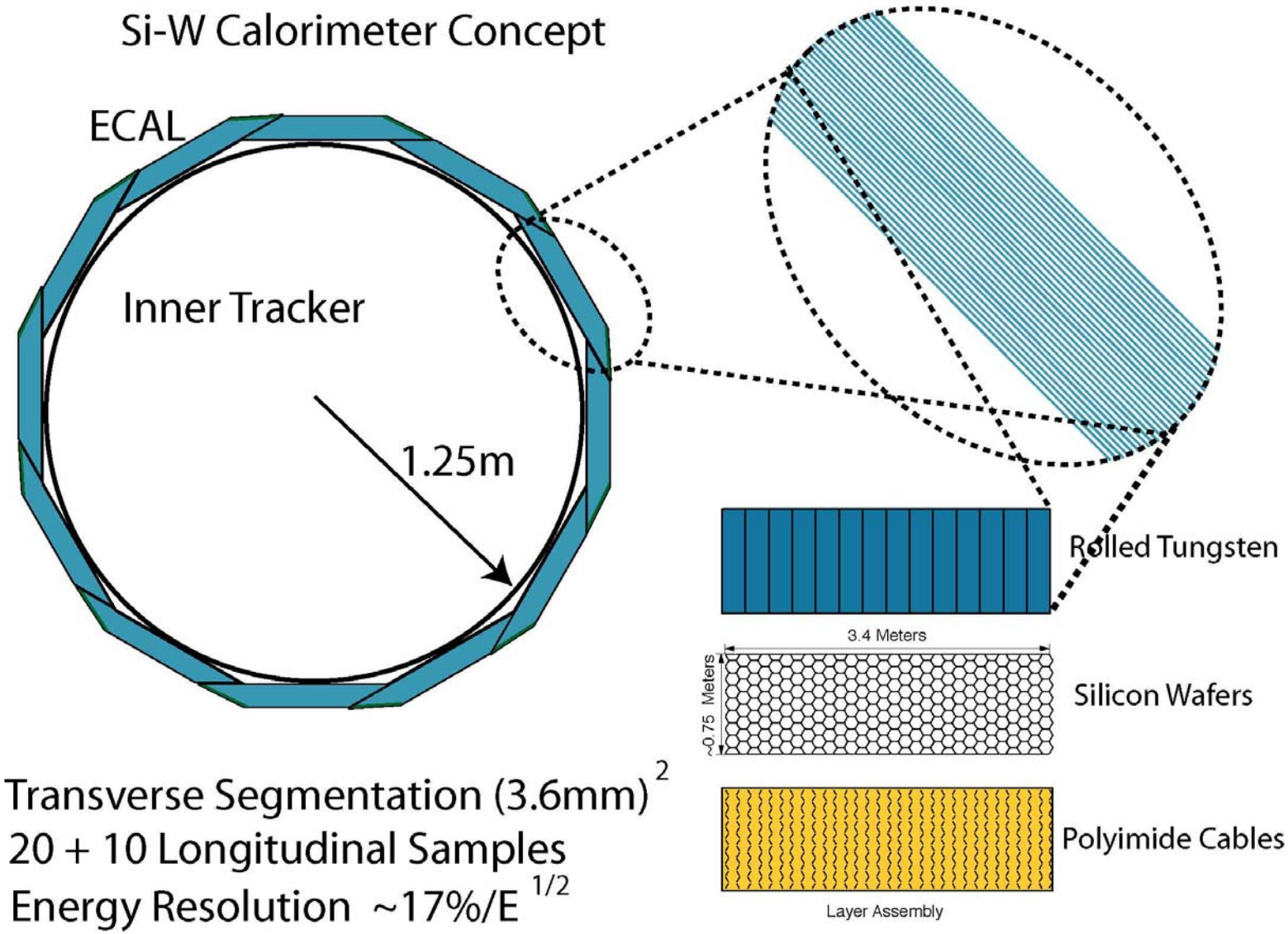
U.S. Silicon-Tungsten ECal R&D – test beam plans



Transverse Segmentation $(3.6mm)^2$

20 + 10 Longitudinal Samples

Energy Resolution $\sim 17\%/E^{1/2}$

Currently optimized for the SiD concept

<u>Baseline configuration:</u>

- transverse seg.: 13 mm^2 pixels
- longitudinal: (20 x 5/7 X_0) + (10 x 10/7 X_0) $\Rightarrow$ 17%/sqrt(E)
- 1 mm readout gaps $\Rightarrow$ 13 mm effective Moliere radius

R&D Goal: Fab. an <u>ILC-ready</u> module (approx 1 sensor x 30 layers) and test in a beam.

