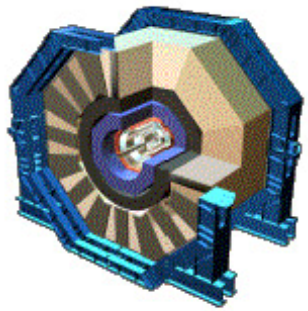
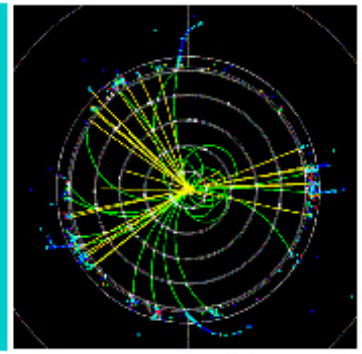
SiD Calorimetry – Progress since Snowmass

- ECal -- R. Frey
- HCal – J. Repond
- PFA – S. Magill
- Discussion
- Tomorrow: “Plan”



SiD Calorimeter/PFA Working Group



News, Meetings, and Agendas	SiD calorimeter email list	HyperNews Forum	SiD Home

News:

Dec 7, 2005	Next telecon Thursday Dec 8, 10:00 Pacific | agenda |
Dec 7, 2005	SiD meeting at Fermilab, Dec 16-17
Aug 15, 2005	Snowmass ! The SiD calorimeter agenda of sessions/activities for Snowmass.
July 26, 2005	Next telecon tomorrow July 27, 10:30 PDT.
May 12, 2005	The WG email list sidcal-l is now ready - see the link above for instructions.
May 2, 2005	First Working Group Phone Meeting will be Weds May 4 at 10:30 Pacific Time. See agenda below and the announcement email for dialing instructions.

Meetings:

		See the **dial-in instructions** in the meeting

Co-leaders:
Repond and Frey

Weekly telecons:

- PFA studies
- simulation and response
- detector R&D
- software tools

SiD Si/W ECal Development

Baseline configuration:

- transverse seg.: 12 mm^2 pixels
- longitudinal: (20 x 5/7 X_0) + (10 x 10/7 X_0)
- ≈ 1 mm readout gaps

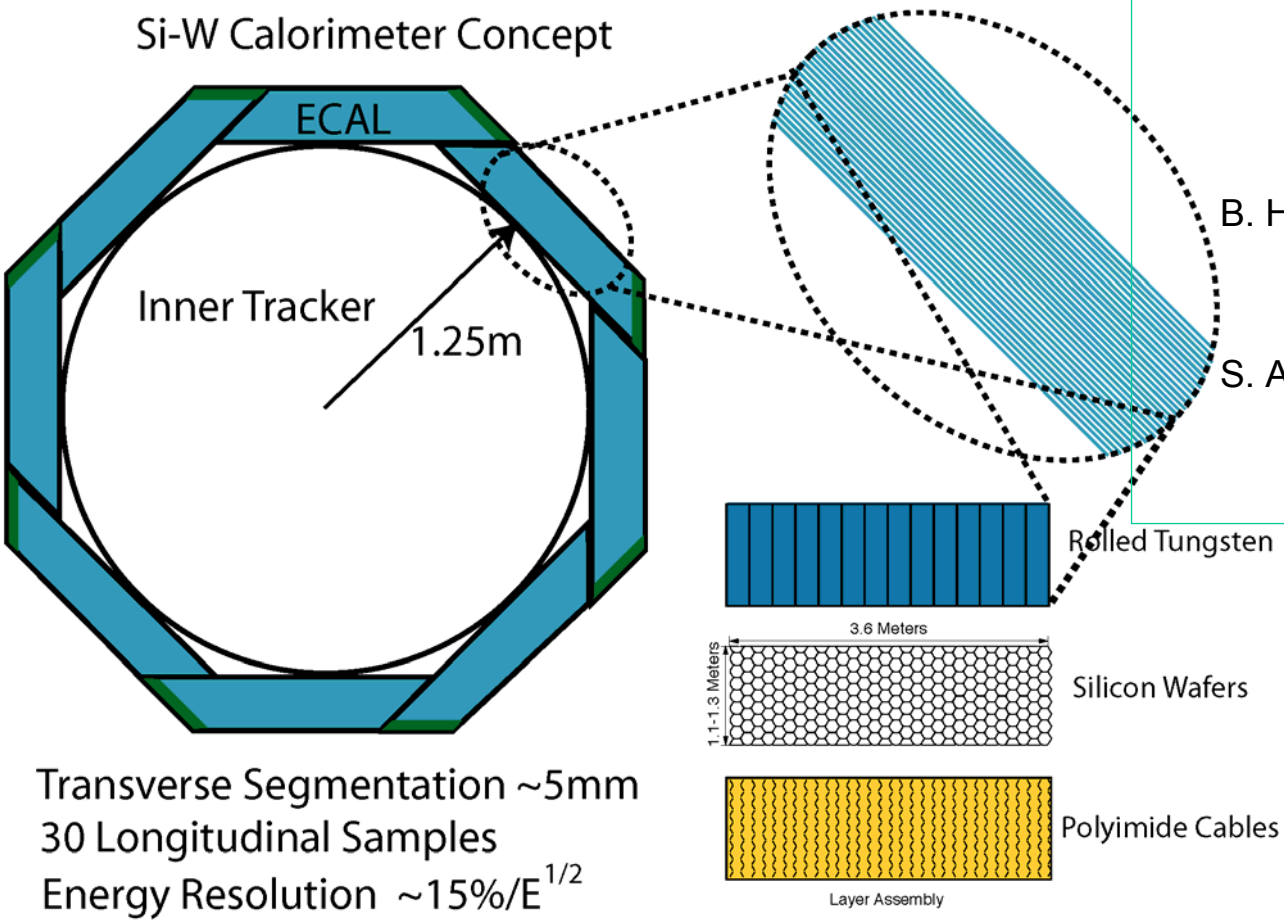
M. Breidenbach, D. Freytag, N. Graf, R. Herbst, G. Haller
Stanford Linear Accelerator Center

