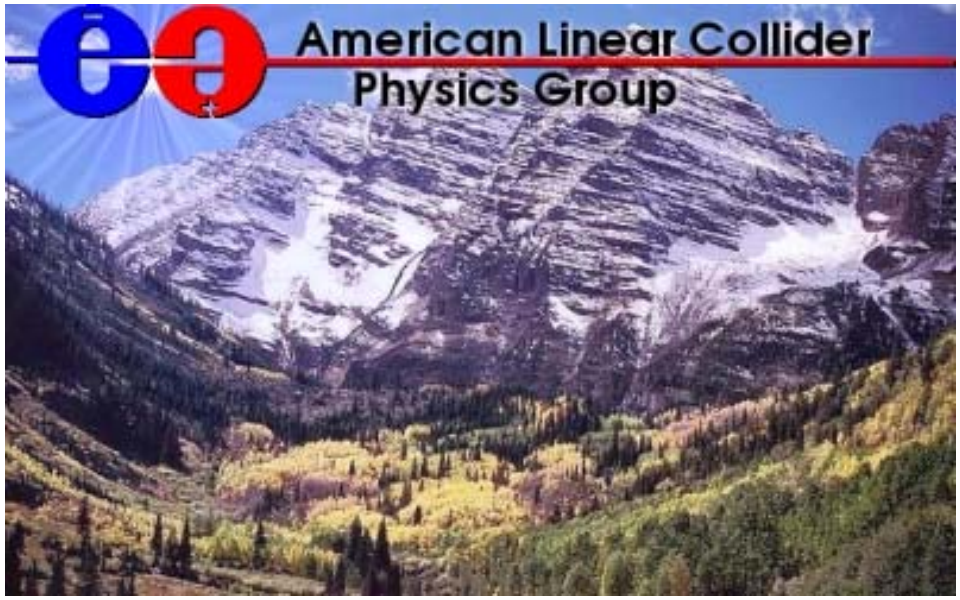
Status of The Tail-Catcher/Muon-Tracker for the CALICE Test Beam Module



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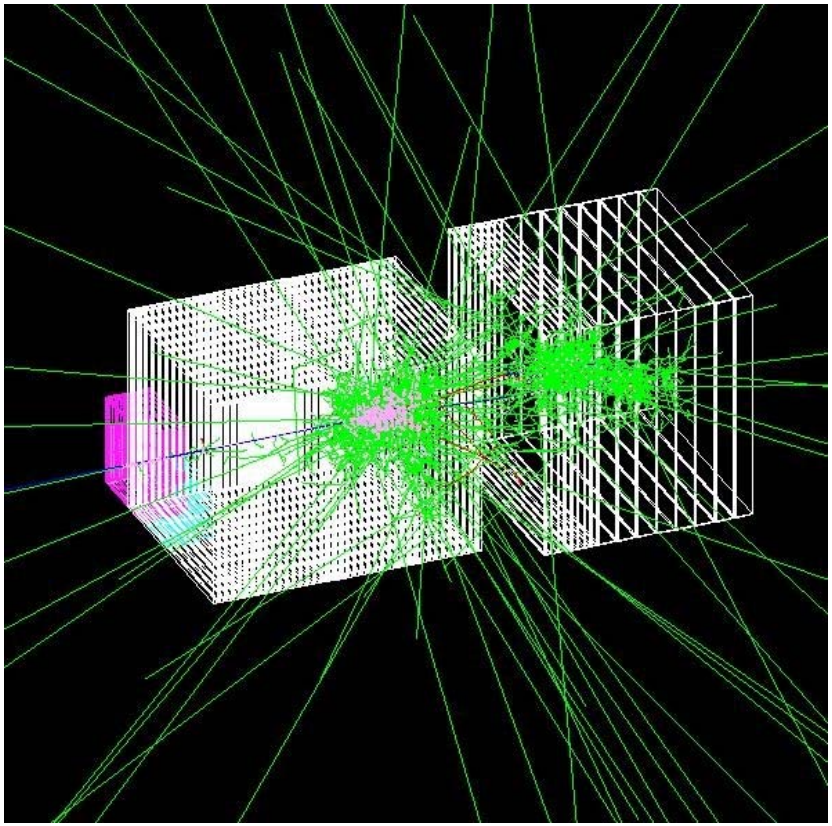
Northern Illinois University

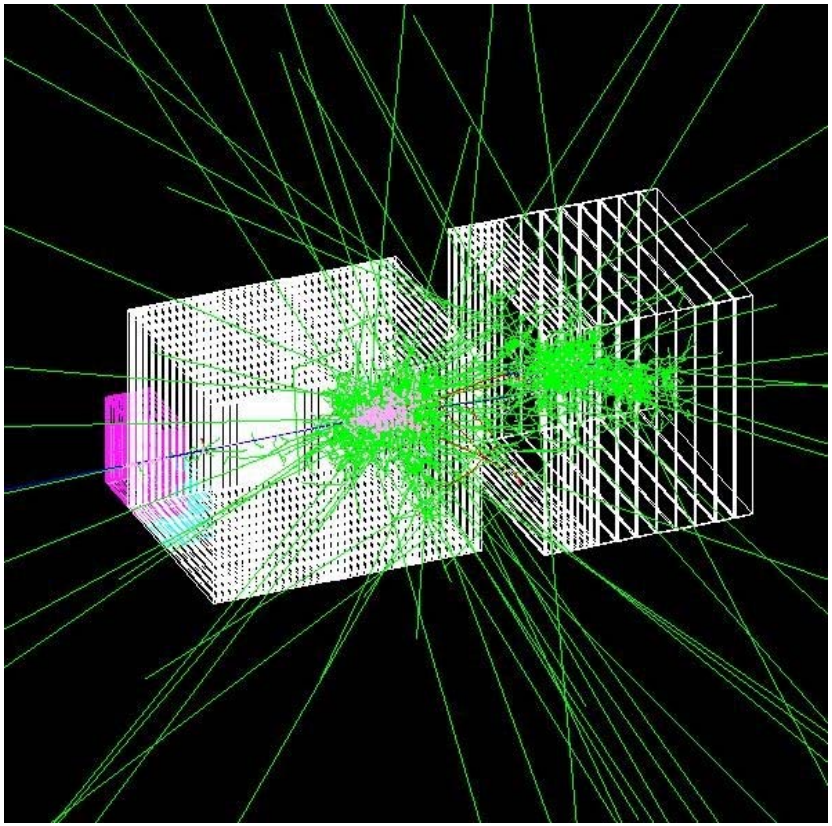
Goals for TCMT Prototype

- Study tail end of hadronic shower and validate simulations
- Prototype detector for generic LCD
  - Promote both eflow and muon identification
  - Correct for leakage
  - Understand and address impact of coil
  - Control fake rates



Vitals for TCMT Prototype

- **Mechanical Structure/Absorber**
  - "Fine" section (8 layers)
    - 2 cm thick steel
  - "Coarse" section (8 layers)
    - 10 cm thick steel
- **16 Cassettes:**
  - Scintillator Strips
    - 5mm thick
    - 5cm wide strips
    - Tyvek/VM2000 wrapping
    - Alternating x-y orientation
  - Readout
    - WLS Fiber
    - SiPM photo detection
    - Common readout with HCAL
- **Dimensions:**
  - Length (along beam) - 142 cm
  - Height - 109 cm
- **Weight ~10 tons**



