

# Construction of a Downstream Ecal for the T2K ND280 Detector

- DS-Ecal Design
- Scintillator Bar QA
- DS-Ecal Construction
- Outlook

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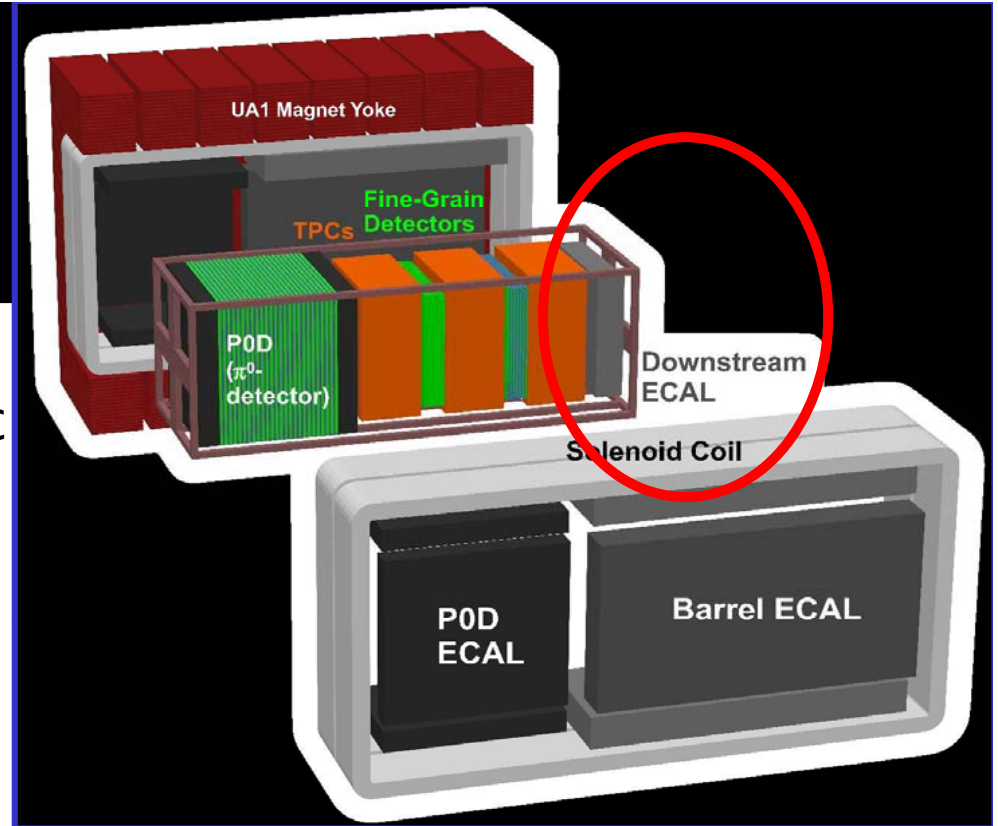
Lancaster University

T2K UK Collaboration

IoP HEPP Lancaster 31/03 – 02/04/08

## DS-Ecal Design

- DS-Ecal is a tracking lead-plastic scintillator calorimeter
- 34 lead-scintillator layers, x-y orientation
  - 2 lead pieces per layer:  
*2.0m x 1.0m x 1.75mm primed*
  - 50 scintillator bars per layer:  
*2.0m x 4cm x 1cm*
- 1 module: *~2.5m x 2.5m x 0.5m*
  - Active area: *2.0m x 2.0m*



- 1700 WLS fibres coupled to MPPC double-ended readout

(see M. George poster for T2K overview)

