



Scintillator HCal Prototype

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for the Tile-Cal Group

Tile-Cal Group



Prague



LAL



DESY, Hamburg Univ.



ITEP, JINR, LPI, MEPhI



Imperial



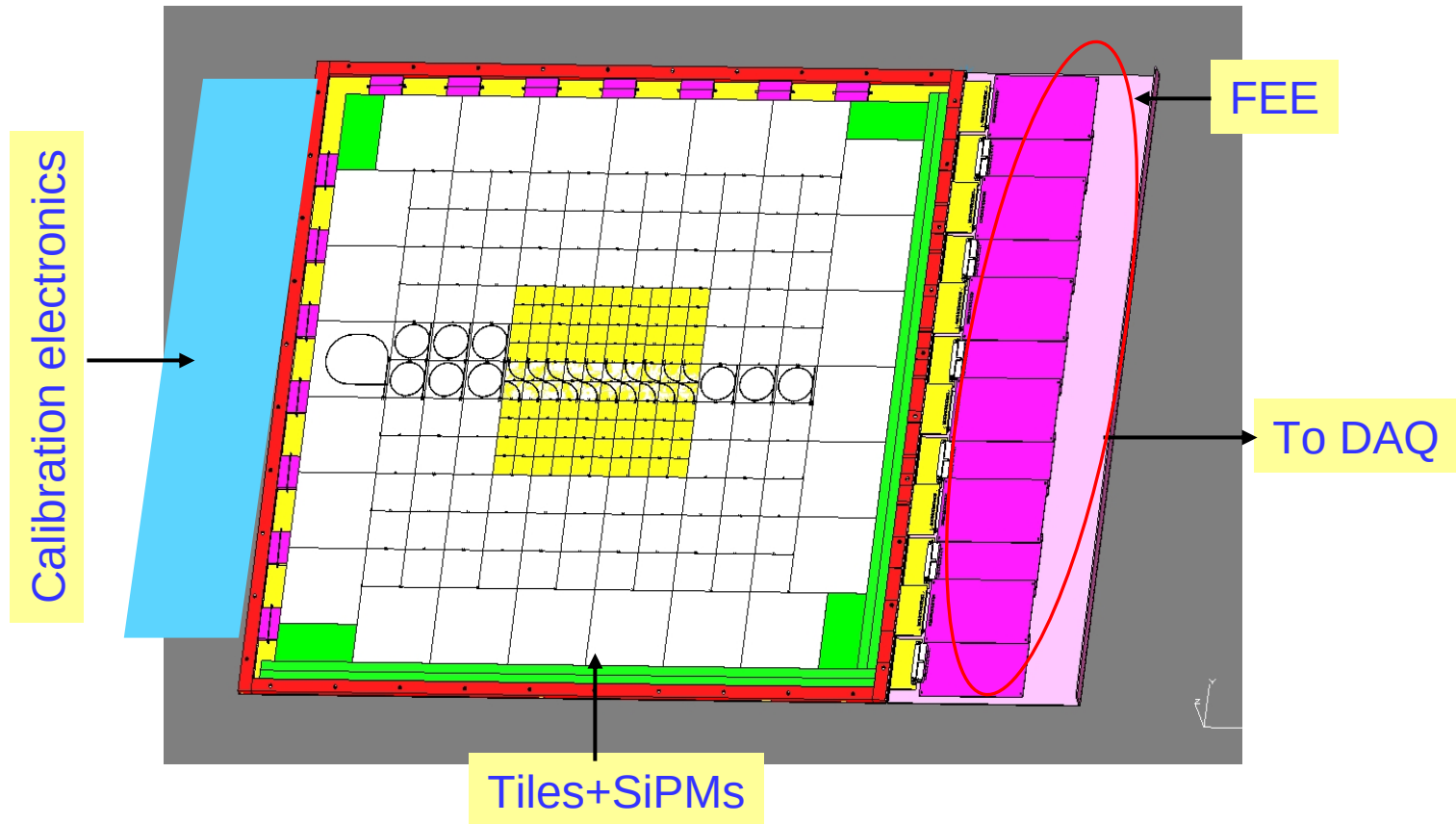
NIU

Prototype

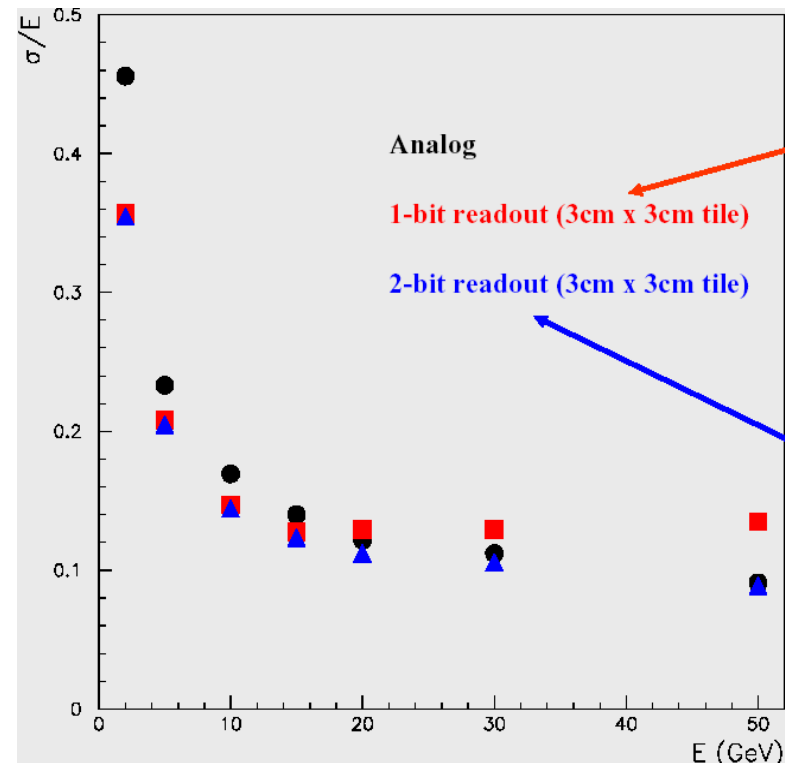
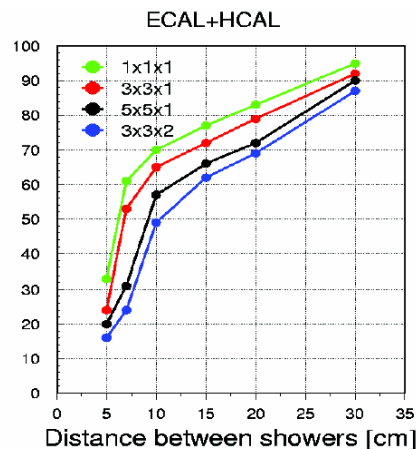
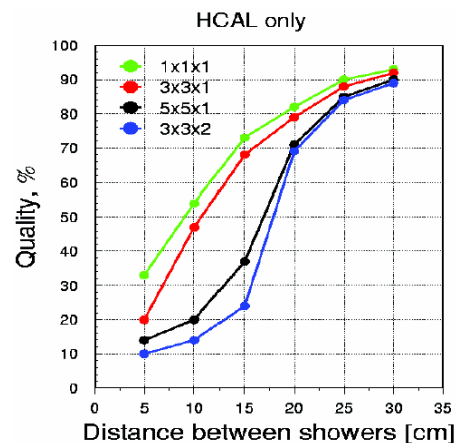
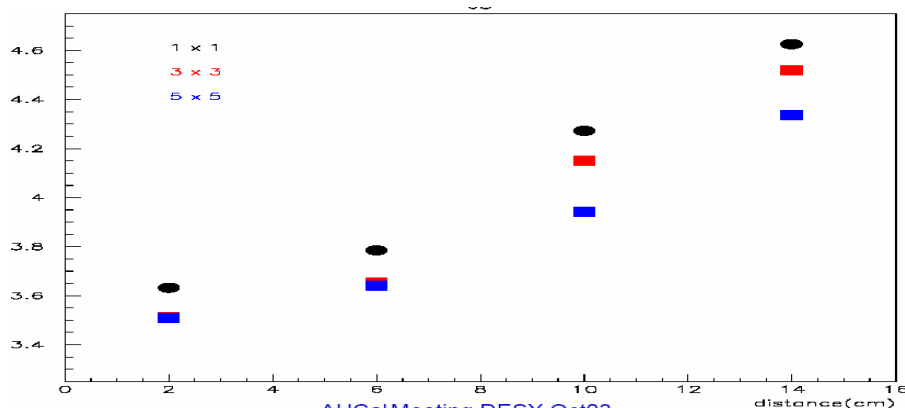
- $\sim 1\text{m}^3$ (38 layers)
- 2cm (1.6 + 0.2 + 0.2) steel absorber
- 5mm thick scintillator with WLS fiber and SiPM on-board

