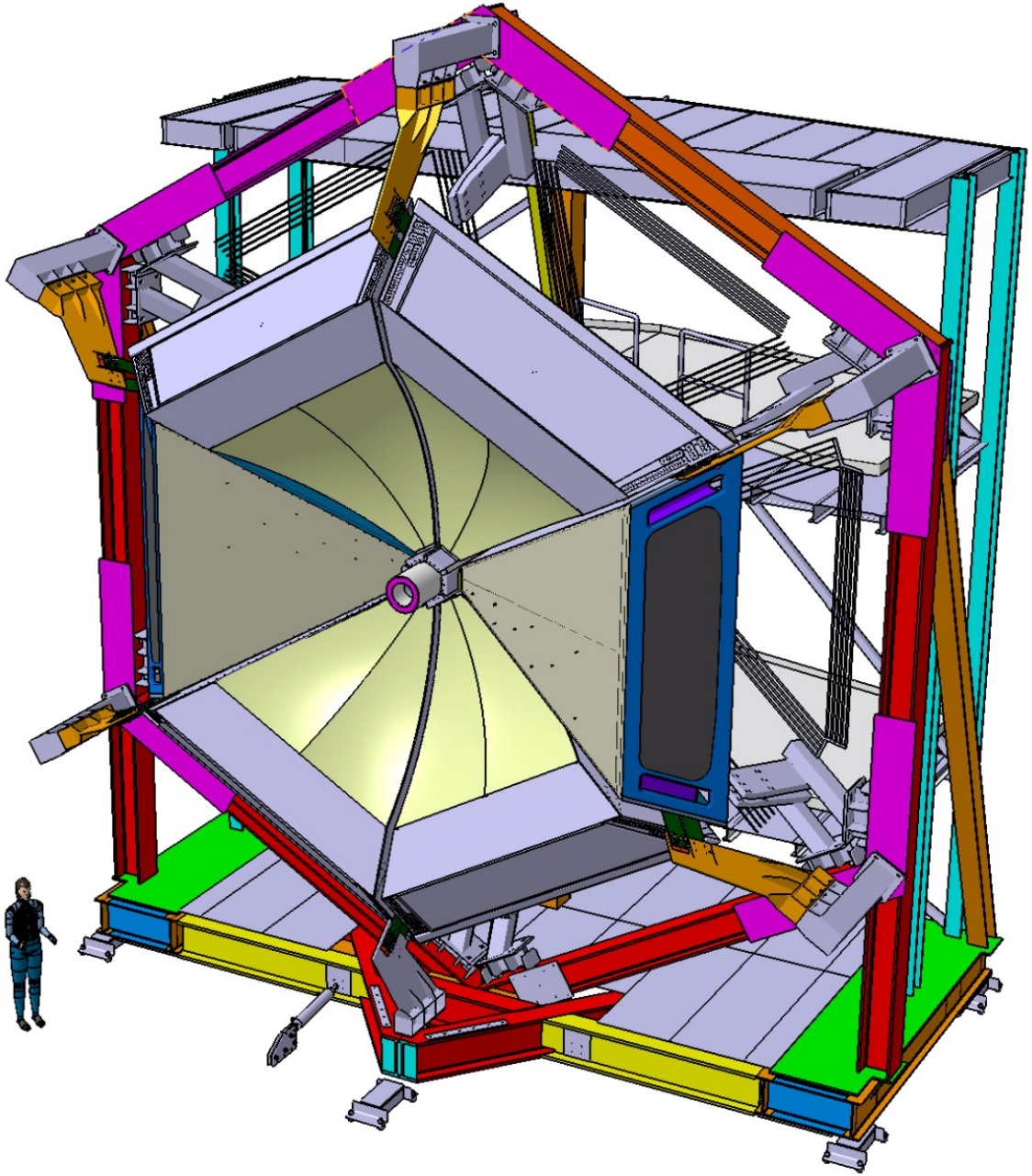
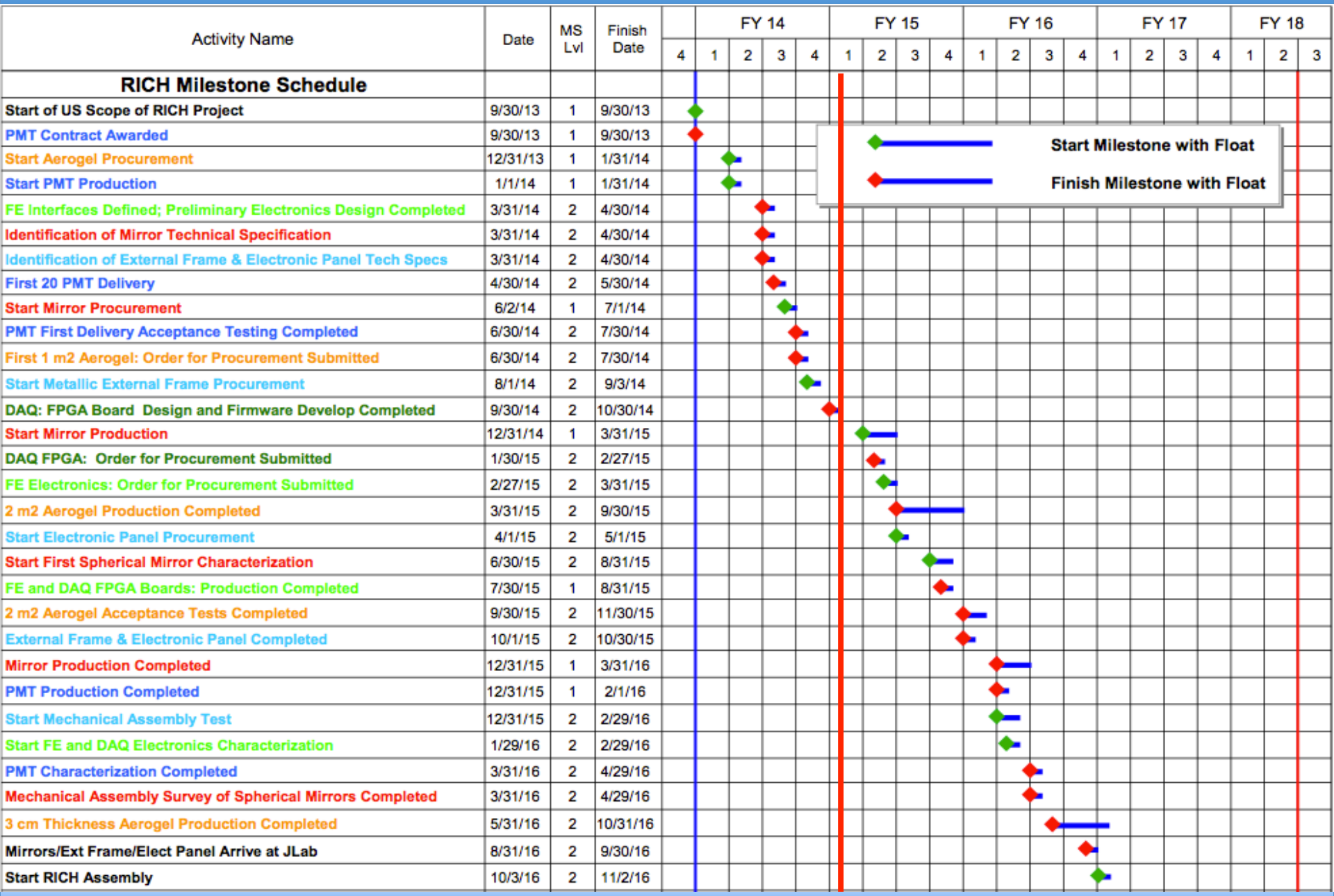