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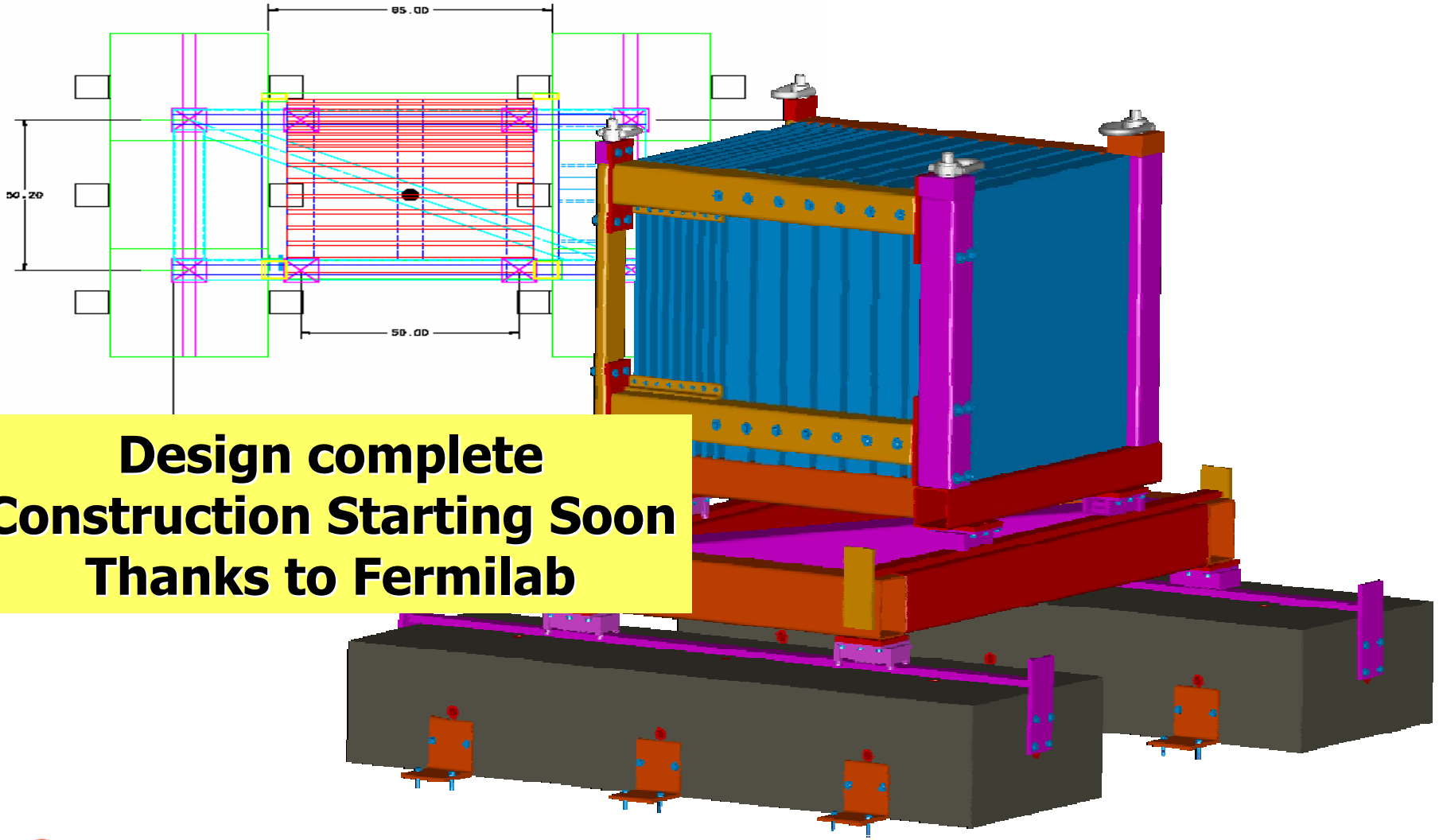
Mechanical Structure & Absorber Stack



Design complete
Construction Starting Soon
Thanks to Fermilab

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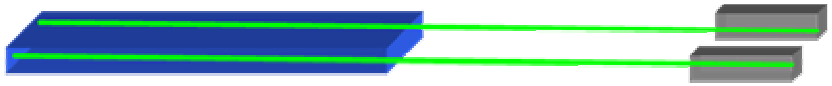
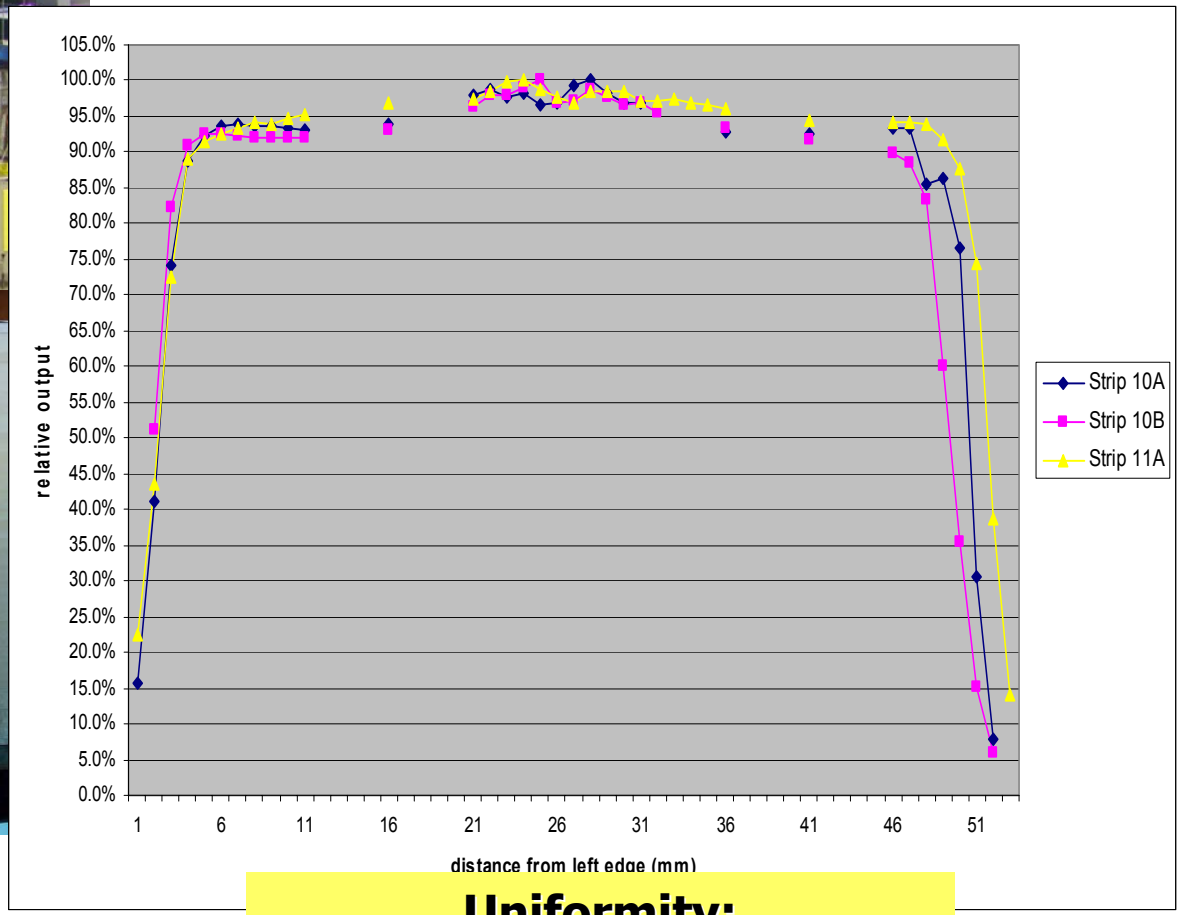
Cassettes: Scintillator Strips