J. Brau, R. Frey, D. Strom, M. Robinson
U. Oregon

V. Radeka
Brookhaven National Lab

B. Holbrook, R. Lander, M. Tripathi
UC Davis

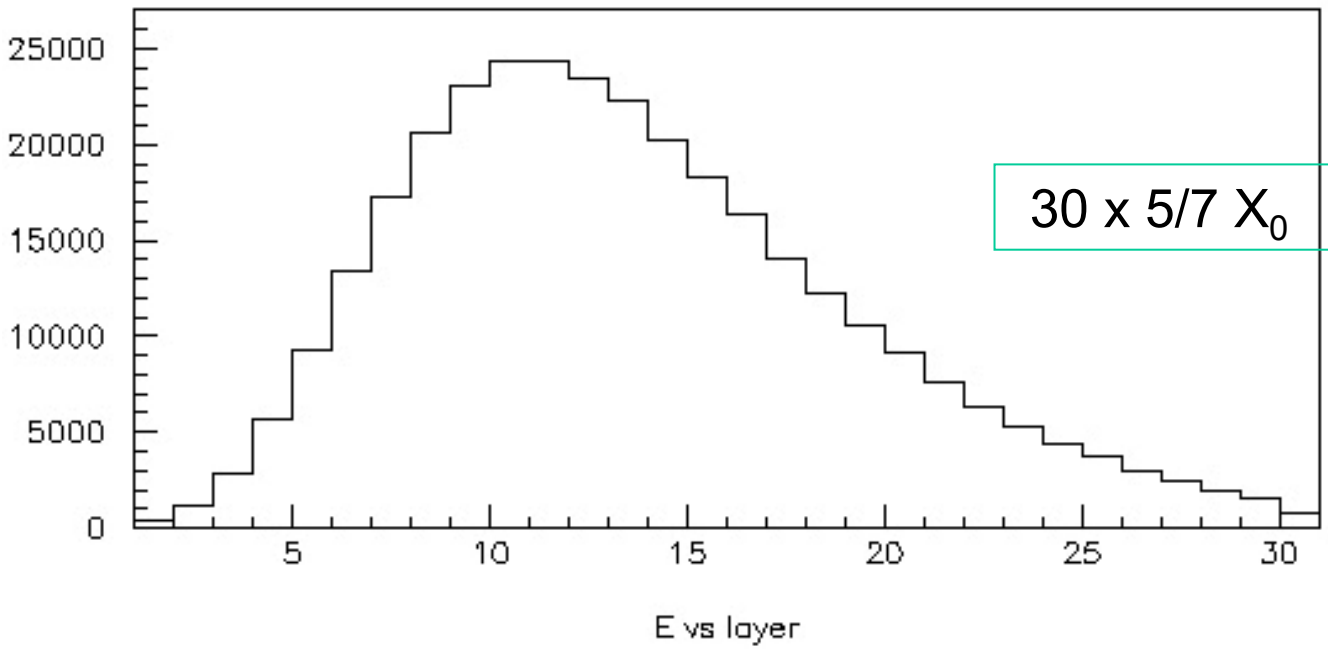
S. Adloff, F. Cadoux, J. Jacquemier, Y. Karyotakis
Annecy



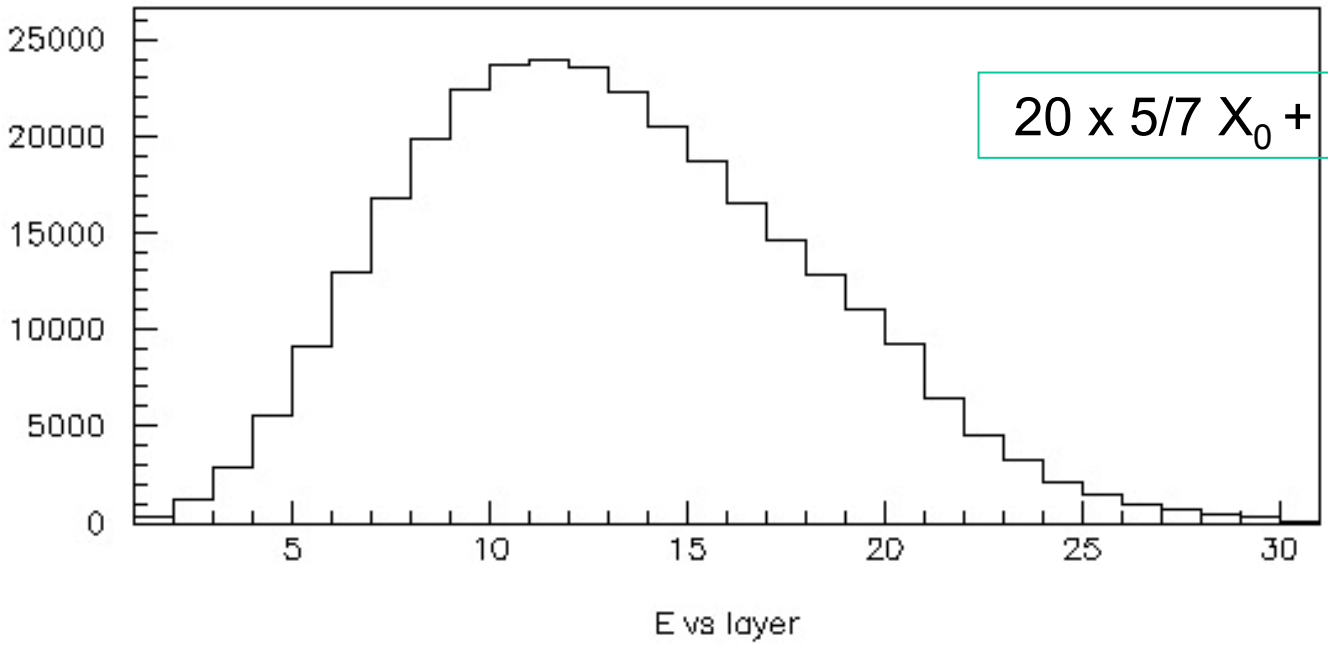
Transverse Segmentation ~5mm
30 Longitudinal Samples
Energy Resolution ~15%/E$^{1/2}$