CLAS12-RICH Status-Report

November 6th 2014

RICH Project Milestones

Activity Name	Date	MS Lvl	Finish Date
RICH Milestone Schedule			
Start of US Scope of RICH Project	9/30/13	1	9/30/13
PMT Contract Awarded	9/30/13	1	9/30/13
Start Aerogel Procurement	12/31/13	1	1/31/14
Start PMT Production	1/1/14	1	1/31/14
FE Interfaces Defined; Preliminary Electronics Design Completed	3/31/14	2	4/30/14
Identification of Mirror Technical Specification	3/31/14	2	4/30/14
Identification of External Frame & Electronic Panel Tech Specs	3/31/14	2	4/30/14
First 20 PMT Delivery	4/30/14	2	5/30/14
Start Mirror Procurement	6/2/14	1	7/1/14
PMT First Delivery Acceptance Testing Completed	6/30/14	2	7/30/14
First 1 m2 Aerogel: Order for Procurement Submitted	6/30/14	2	7/30/14
Start Metallic External Frame Procurement	8/1/14	2	9/3/14
DAQ: FPGA Board Design and Firmware Develop Completed	9/30/14	2	10/30/14
Start Mirror Production	12/31/14	1	3/31/15
DAQ FPGA: Order for Procurement Submitted	1/30/15	2	2/27/15
FE Electronics: Order for Procurement Submitted	2/27/15	2	3/31/15
2 m2 Aerogel Production Completed	3/31/15	2	9/30/15
Start Electronic Panel Procurement	4/1/15	2	5/1/15
Start First Spherical Mirror Characterization	6/30/15	2	8/31/15
FE and DAQ FPGA Boards: Production Completed	7/30/15	1	8/31/15
2 m2 Aerogel Acceptance Tests Completed	9/30/15	2	11/30/15
External Frame & Electronic Panel Completed	10/1/15	2	10/30/15
Mirror Production Completed	12/31/15	1	3/31/16
PMT Production Completed	12/31/15	1	2/1/16
Start Mechanical Assembly Test	12/31/15	2	2/29/16
Start FE and DAQ Electronics Characterization	1/29/16	2	2/29/16
PMT Characterization Completed	3/31/16	2	4/29/16
Mechanical Assembly Survey of Spherical Mirrors Completed	3/31/16	2	4/29/16
3 cm Thickness Aerogel Production Completed	5/31/16	2	10/31/16
Mirrors/Ext Frame/Elect Panel Arrive at JLab	8/31/16	2	9/30/16
Start RICH Assembly	10/3/16	2	11/2/16