NICADD/Fermilab Extruder





Uniformity:
~5% across strip
~strip-to-strip

nicadd

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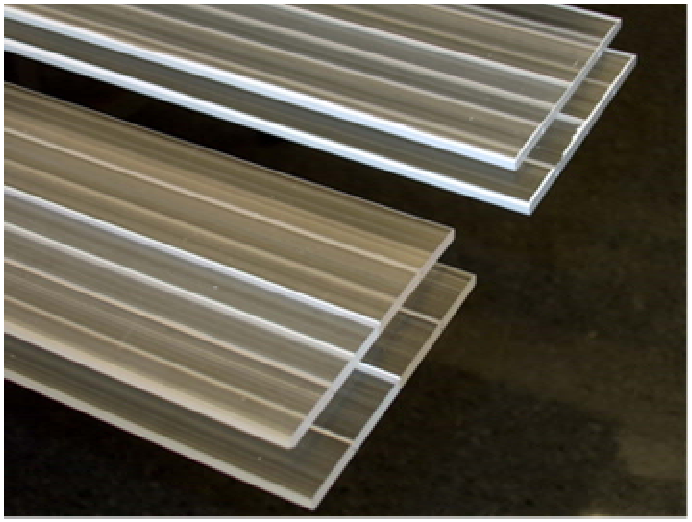
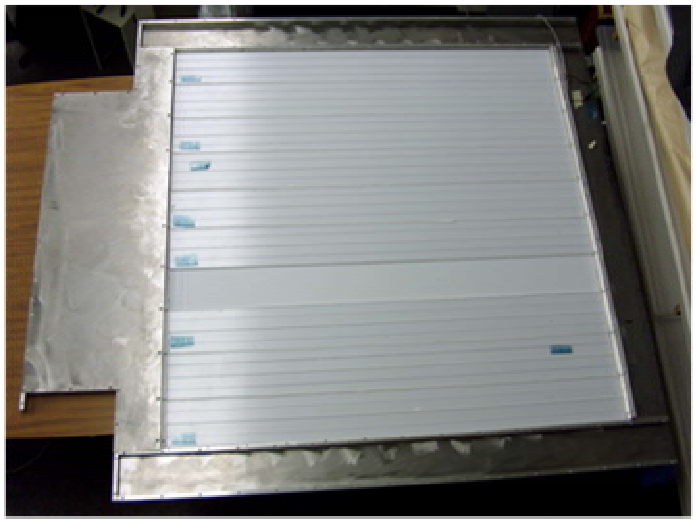
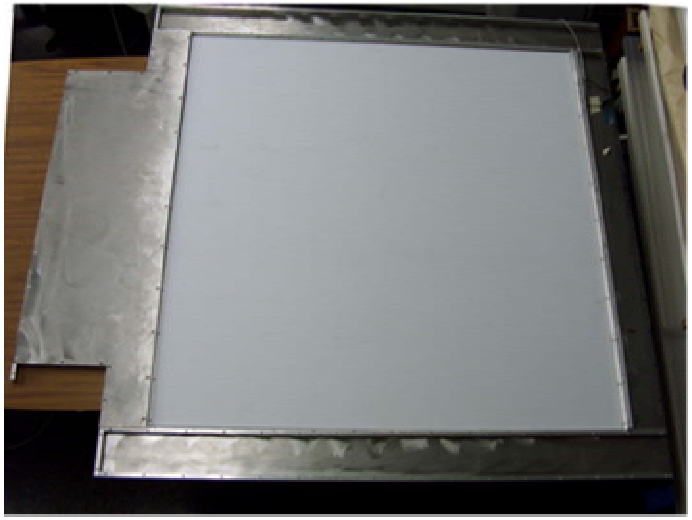
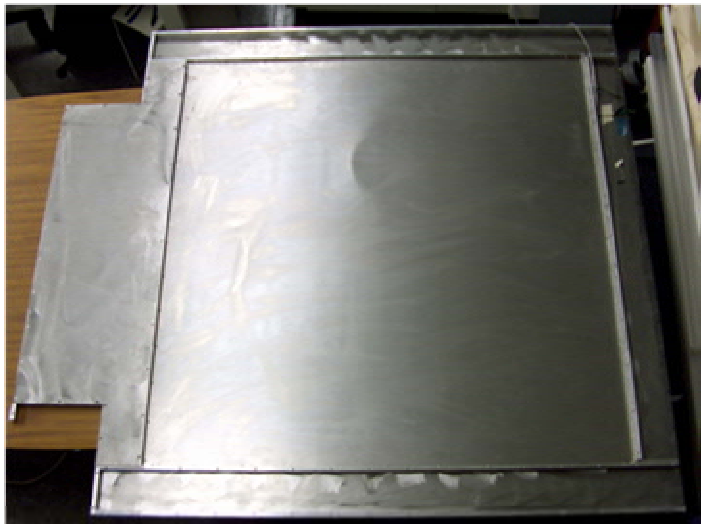
Cassettes: Mech. Prototype