Aiming at technology and physics goals.....

Component schematic



Prototype Geometry Studies



Scintillator tiles



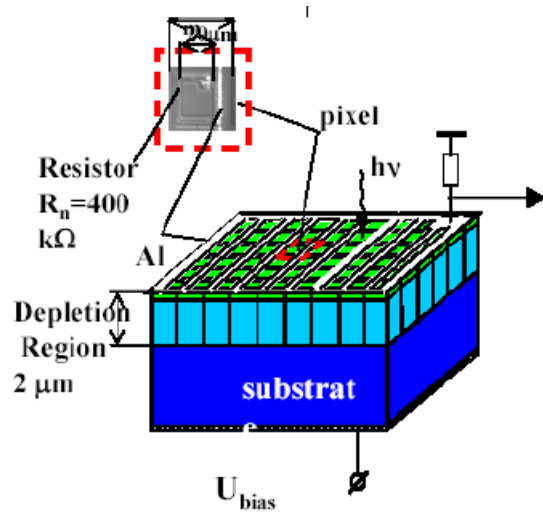
12cm x 12cm

6cm x 6cm

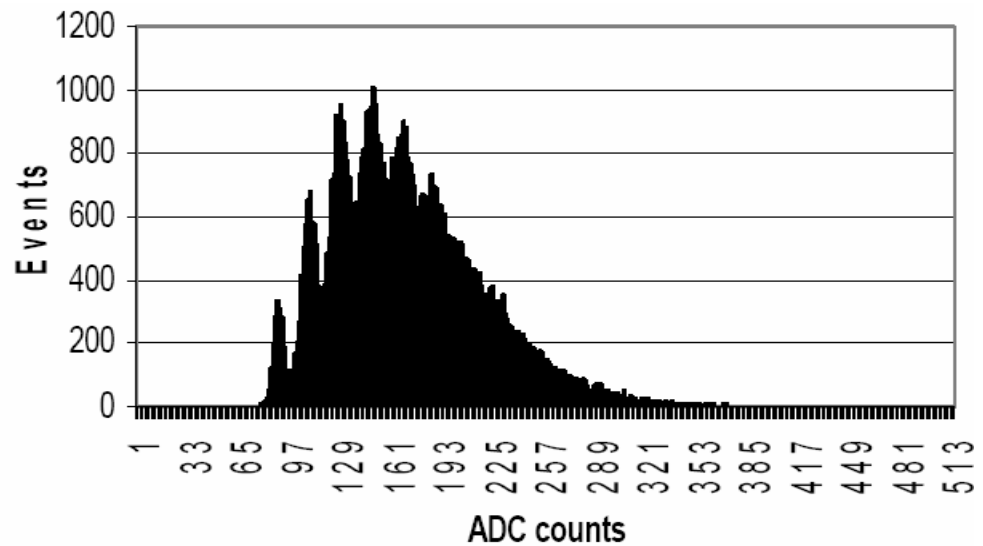
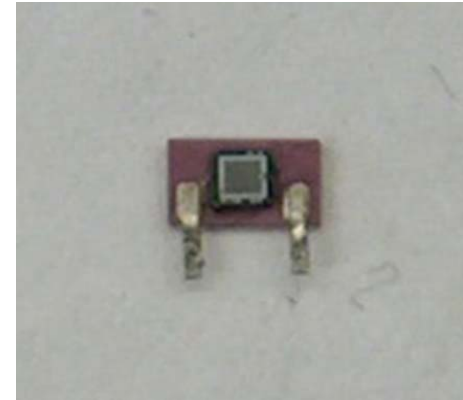
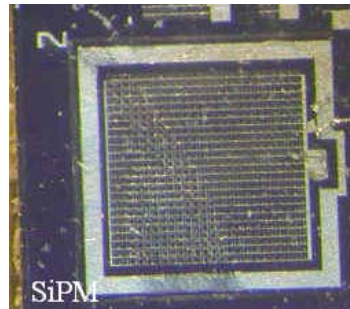
3cm x 3cm

Tile size	3x3	6x6	12 x 12
need	3500	4000	1000
molded	3500	4000	1000
milled	3500	3000	800

