

HCAL-J Status

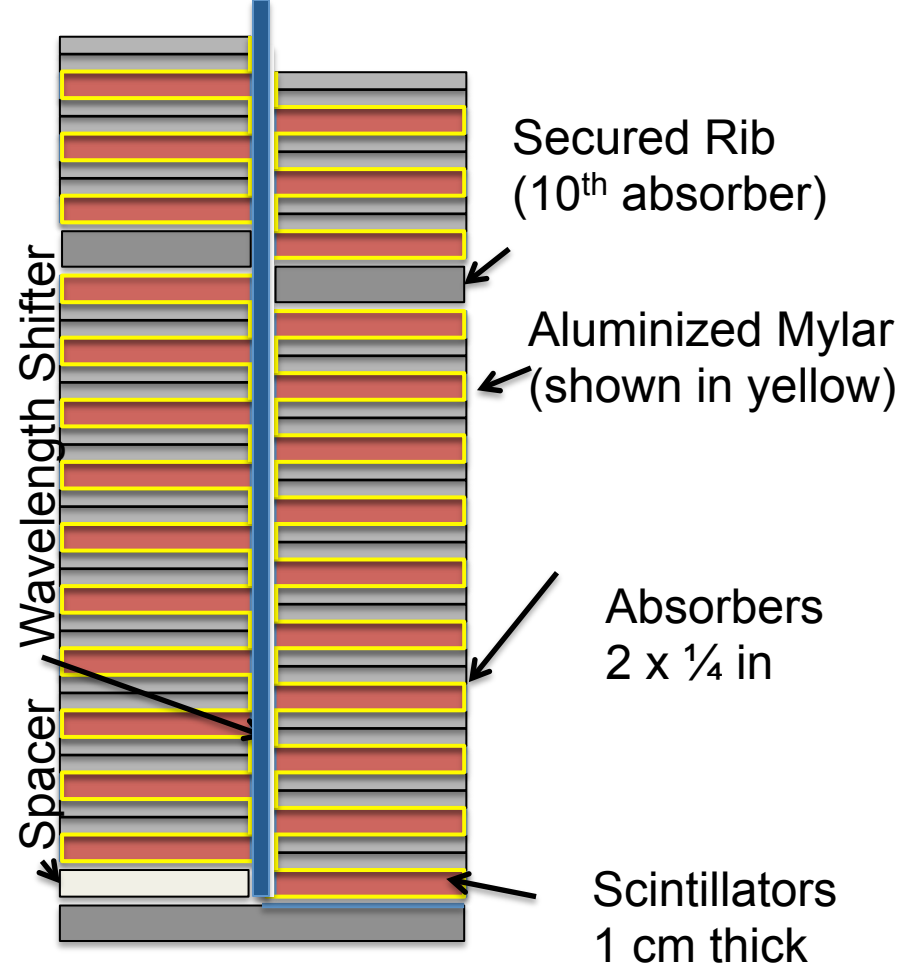
G. Franklin CMU

288 Modules

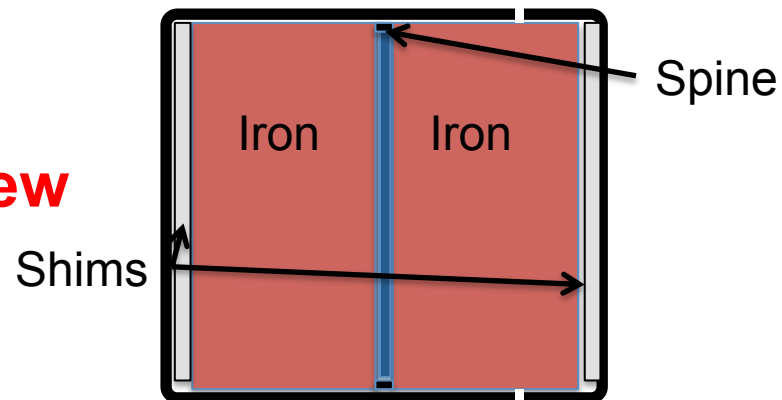
Each module: 6 in x 6 in x 48 in

Array 12 wide by 24 high