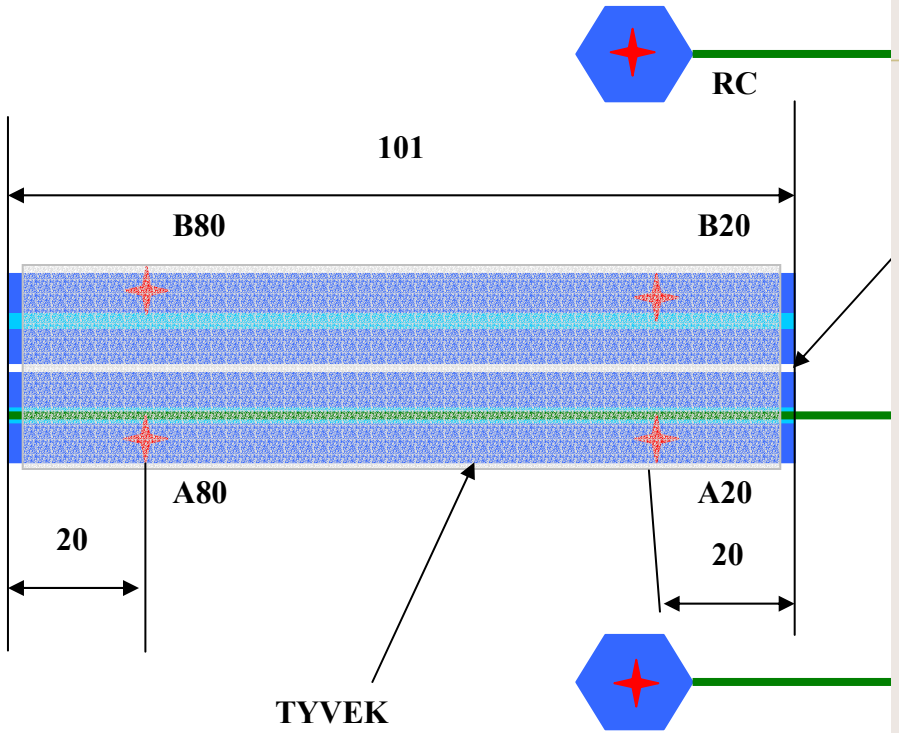


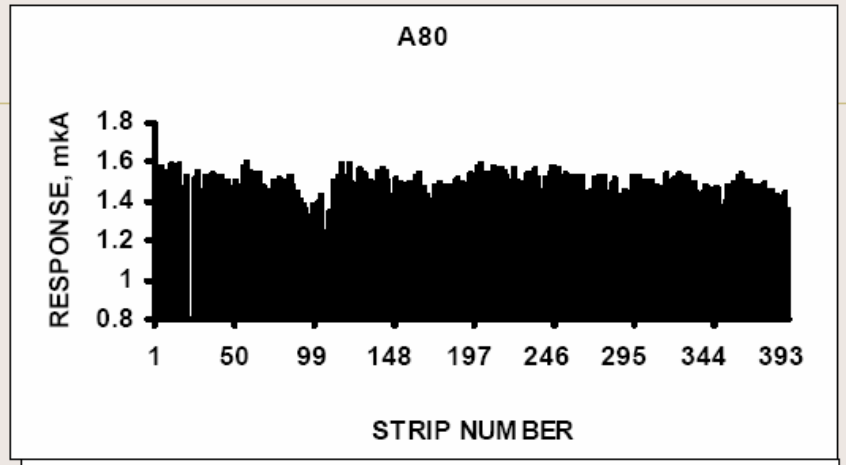


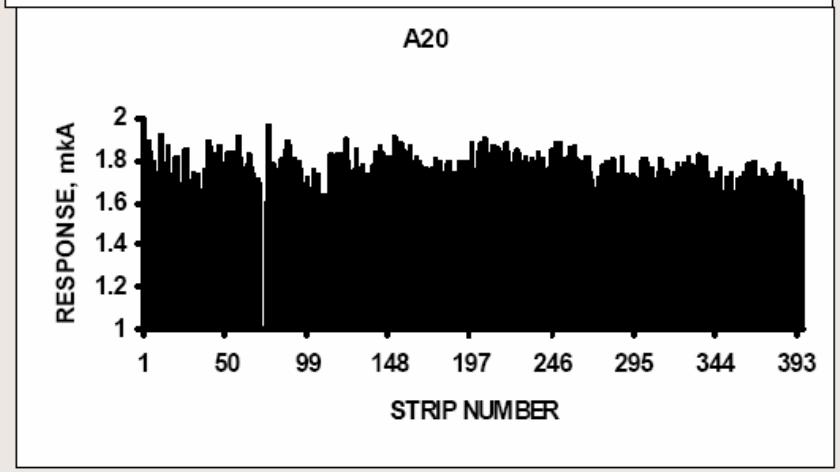




Cassettes: Strip QC







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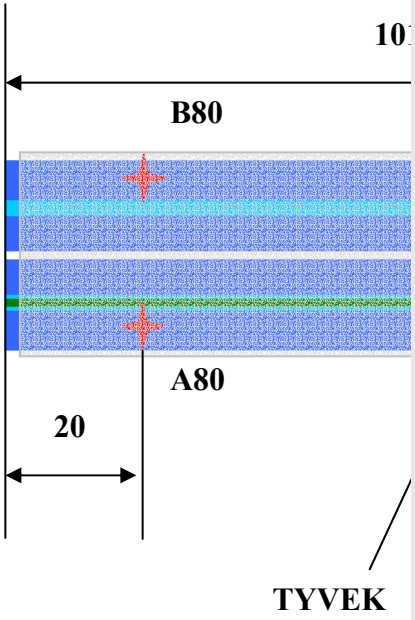
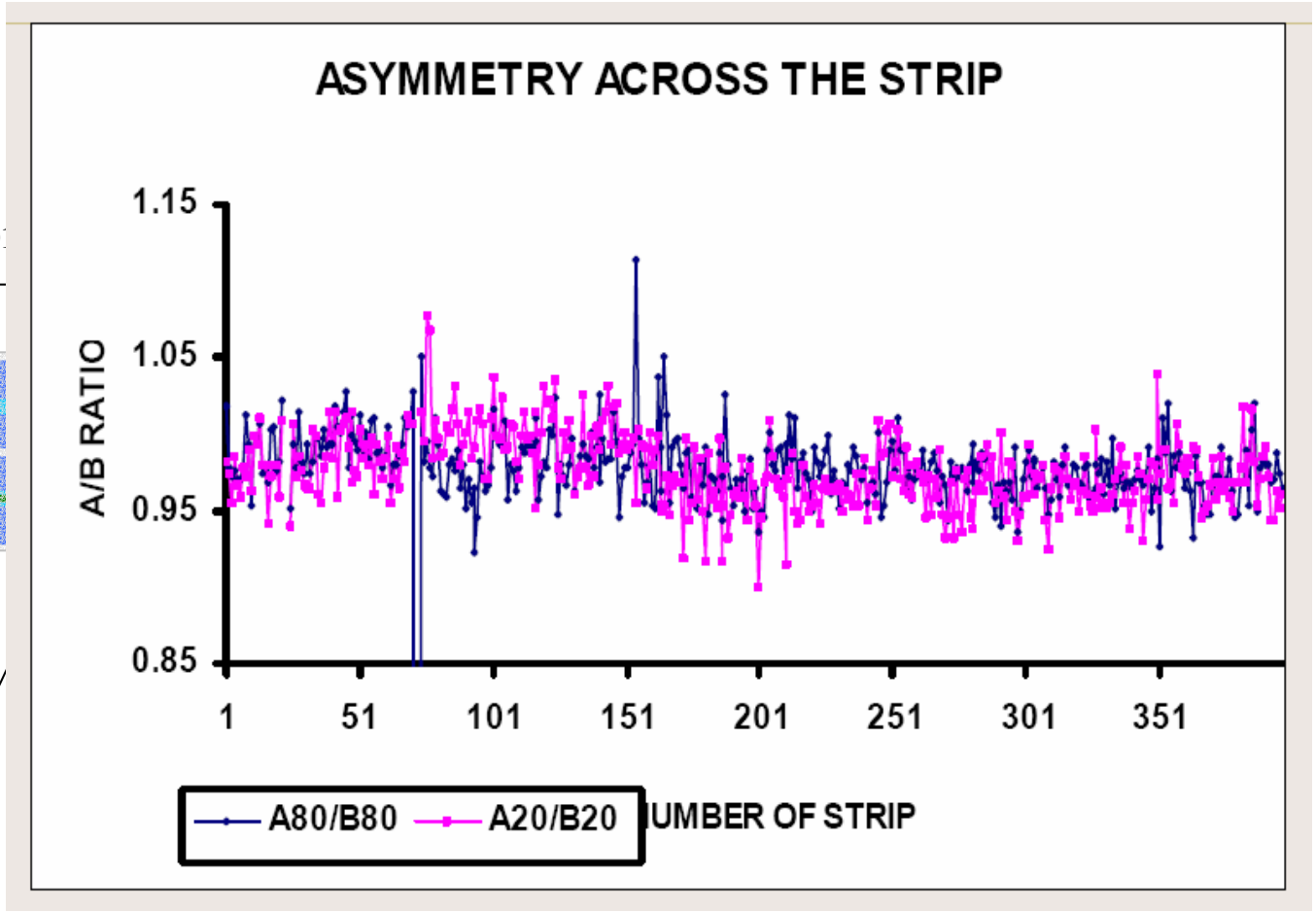
Cassettes: A Finer Look @ Strips





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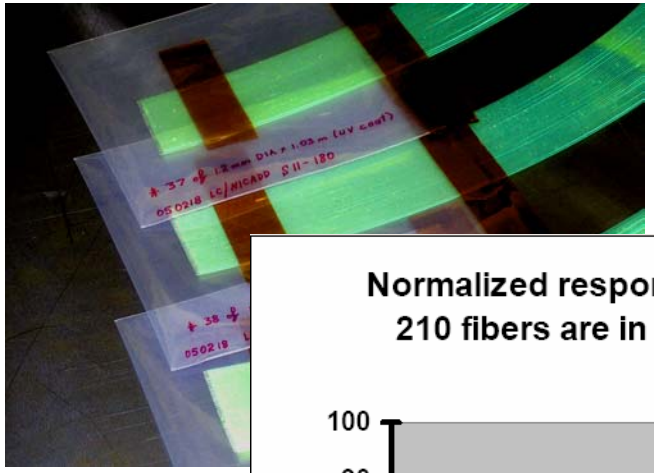
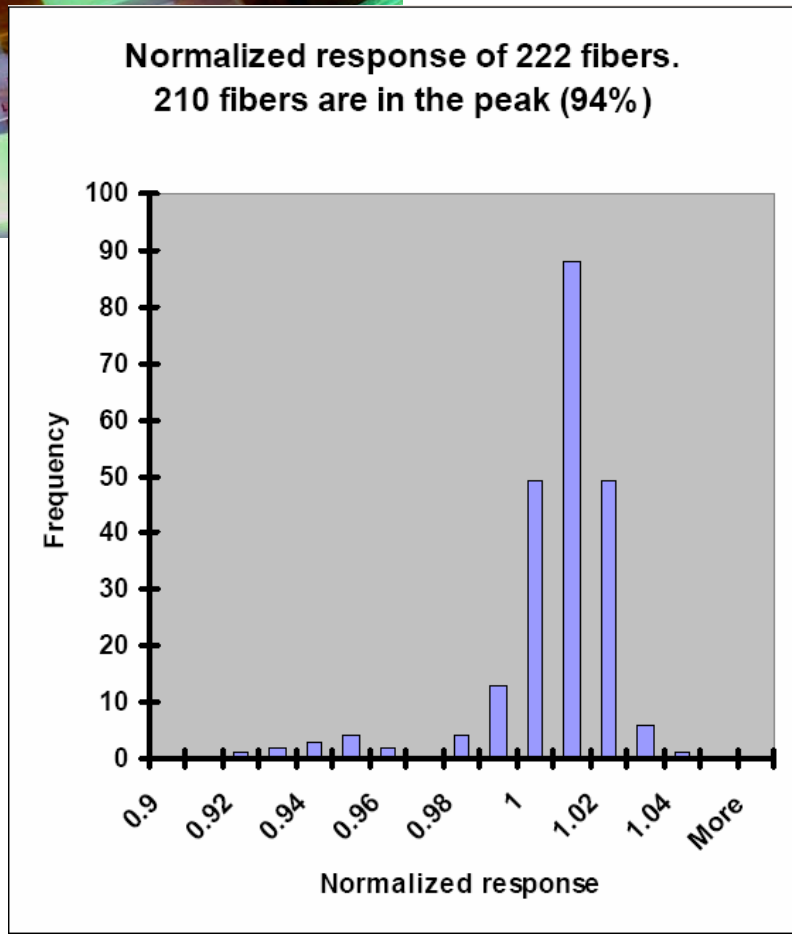
Cassettes: Fibers & QC