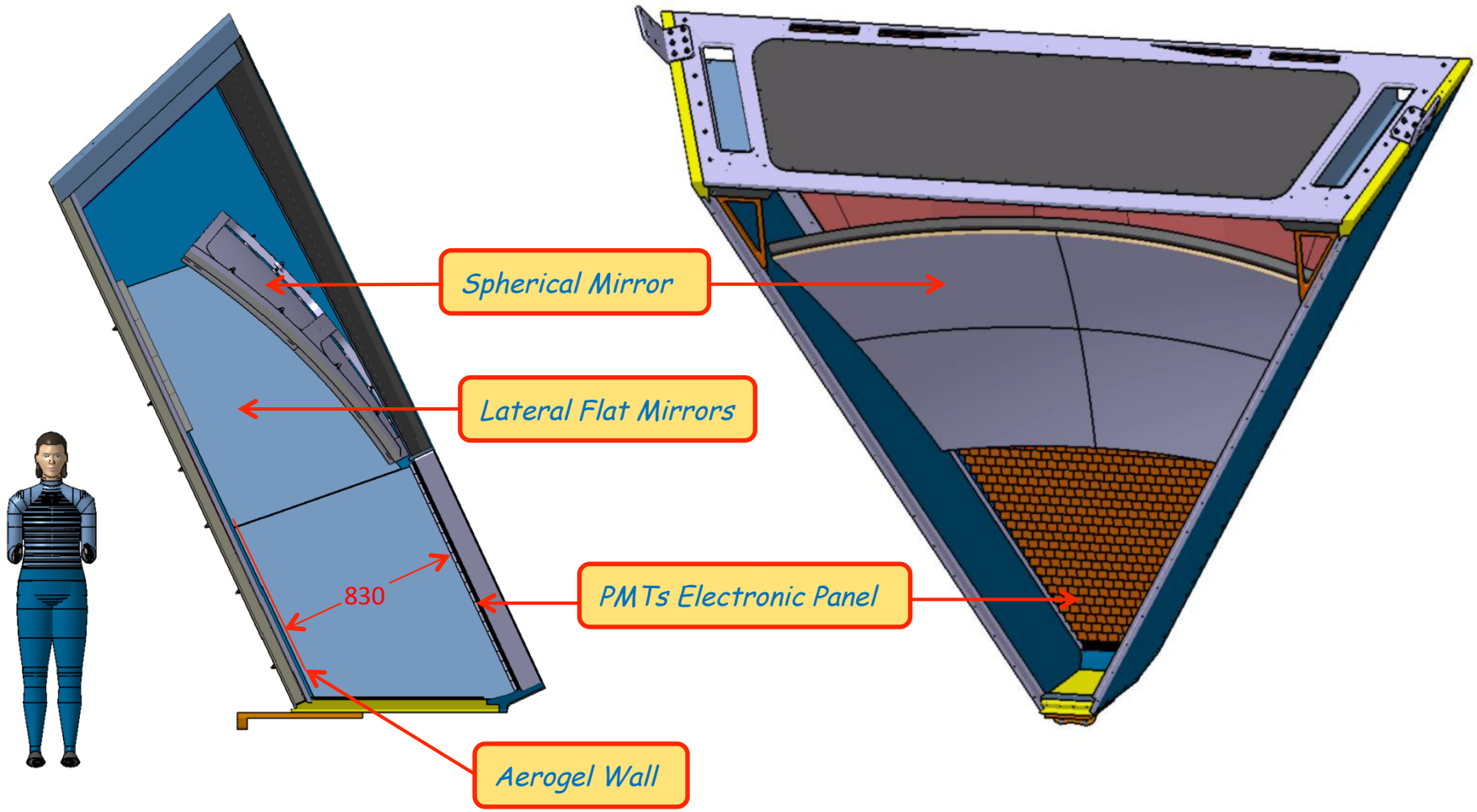
External Frame & Electronic Panel

Milestone L2: Start Metallic External Frame Procurement (8/1/14) **foreseen (11/20/14)**

Technical review with JLab engineers 20 June 2014

Engineers now at JLab to answer reviews remarks and fix last details

Not critical: delay to join external frame with electronic, front and back panels manufacture



