

# CLAS12-RICH

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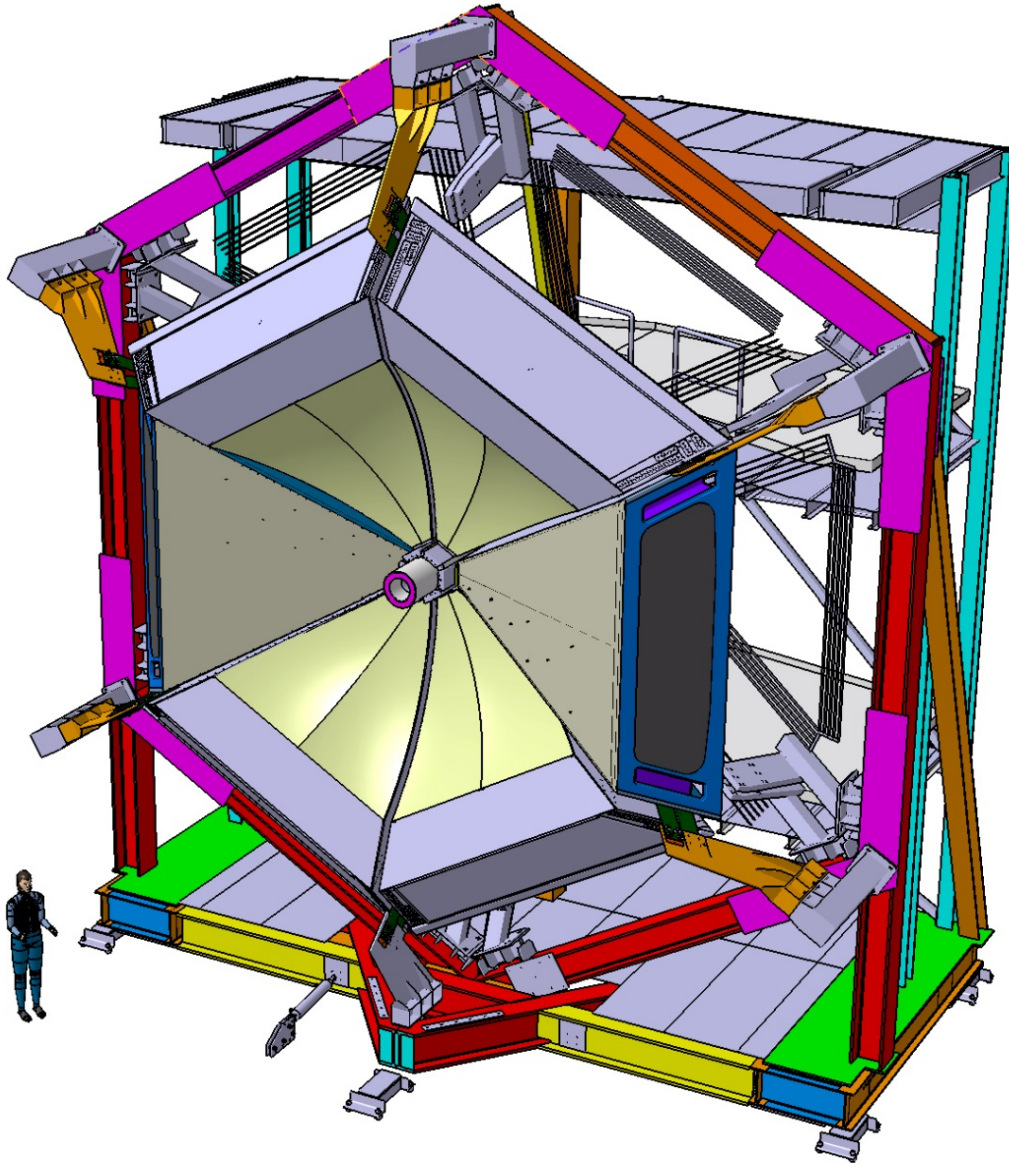
## Project-Status & Tasks Towards Completion

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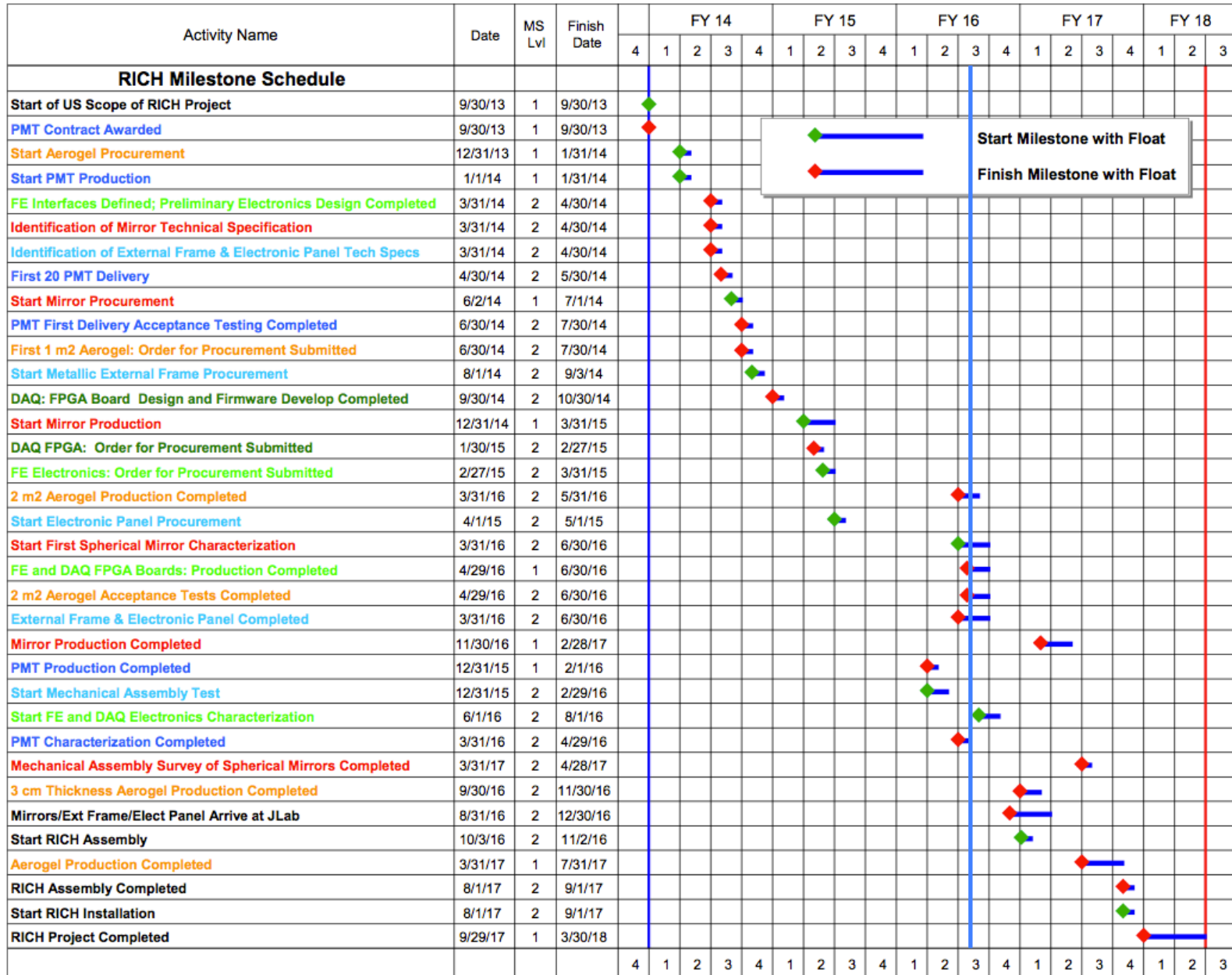
June 13<sup>th</sup> 2016