- Kuraray Y-11
- Multi-clad WLS,
- OD = 1.2 mm
- Length = 1.03 m
- Polished ends
- One end mirrored





- QC reference system repeatability 0.25%
- 0.5% outliers with response below 92% of average.
- 94% fibers in peak with σ less than 1%.

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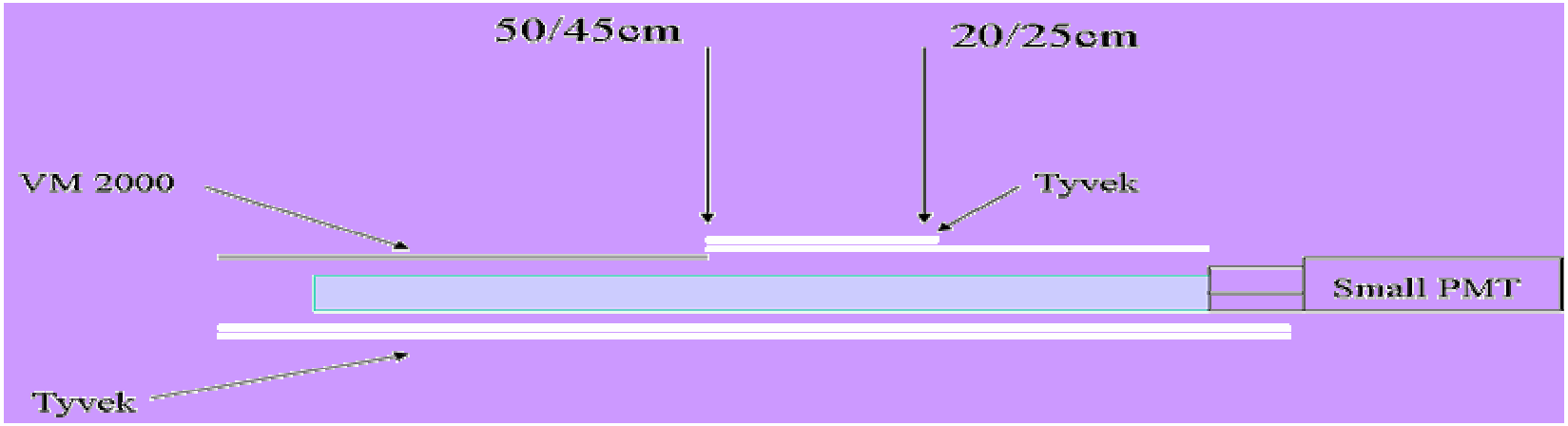
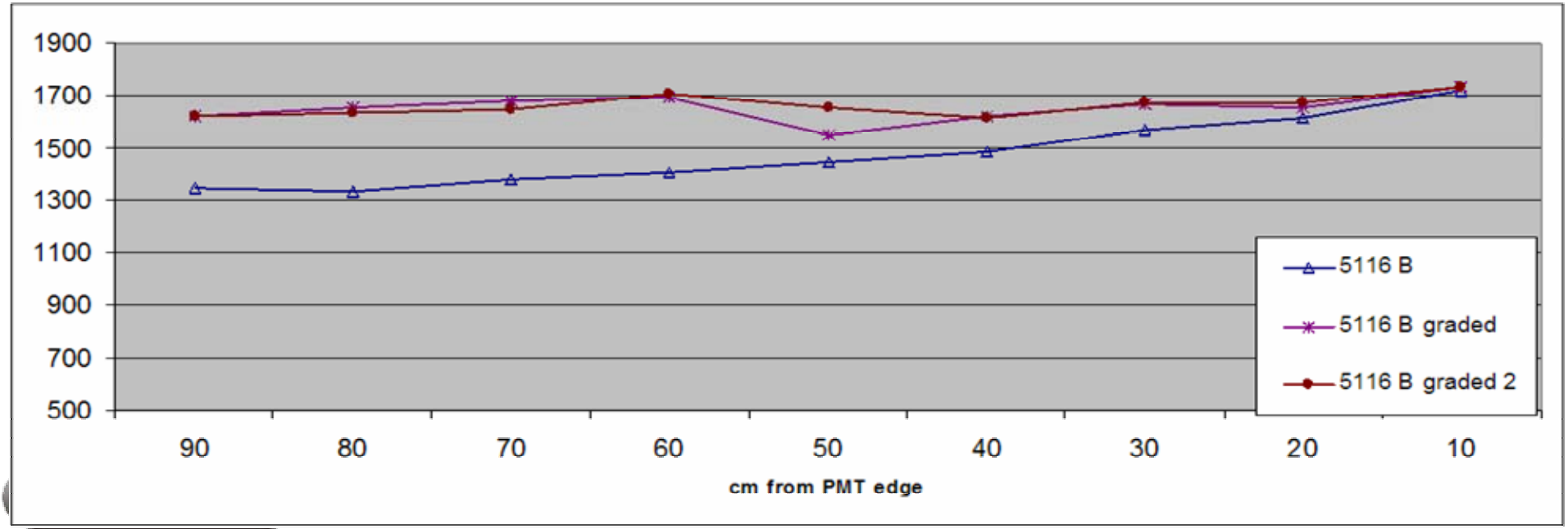
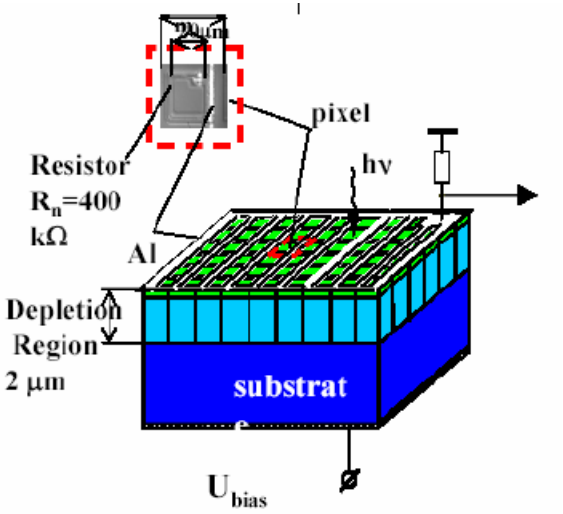
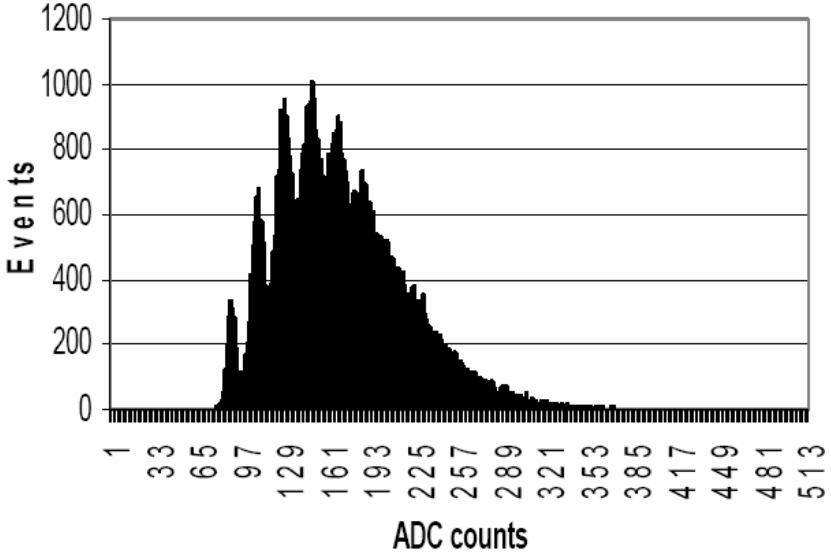
Cassettes: Use of Reflector to Improve Uniformity



