

# The Tail-Catcher/Muon Tracker for the CALICE test beam

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NORTHERN ILLINOIS  
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 **Fermilab**



2005 INTERNATIONAL  
LINEAR COLLIDER WORKSHOP

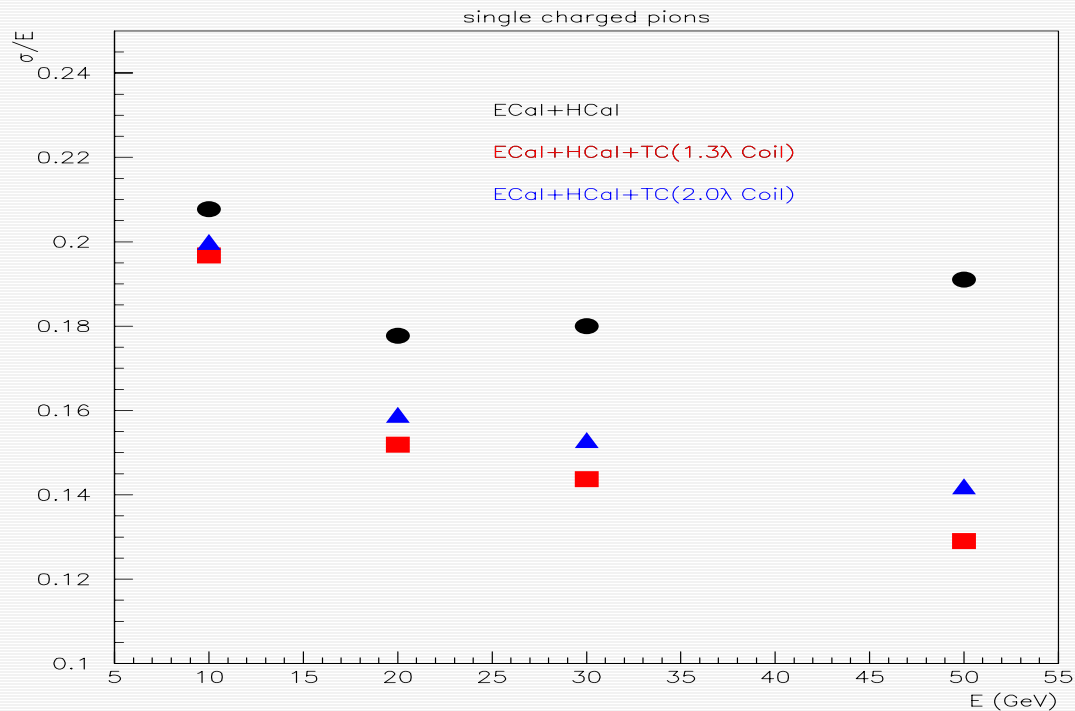


Stanford, California, USA 18-22 March, 2005

# Introduction

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

## Single particle E Resolution



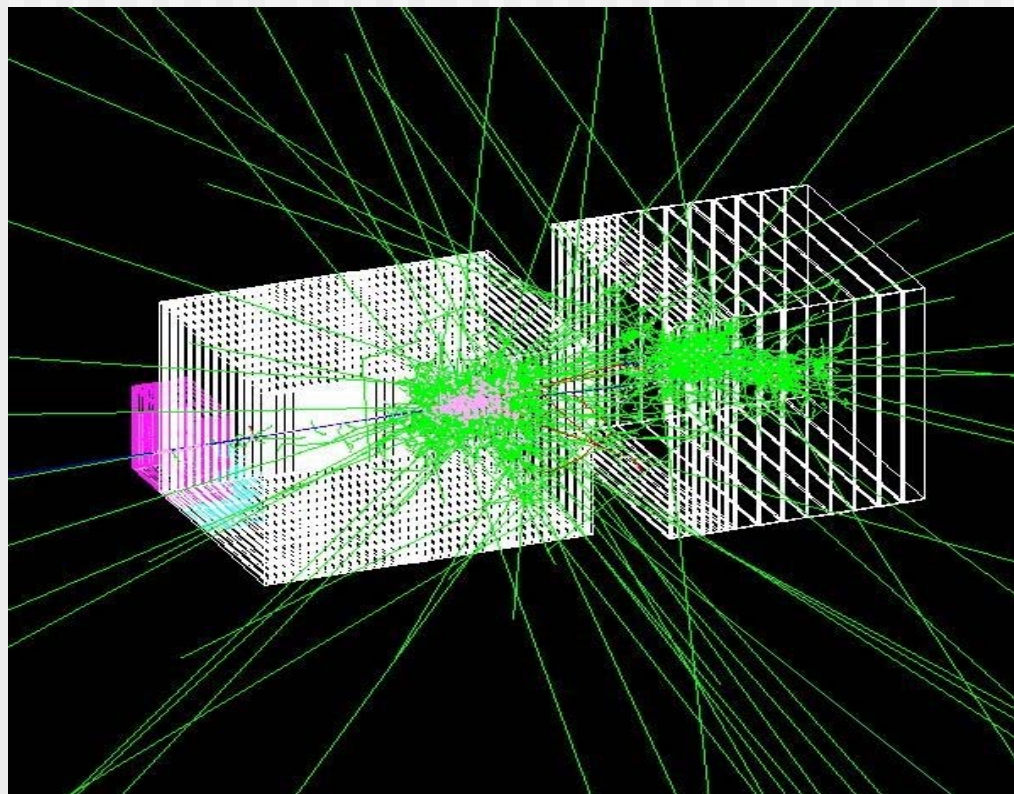
# Goals

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- 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
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- 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



