The Tail–Catcher/Muon Tracker for the CALICE test beam

Dhiman Chakraborty
NICADD is building the Tail-Catcher/Muon Tracker to study hadronic punch-through and muon tracking in the (relatively thin) CALICE test beam module.
Goals

• Provide a reasonable snapshot of the tail-end of the shower for simulation validation
• Prototype detector for a generic LCD muon system
  • correcting for leakage
  • understanding the impact of coil
  • muon reconstruction and ID
  • fake rate
**TCMT design**

- “Fine” section (8 layers): 2 cm thick steel
- “Coarse” section (8 layers): 10 cm thick steel
- 5mm thick, 5cm wide strips
- 1.2 mm–diameter Kuraray Y11 fibers
- Tyvek/VM2000 wrapping
- Alternating x–y orientation
- Si–PM photo detection
- Common readout w/ Hcal
- Along beam: 142 cm
- Height: 109 cm
- Weight: ~10 ton
The strips

• Each 10 cm wide strip divided in 2 halves, one fiber in each half.

• All strips have been produced and passed QC tests (see A. Dychkant’s talk for details).
Initial uniformity calibration

- Ref cells + strip response to Sr–90 measured w/ PMT.
Quality of extruded scintillators

- Extruded scintillator has many potential advantages (see Dr. Kim’s talk in session 2).
- Our R&D at the NICADD/Fermilab extrusion facility over the past 2.5 yrs confirms this:
  - Savings in cost does not compromise reliability,
  - The response and clarity are good enough that they do not limit segmentation,
  - Uniformity is excellent in both geometry and resoponse.
Cassette assembly
SiPM’s with holders
WLSF–SiPM misalignment is within 0.1 mm
WLS fibers with UV–protected mirroring are ready for QC tests
Front-end electronics

M. Reincke (DESY)

- DAQ Interface (SCSI)
- 6 Analog Boards (18 channels each)
- Power (Sub D)
- Connectors C1, C2, C3 and C4, 2.54 mm pitch
- HCAL Base Board (left), 108 channels
- 18 Multicoax Connectors, Coaxipack2, straight male, (6 positions each)
- Adapter Board, type left, 40 x 380 mm², 4 layers
Calibration and monitoring

- Individual LED driver for each strip.
- Preliminary driver design has been proposed.
- Read-out schema under discussion.

Block diagram of current switch at LED

One TCMT cassette includes

- 20 of current switchers
- 18 inputs
- Pulser Card
- Preamplifier Card
- Com. card

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LCWS05

CALICE TCMT
Dhiman Chakraborty
The LED driver

- Testing prototype channel this week

Pulser Card Block Diagram

Data Bus

Timing Adj

Trig

LCWS05

CALICE TCMT

Dhiman Chakraborty
The TCMT stack at TB

- 16 layers of NICADD extruded scint. Strips
  - 0.5 cm thick
  - 10 cm wide
- Steel absorber
  - 8 x 2 cm
  - 8 x 10 cm
- Lateral size: 1m x 1m
The TCMT stack at TB (contd.)
The TCMT stack at TB (contd.)
TCMT schedule for 2005 beam test

- Mar–May: QC for WLS fibers, first full cassette assembly, cut absorber plates.
- Jun–Aug: Continue cassette assembly, testing with baseboard, start full-chain commissioning.
- Sep–Nov: Start extended calibration, data taking with CR triggers, CR tests with all cassettes in place.