### Charge 3:

Has the detector been completed towards operation? If not, what are the completion/ commissioning schedule and tasks?



# Project Milestones



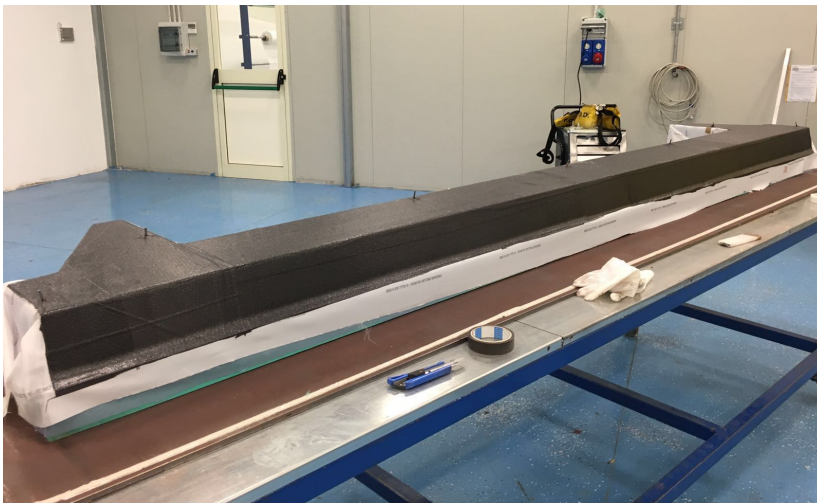
◆ Start Milestone with Float  
◆ Finish Milestone with Float

# Mechanics

3m diameter autoclave housing large panels



CFRP Reinforcing Ribs



CFRP Top Panel

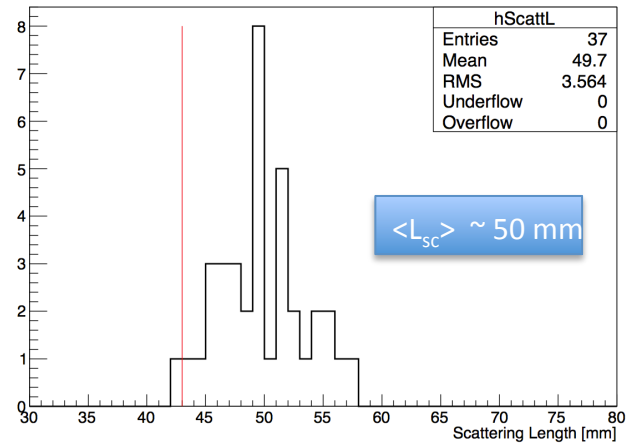
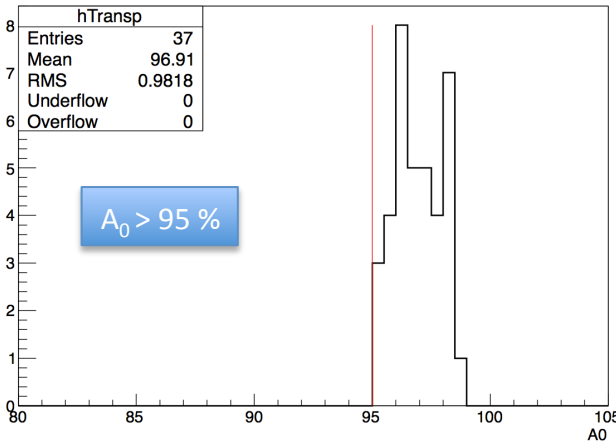
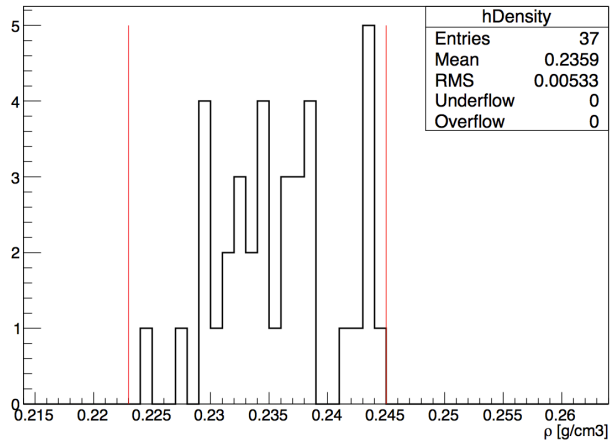


Assembling test ongoing in Italy  
Delivery expected before the summer

Next:

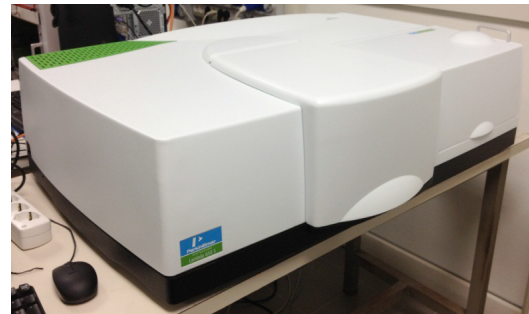
- Closing panel (Argonne)
- Cart and joints for Installation (LNF)

# Aerogel



All tiles are measured at the production site (Novosibirsk) before delivery approval.