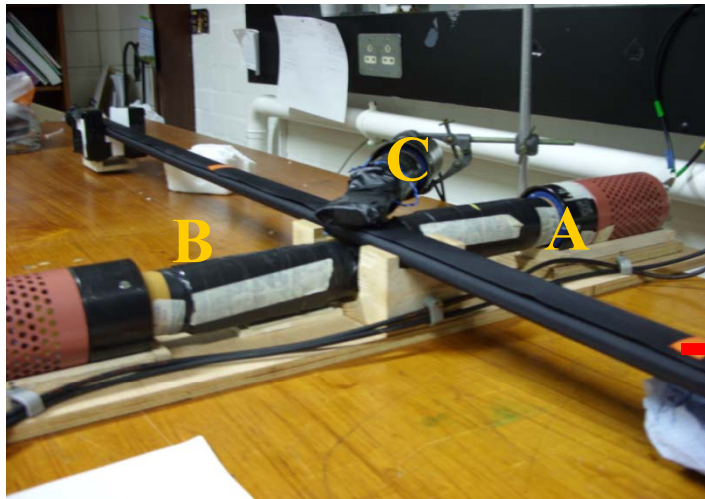




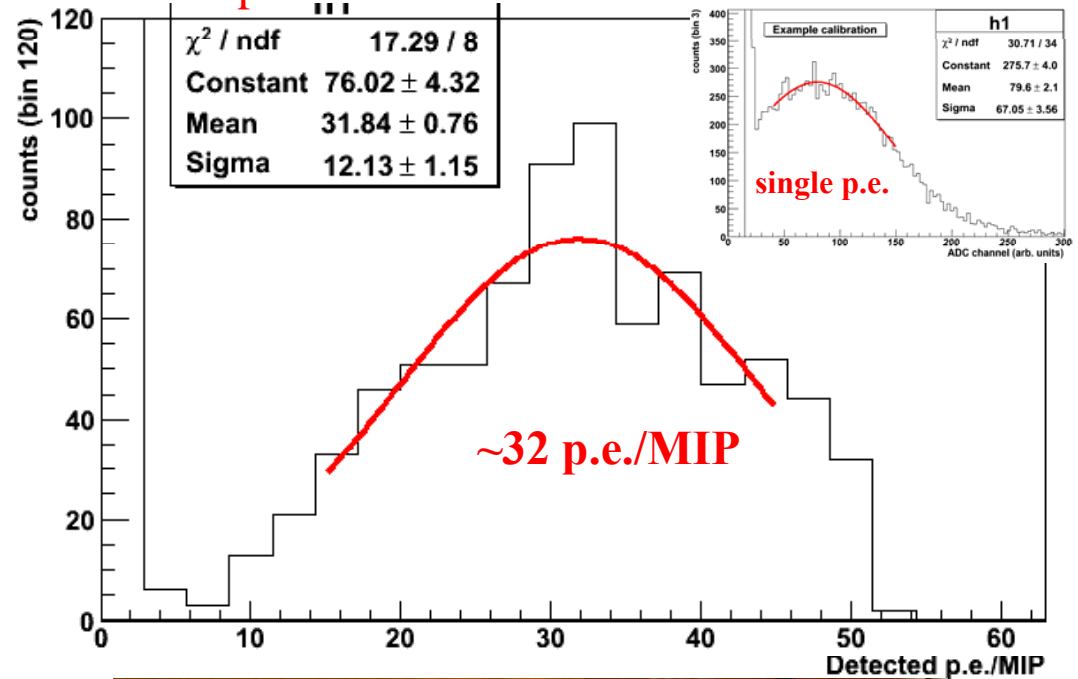
# Scintillator Bar QA Optical



- Cosmic Trigger, producing at least 450 triggers/hour
- Three 4 x 6cm scintillator pads coupled to 2" PMTs
  - Coincidence area of 16cm<sup>2</sup>
- Triple coincidence window of 150ns