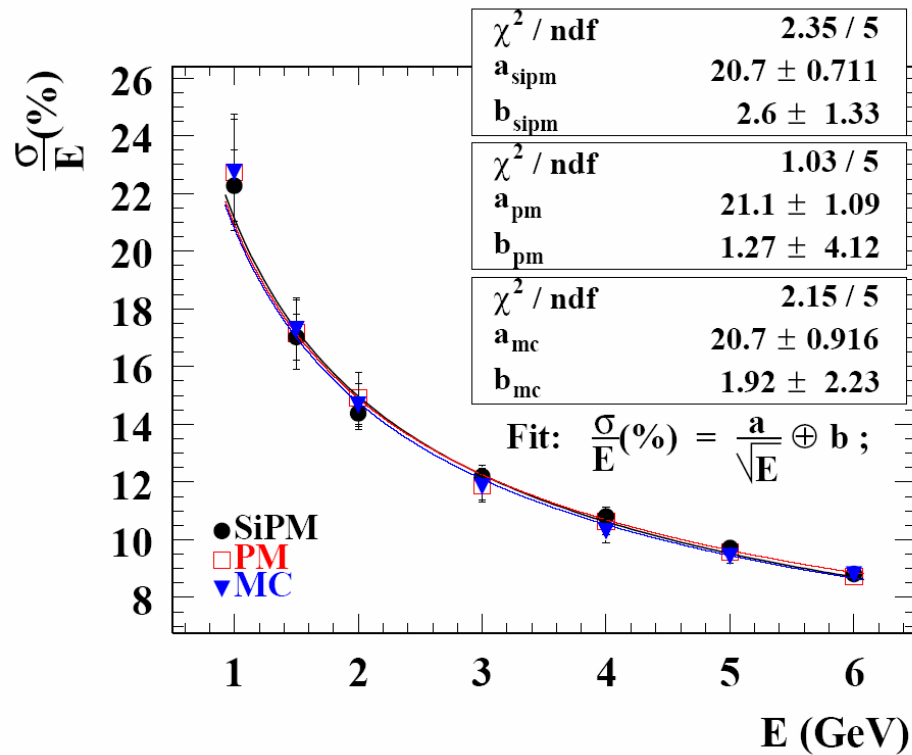
SiPM



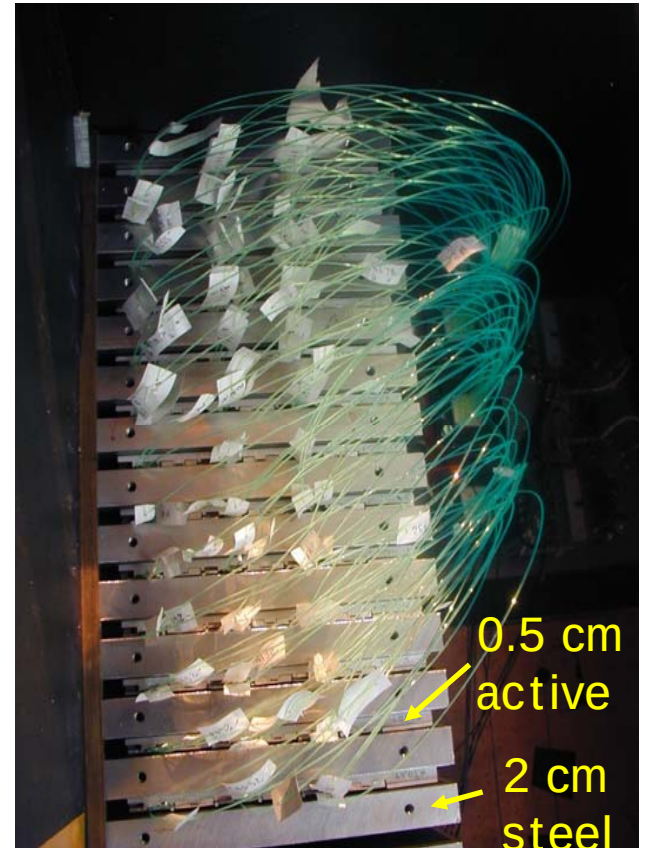
~1000 pixels on 1mm x 1mm
Bias voltage ~ 50-60V
Gain ~ 10^6
Quantum x geom ~ 12-15%



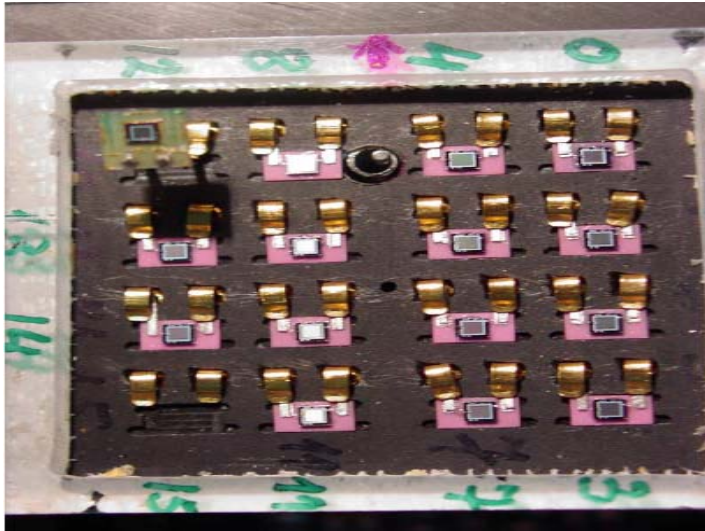
'Minical' test



Confidence in SiPM as a calorimetric device

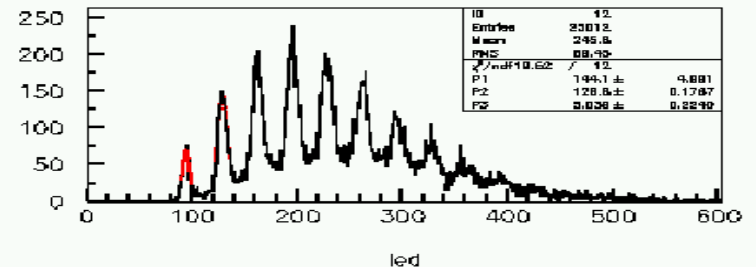
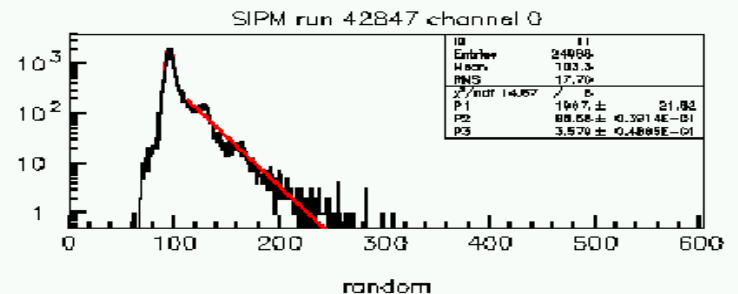