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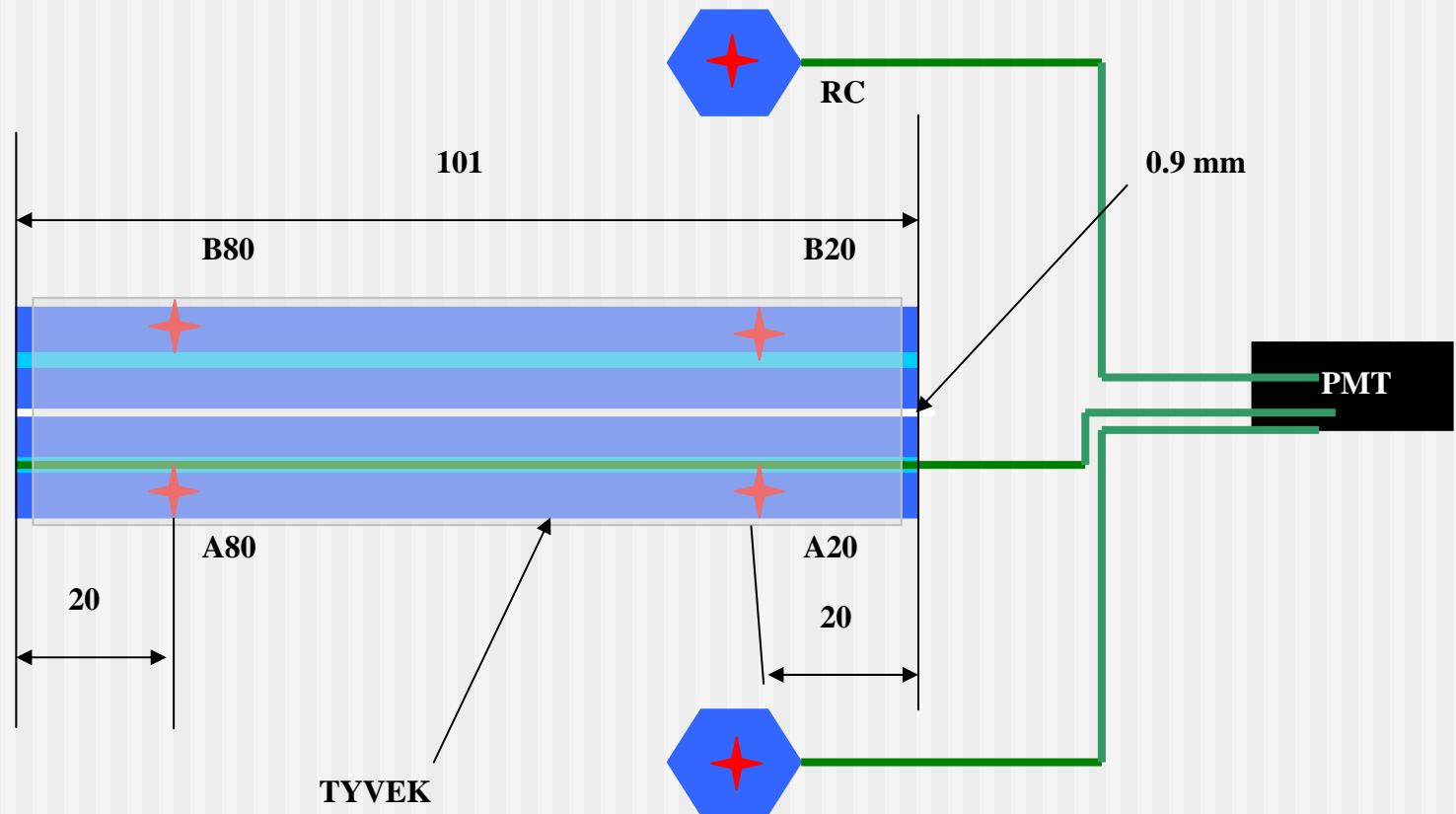
# The strips

- 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.



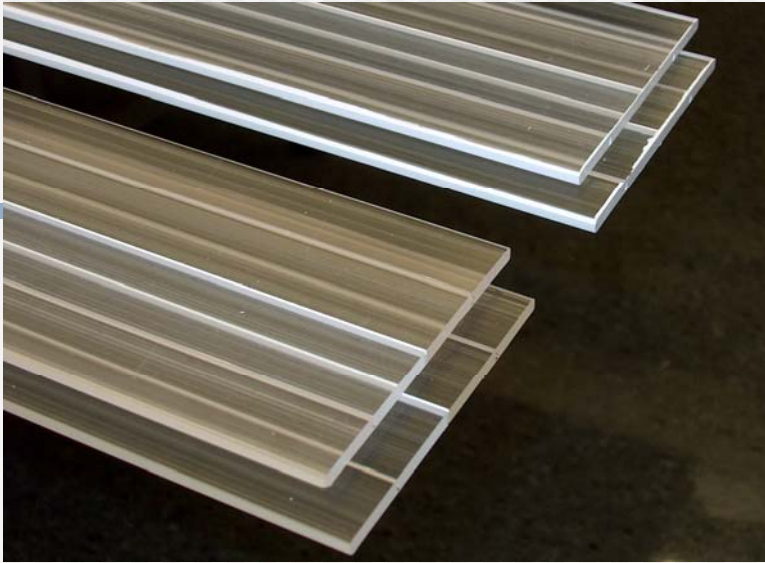
# Quality of extruded scintillators

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- 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 response.