Longitudinal Profiles

20 GeV photons



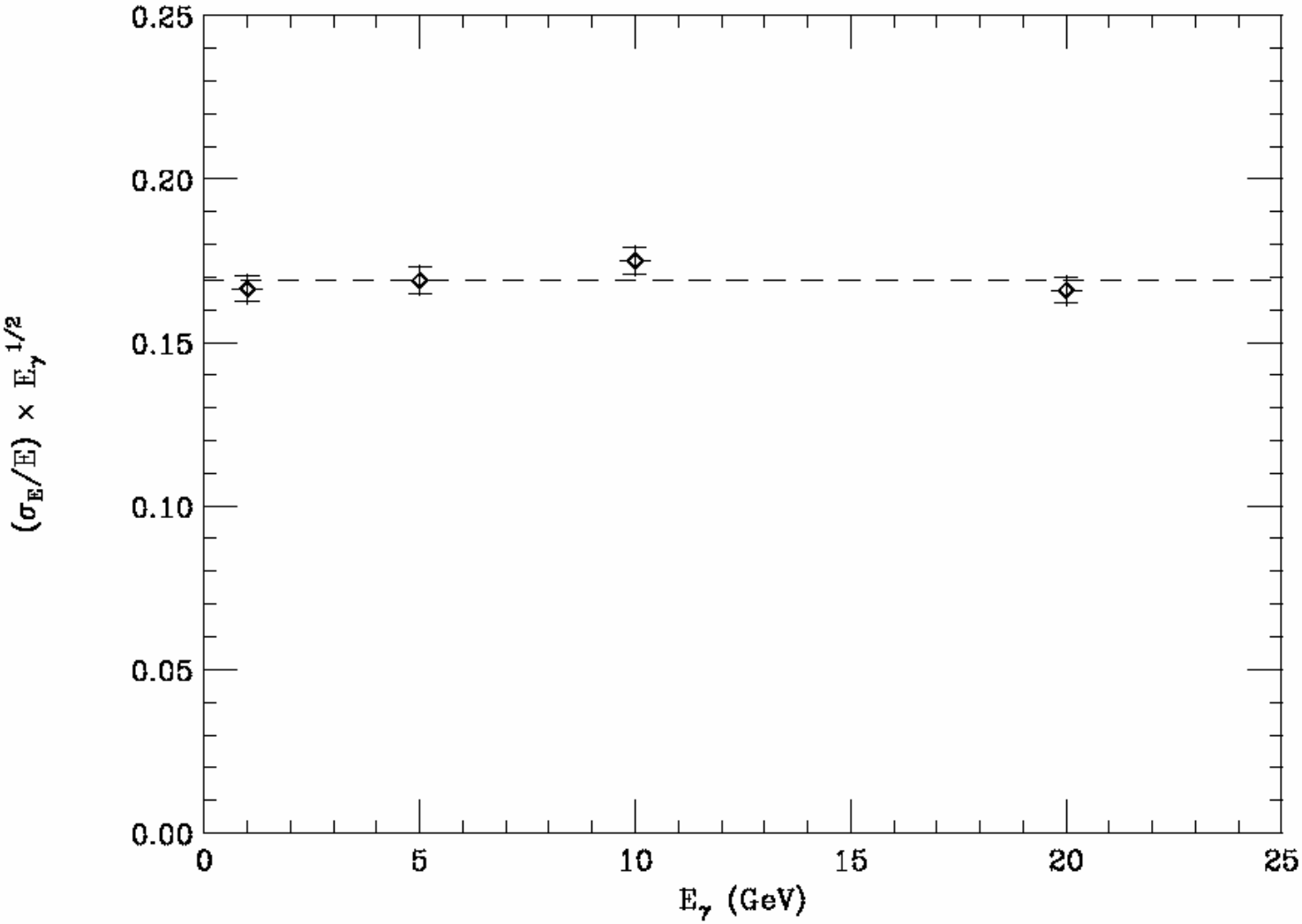
30 x 5/7 X_0



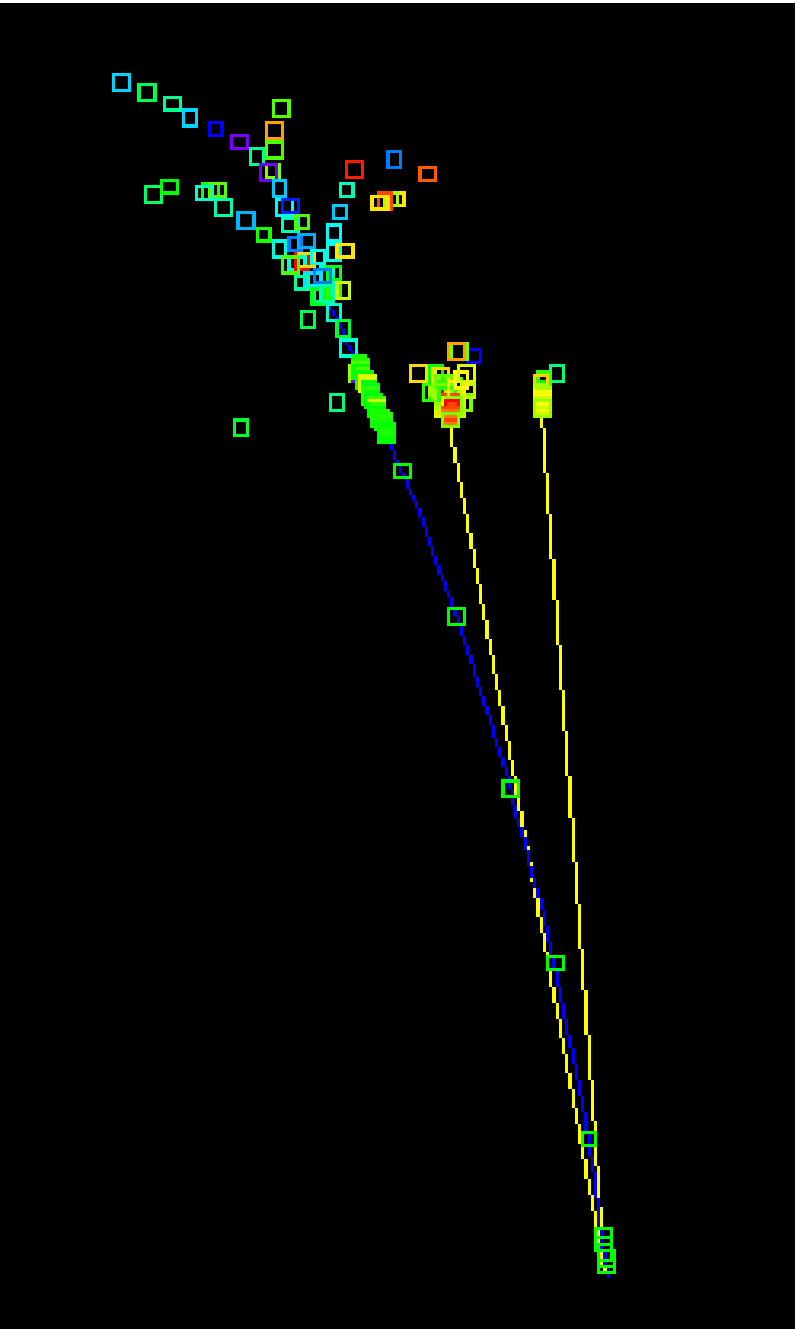
20 x 5/7 X_0 + 10 x 10/7 X_0

20+10 resolution

photons



From Snowmass: "Segmentation is good"



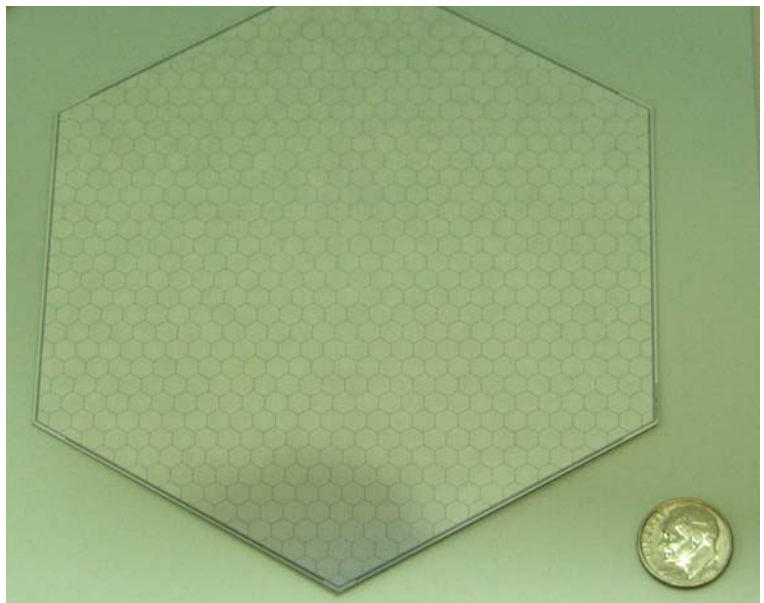
Si/W pixel size:

KPiX chip: designed for 12 mm^2

How small can we go?? 2-4 mm^2 ?

