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

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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
    - 5 mm thick
    - 5 cm 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**
Mechanical Structure & Absorber Stack

Design complete
Construction Starting Soon
Thanks to Fermilab
Cassettes: Scintillator Strips

NICADD/Fermilab Extruder

Uniformity:
~5% across strip
~strip-to-strip
Cassettes: Mech. Prototype
Cassettes: Strip QC

A80
A20
B80
B20

TYVEK

RC

101

RESPONSE, mA

STRIP NUMBER

1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0

1 50 99 148 197 246 295 344 393

2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0

1 50 99 148 197 246 295 344 393

Jerry Blazey
NIU/NICADD
Cassettes: A Finer Look @ Strips

ASYMMETRY ACROSS THE STRIP

A/B RATIO

1.15
1.05
1.00
0.95
0.85

1 51 101 151 201 251 301 351

NUMBER OF STRIP

A80/B80 A20/B20

TYVEK
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 $\sigma$ less than 1%.

Normalized response of 222 fibers.
210 fibers are in the peak (94%)
Cassettes: Use of Reflector to Improve Uniformity
Cassettes: SiPM readout and holders

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

![Image of SiPM cassettes](image-url)
Cassettes: Fiber-Photodetector Matching
Cassette Production*

Production:  
4 Complete  
19 Complete mid-Sept  

*w/o SiPM
Cassettes: Commissioning & Keeping Track

SiPM Calibration w/ LED Inside Cassette

Currently Commissioning 1st Cassette w/ cosmics
Readout: Cable/Connectors

Multi Coax Connectors all in hand
Thanks to T. Wesson/Fermilab
Readout: Front End and Adaptor Board Layout

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

Power (Sub D)

DAQ Interface (SCSI)

6 Analog Boards (18 channels each)

HCAL Base Board (left), 108 channels

18 Multicoax Connectors, Coaxipack2, straight male, (6 positions each)

Connectors C1, C2, C3 and C4, 2.54 mm pitch

Adapter Board, type left, 40 x 380 mm², 4 layers
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.**