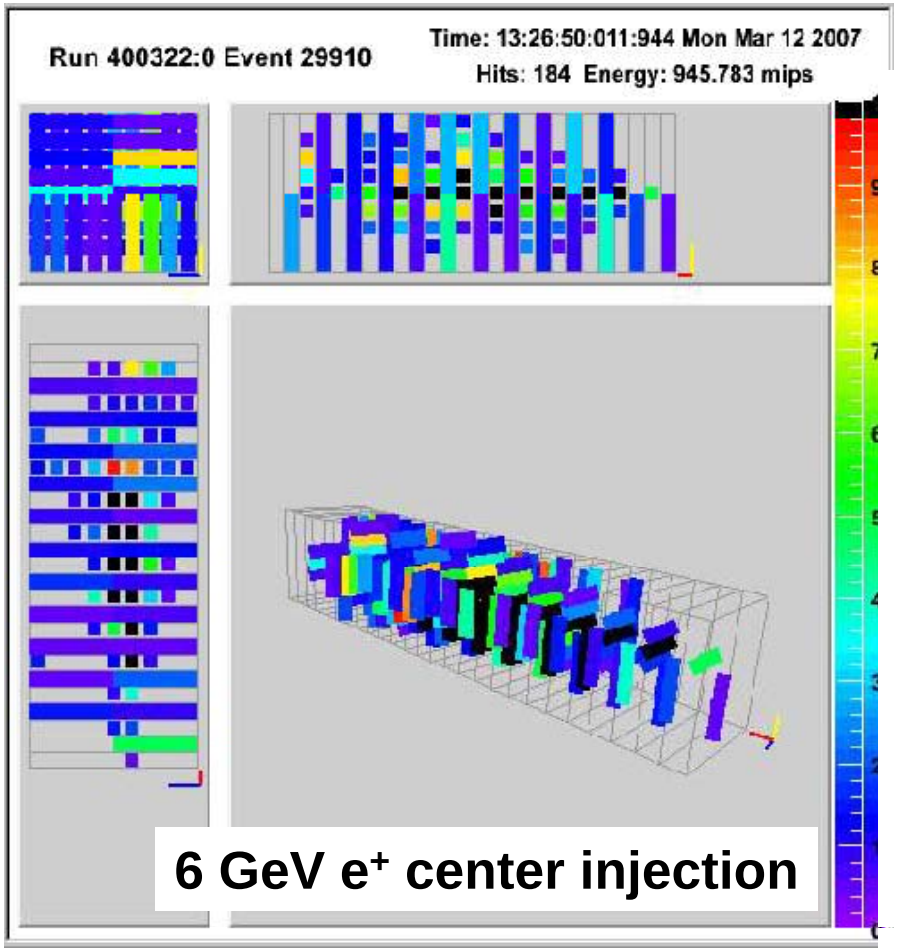


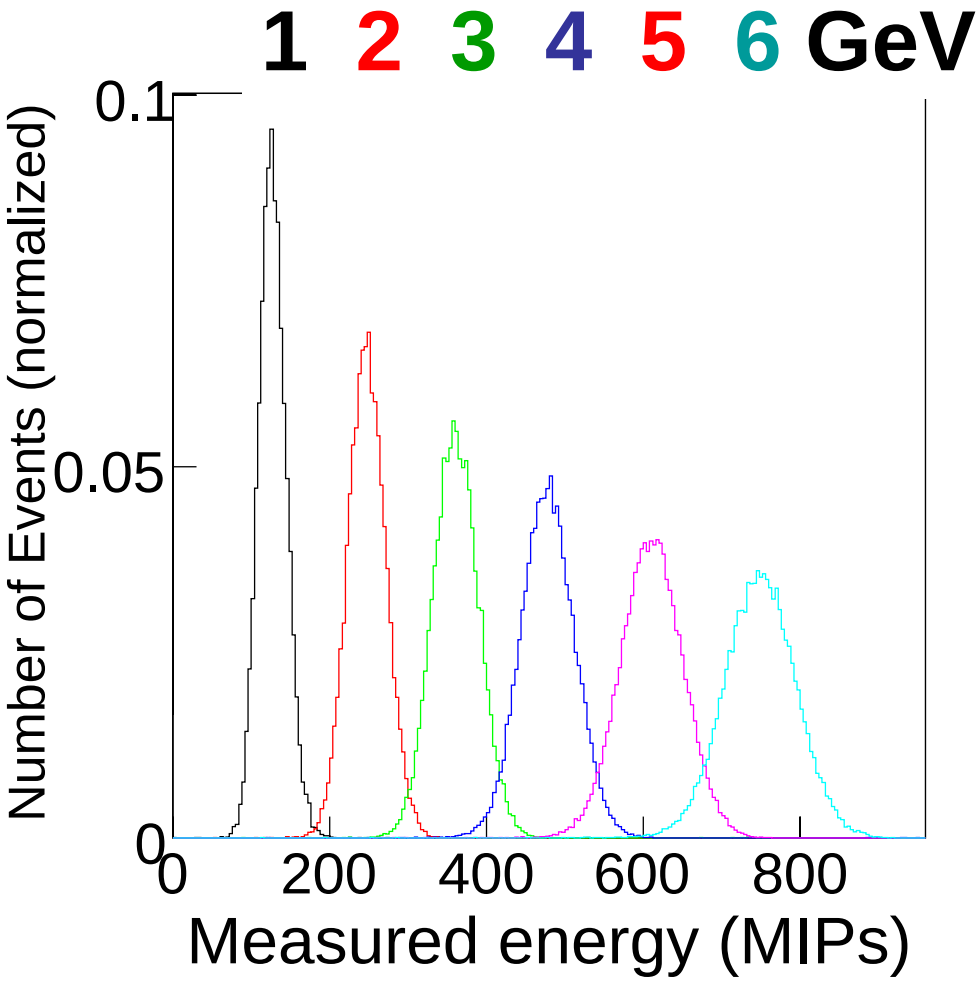


Calibration constants With fiber+direct Module combination :