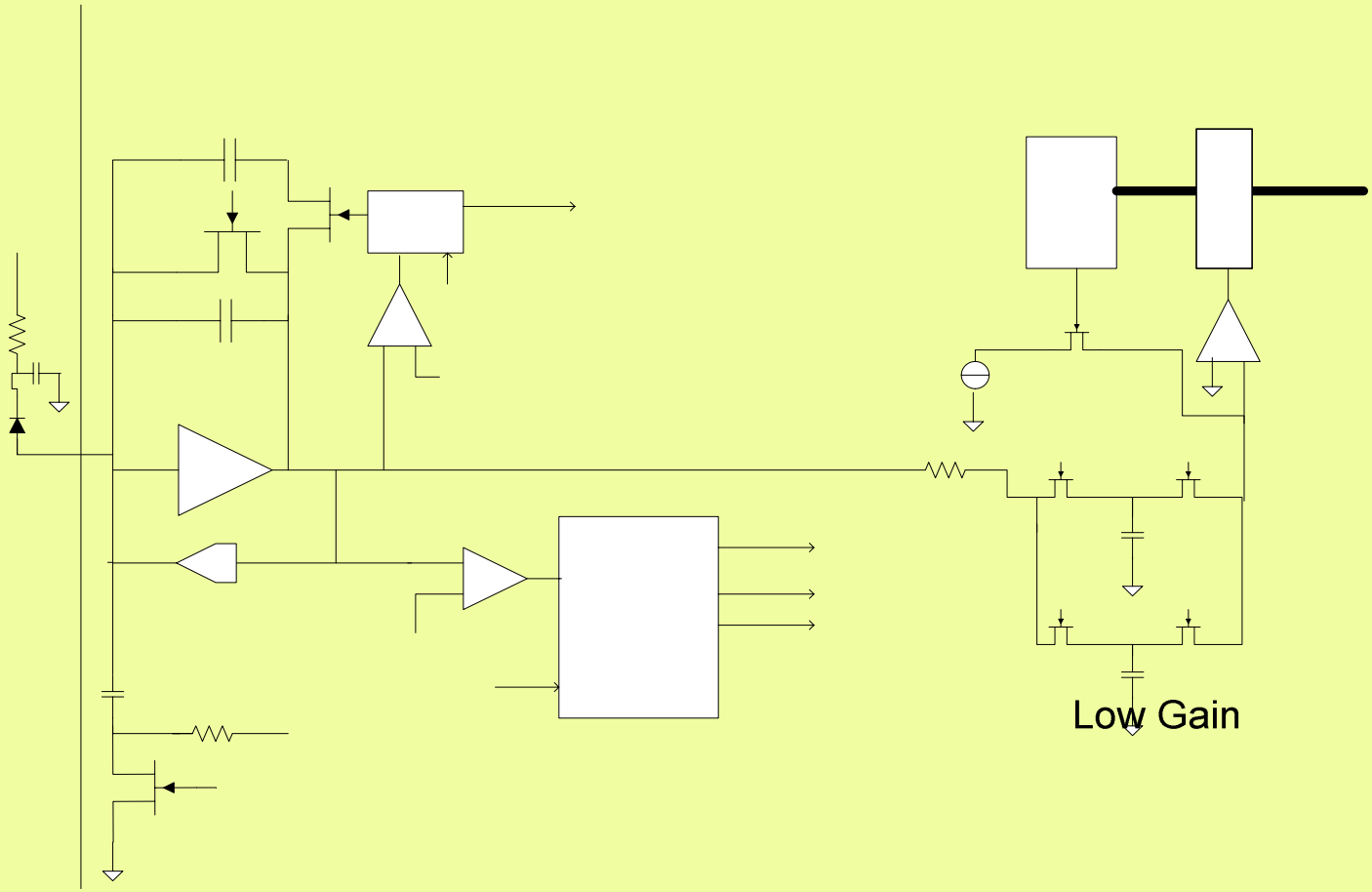
Is there a physics argument for small pixels (< 10 mm^2) ?