Example cosmic run with associated calibration

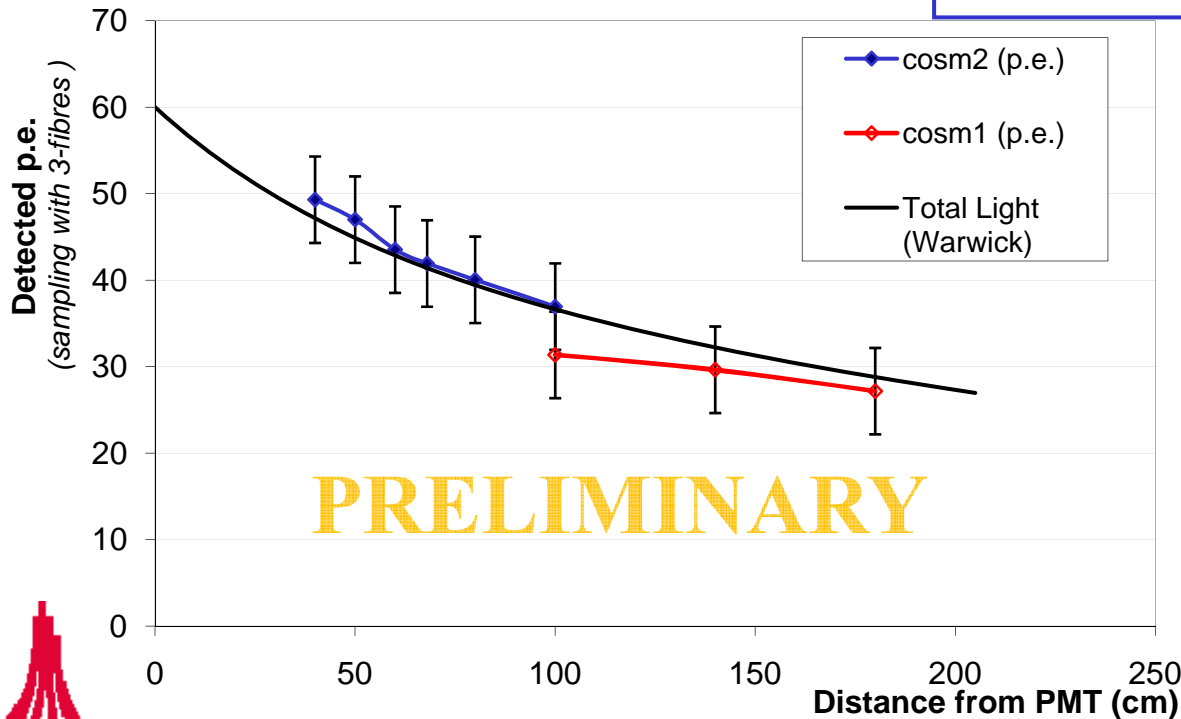
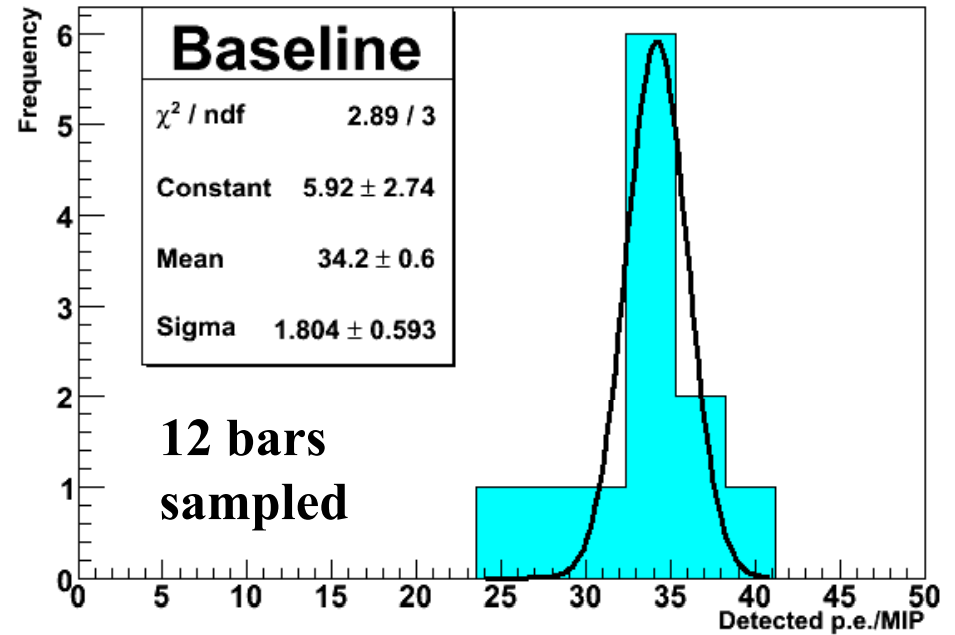