SiPM QC

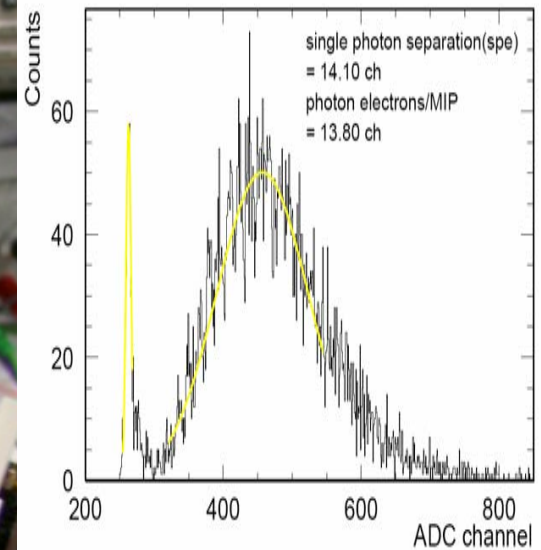


Gain, dark rate, cross-talk, saturation monitored to select SiPM's for use in HCal.

2500 in hand. Hope to have every tile instrumented by early 2006



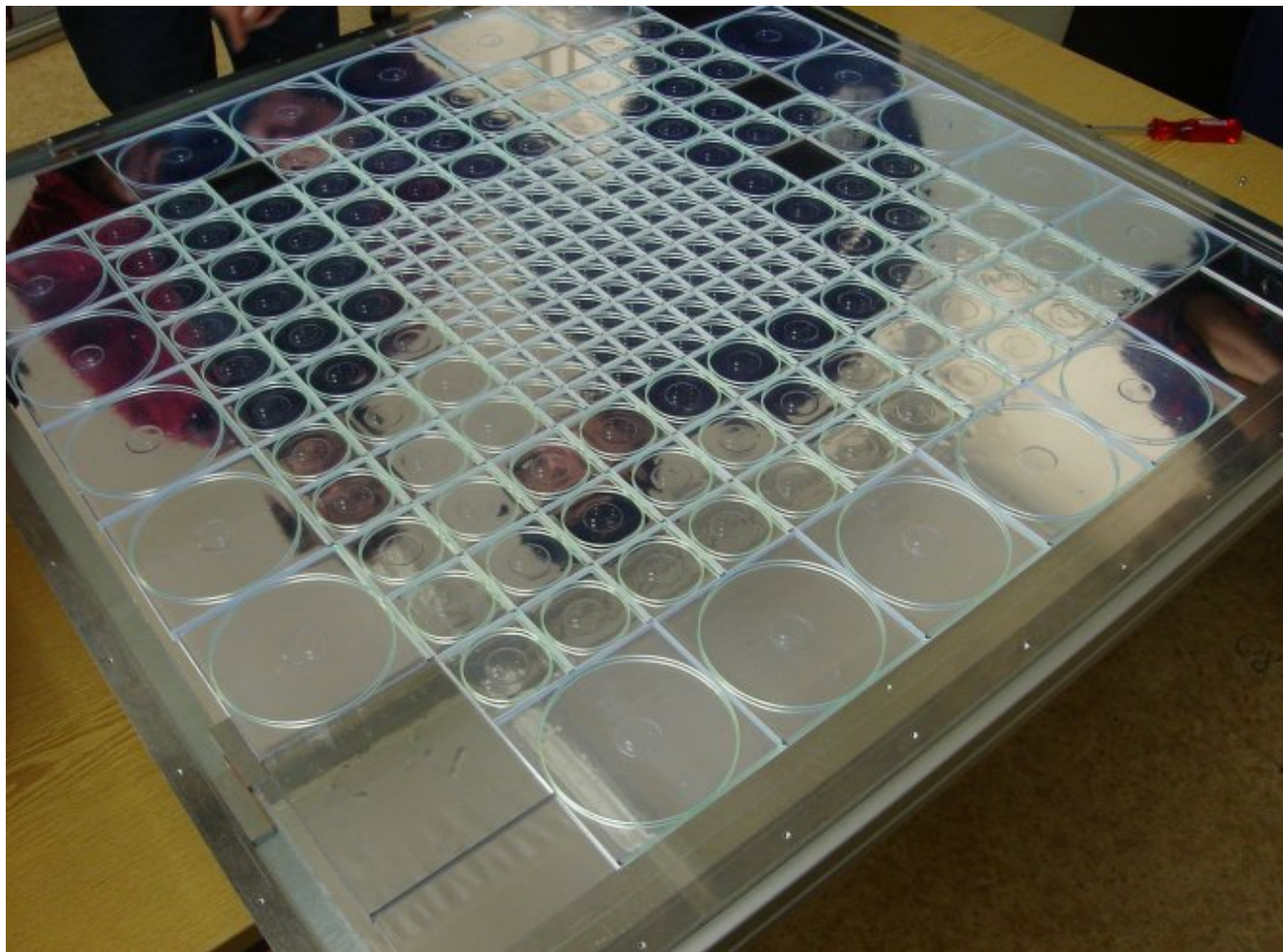
Light yield



SiPM HV set to
Obtain 14-15pe/mip

Cassette

Commissioning in the e^- TB initiated