Adopt 12 mm^2 as standard for now

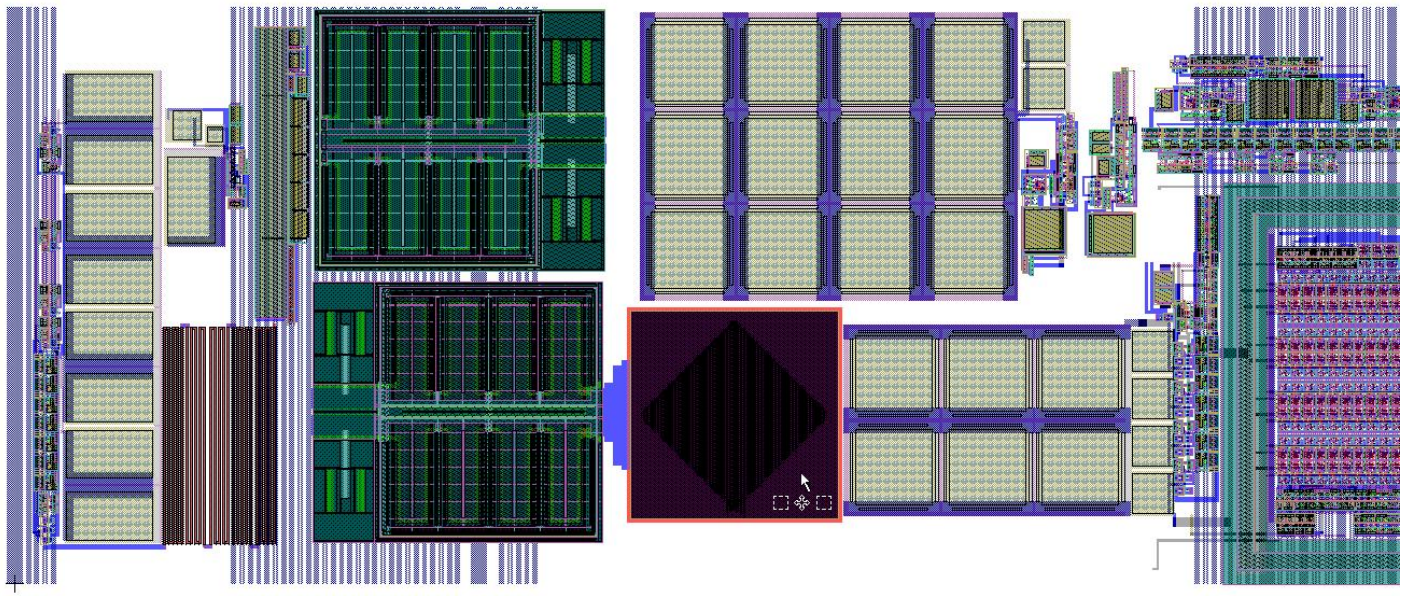


ECal Progress since Snowmass

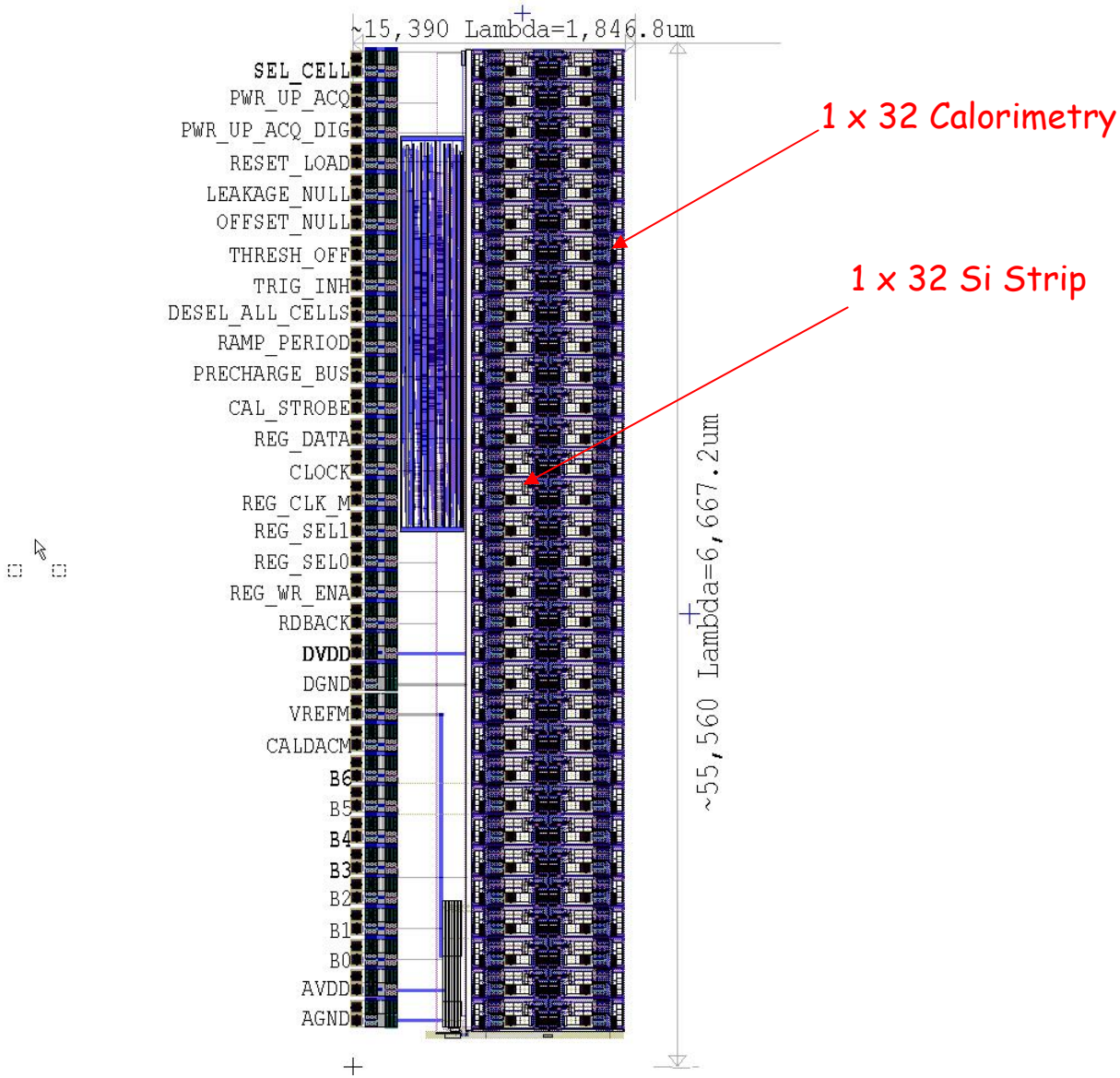
- Prototype KPiX chip arrives at SLAC “today” -- SLAC
  - Meets specs of a final LC readout chip
    - Can also be used for HCal or Si strip tracker
  - Prototype: 2 x 32 channels instead of 32 x 32 (cheaper)
- New cable design (KPiX → ECal module edges) – UC Davis
- Mechanical design – Annecy
- Continuing Si detector studies -- Oregon