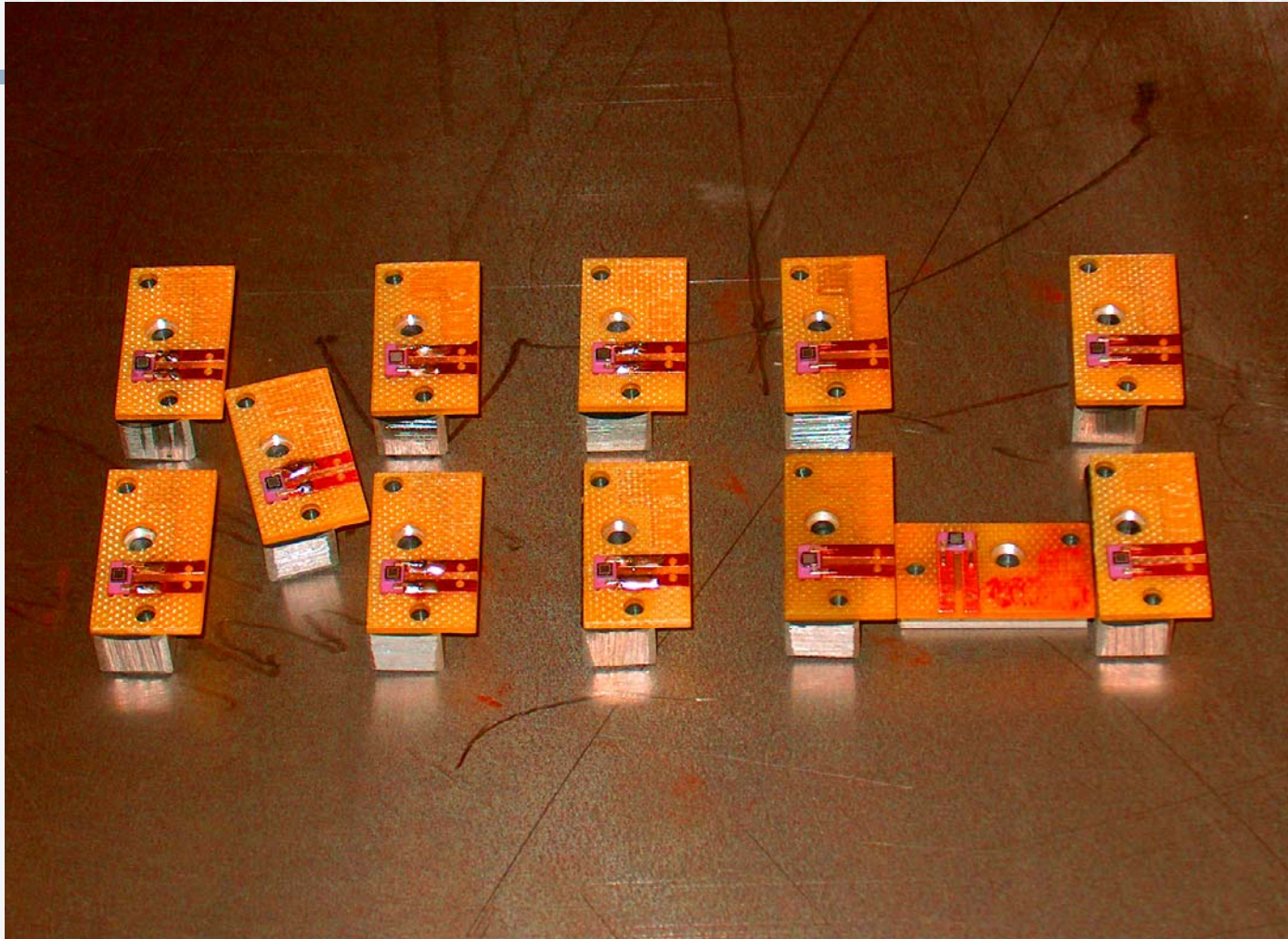


# Cassette assembly

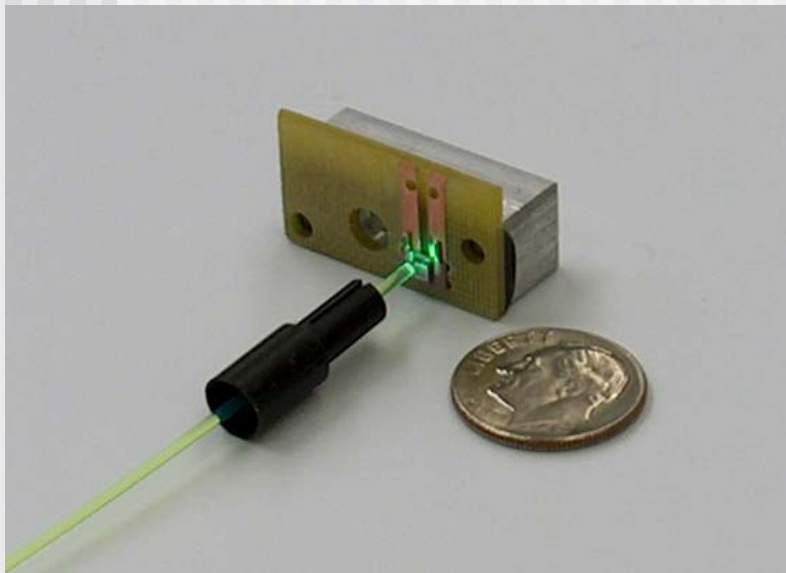