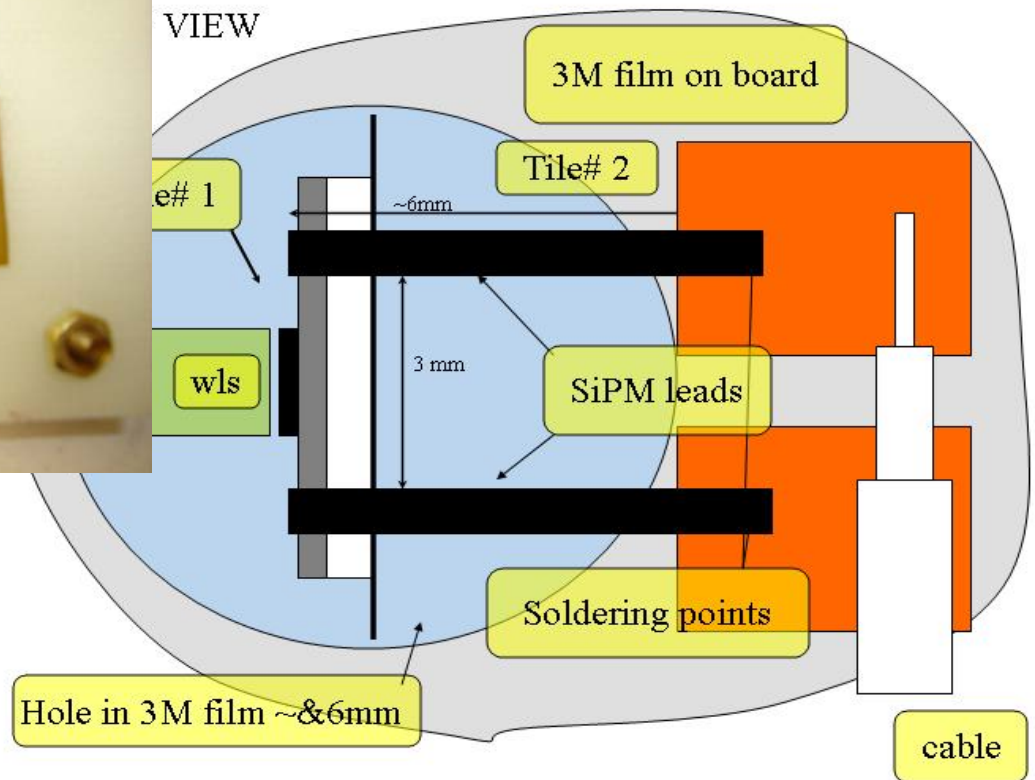
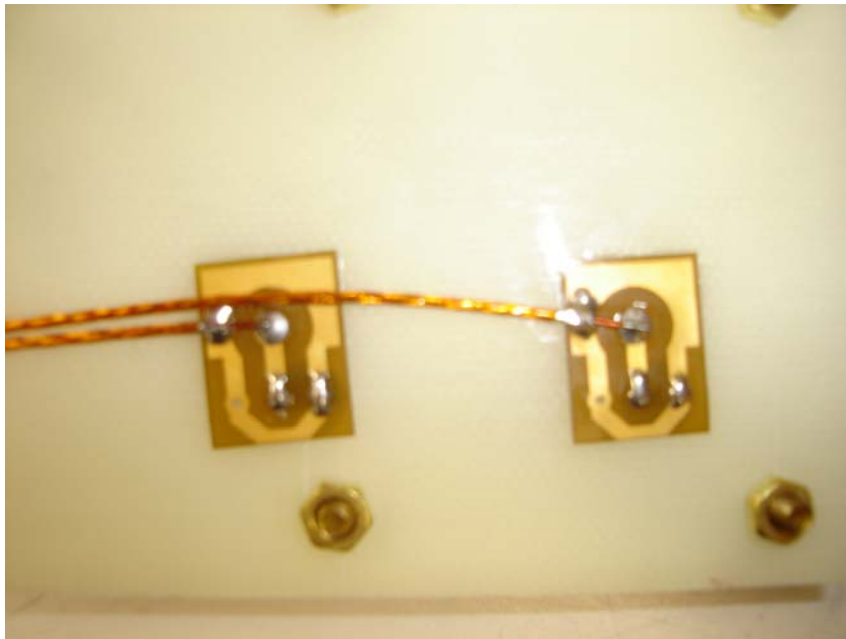
2 assembled, 4 in the works

8/28/2005

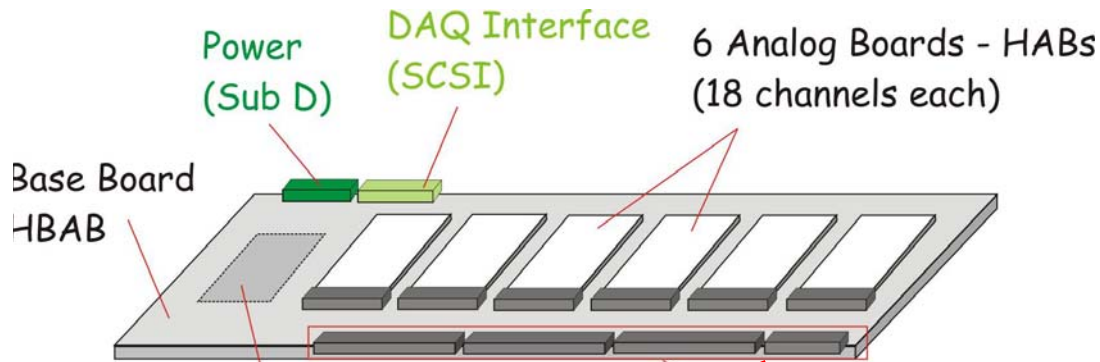
V. Zutshi, Snowmass 2005

11

Cabling



Base board

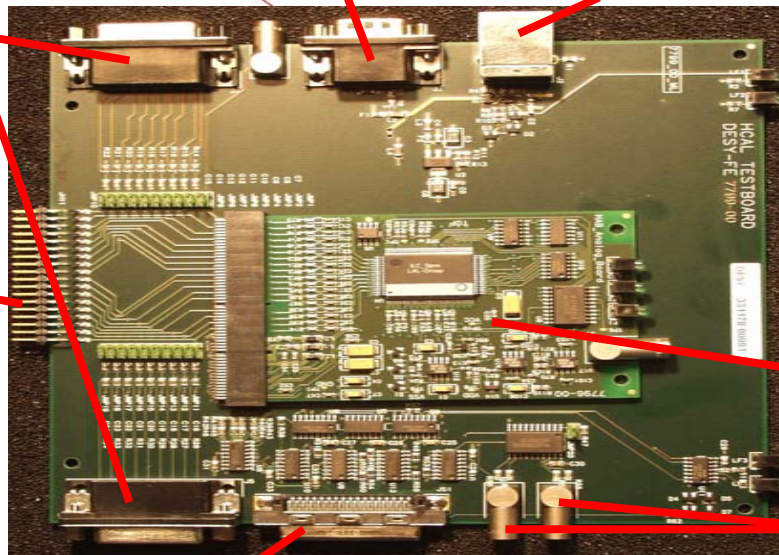


2 base boards (12 amplifier cards) / layer

Charge Injection

SiPM Interface, 18 chns.