Low Gain
Reset

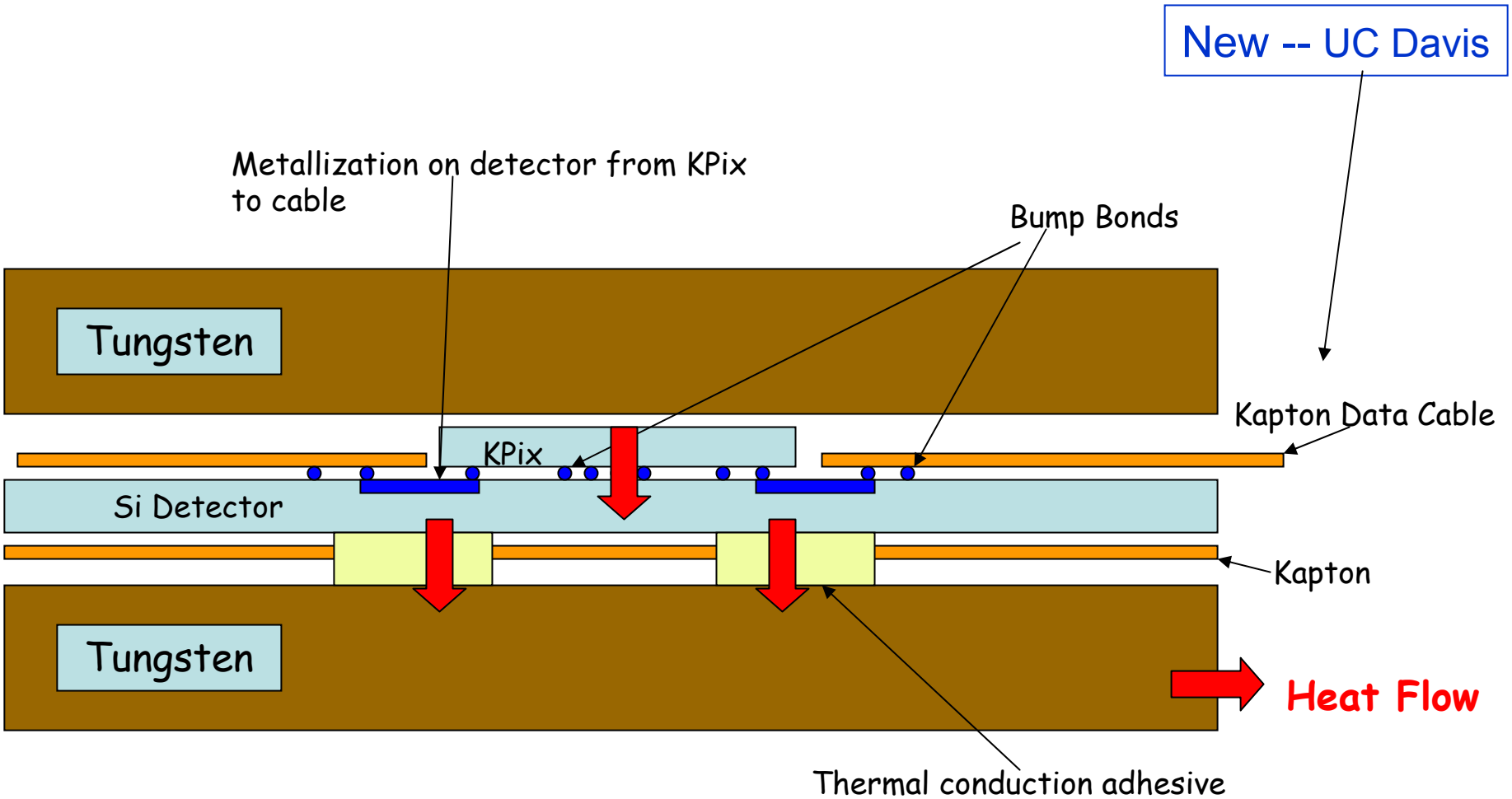
KPix Cell 1 of 1024



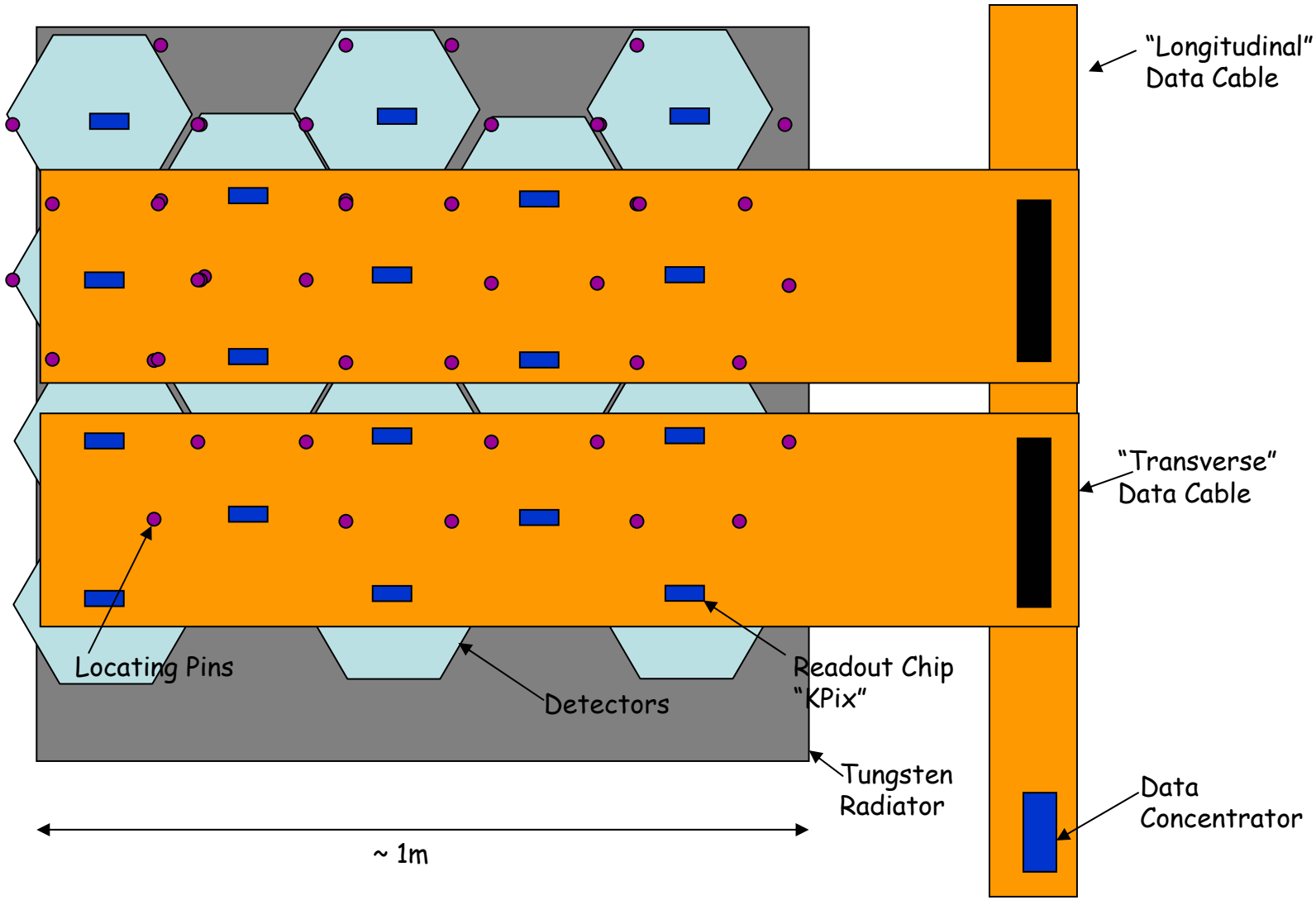
Prototype Layout 1x32



EMCal Schematic Cross section



Conceptual Schematic – Not to any scale!!!