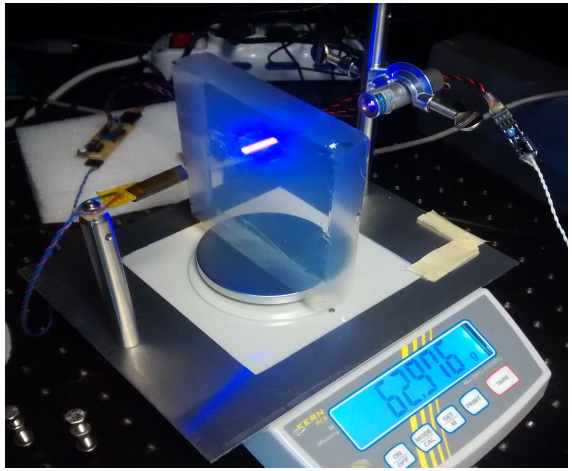
Aerogel

Purchasing order for the first 2 m^2 from the Russian vendor has been submitted

Dry box for aerogel characterization and storage commissioned

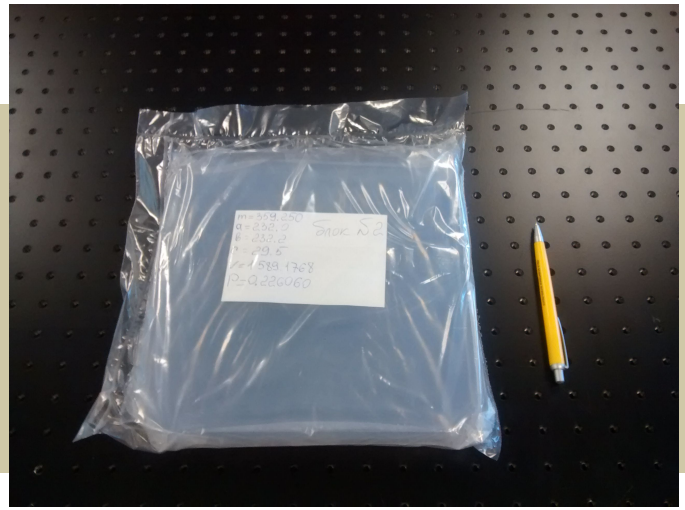
Long term stability tests ongoing

Systematic study of aerogel uniformity ongoing



Aerogel Radiator

Rafractive index: 1.05
Area: 20x20 cm^2
Thickness: 3 cm
Scattering Length: greater than 50 mm