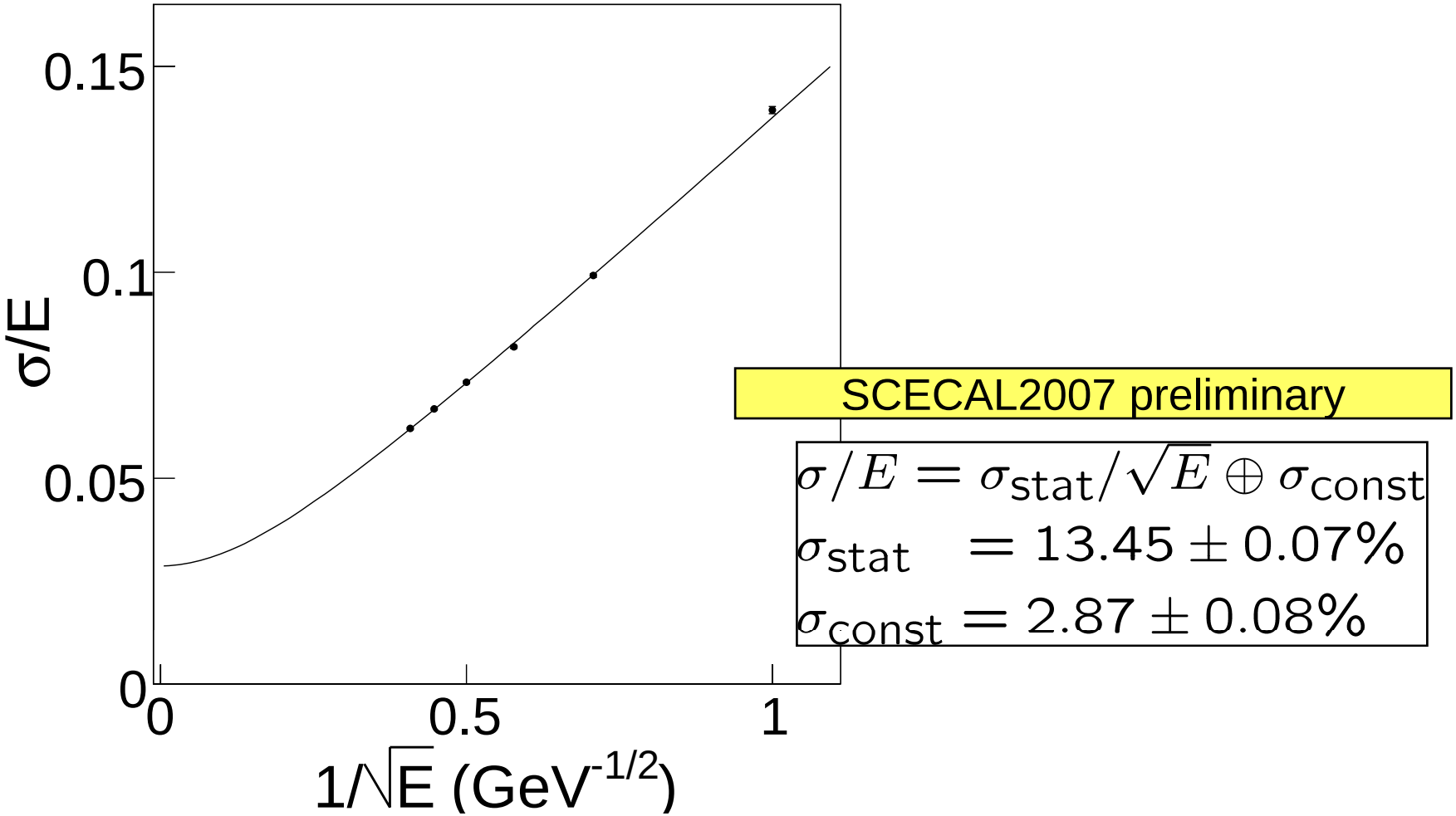


Electromagnetic Shower events



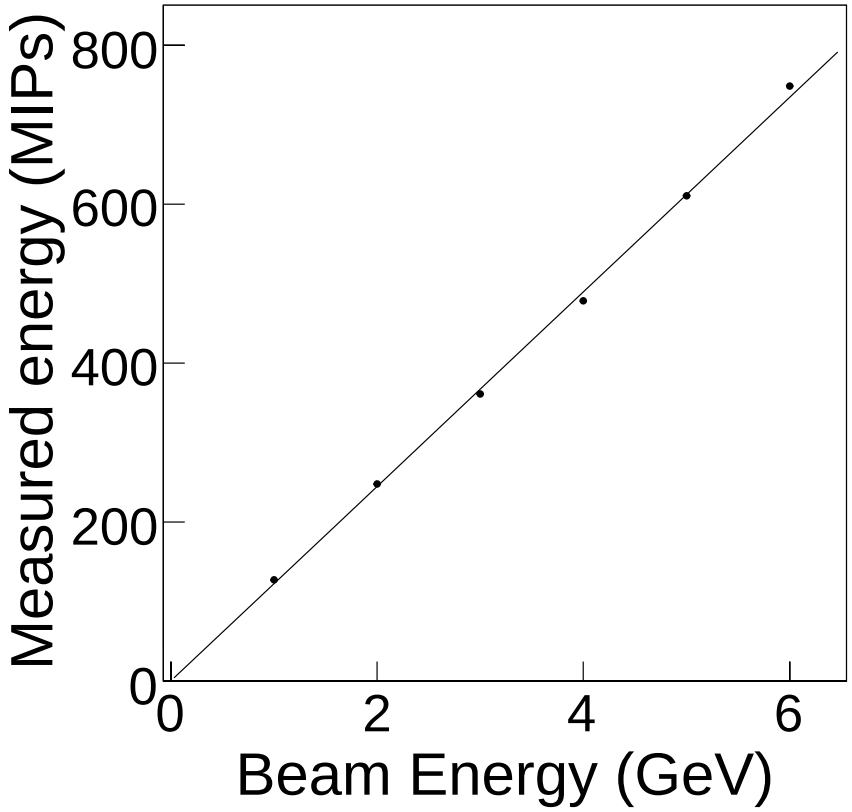


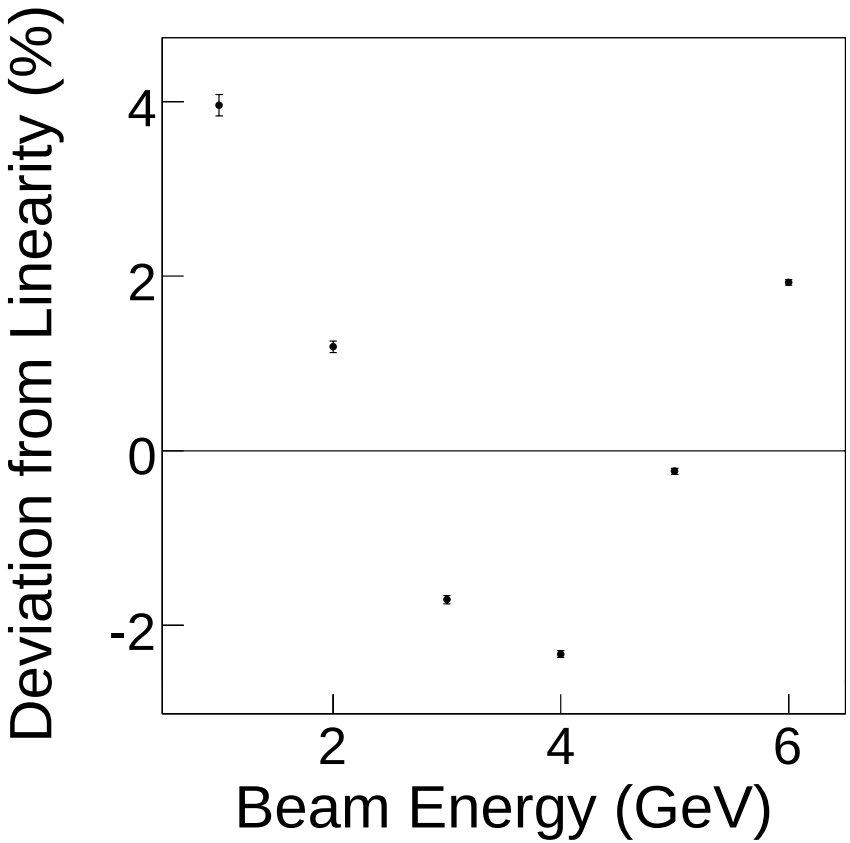
Energy Resolution, Linearity (fiber+direct module)



- σ_{stat} is larger than expected (12~13% predicted by simulation).
- σ_{const} is not small … effect of non-uniformity of strip response ? or some other reasons ?