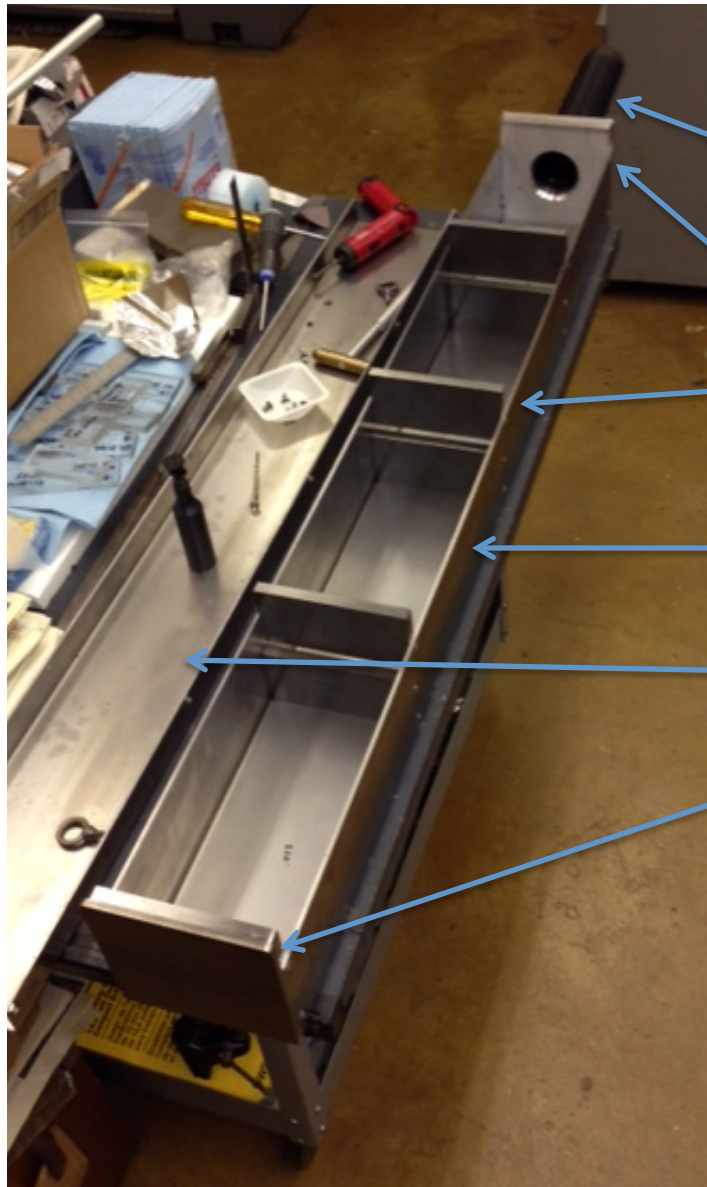
Top View



Front View



HCAL-J Module Prototype Near Completion



Everything but scintillator & light guide

PMT Housing (O-ring sealed)