Acceptance tests at JLab and CUA.  
Stress tests and optical study at Ferrara.

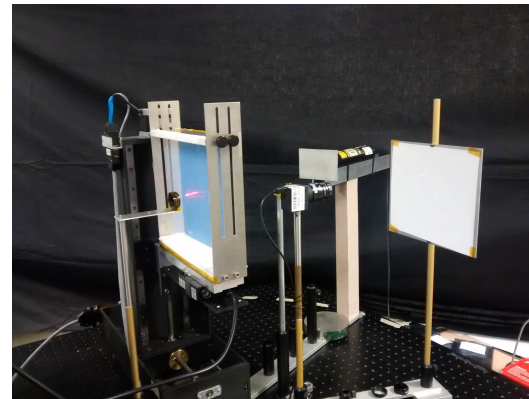


Same spectrophotometer with large sample compartment available @ FE and CUA.

3 cm layers:

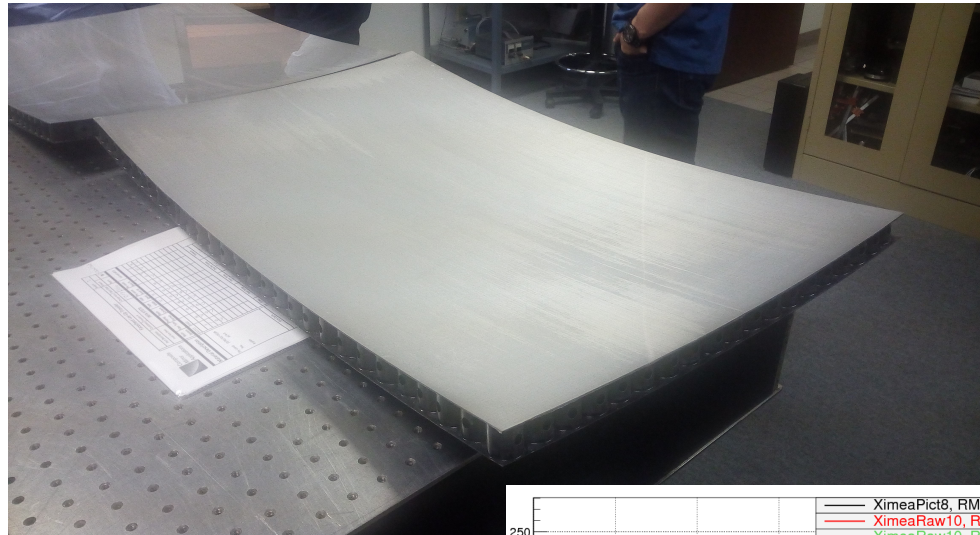
Production tiles fulfill specifications  
Tile delivery proceeds steadily  
36 tiles out of foreseen 72 approved

Next: start 2cm layer production



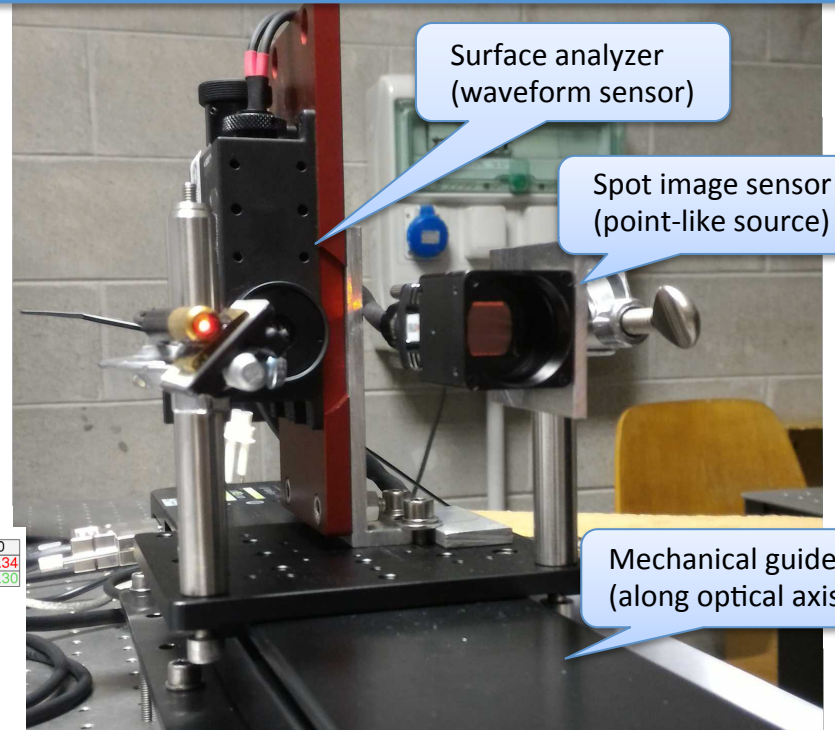
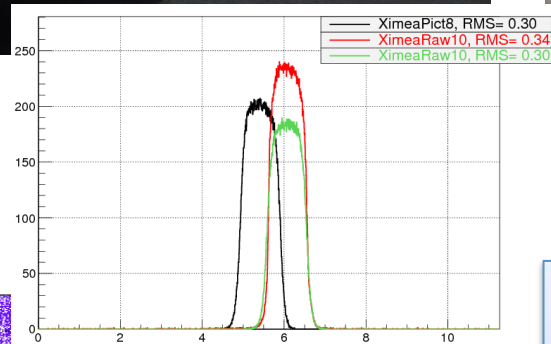
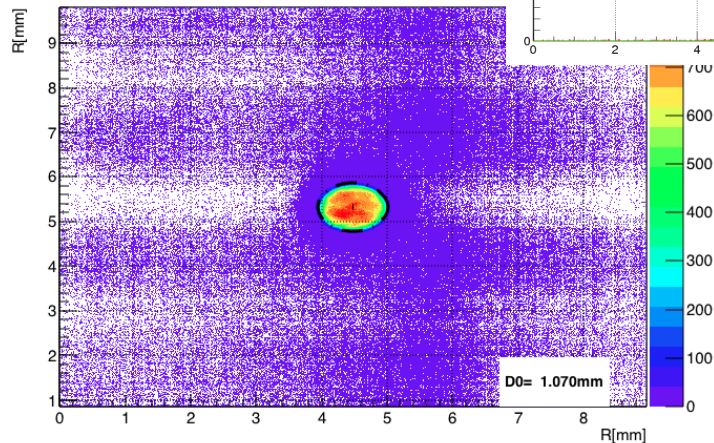
Laser bench @ FE for specific light propagation  
Tests (FS, double passage)