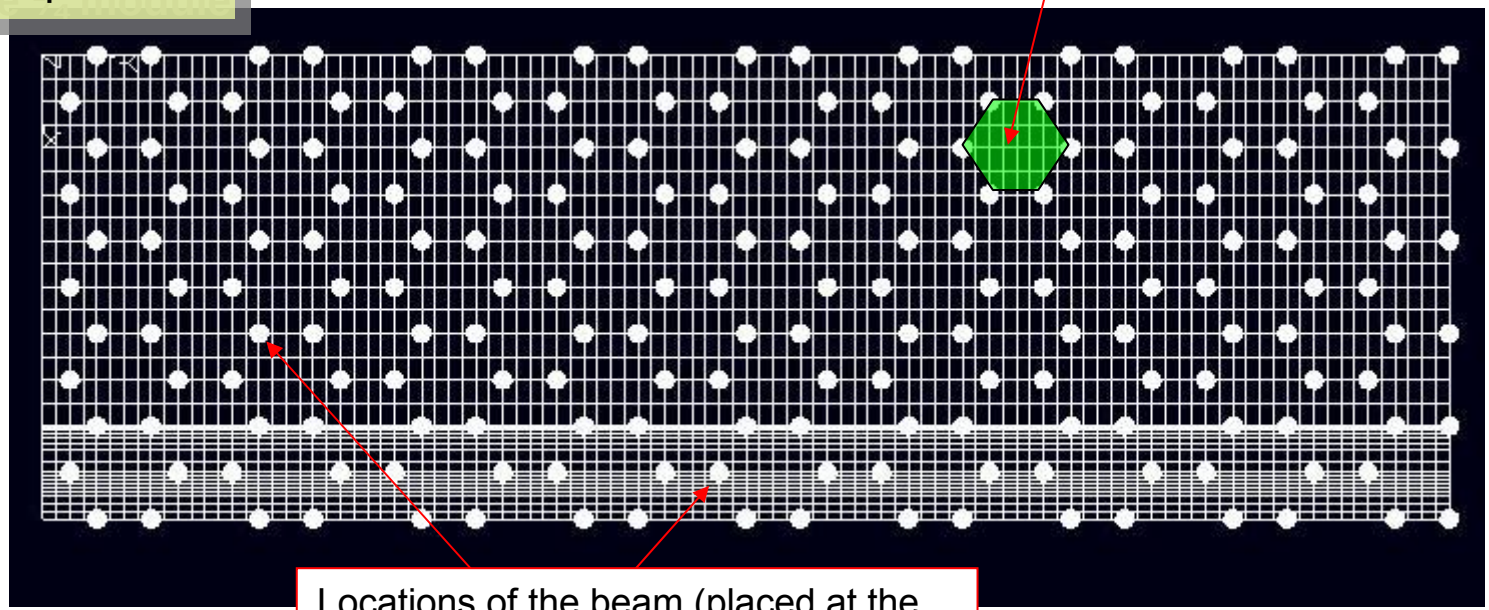


Annecy

Preliminary results on SiD studies

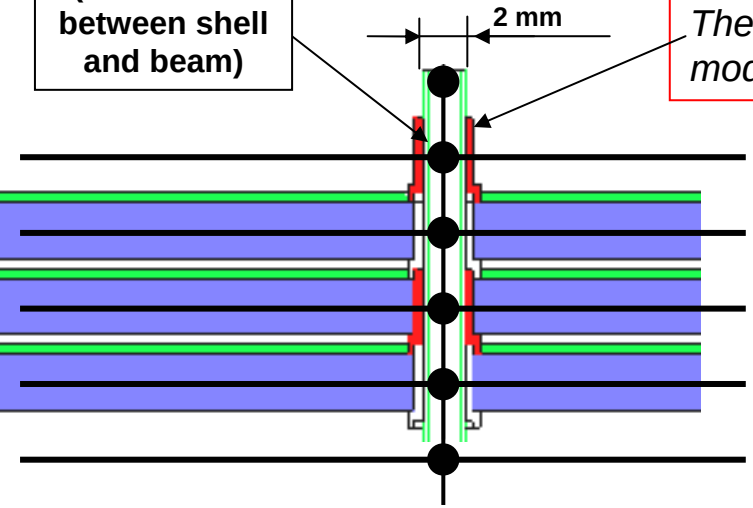
- Meshing -

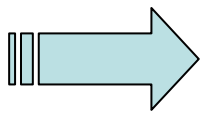
Top view on the ¼ module

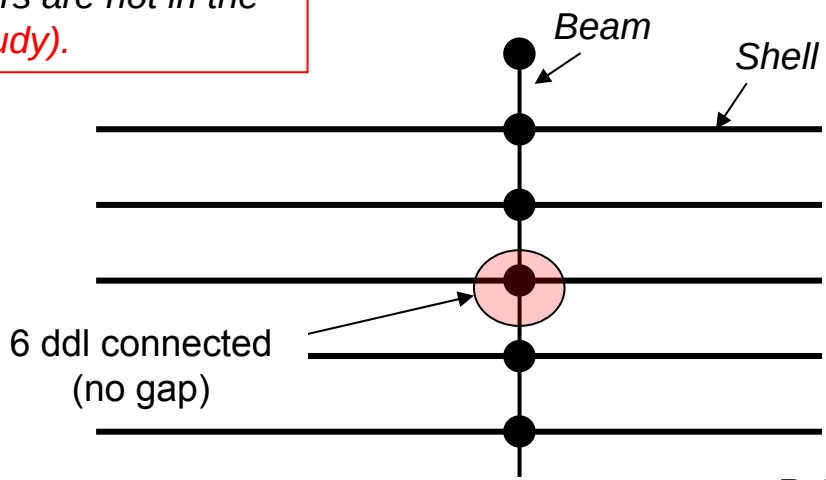


Locations of the beam (placed at the corners of the Si hexagons)
The threaded fasteners are not in the model (worst case study).

Node (connection between shell and beam)