U.S. Si/W ECal R&D Collaboration

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Stanford Linear Accelerator Center

- KPiX readout chip
- downstream readout
- mechanical design and integration

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U. Oregon

- detector development
- readout electronics

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- readout electronics

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- cable development
- bump bonding

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LAPP Annecy

- mechanical design and integration

R&D status overview**

- Require 1024-channel KPiX ASIC chips
  - Still evaluating 64-channel prototypes (KPiX-5 is latest)
  - Has been the critical-path item
- Silicon sensors
  - v1 evaluated successfully
  - v2 on order – expect to have 40 ~ Jan 08
- Tungsten
  - Have it
- Module mechanics and electromechanical
  - Serious work starting
- DAQ
  - Needs work
  - Compatibility with CALICE test beam DAQ

** See talks by M. Tripathi and T. Nelson in calorimeter session

R&D Milestones and test beams

I. Connect (bump bond) prototype KPiX to prototype detector with associated readout cables, etc ("technical tests")

- Would benefit from test beam (hopefully SLAC?) – 2007-8-?
- One such test done at SLAC ESA, Aug 2007

II. Fabricate a full-depth ECal module with detectors and KPiX-1024 readout – functionally ≈equivalent to the real detector

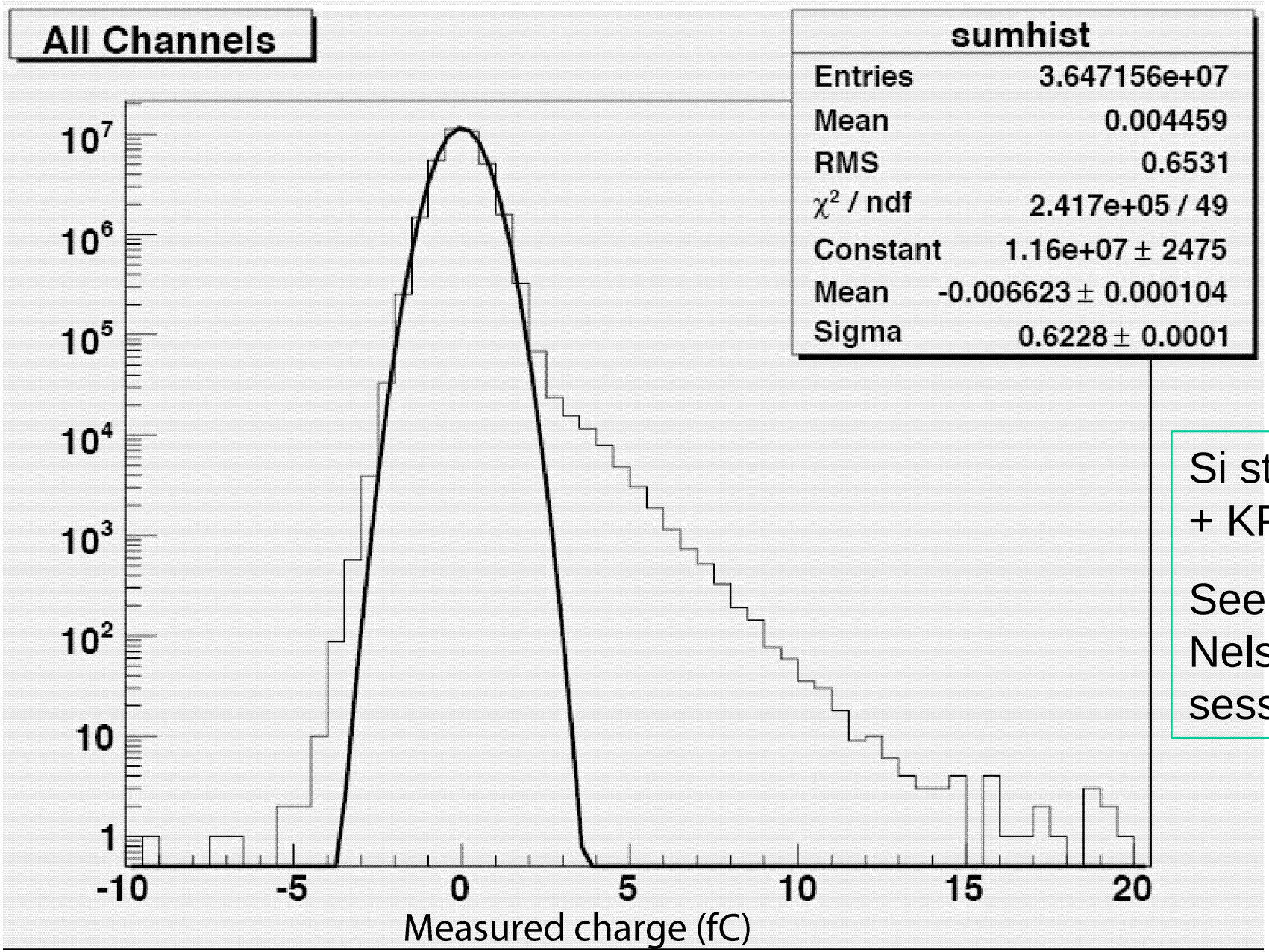
- Determine EM response in test beam – late 2008
- Ideally a clean, well-defined electron beam (SLAC?)

III. Test with an HCal module in a hadron beam (FNAL) – 2008-?

- Test/calibrate the hadron shower simulations; measure response

IV. Pre-assembly tests of actual ECal modules in beam – >2010-?

KPiX in SLAC ESA beam



Si strip detector + KPiX

See talk by Tim Nelson in cal. session