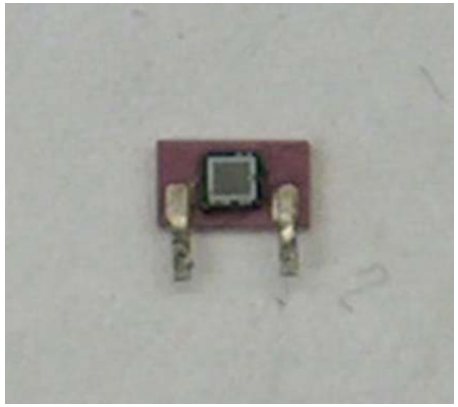


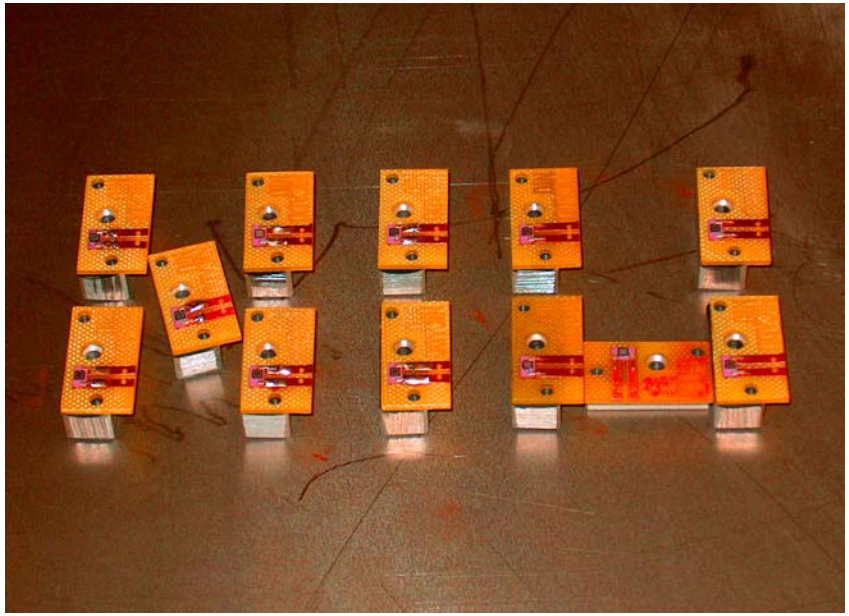
Cassettes: SiPM readout and holders





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





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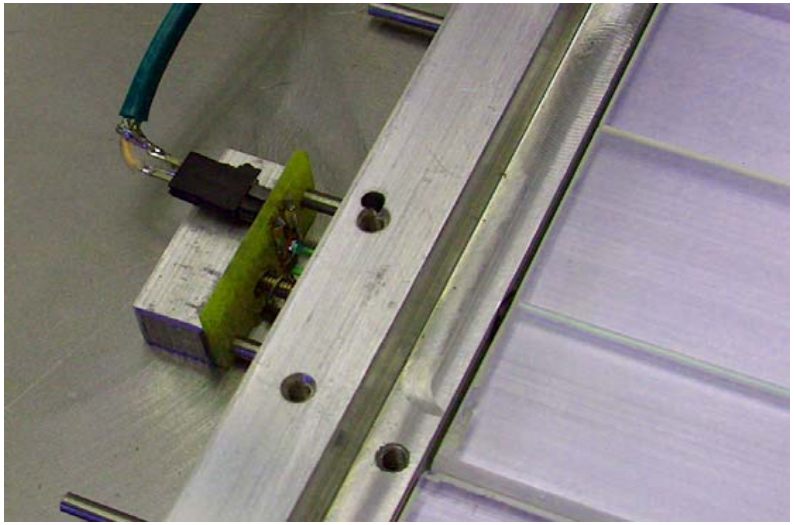
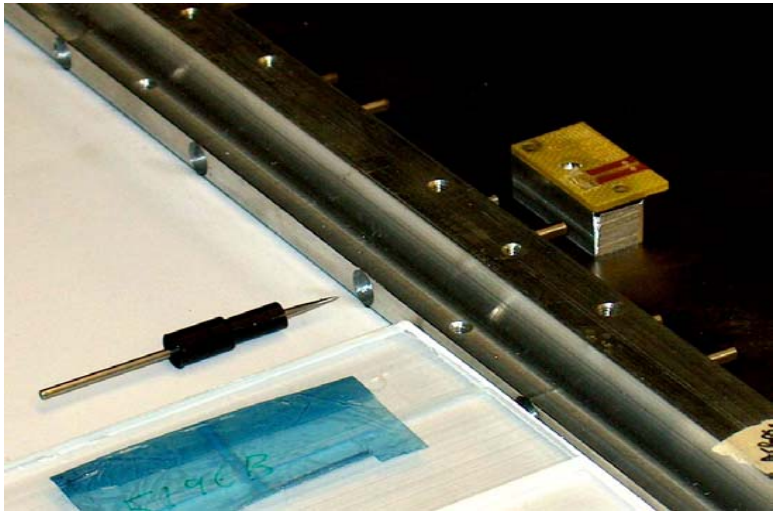
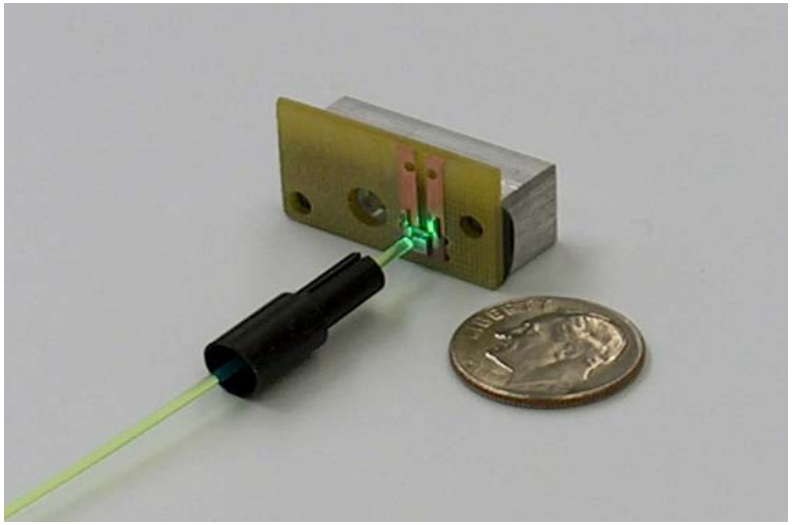
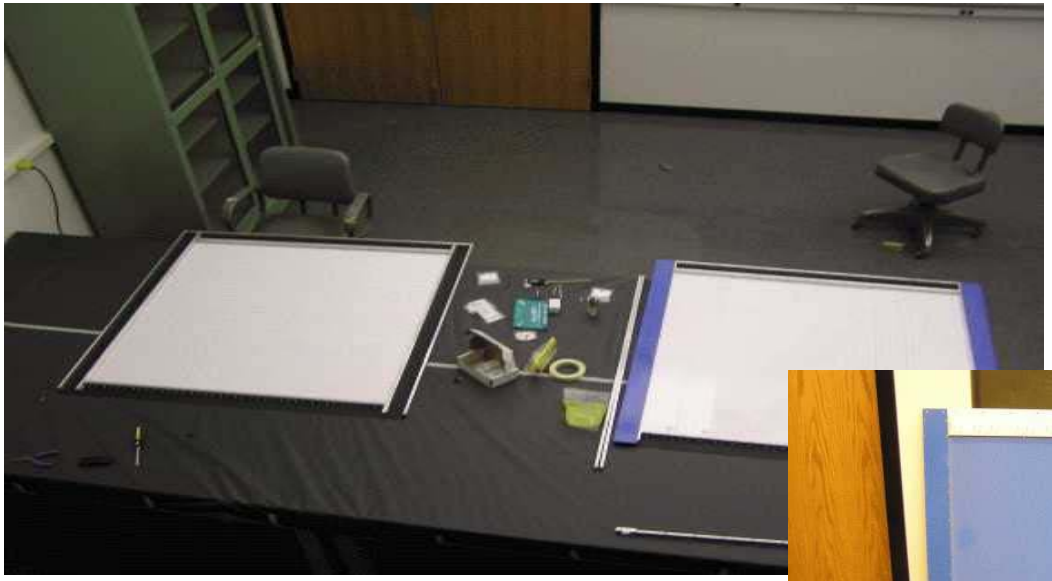
Cassettes: Fiber-Photodetector Matching