DAQ Interface

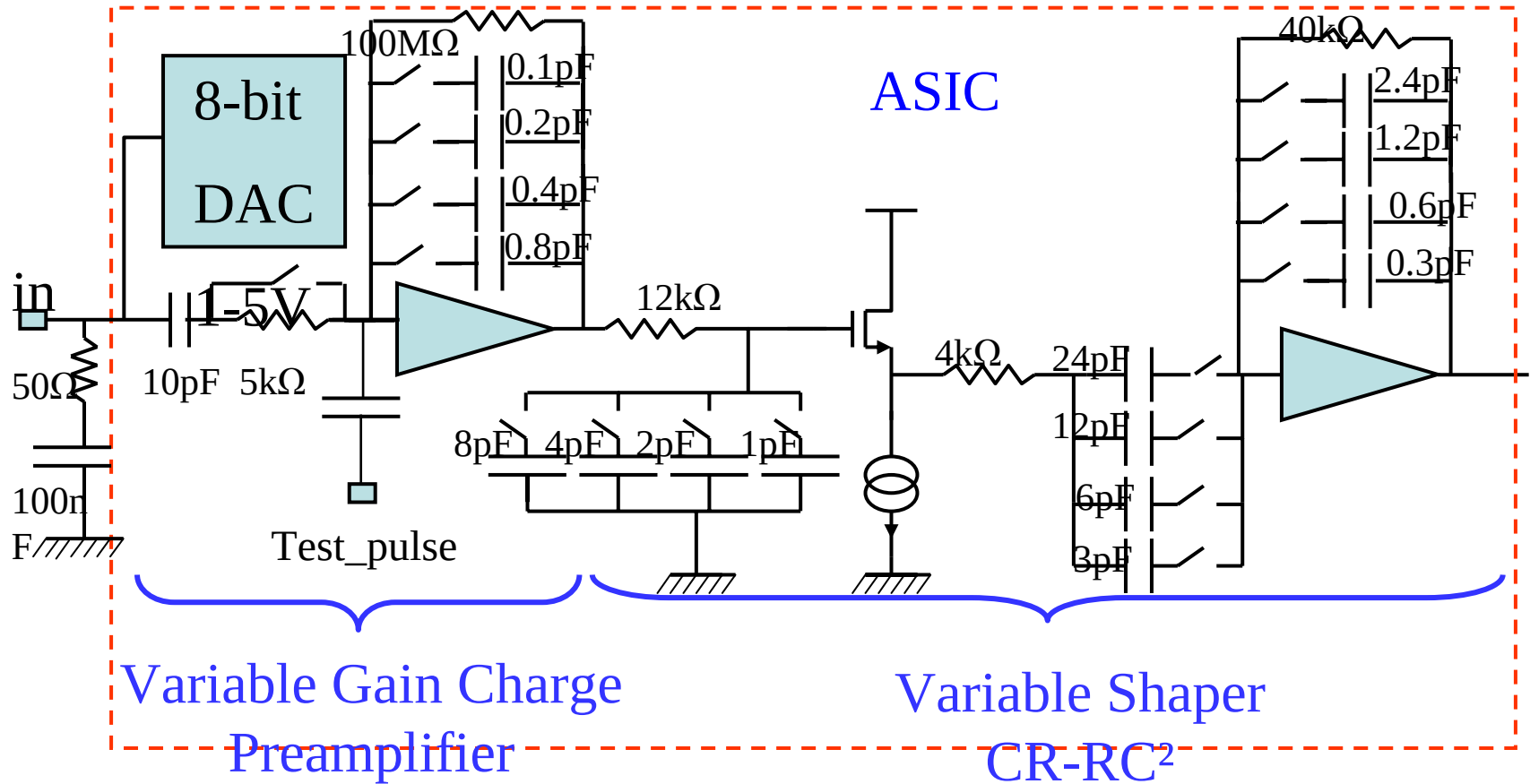


Dimensions:
16 x 16 cm²

HAB

Test Outputs
(SRIN, TCALIB)

Front-end ASIC



Amplifier Board

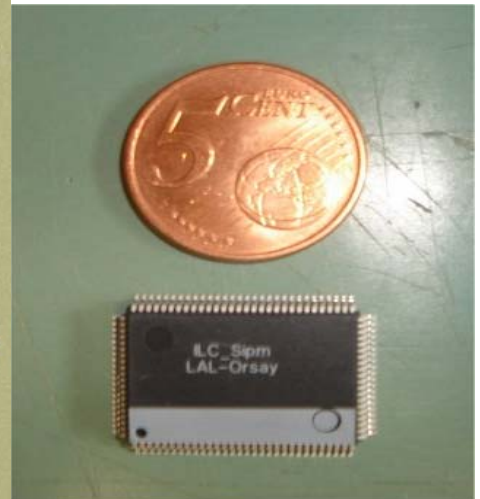
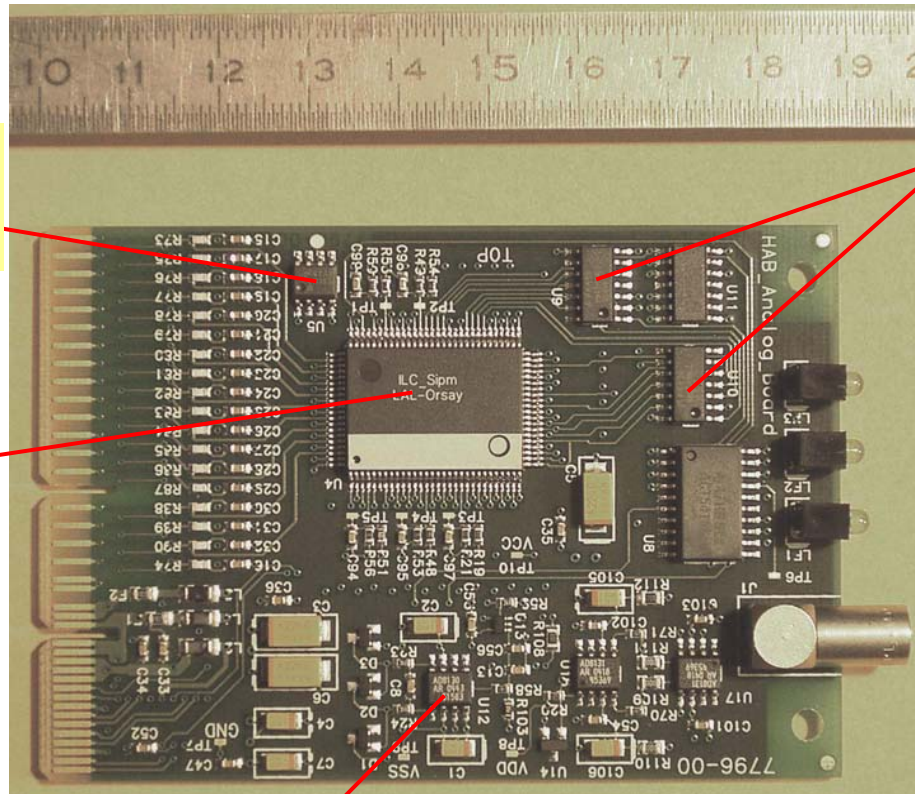
Temperature Monitor

ASIC

Parameter Shift-Reg

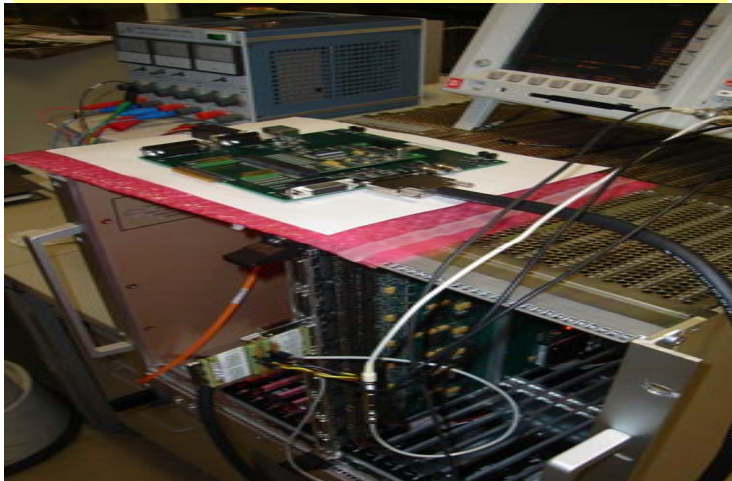
Analog Line Driver

ASIC's all tested. Boards being assembled.