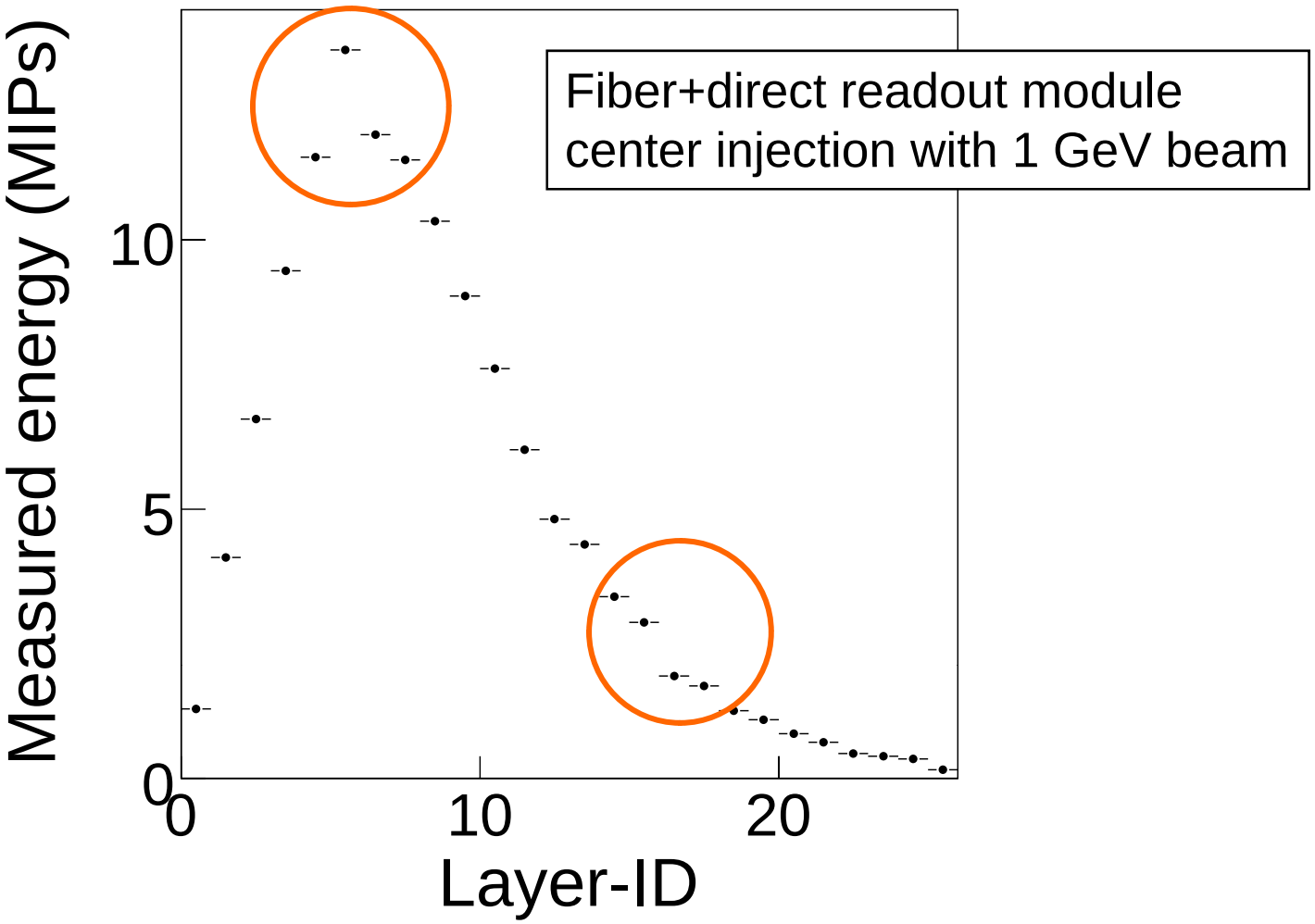
Linearity





- Linearity is not bad, even without correction of saturation effect of the photon sensor.
- However a systematic shift from linearity has been observed.
- Reason not yet know. Investigating…

Longitudinal Shower Shape



- Some bumps observed on the longitudinal shower shape.
- Calibration is still not good enough ? Investigating…

Still a lot of things to do …

We need to …..

- correct for saturation effect of the MPPC
- correct for effect of temperature change
- analyze position dependence of s/E and linearity
- improve tracking (study drift velocity, alignment…)
- compare results with different types of modules
- study about non-zero sconst using simulation
- evaluate systematics

Summary and Plans

- The SCECAL beam test has been carried out at DESY in Feb-Mar 2007.
- We are analyzing the data, and we met some problems:
  - Resolution is worse than simulation.
  - Especially $\sigma_{\mathbf{constant}}$ is not small (2~3 %).
  - 3~4% of non-linearity is observed.
  - Bumps on the longitudinal shower curve.
- We are still at the first stage of the analysis, and we still have several things to try :
  - Correct for saturation effect of MPPC, temperature shift
  - Check stability of data
  - Check other types of modules
- Lots of good experience with this beam test data will be useful for the next beam test at Fermilab.