Aluminum Back Plate

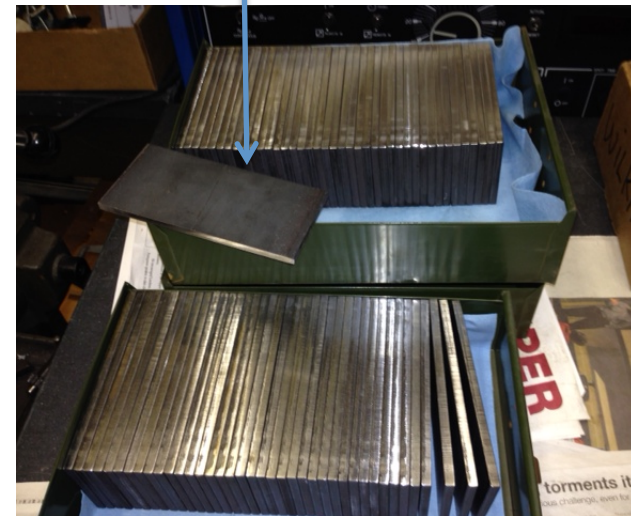
3 Pairs of Steel Ribs

Can

Lid

Steel Front Plate

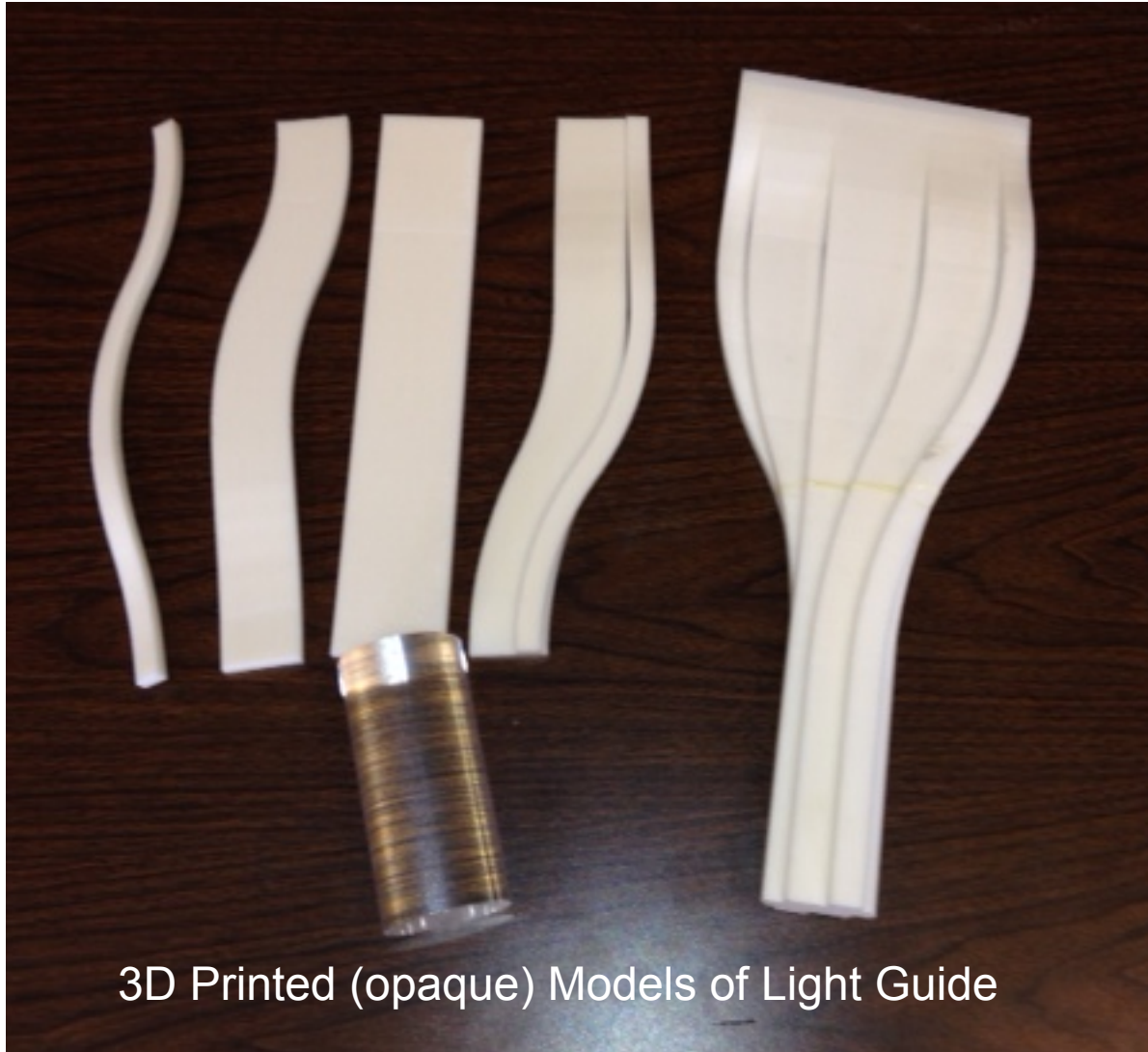
160 Steel Absorbers



Injection Molded Light Guides

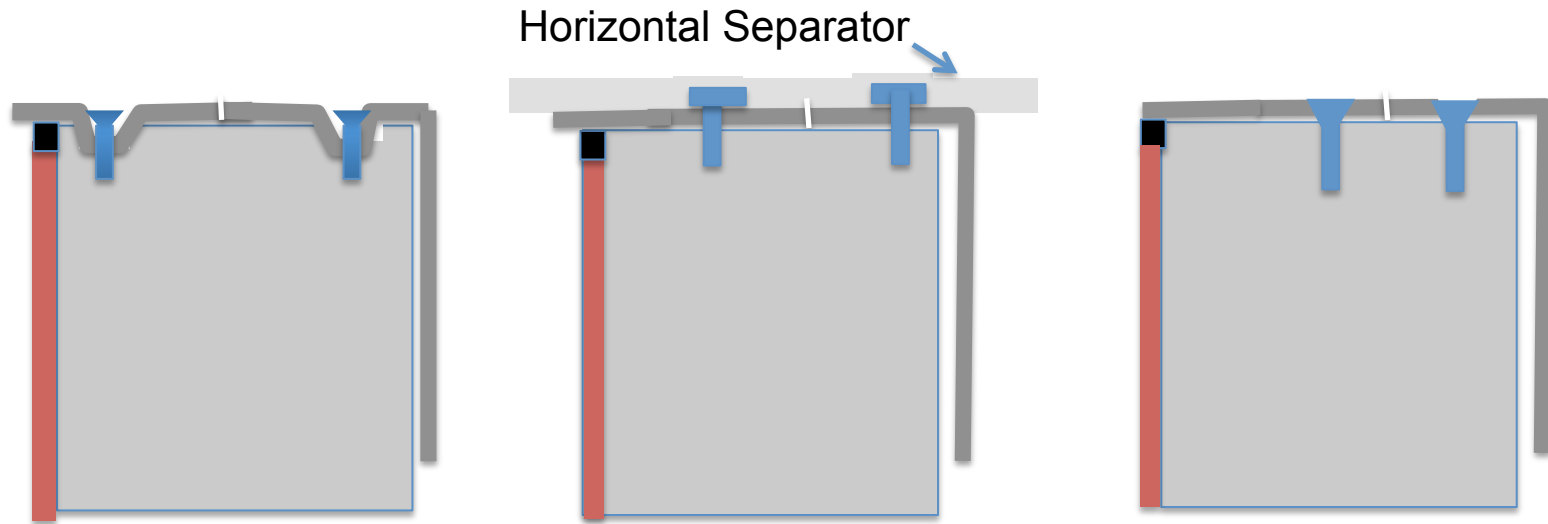
New Design
Injection Molded
5 Pieces + Cylinder

Original Design
Injection Molded
Single Piece



3D Printed (opaque) Models of Light Guide

Module Wall Options



Slot & Dimple

- 1.5 mm walls
- Slot edge of rib
- Dimple Container Wall

JINR Design

Protruding Pan Head

- Gasket seals
- 1.5 mm walls
- 3.0 mm horiz. separators

Next Prototype
Preferred Choice?