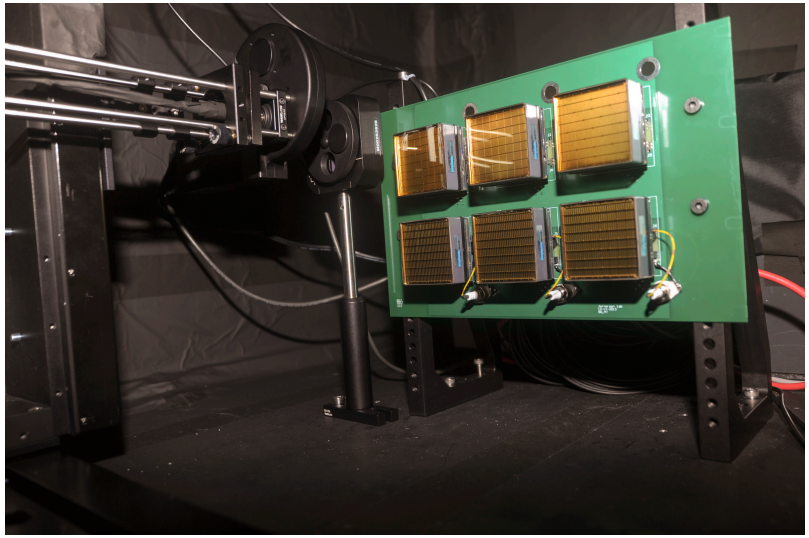


MA-PMT Photon Detector

110 Hamamatsu MAPMT out of 430 delivered and tested at JLab

- 80 H8500
- 30 H12700 with enhanced SPE spectrum

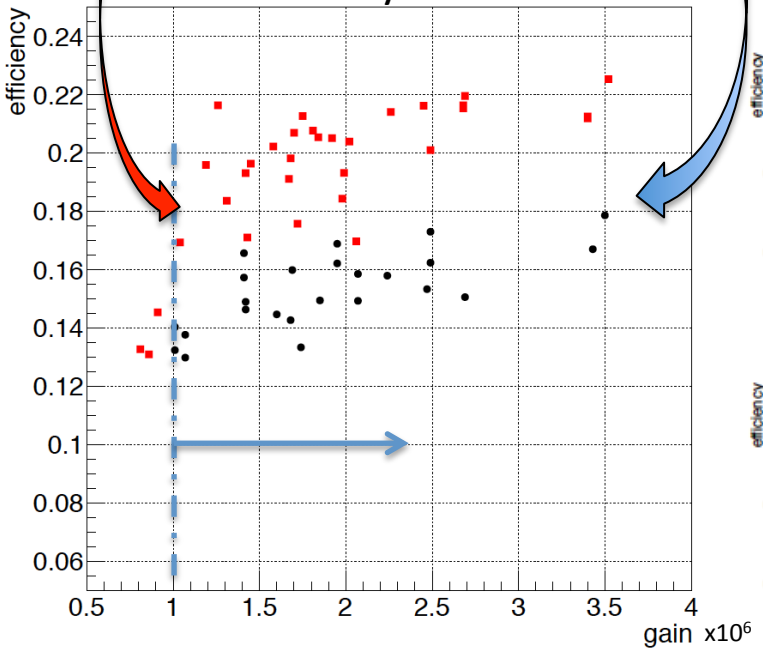
Procurement secured for new H12700 PMTs



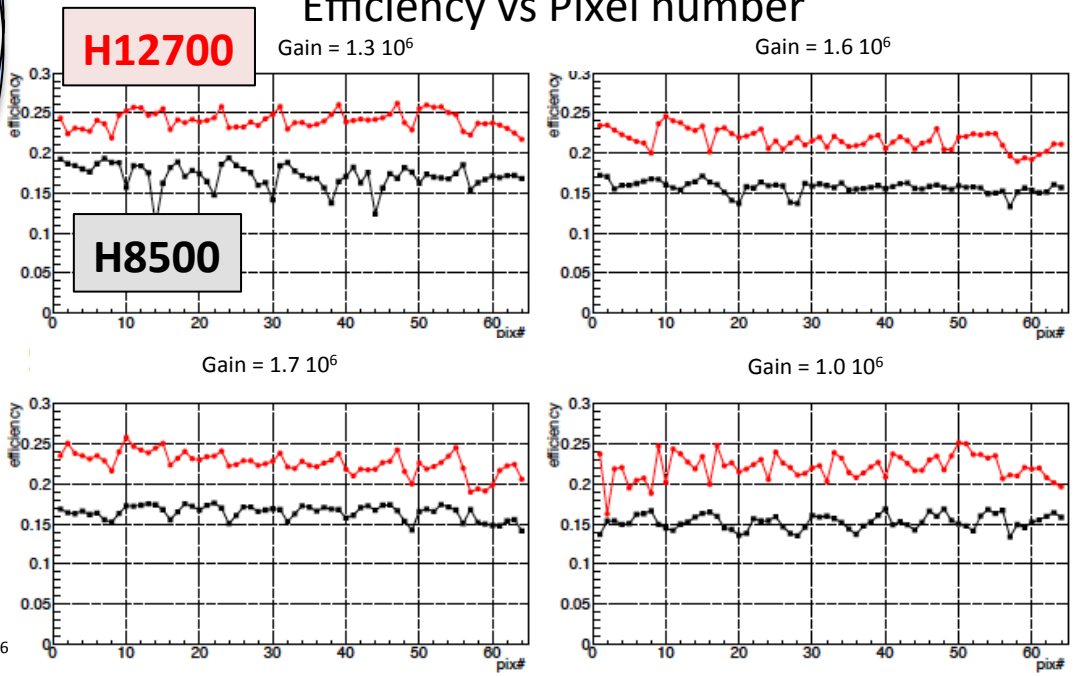
PMT Efficiency Comparison:

H12700 ⟷ **H8500**

Efficiency vs Gain



Efficiency vs Pixel number



Read-Out Electronics

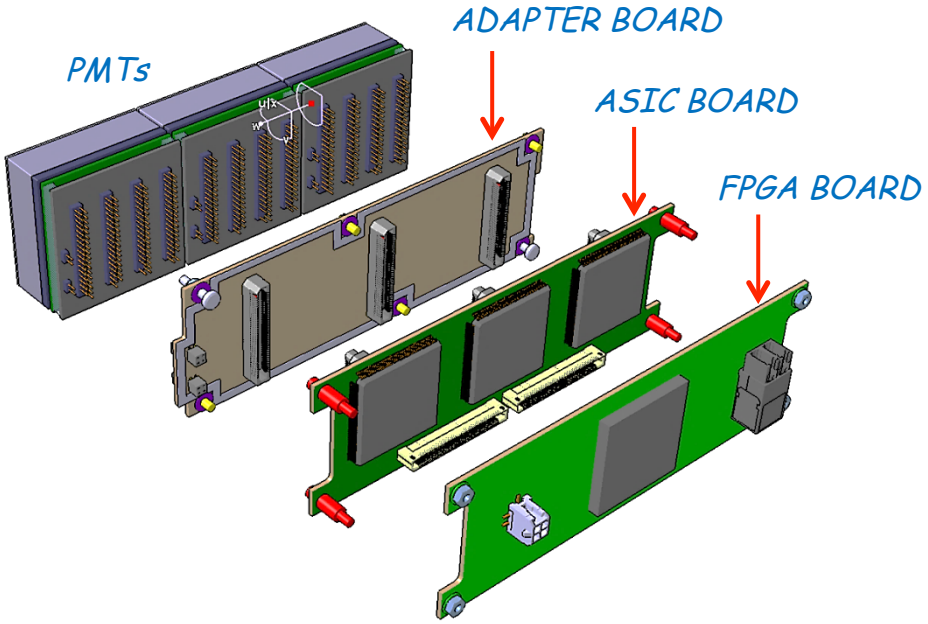
Milestone L2: DAQ: FPGA Board Design and Firmware Completed (9/30/14) **achieved (10/31/14)**