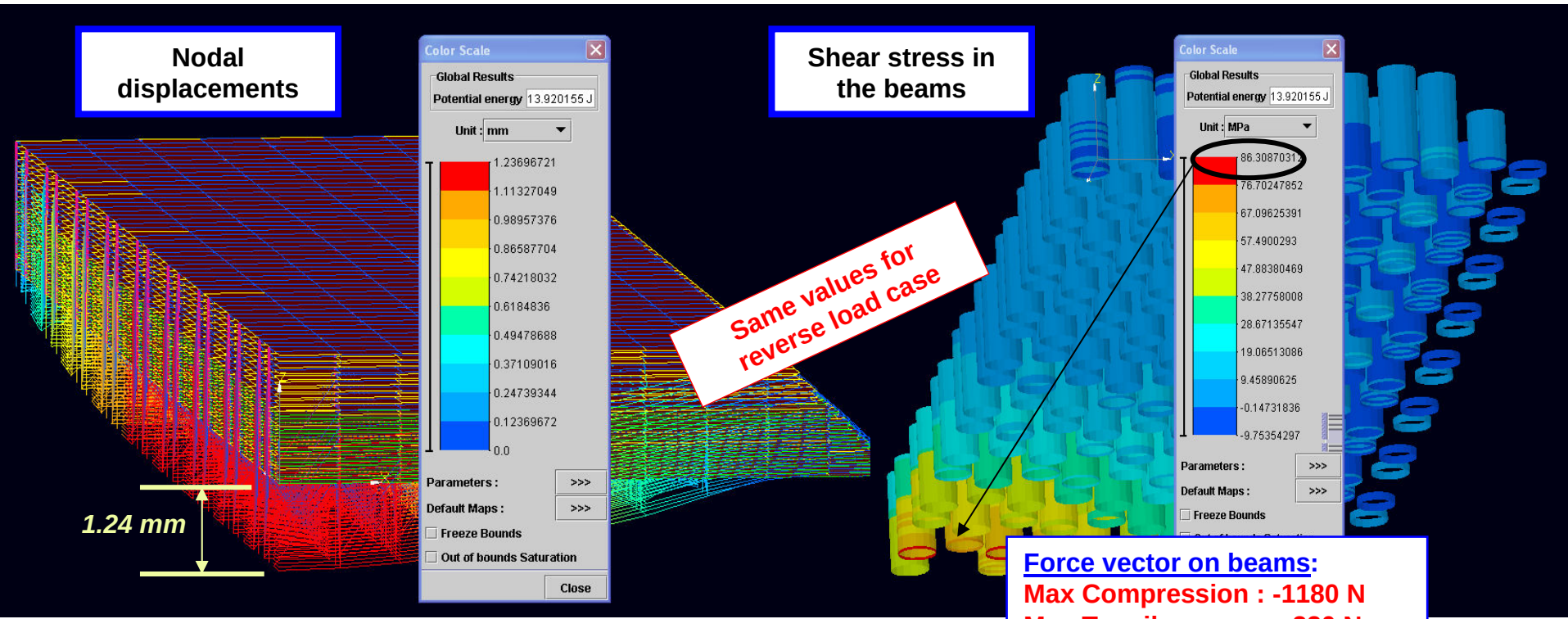


Preliminary results on SiD studies

- RESULTS -

Deflection and stresses …

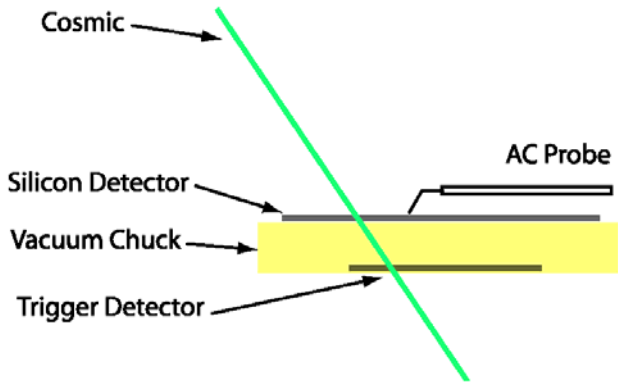
Let's check :
- *The central deflection*
- *Shearing and tensile Stresses in the beams*
- *"Von-Mises" stresses in the Tungsten plates*



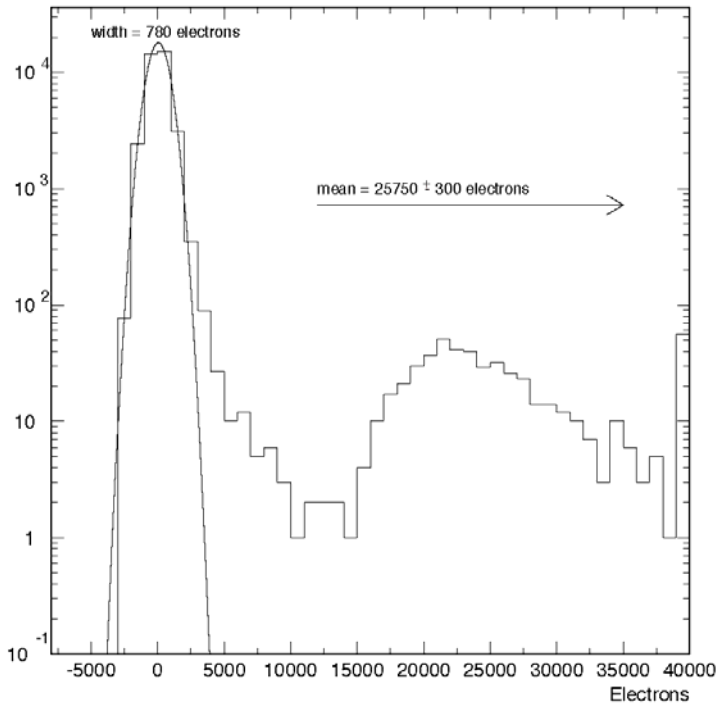
Force vector on beams:
Max Compression : -1180 N
Max Tensile : +220 N

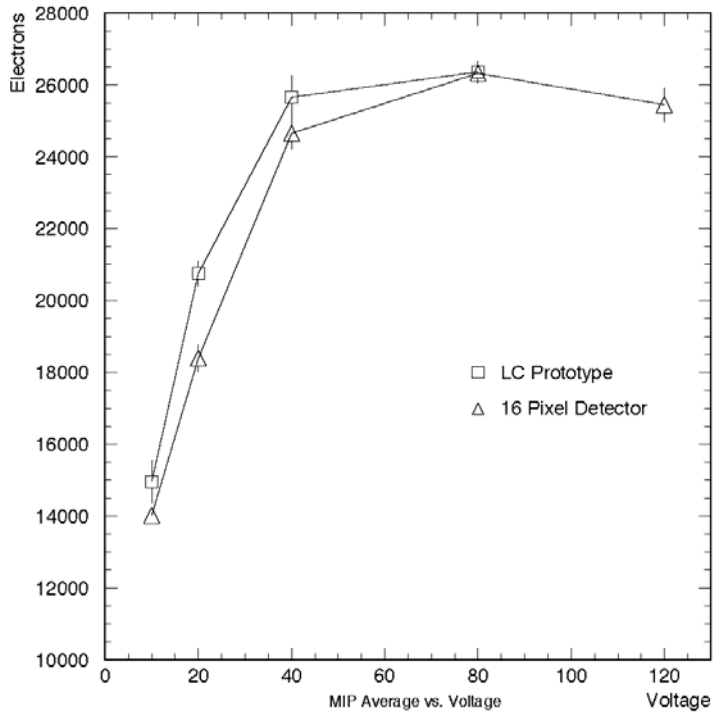
prototype Si detector studies

Response of detectors to Cosmics
(Single 5mm pixel)
Simulate LC electronics
(noise somewhat better)



D. Strom





Errors do not include ~ 10% calibration uncertainty (no source calibration)

Calorimeter discussion...

To develop SiD, do we need to pursue:

1. "generic" LC R&D (e.g. LCDRD, Calice, ...) ?
2. R&D defined by the Concepts ?
3. Some combination of these ?

Issue	Addressed by	Other considerations
ECal radius	PFAs + guidance from Fast MC	cost
ECal depth and segmentation	simulations – not necessarily limited to PFAs	cost
Validation of G4 for hadrons in highly-segmented calorimeters	Test beam	Is what gets tested applicable to SiD and the LC ? e.g. the electronics or the detector technologies
HCal technology and parameters	PFAs validated by test beam results	Did the test beam configuration provide what is needed for SiD?
Digital or analog HCal	Response simulations and PFAs validated by test beam	Did the beam test provide enough information?

Does SiD need its own beam test? Money??