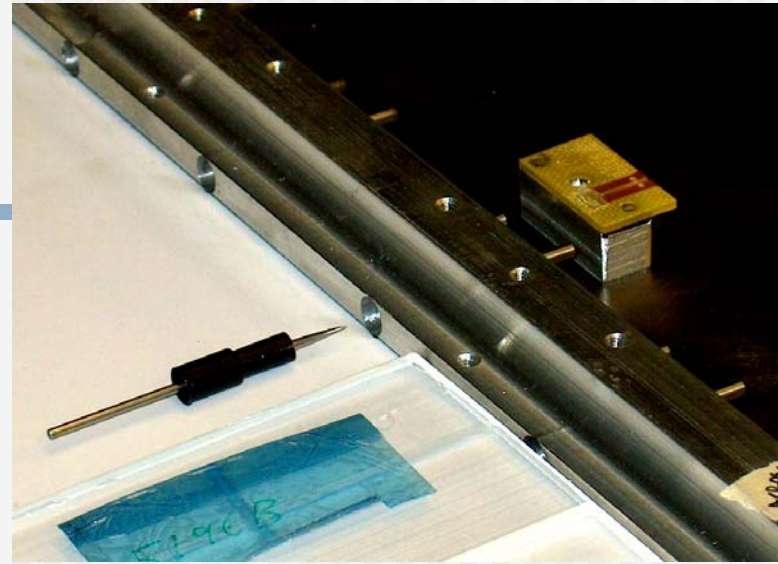
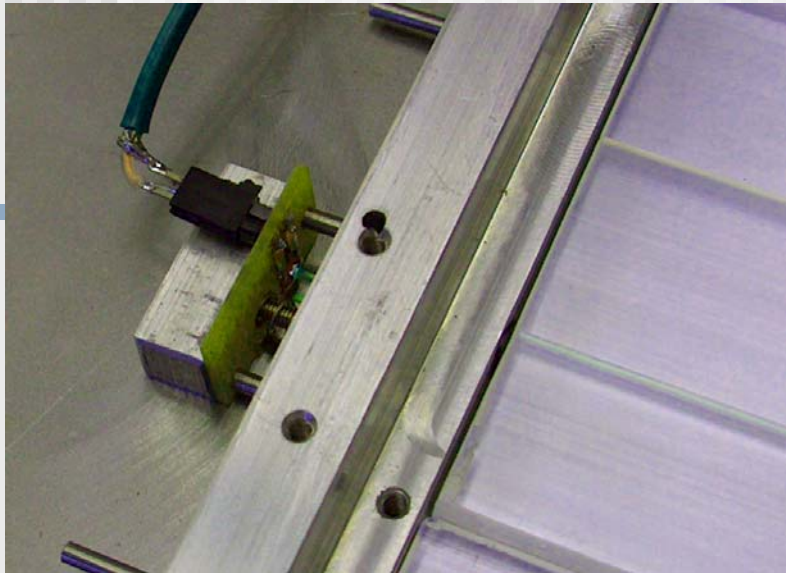