# Spherical Mirrors



Reflected image comparable with the 1 mm source size and stable over time

Spot



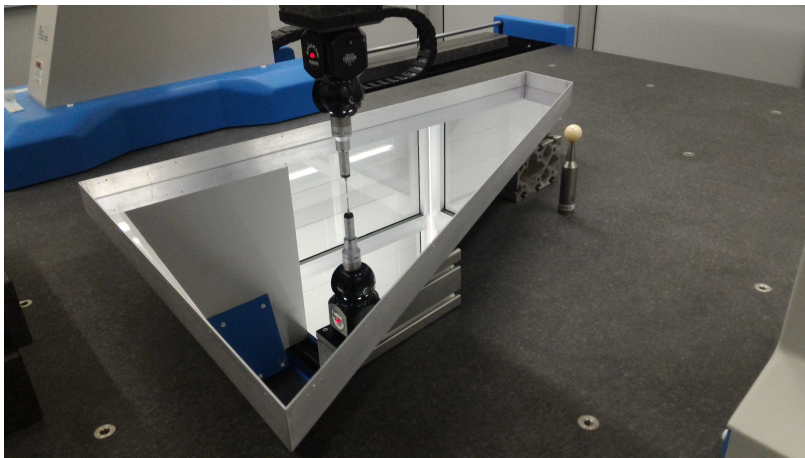
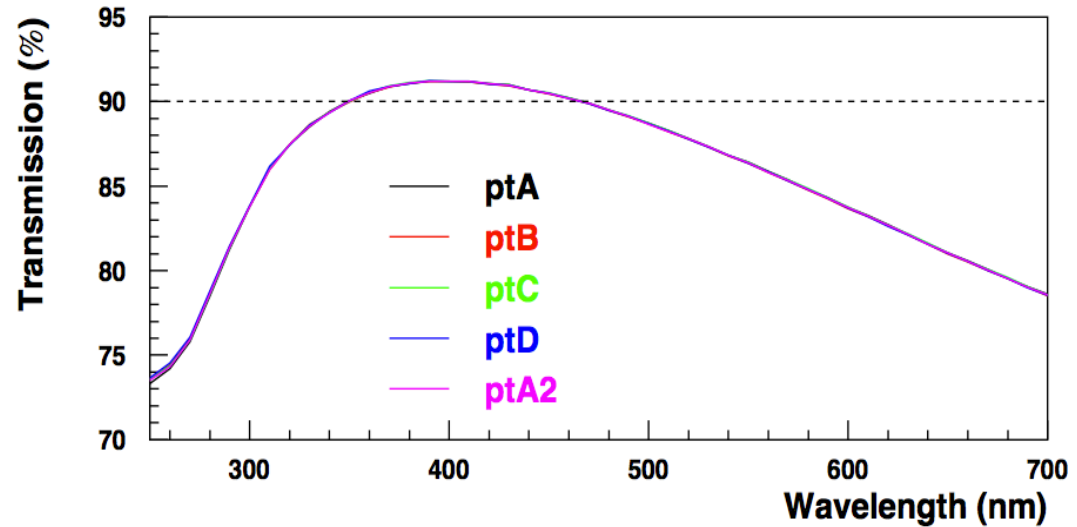
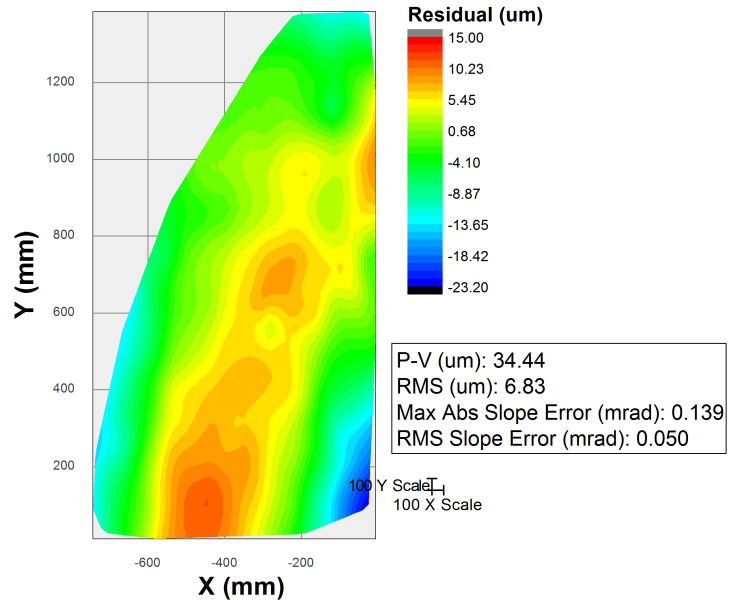
Produced at CMA (Tucson, AZ)  
4 Mirror delivered (out of 10)  
Surface accuracy better than specifications  
Areal density better than LHC-b

Next (LNF):

- Mockup for assembling
- Support structure

# Planar Mirrors

A1R - Misura 2

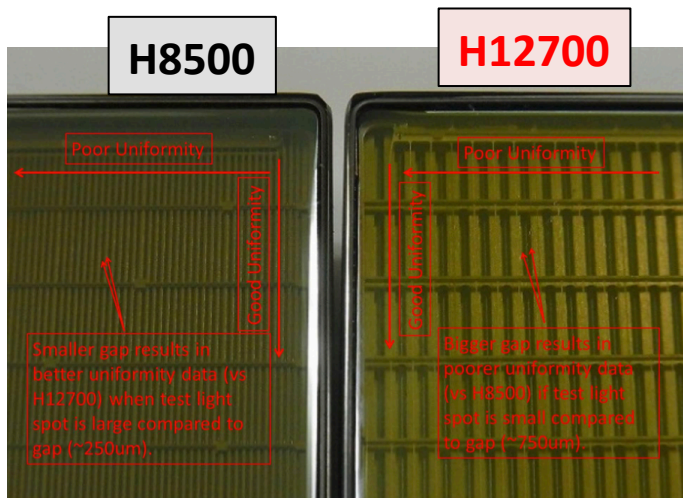


Produced at Media-Lario (Bosisio Parini, Italy)  
2 Mirror produced (out of 7)  
Surface accuracy better than specifications  
Reflectivity fulfilling specifications