Prototype board production completed:

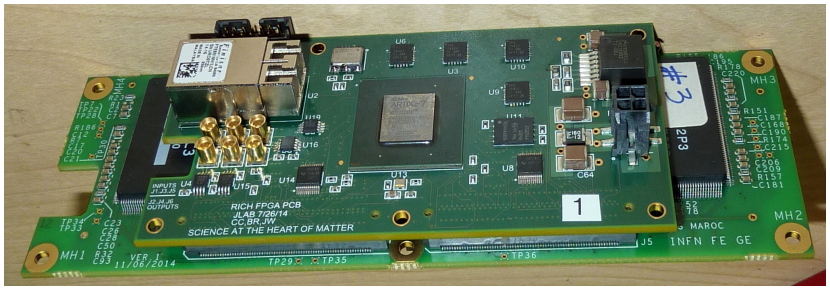
- Adapter board (Genova)
- ASICs boards (Ferrara)
- DAQ boards (JLab)

Italian experts on site for commissioning of a joined test stand

A second test stand will become operative in Italy by the end of the year



3 x ASIC BOARD (INFN) matching the



Universal FPGA BOARD (JLab)

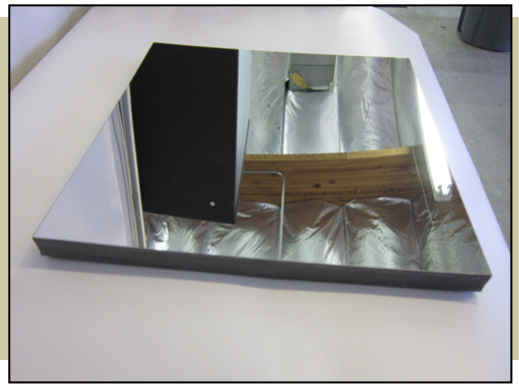
Mirrors

Milestone-1: Start Mirror Procurement (6/2/14) **achieved**

Invitation to tender for spherical mandrel in preparation (2014 funds secured)
First spherical and planar demonstrators under test
Second-stage final demonstrators foreseen by beginning of 2015

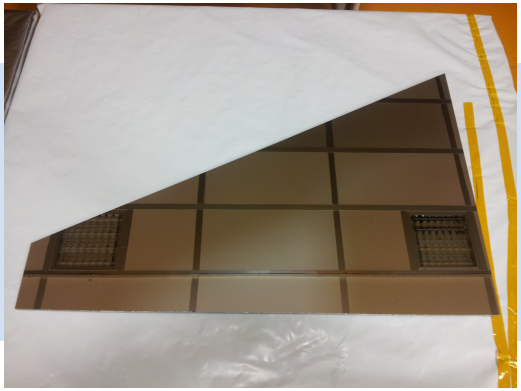
CFRP SPHERICAL Mirror

Radius tolerance <= 1%
Surface accuracy: 5 µm RMS
Surface Quality: 3 nm RMS
D0 < 5 mm
Reflectivity > 90%