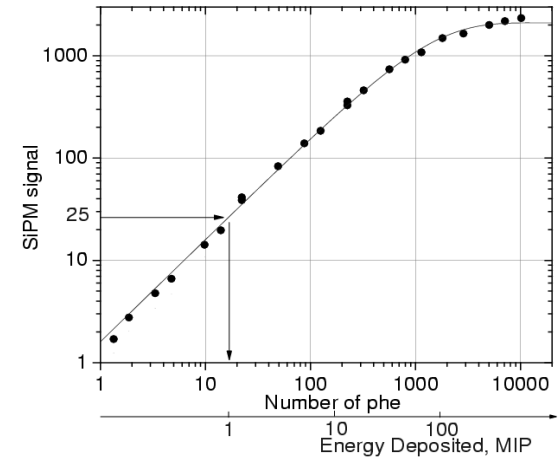
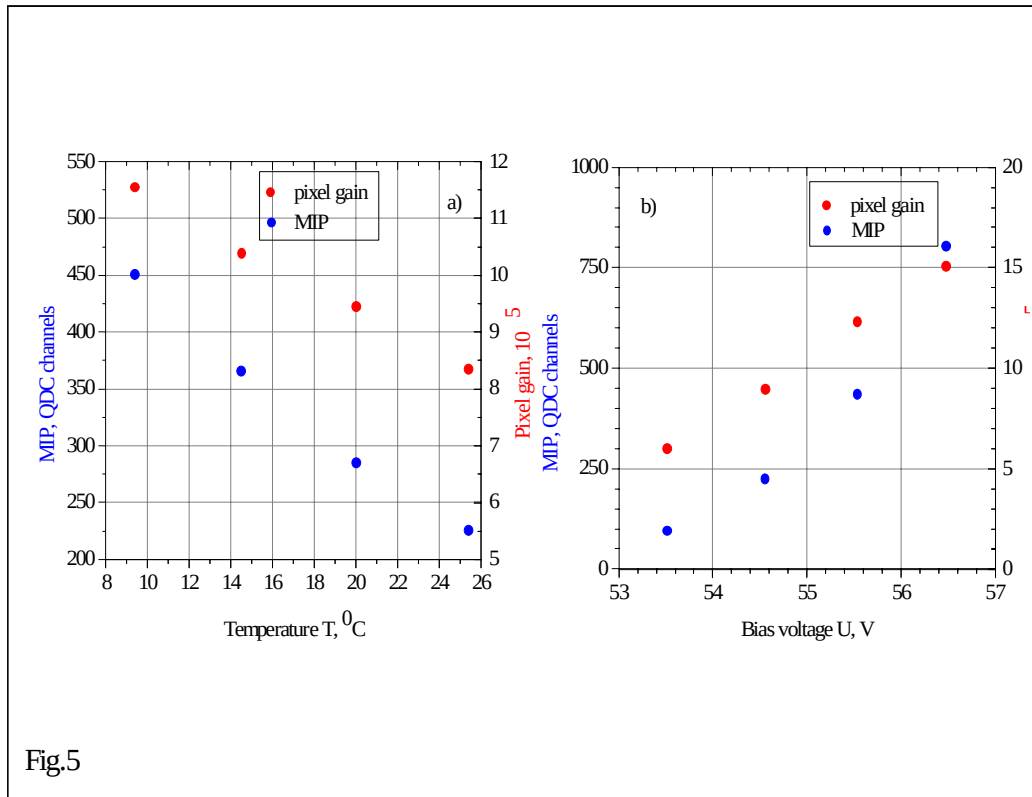
Data Acquisition

Use modified version of the
ECal (CERC) board. Similar no.
of analog channels.
8x12 (16-bit) ADC's
8Mb memory (2k events)
1 KHz peak rate
180ns trigger latency
Have been used successfully
In ECal test beam run



Become available in Nov.