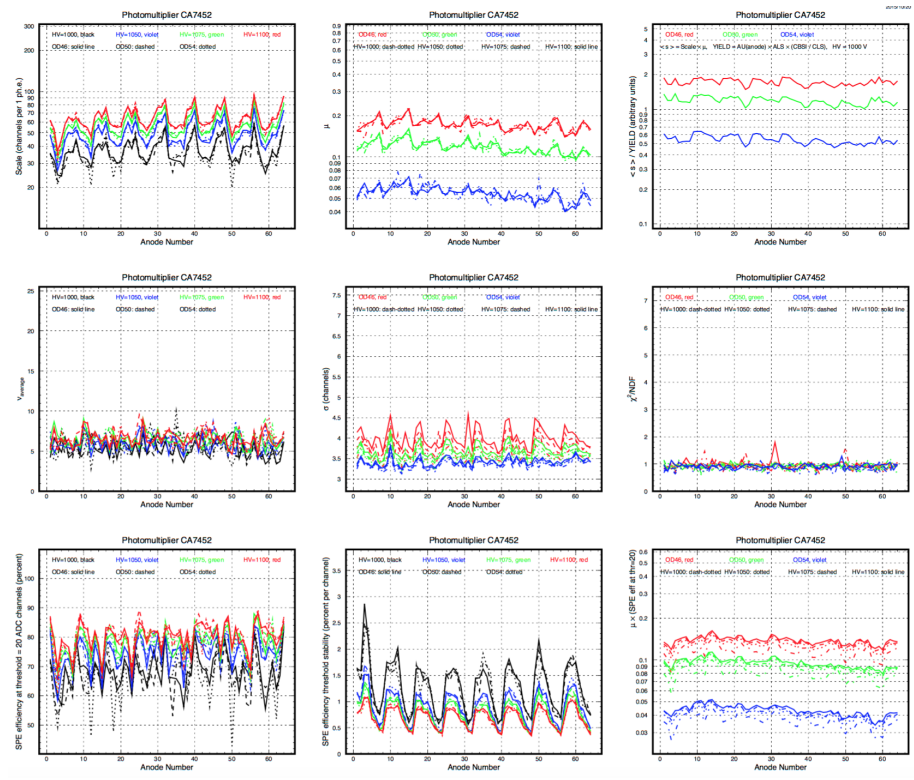
Next (LNF):

- Validate aerogel assembling procedure

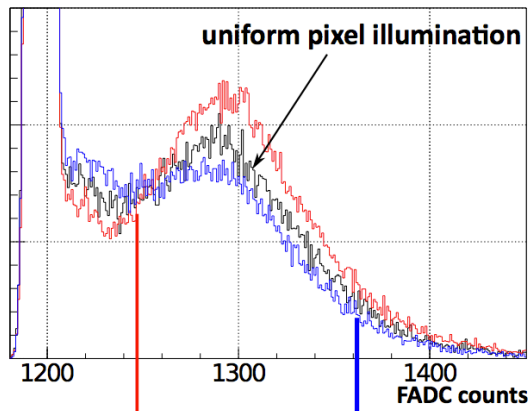
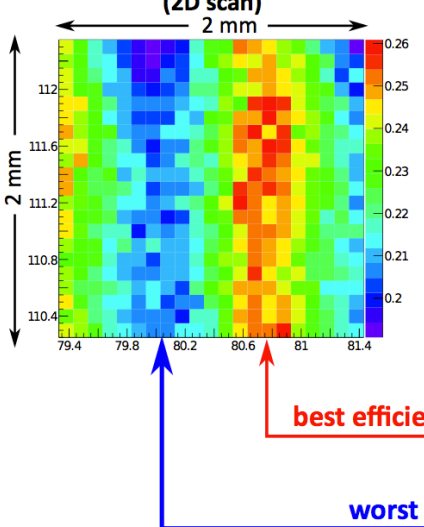
# MA-PMT Photon Detector



Full characterization done on a pulsed-laser bench

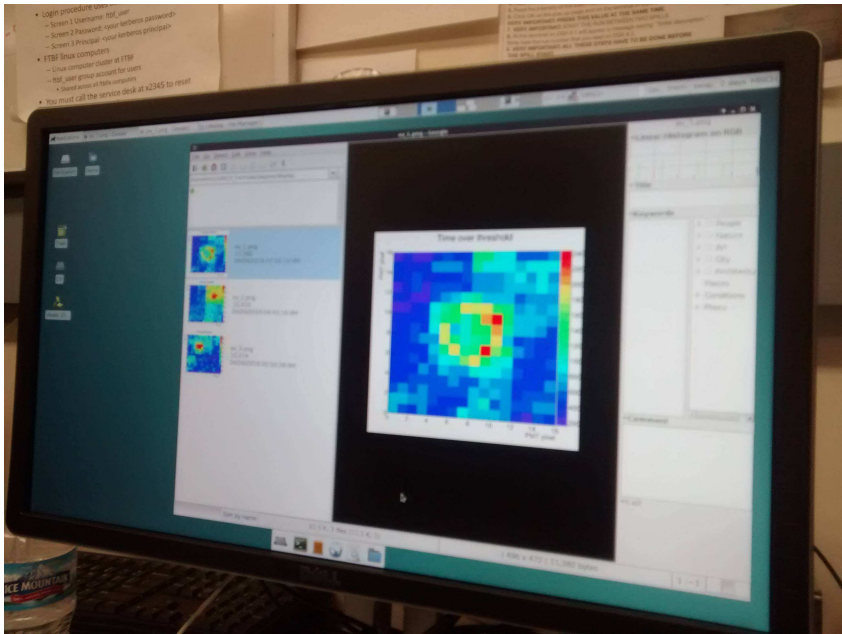
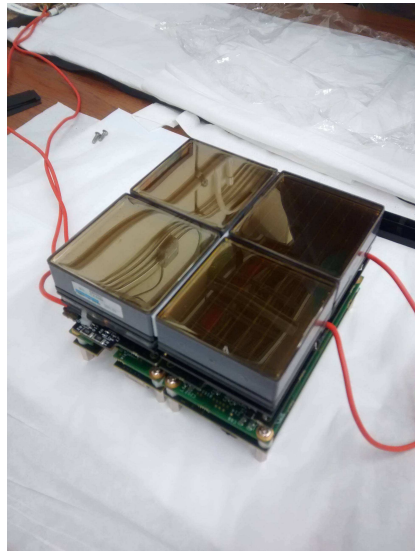
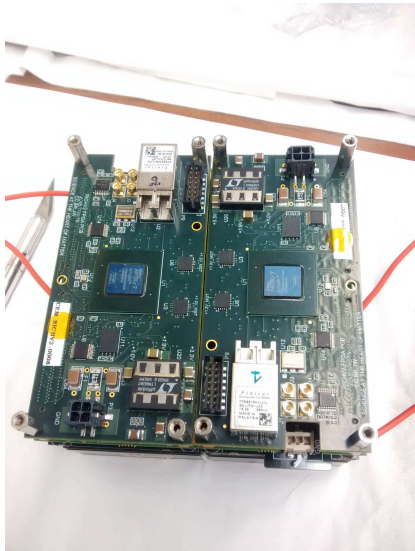