# SiPM's with holders



# WLSF-SiPM misalignment is within 0.1 mm



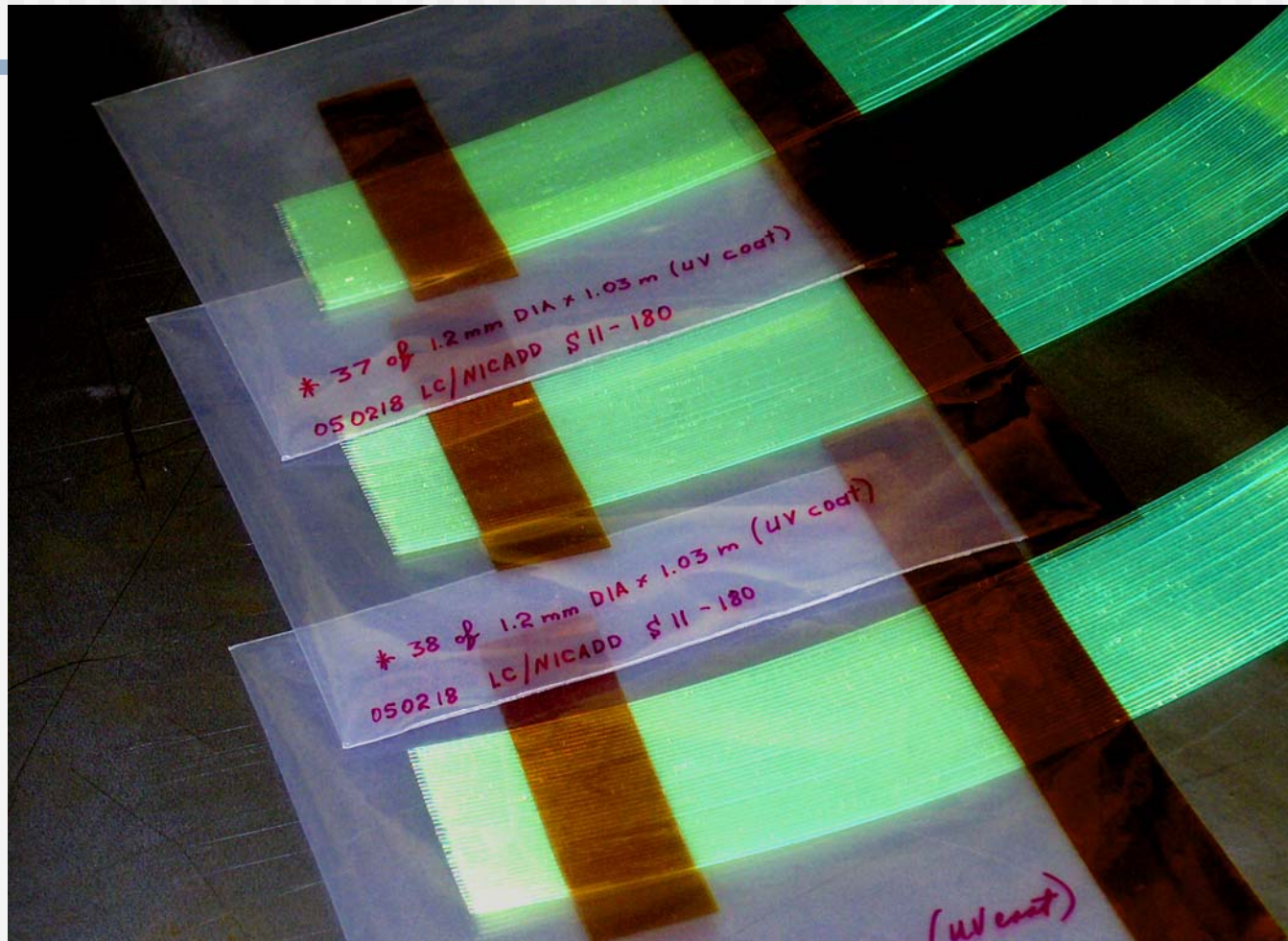
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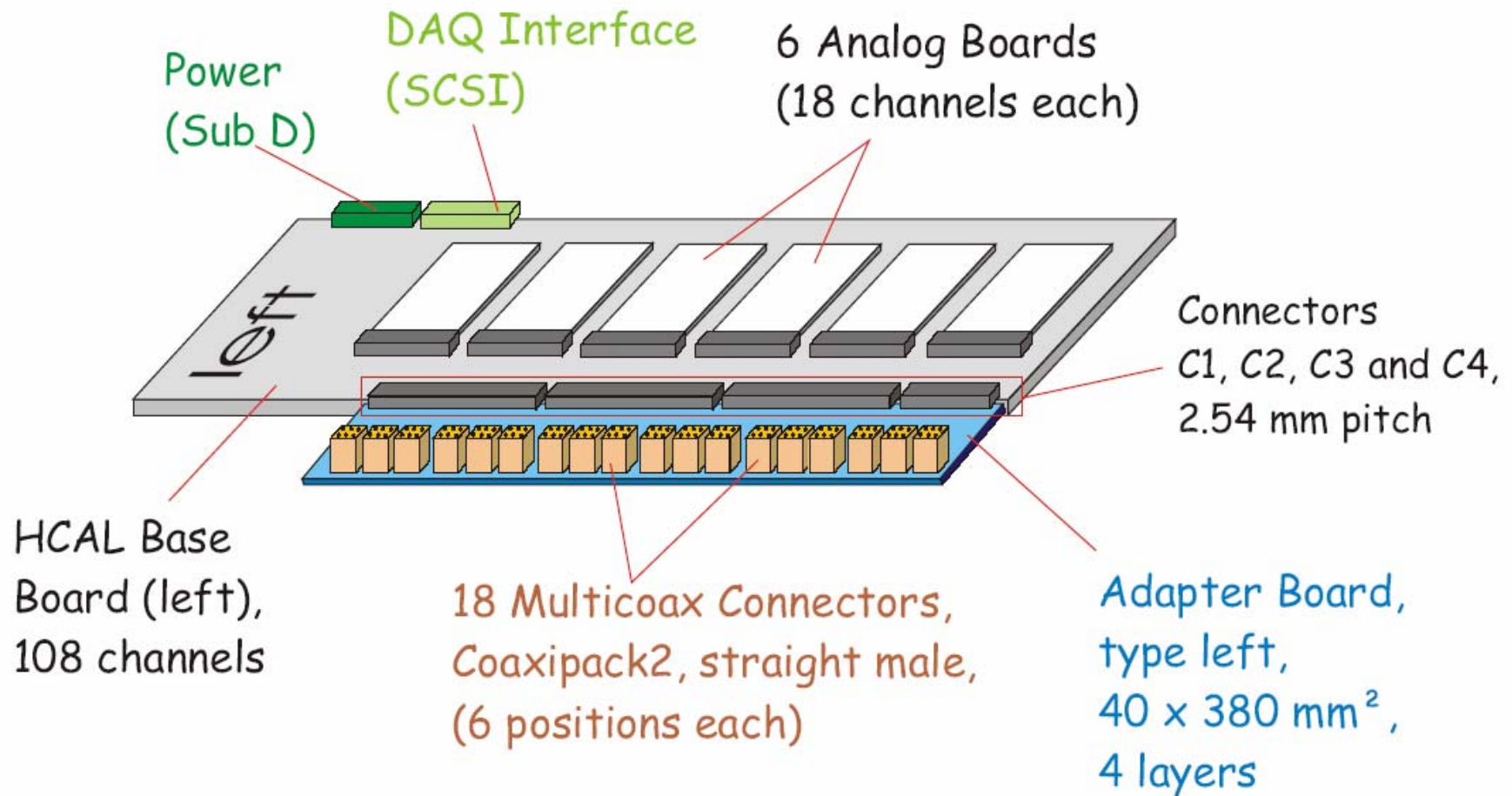