# Scintillator Bar QA Optical

## ■ Baseline

- Pass/Fail criterion
- Measurements at 70cm from end of bar

## ■ Attenuation tests



- First light attenuation tests of scintillator bar from DS-Ecal
- Compared to the light-attenuation (average lengths) of the WLS fibres, as reported from measurements with the Warwick fibre scanner setup





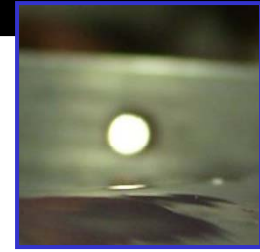
# Ecal Construction Layer Build

## IN PROGRESS!!



### ■ Layer-by-layer building

- Build all layers first



First light through hole in scintillator bar in a layer

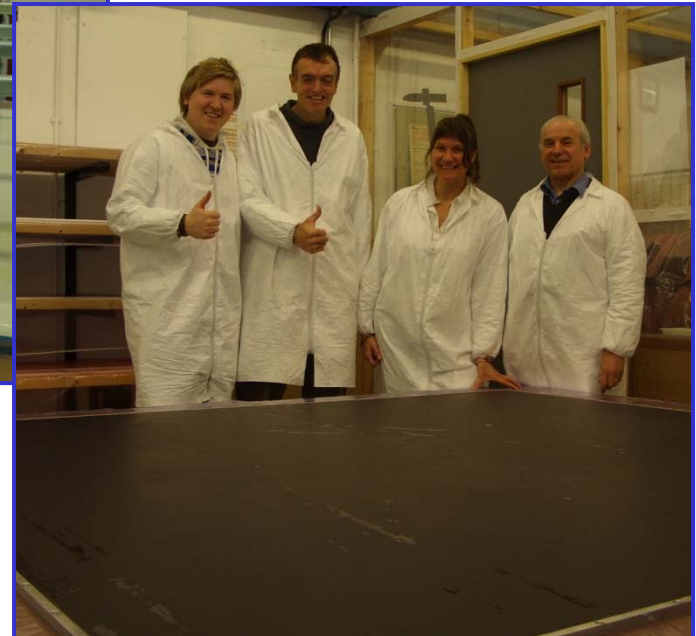


Applying glue to sides of bars

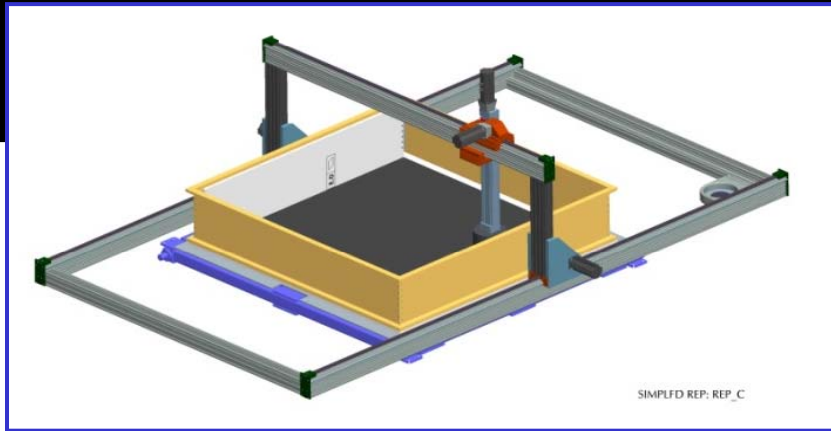