efficiencies at different beam position (2D scan)



All MA-PMTs delivered  
 2 out of 391 rejected and substituted  
 Stand-alone characterization done  
 Storing info into CLAS12 database (JLab/DU)  
 Next (FE + JLab):  
 - Characterization with RICH electronics

# Electronics



## FPGA:

- Production done
- Stand-alone validation done

## Asics+Adapter

- Pre-production done
- Stand-alone validation done
- All MAROC3A chips delivered

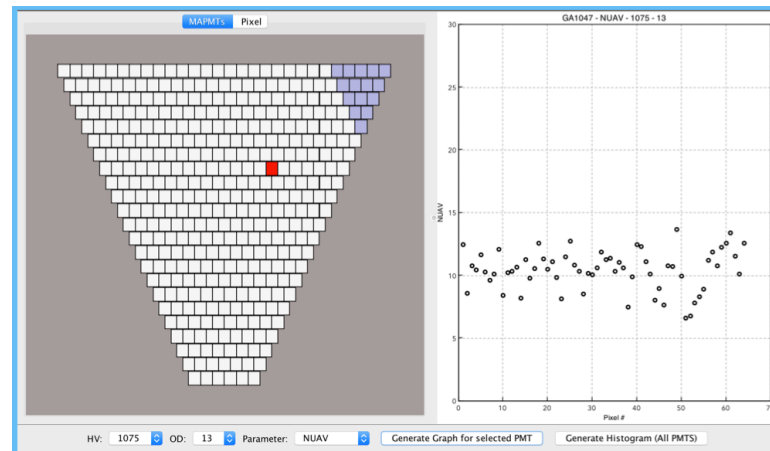
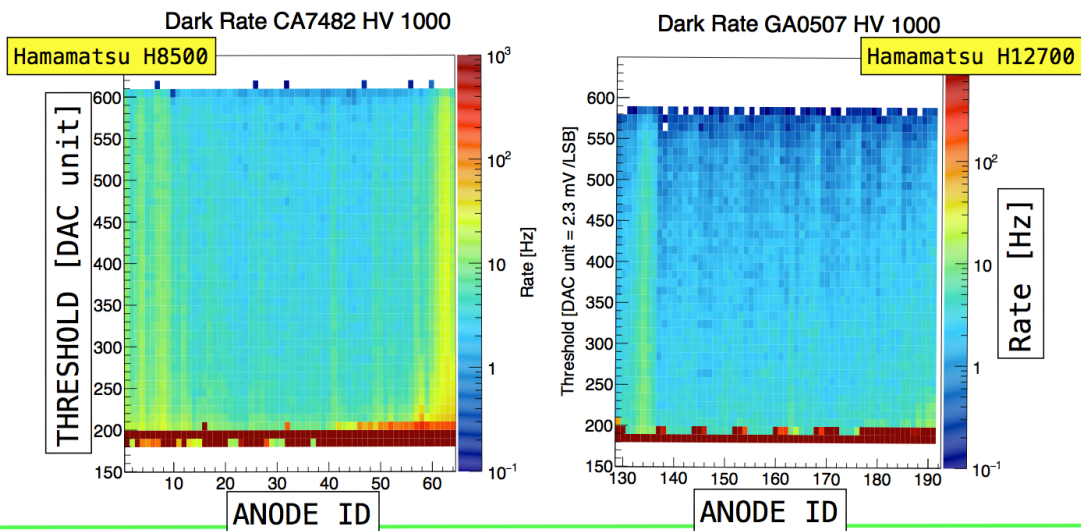
Successfully Test-Beam @ Fermilab

## Next (FE):

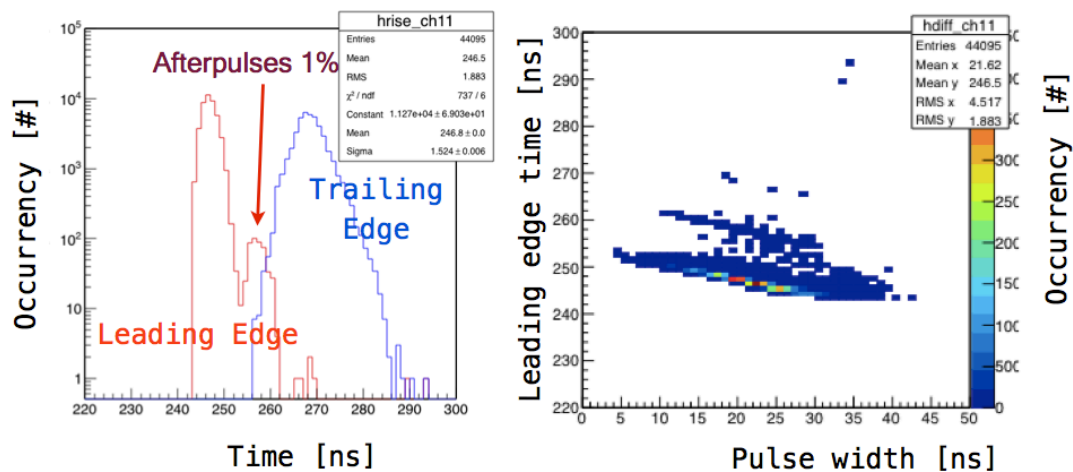
- Complete production before summer



## Noise, single (photo)-electron signal



## Time resolution with pulsed laser



Preliminary Tests Done  
Developing characterization procedures

Next (FE + JLab):