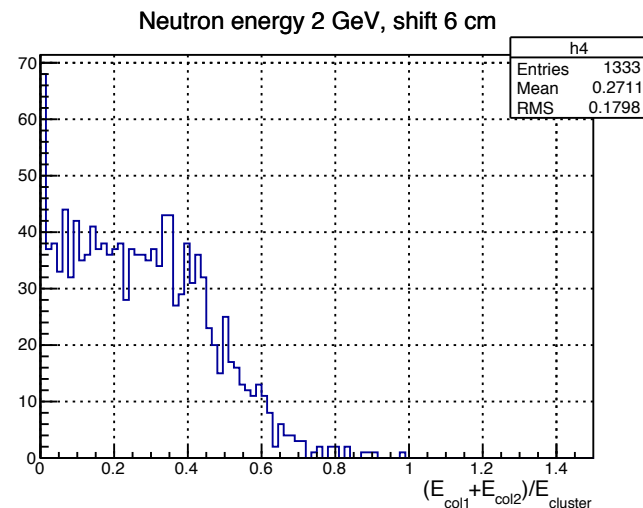
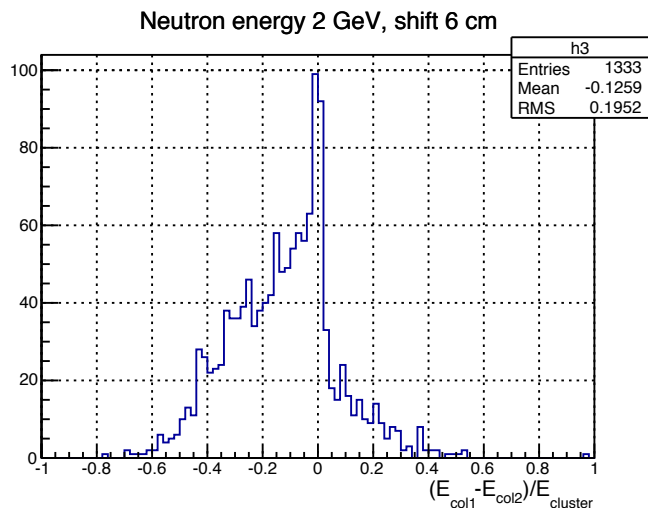
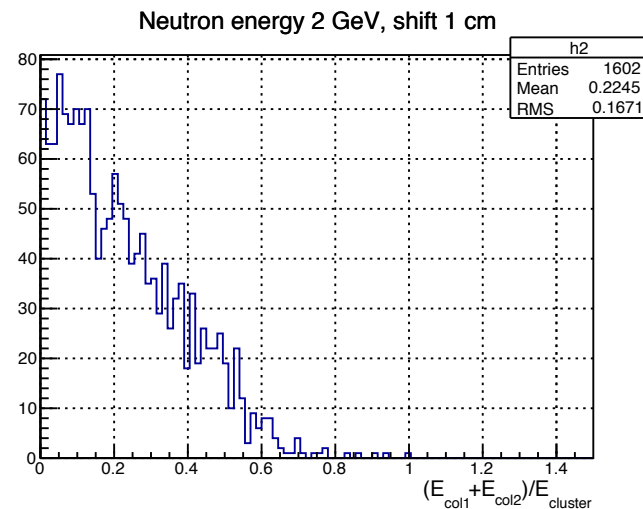
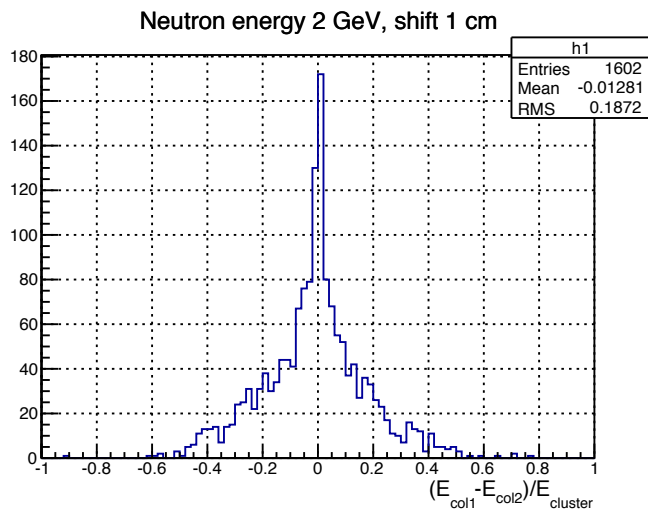
Recessed Flat Head