Cassette Production*



Production:
4 Complete
19 Complete mid-Sept

***w/o SiPM**

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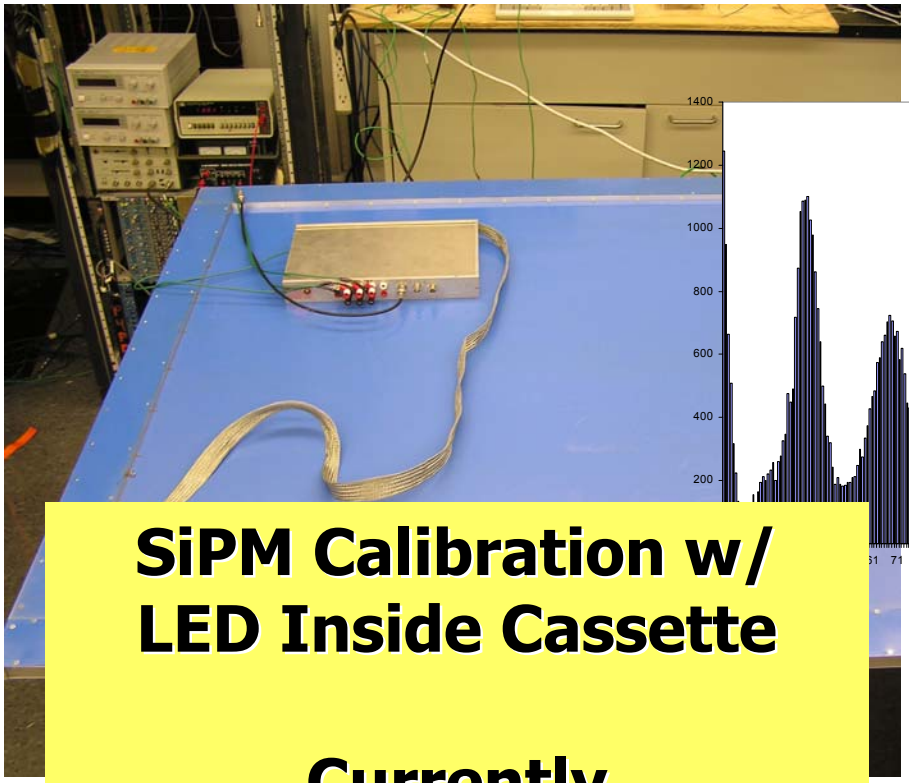
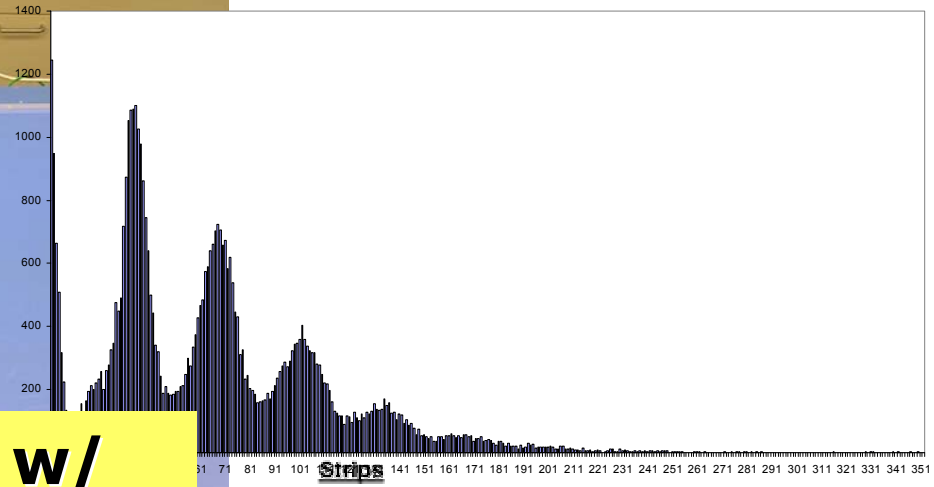
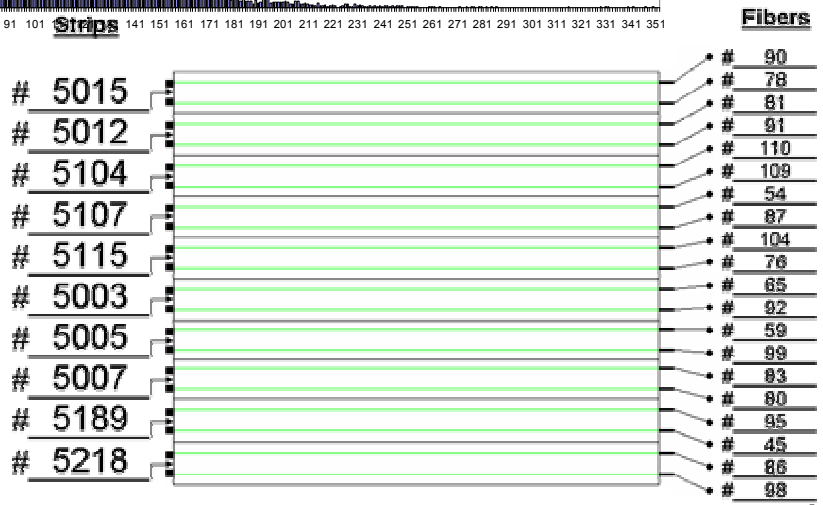
Cassettes: Commissioning & Keeping Track







SiPM Calibration w/ LED Inside Cassette

Currently Commissioning 1st Cassette w/ cosmics

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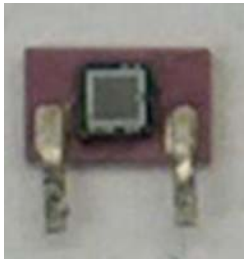
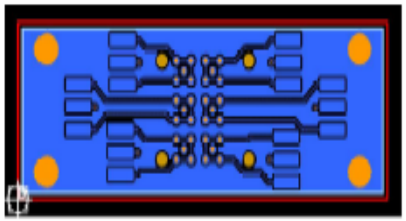
Electronic Components

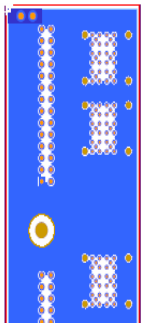
320 SiPM



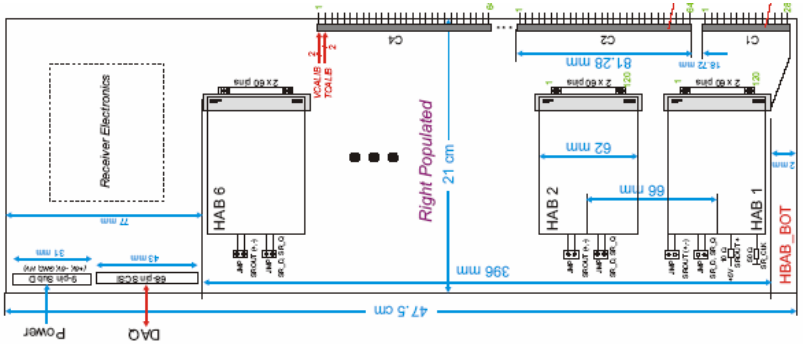
64 Connectors
6 channels/conn.
4/cassette