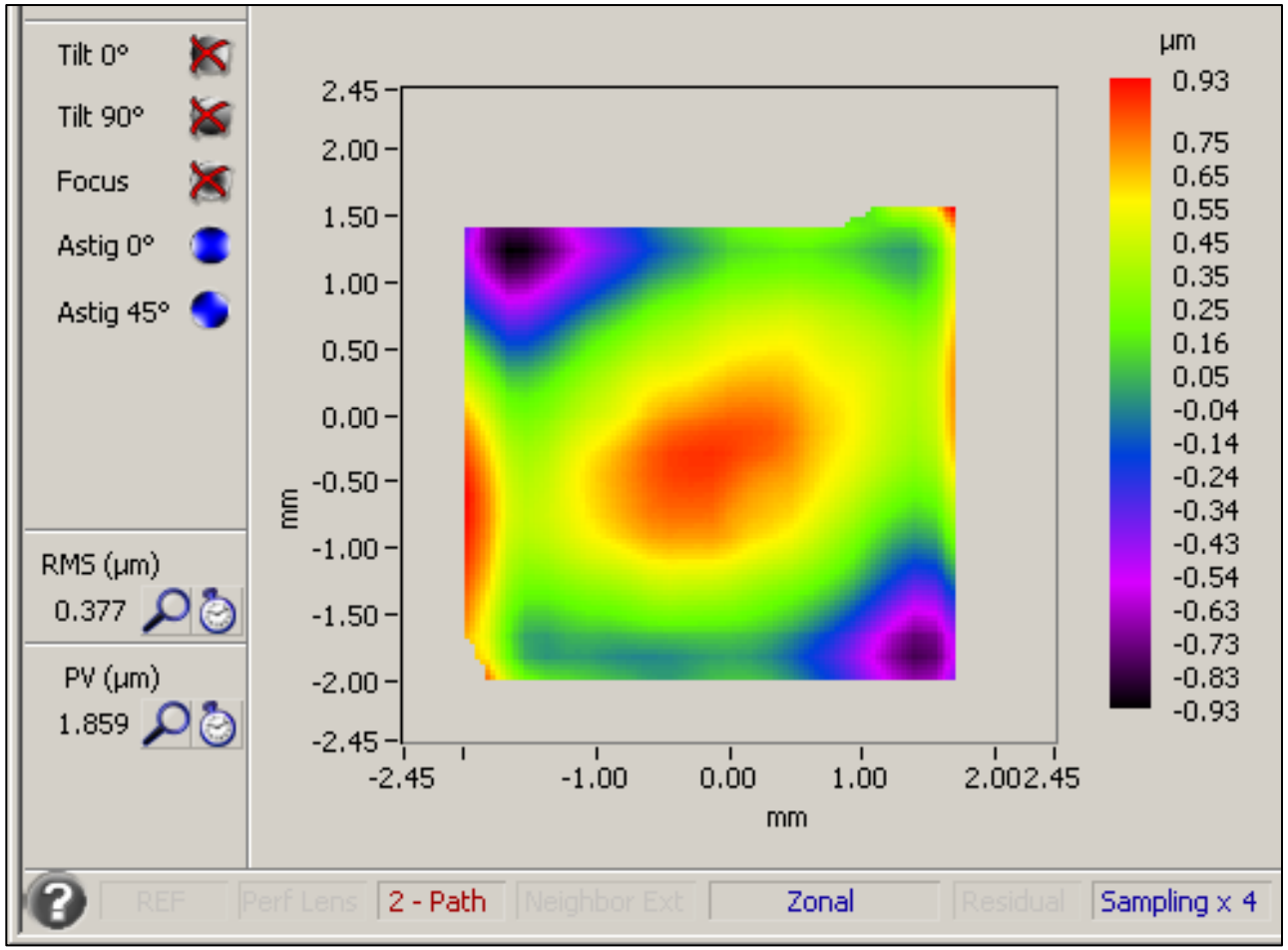
Planar Glass Mirror

Planarity tolerance <= 0.1 mm
Surface accuracy: 5 µm RMS
Surface Quality: 3 nm RMS
Reflectivity > 90%



Wavefront Data

Surface Shack-Hartmann map of the CFRP mirror shows errors of 1.86μm p-v surface, below the 2.5 μm p-v surface requirement.