- Gasket seals
- 3.0 mm walls

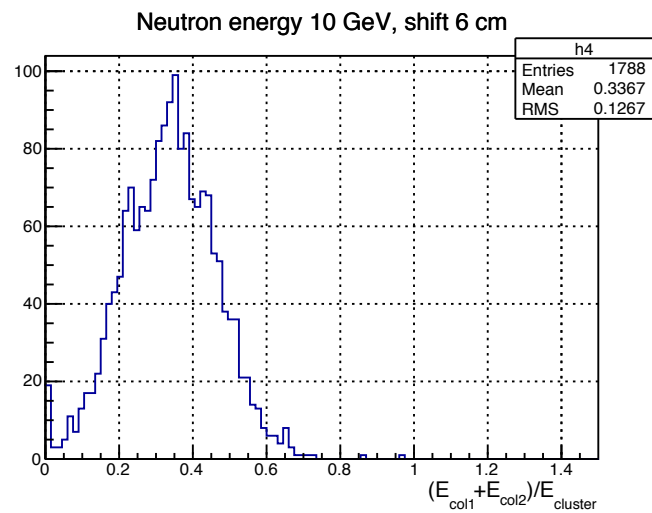
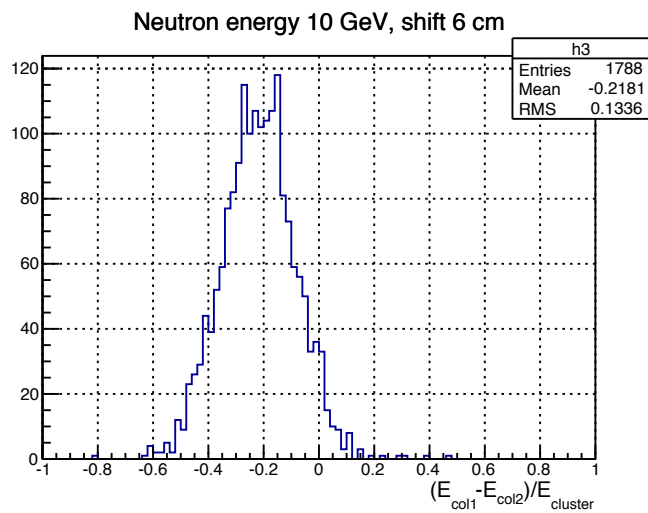
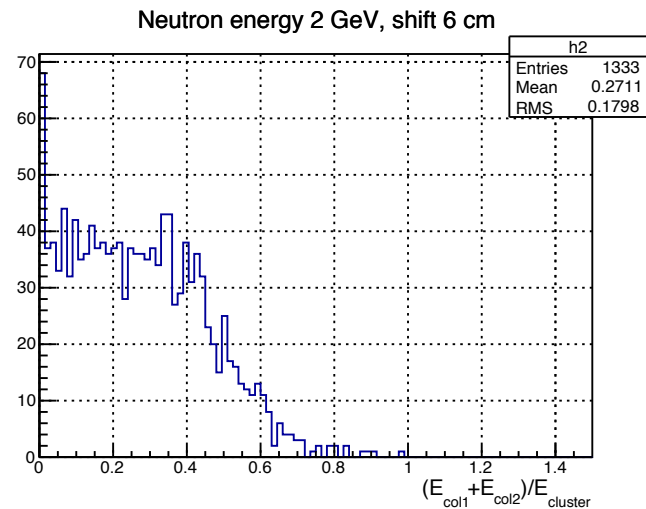
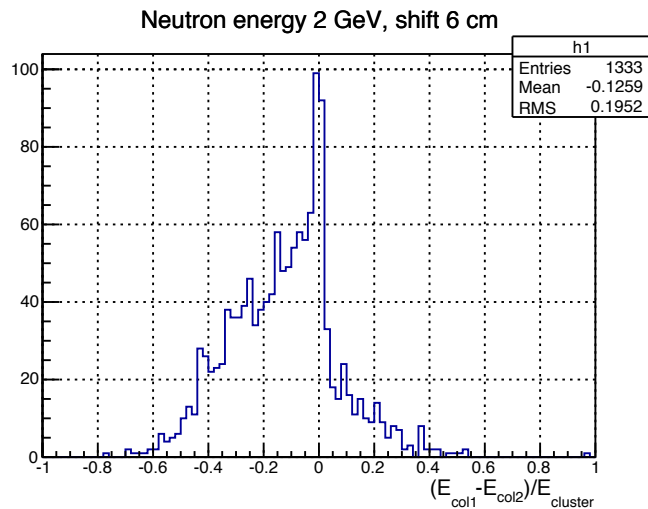
1st HCAL-J Prototype