Lowering lead into position with vacuum-suction system

First completed Layer

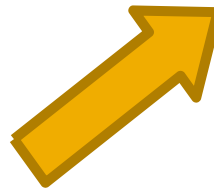


# Ecal Construction Module Build



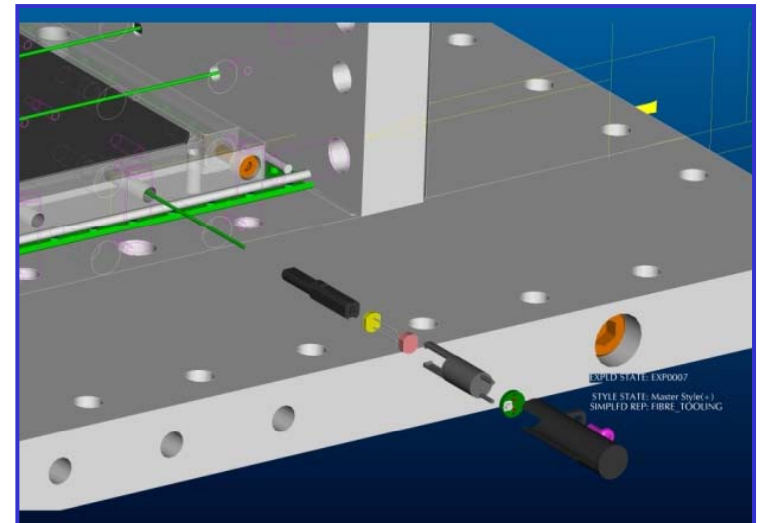
...2D scan of layer with 3mCi  $^{137}\text{Cs}$  source.

First layer: Attach carbon panel, bulkheads, fit light injection system. Now place each layer into the module frame and attach the 2D scanner...



...install WLS fibres and ferrules into the 50 scintillator bars.

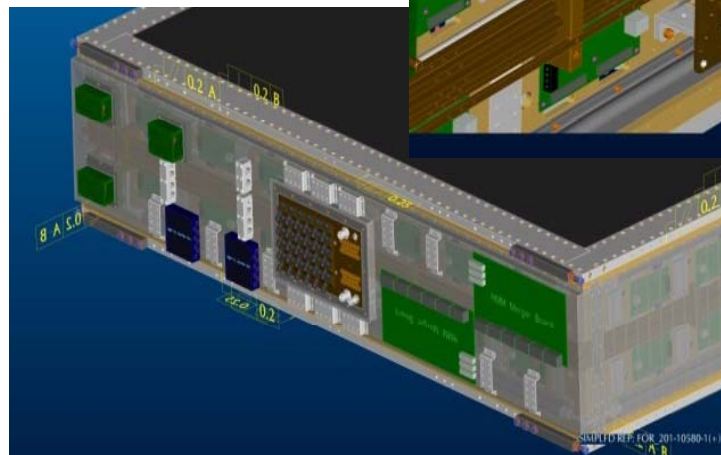
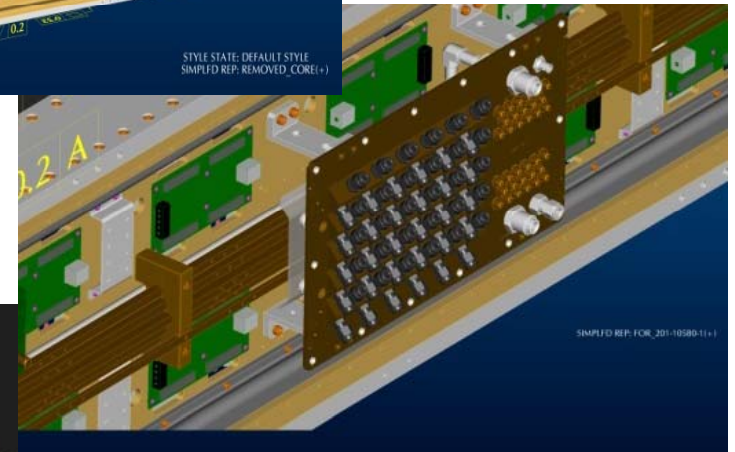
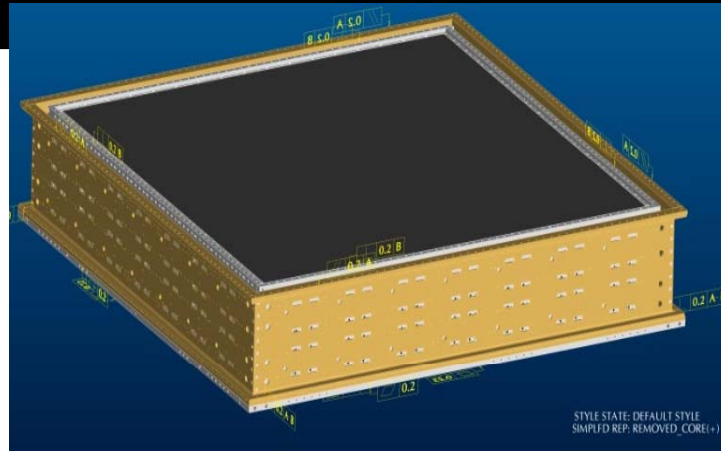
Clip 100 MPPCs (see M.Ward talk and M.Haigh poster), with electronics, to ferrules and connect to DAQ...