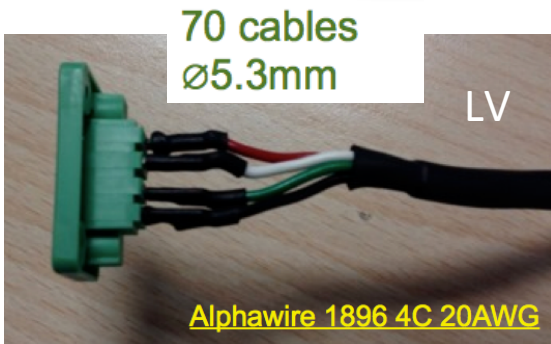
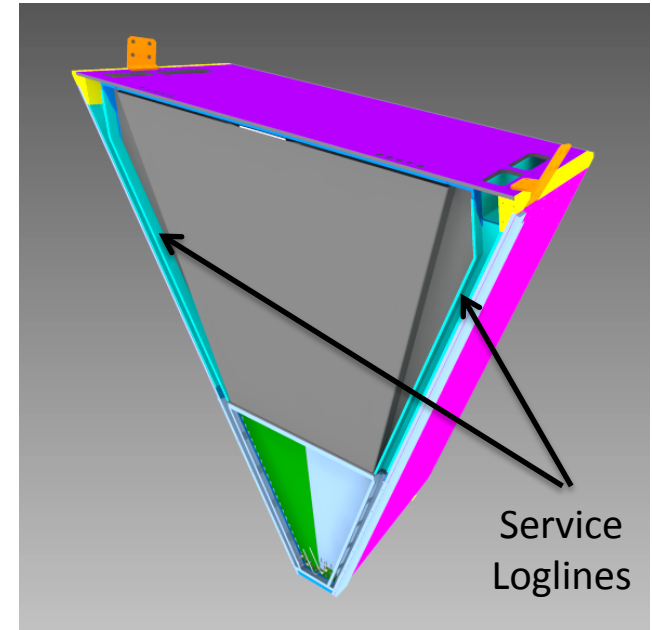
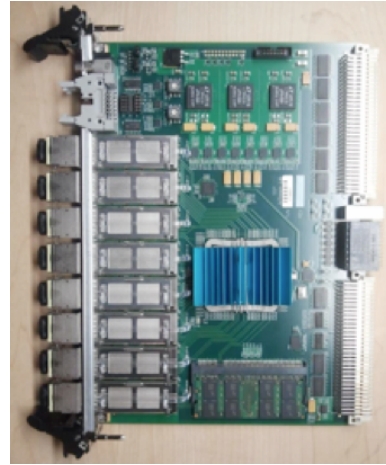
- Characterization with MA-PMTs
- Store relevant information on CLAS12 database

# Services: Powers and DAQ

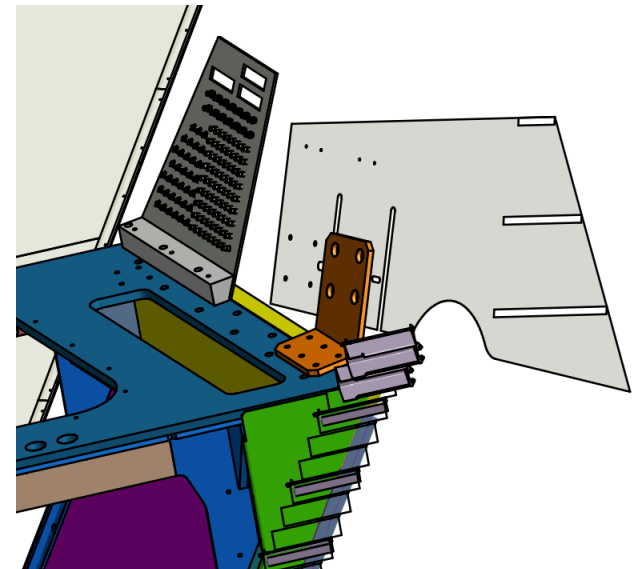
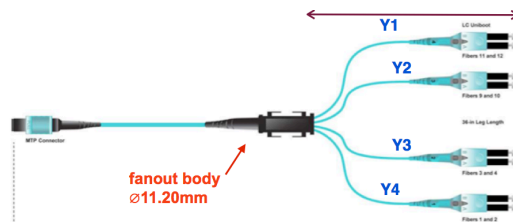
SY4527 LV & HV Power Supply  
(compatible with EPICS)