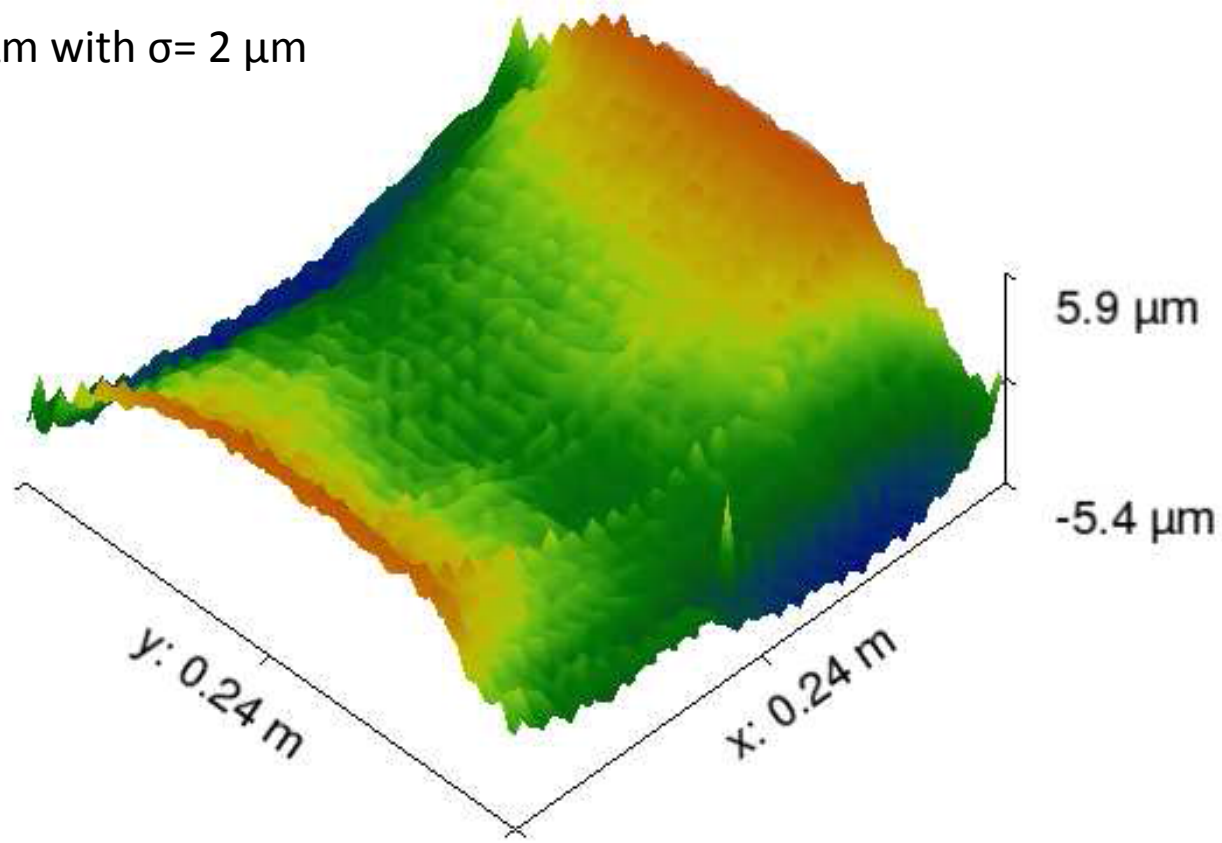


Surface Map of the full aperture of the CFRP mirror. Only tip, tilt and focus removed.

Error is 1.86 μm p-v on the surface.

CFRP Spherical Mirror: Shape

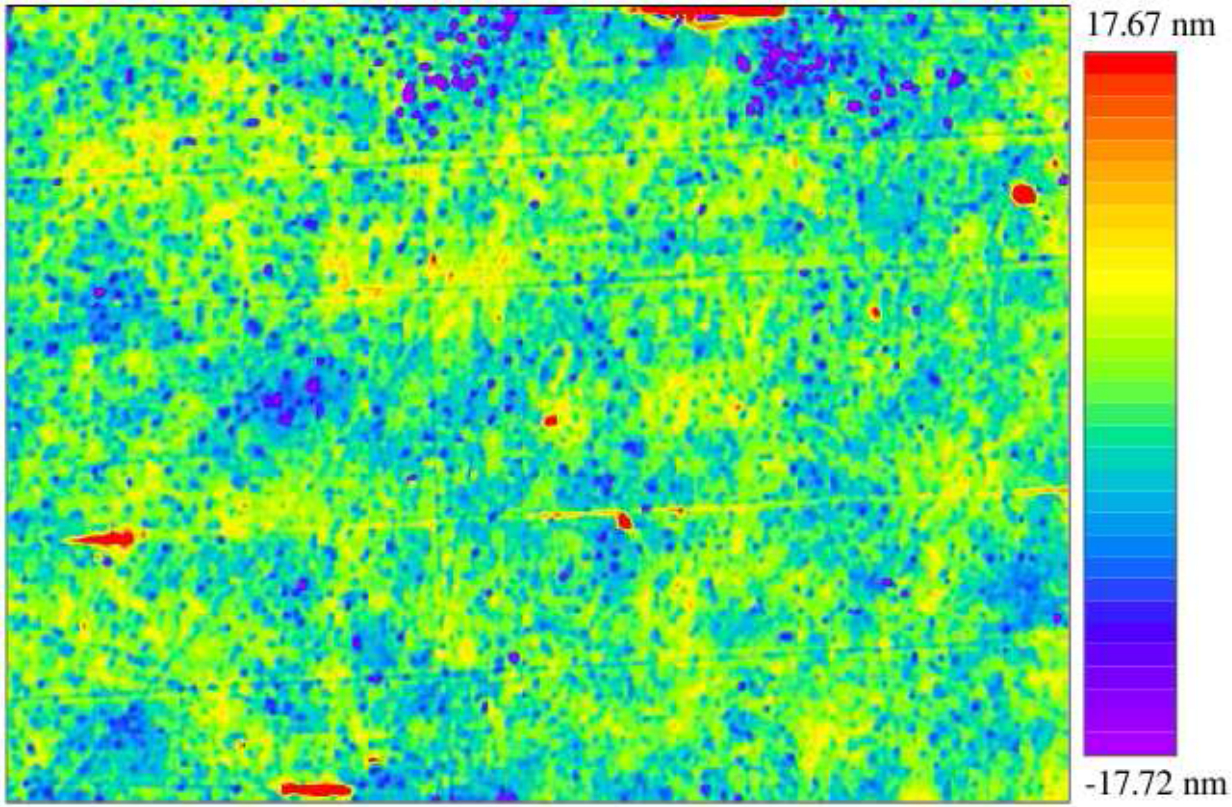
Measured in September in Italy
(by INFN and Media-Lario):
peak-to-valley variation ~ 11 µm with σ= 2 µm
Outside specifications



Aging tests onging
Meeting with CMA schedule on November 10

CFRP Spherical Mirror: Shape

Measured in September in Italy
(by LNF and Media-Lario):
Roughness rms ~ 3 nm
Fulfills CLAS12 RICH specifications



CFRP Spherical Mirror: Reflectivity

Measured in July at JLab
Reflectivity around 80%
Outside specifications

CMA is not specialized in coatings

Meeting with
ECI Optical Coatings
Scheduled on November 11