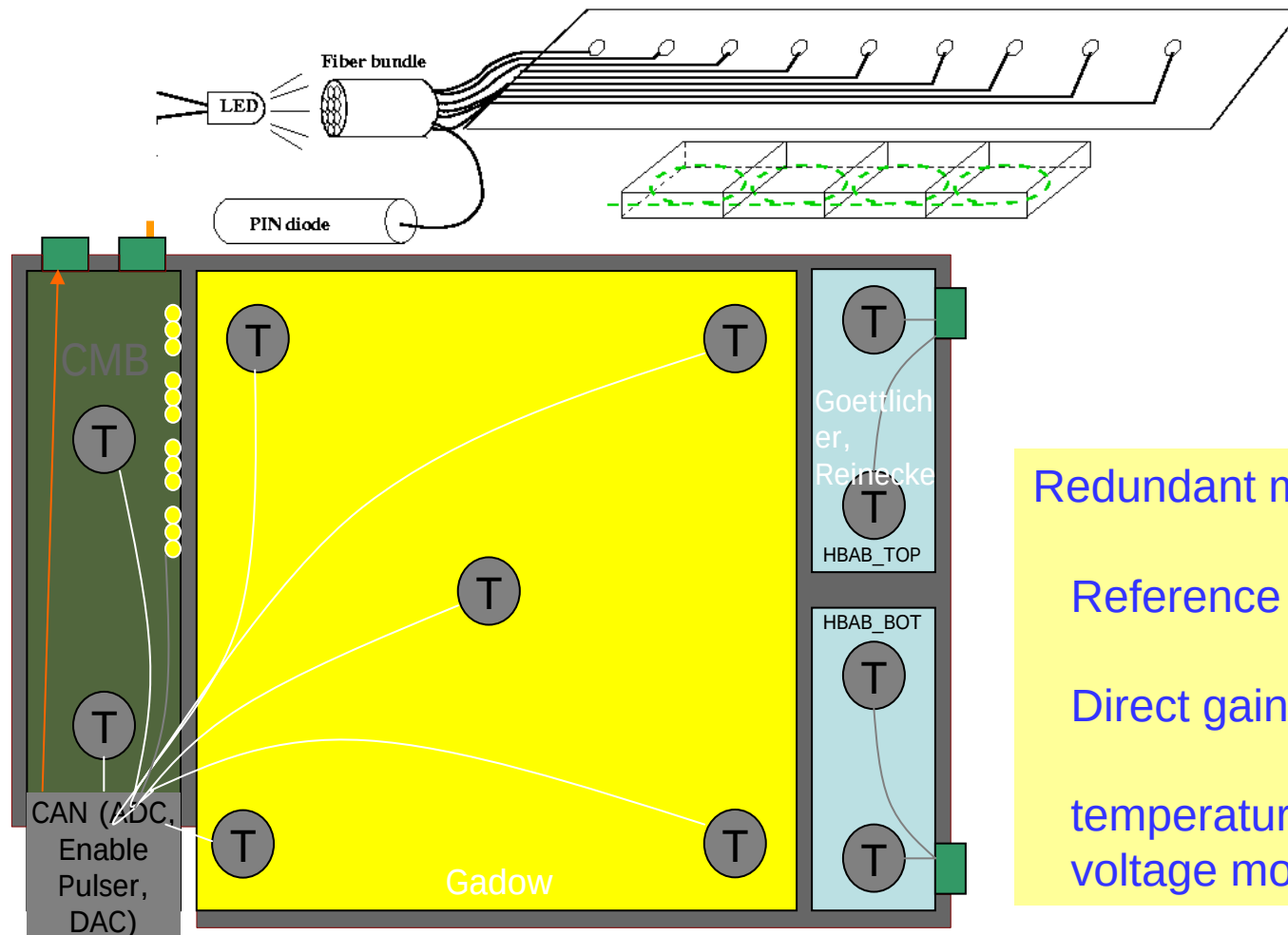
Calibration & Monitoring



Observation of single pe for non-linearity correction.
Need mip and variable Intensity LED calibration

Gain $\rightarrow 1.7\% / \text{K}, 2.5\% / 0.1\text{V}$
Signal Amplitude $\rightarrow 4.5\% / \text{K}, 7\% / 0.1\text{V}$

Monitoring



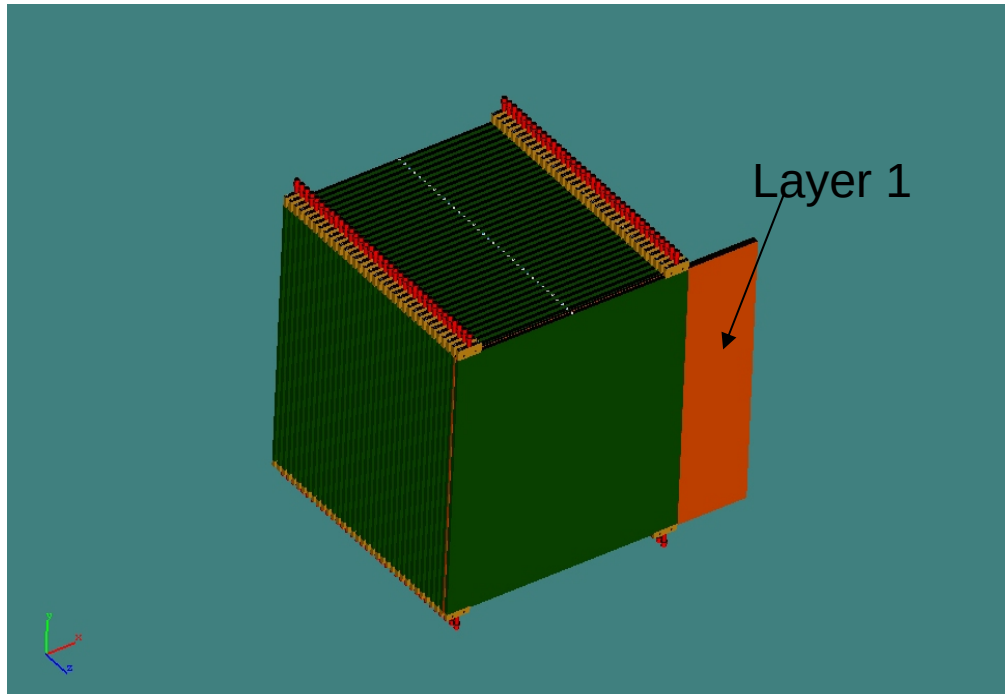
Redundant monitoring:

Reference LED pulse

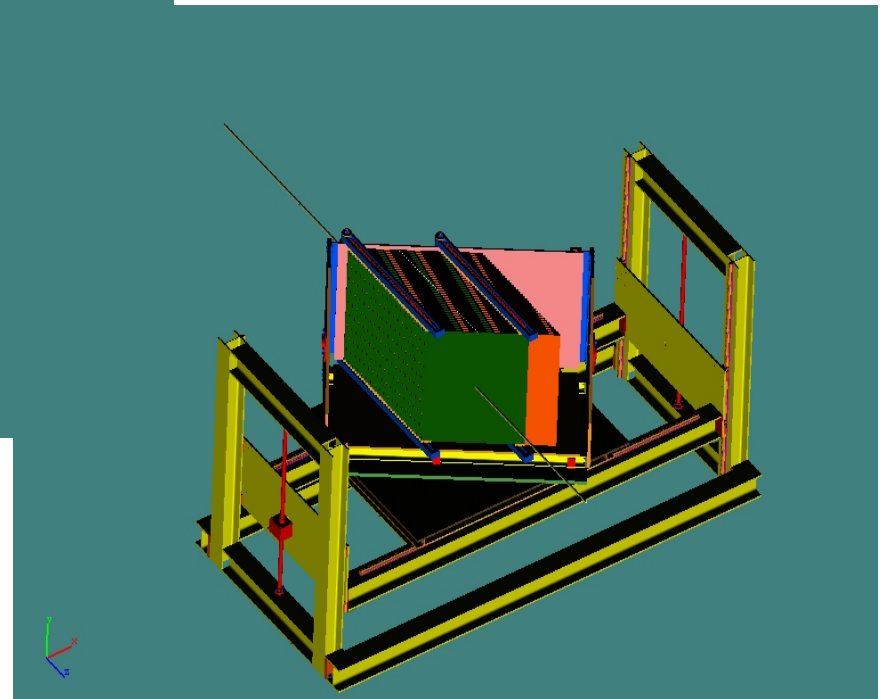
Direct gain monitoring

temperature and
voltage monitoring

Absorber stack and table



Construction of moveable
table in spring 2006



Will be used for all CALICE
HCal options.

Summary