# WLS fibers with UV-protected mirroring are ready for QC tests



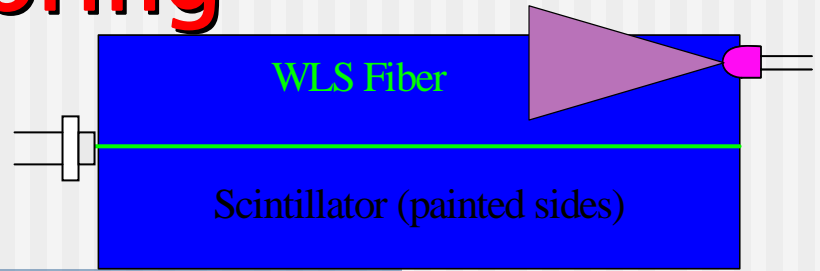
# Front-end electronics

M. Reincke (DESY)

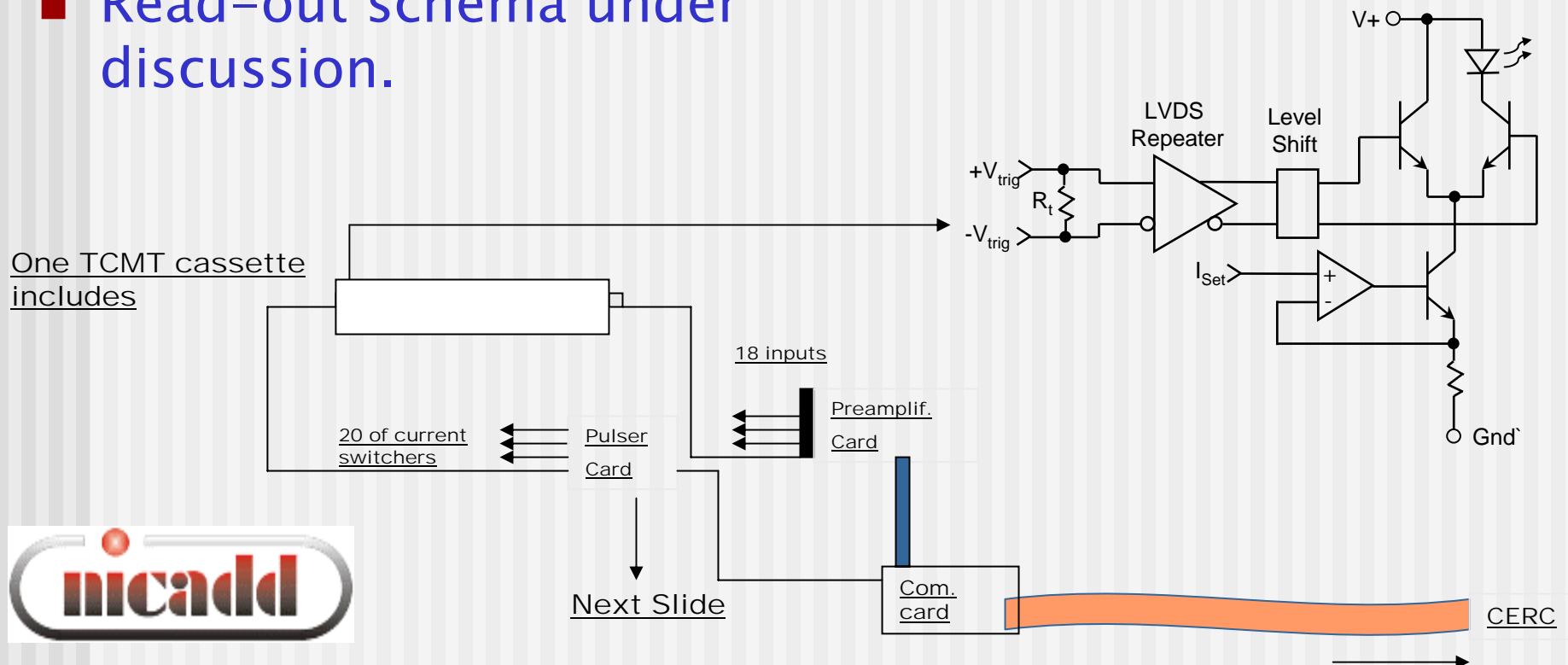


# Calibration and monitoring

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



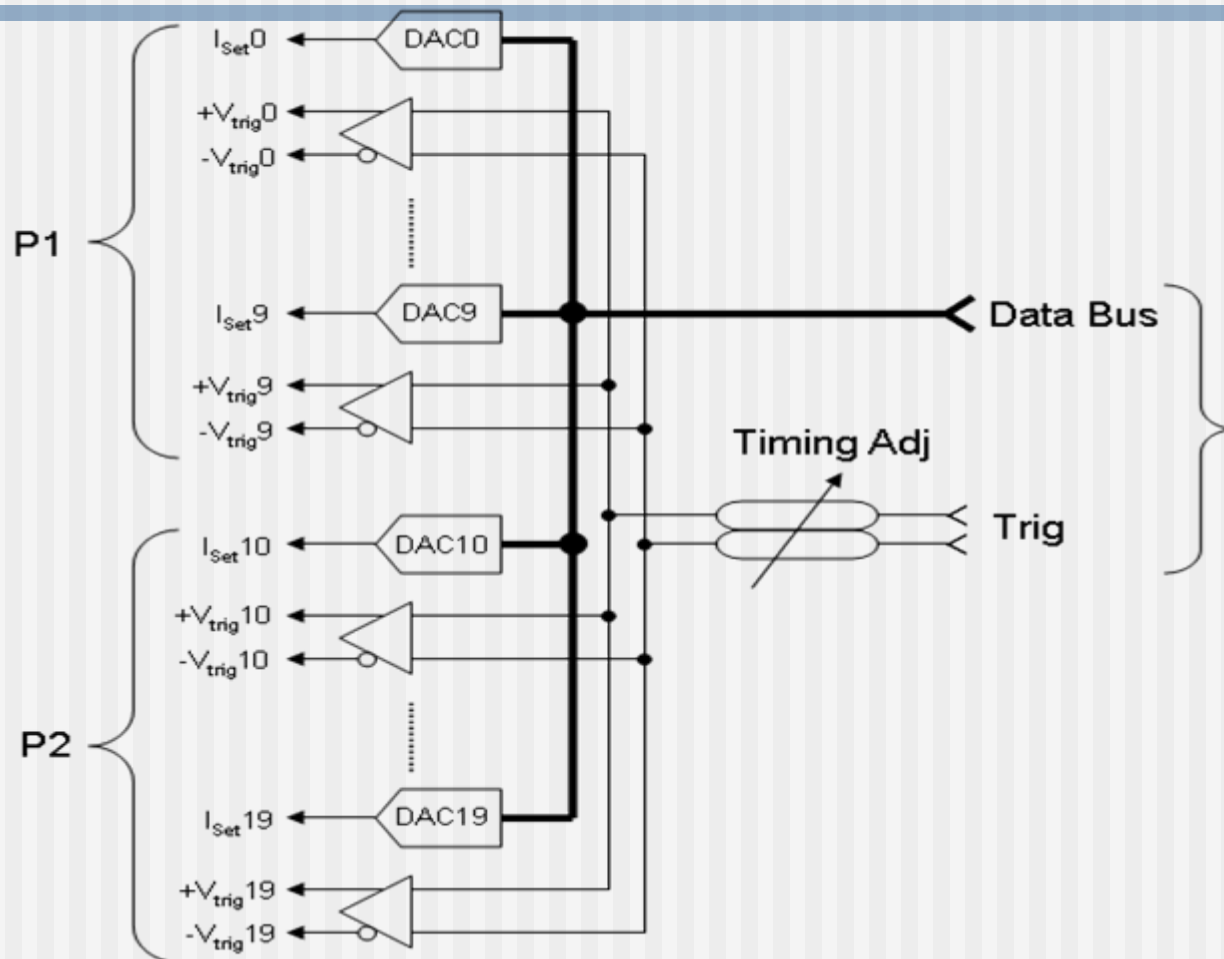
### Block diagram of current switch at LED