4 Adapters
108 channels/adapter



1 DAQ Board



4 HCAL Base Board

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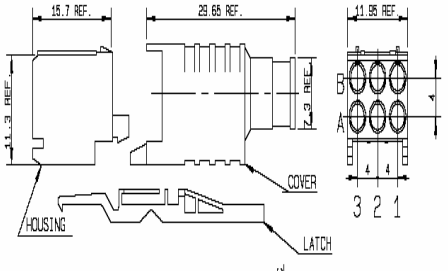
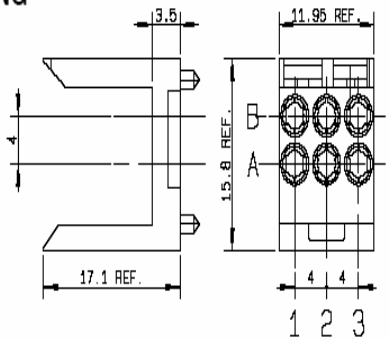
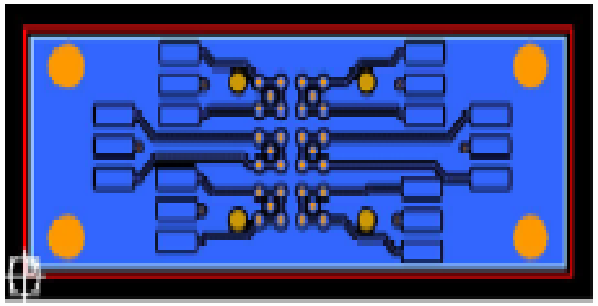
Readout: Cable/Connectors

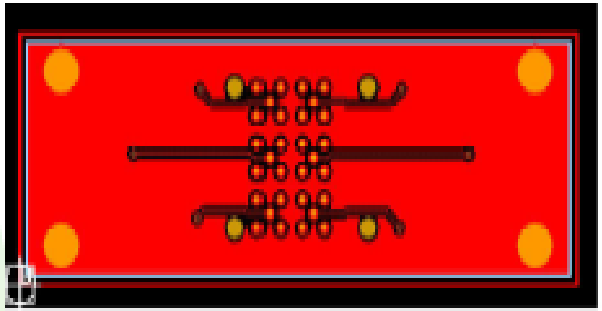
STRAIGHT FEMALE KIT FOR CABLE ASSEMBLIES



STRAIGHT MALE HOUSING







Multi Coax Connectors all in hand
Thanks to T. Wesson/Fermilab

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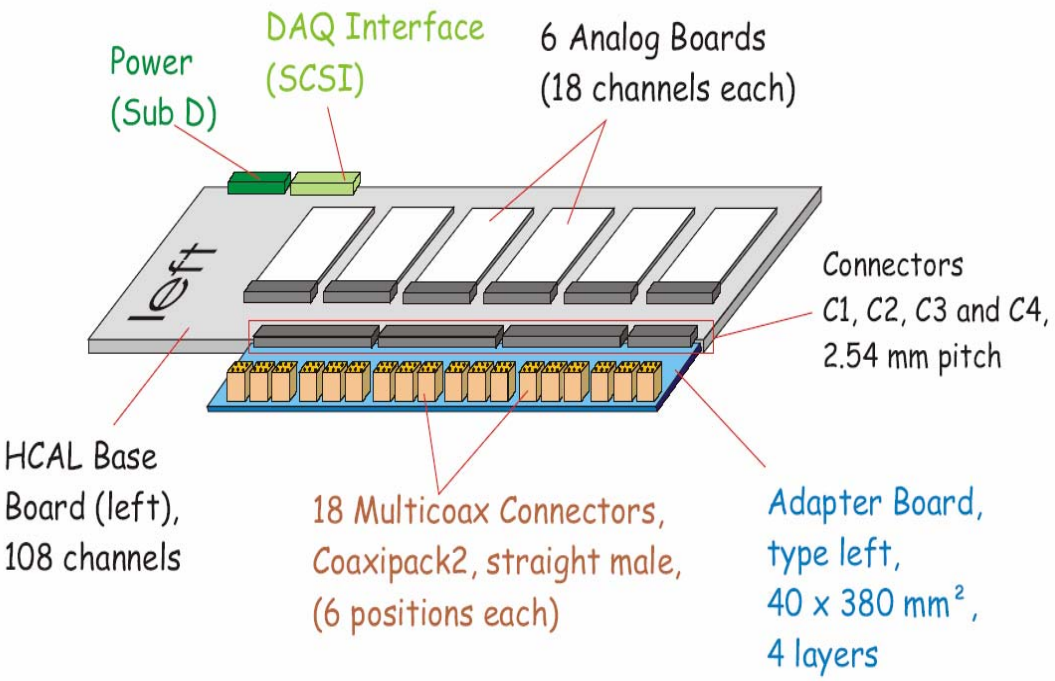
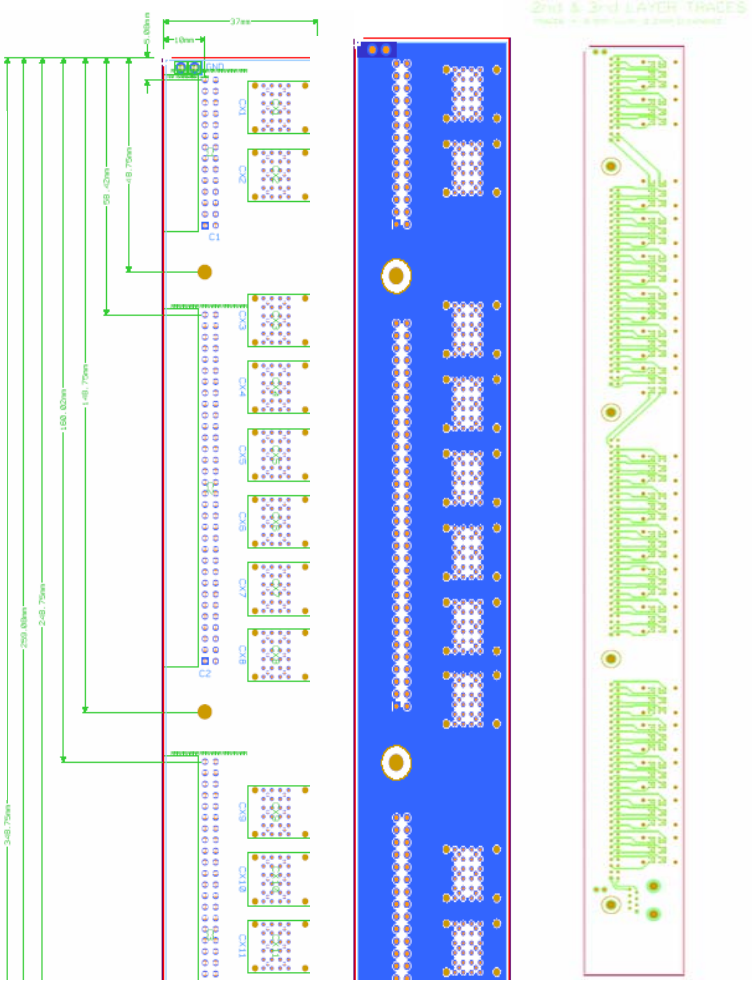
Readout: Front End and Adaptor Board Layout





Concept: Concept by M. Reinecke (DESY)
Adapter Board Layout Complete
Thanks C.Needles/Fermilab

Jerry Blazey
NIU/NICADD

Summary

- TCMT making excellent progress
- Mechanical Structure/Absorber
  - Design complete
  - Starting construction
- Cassette
  - Uniformity acceptable
  - production complete by September
  - Cassette commissioning underway
- Electronics
  - Interface w/ CALICE HCAL in design/production
  - Awaiting arrival of full SiPM
- Should be ready for beam 2006.