# Ecal Construction Module Build

*...NOW DO THE SAME FOR 33 MORE LAYERS!*

- Assemble cooling plates and feed through 3400 MPPC cables
- Install FEB electronics cards, cooling system and pressure test
- Install voltage feeds and bus bar system
- Fit signal feedthrough panel
- Attach outer cover panels
- Install services: dry  $N_2$ , water, etc



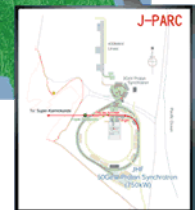
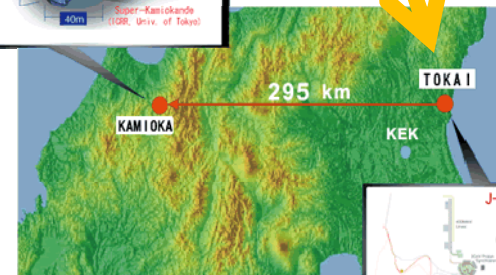
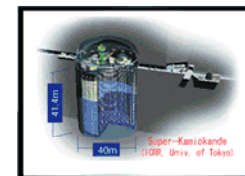
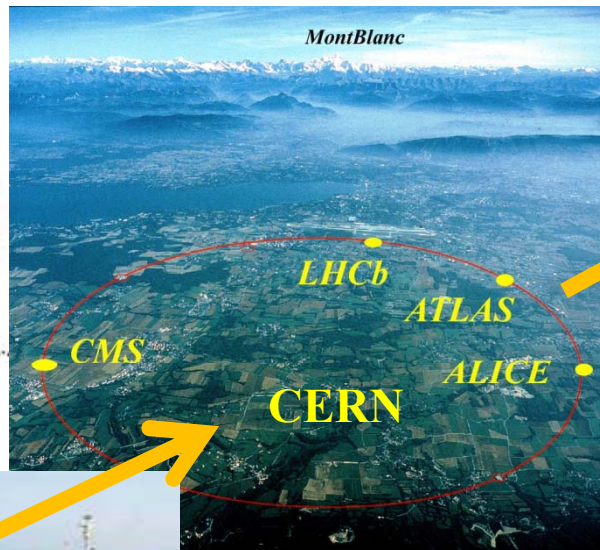
• Attach module support system





# Ecal Construction

The finished DS-Ecal module... 



# Outlook



- Schedule
  - Finish layer building: *mid-May*,
    - started 27<sup>th</sup> March. Completed 4 layers so far
  - Module build, incl. fibres installation and layer scans: *June – mid-September*
  - Cabling and services: *mid-September – 1<sup>st</sup> November*
  - CERN test beam: *Spring '09*
  - First T2K beam at Tokai: *April '09*
  - Arrive Tokai: *Autumn '09*