# The LED driver

- Testing prototype channel this week

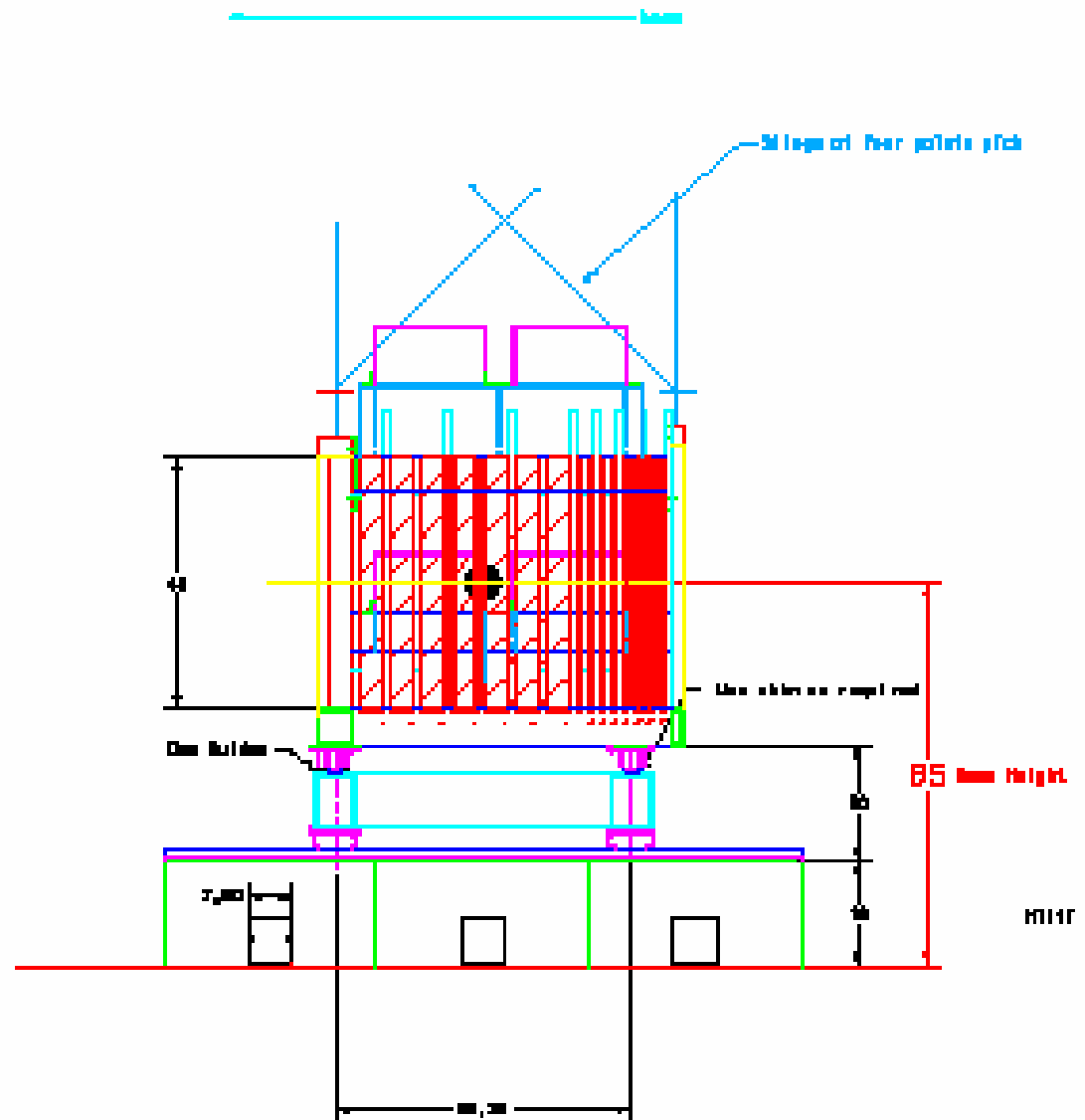
Pulser Card Block Diagram



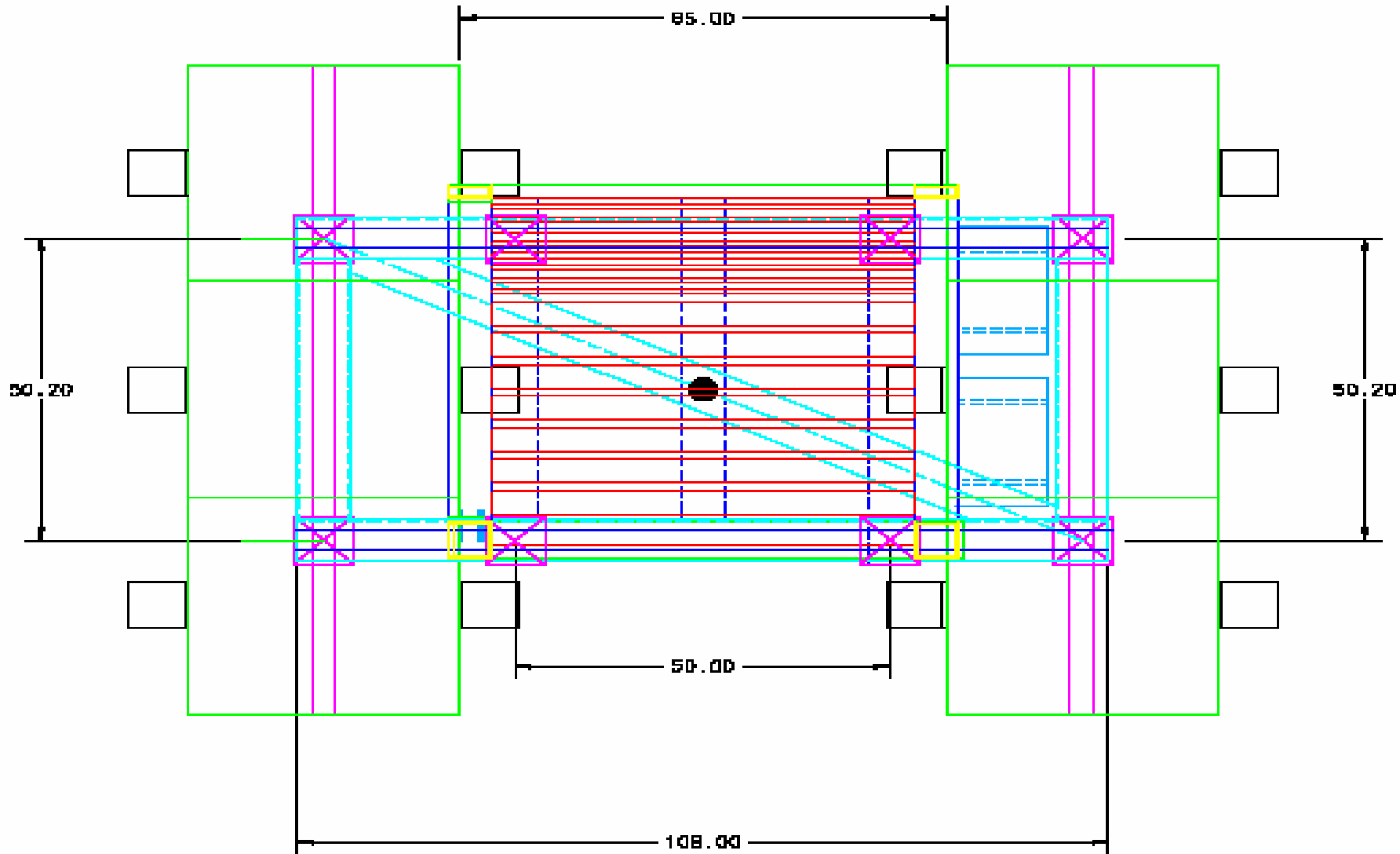


# The TCMT stack at TB

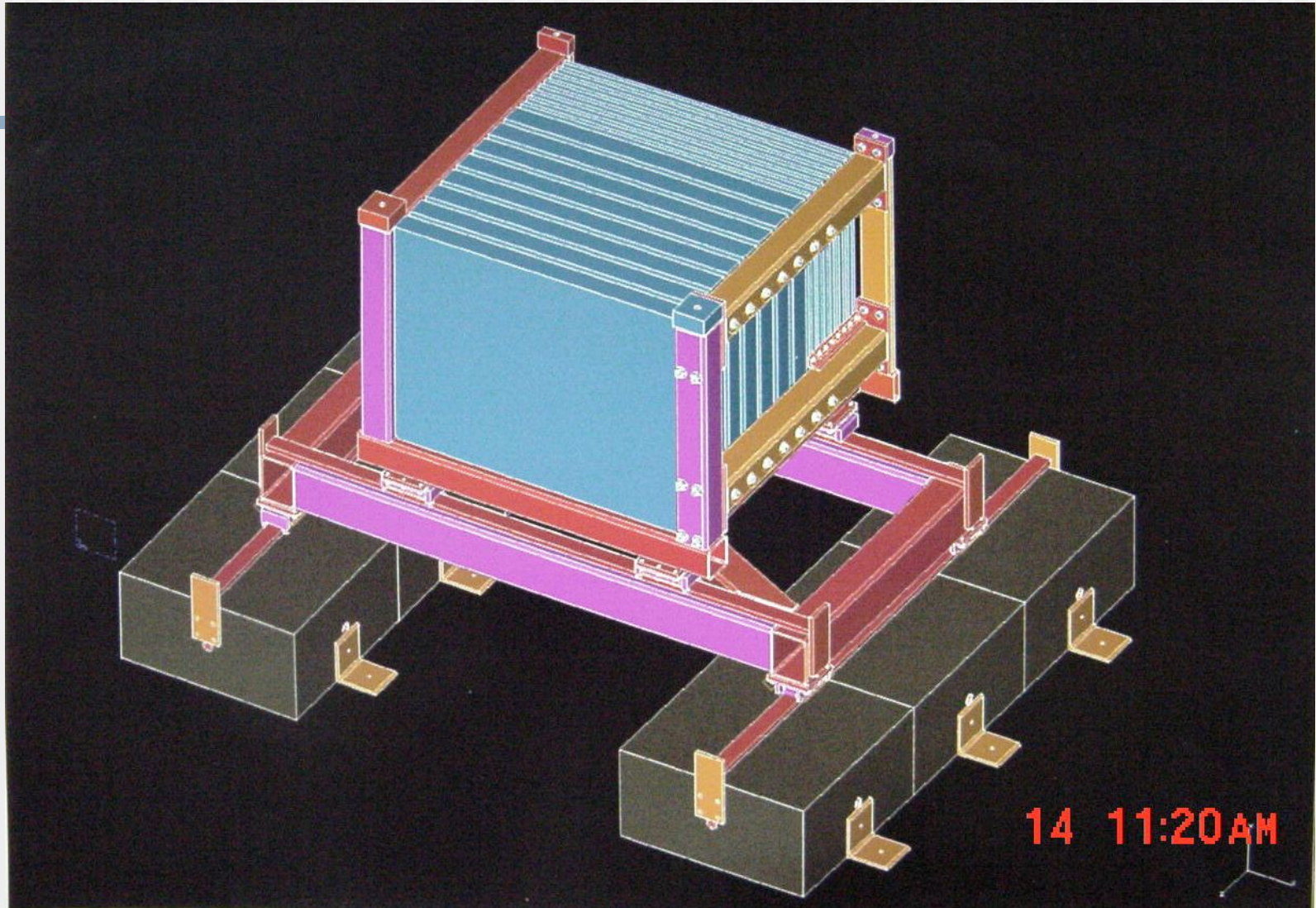
- 16 layers of NICADD extruded scint. Strips
  - 0.5 cm thick
  - 10 cm wide
- Steel absorber
  - 8 x 2 cm
  - 8 x 10 cm
- Lateral size: 1m x 1m



# The TCMT stack at TB (contd.)



# The TCMT stack at TB (contd.)



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# TCMT schedule for 2005 beam test

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- 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.