GEANT Simulations of wall and front-plate thickness effects

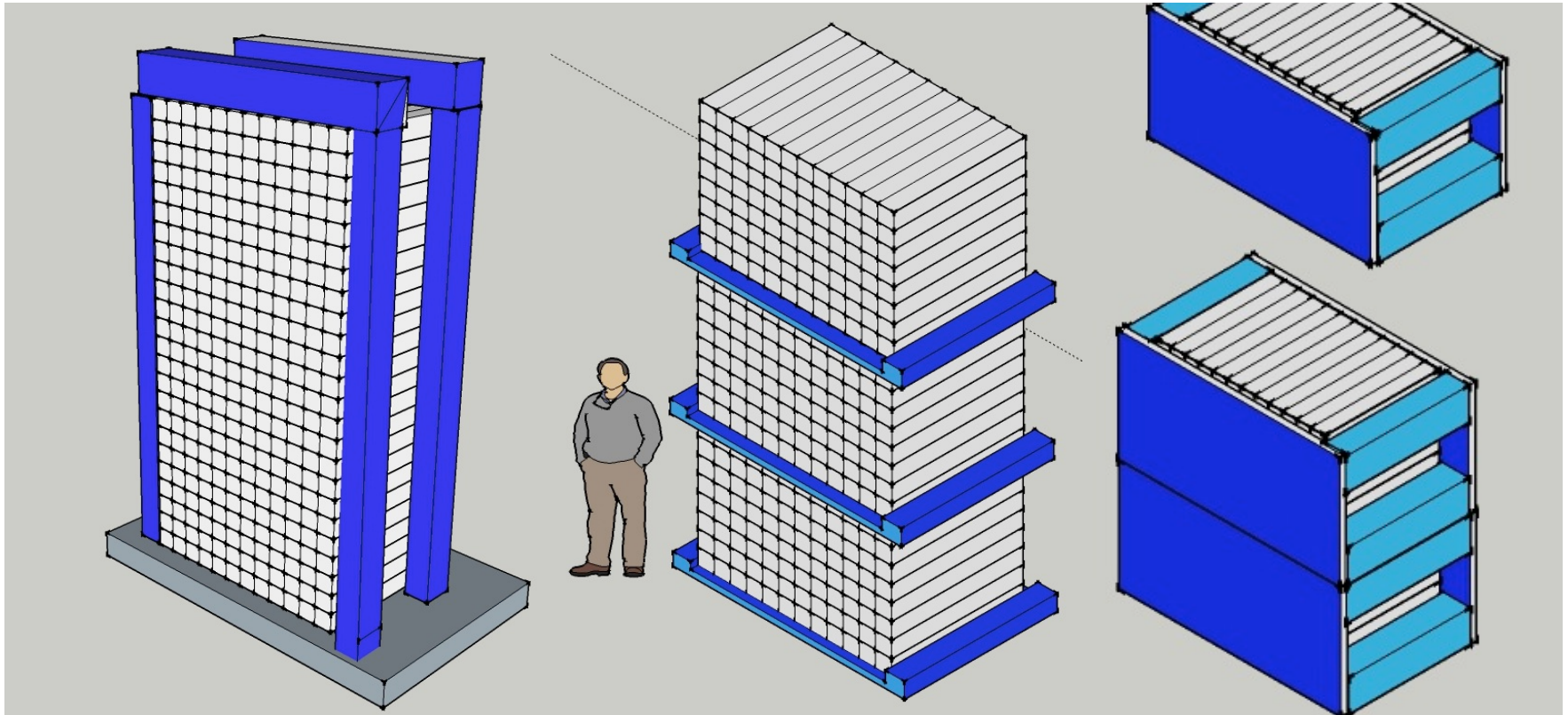
Example: Study of shower distribution effects on coordinate reconstruction



GEANT Simulations



36 Ton HCAL-J, 20 Ton Crane



Monolith
on air-pad

Breakfast Tray
3 subassemblies

Exo-skeleton Crustacean
3 subassemblies

Workforce and Projected Schedule:

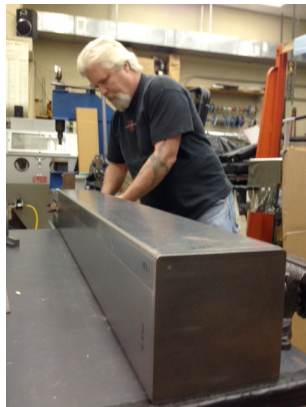
- FNAL
 - Workforce: Dr. Pla-Dalmau + Extrusion facility techs
 - Extruded scintillator early 2014 (First run this month?)
- INFN
 - Workforce: Dr. Bellini, Mech.Eng. F.Noto + INFN funded techs.
 - Wavelength Shifters Dec. 2013
 - Light Guides, spring 2014 (Injection molded pieces ordered?)
- CMU
 - Workforce: Dr. Franklin, Dr. Quinn +Post Doc + Machinist
Need additional technician + Undergrads
 - Prototype Feb., 2014
 - Scintillator preparation Spring 2014 (400 hours)
 - Ribs and end-plates Summer 2014
 - Assembly 1 calendar year (Complete Summer 2015)
- JLab
 - Workforce: Dr. Camsonne, Dr. Wojtsekhowski, Engineering
 - Detector stand, cabling, HV.
 - DAQ

BACKUP

- Fall 2013 Status:
- Scintillator
 - FNAL work supported by JLab
 - Manufacturing of Extrusion Die in progress
 - First extrusion run pending
 - CMU custom saw will be used for chopping
 - Wavelength Shifters
 - INFN has ordered BC-484 WLS
 - Light Guides
 - CMU optimized geometry
 - INFN overseeing production
 - Pieces Ordered?
 - Iron absorbers
 - Quotes obtained by CMU
 - Module housing and assembly
 - Prototype under production at CMU



Module prototype assembly
Will be filled with FNAL scintillator



o-ring sealed
PMT bases

Spring 2013 Decisions: PLAN is FINALIZED

- Geometry fixed

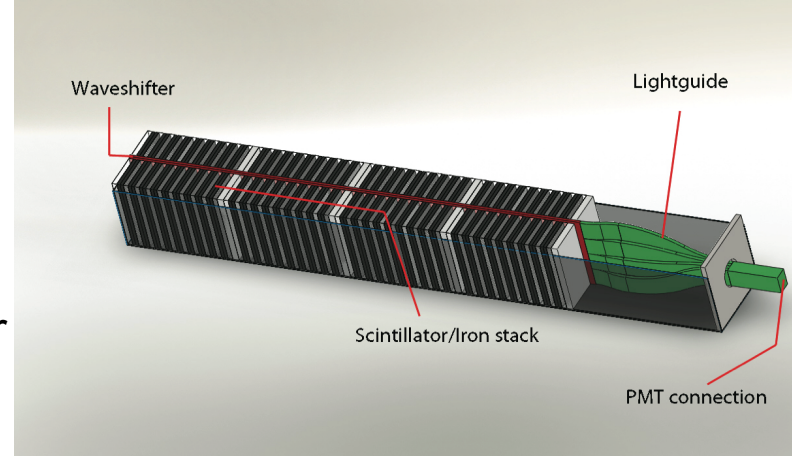
WLS moved from side to center of module

Two (15 cm x 7.5 cm x 1 cm) scintillators/layer

7.5 cm x 1 cm within capabilities of FNAL

Minimizes light attenuation (WLS in middle)

Eliminates small asymmetric tail in spatial resolution function



PMT Housing designed to allow N_2 to inhibit helium poisoning of PMTs

- FNAL will produce scintillators

FNAL will extrude 3.5 km of (7.5 cm x 1 cm) novel scintillator

CMU will chop into 15 cm lengths. (Need 24,000 pieces)

Cost ~\$100k. (Compare to St. Gobain quote of \$1,140k)

- INFN will fund WLS and oversee Light Guide production
- Modules will be assembled at Carnegie Mellon

Internal Structure