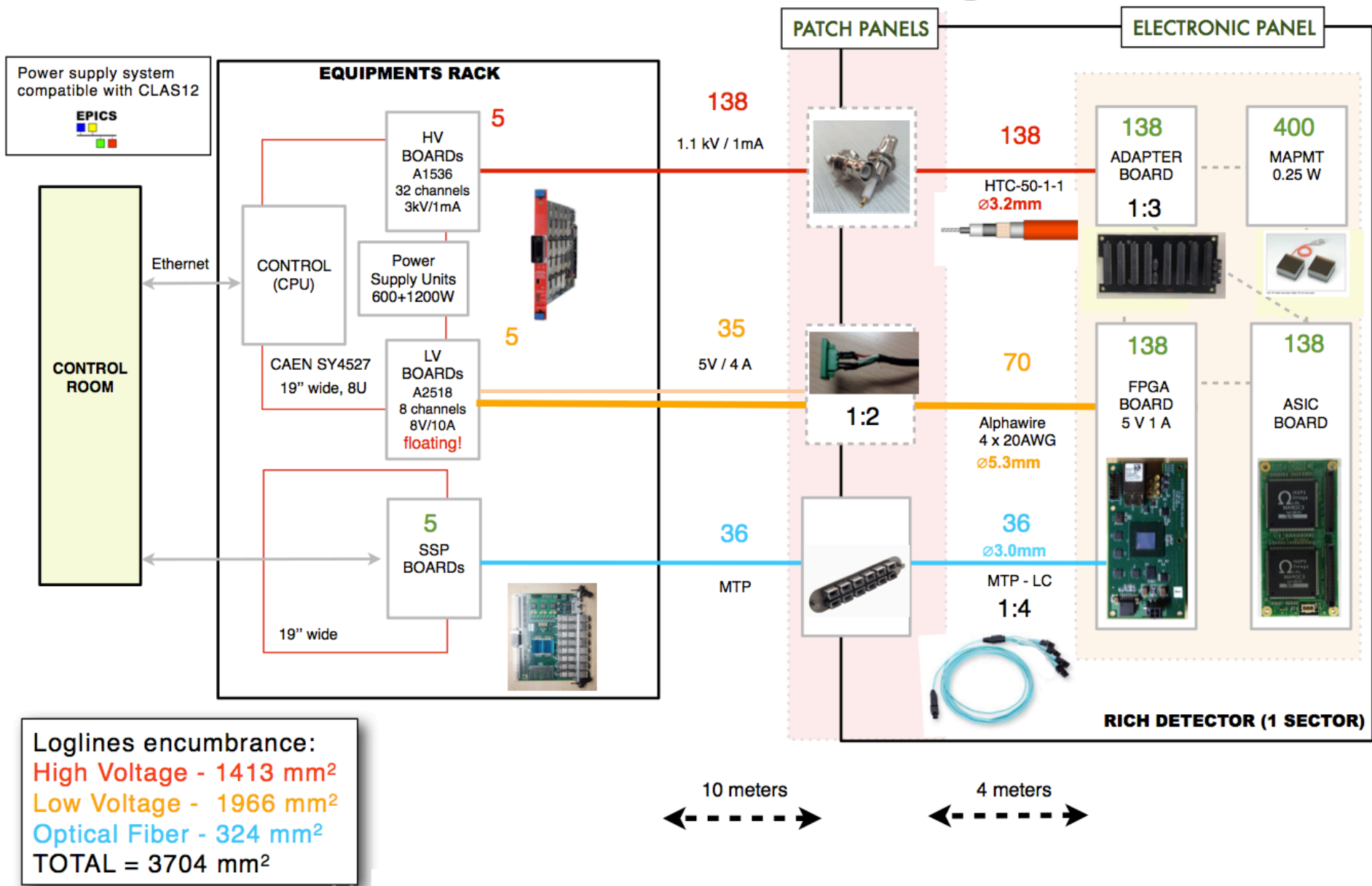
5 SSP Fiber-Optic DAQ  
(compatible with CLAS12)



HTC-50-1-1 HV  
ø3.2mm, 138 cables

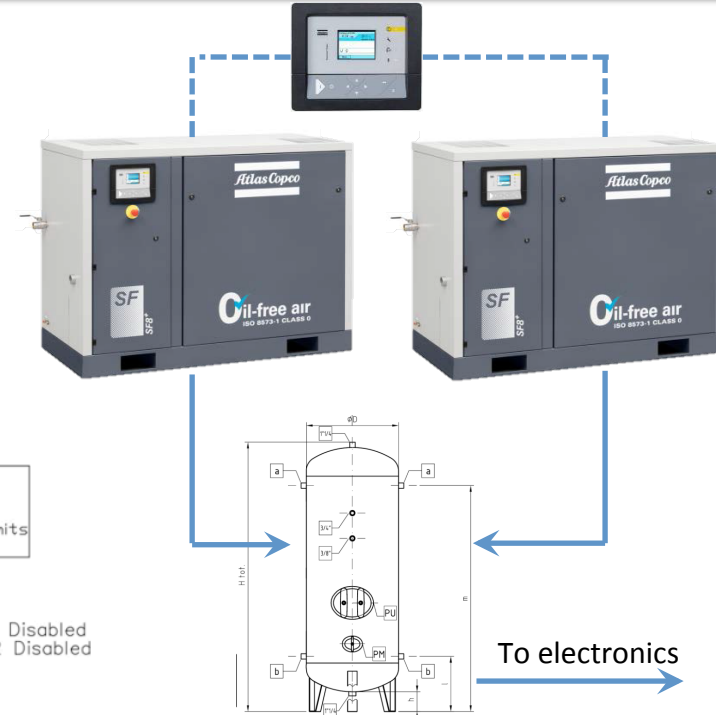
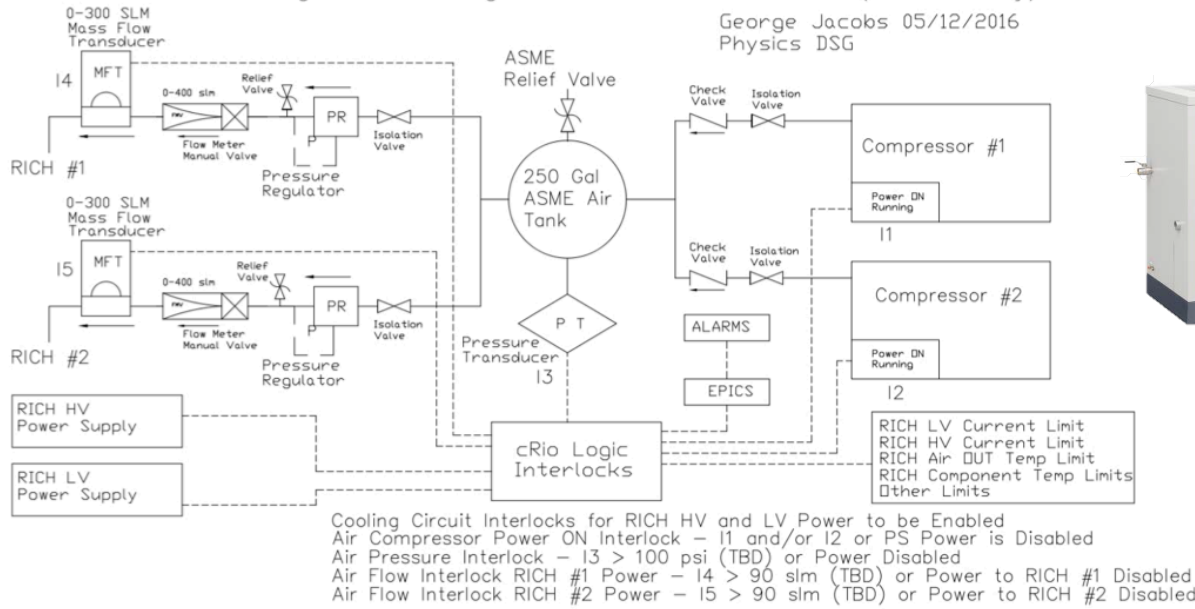


# Services: Backend Electronics



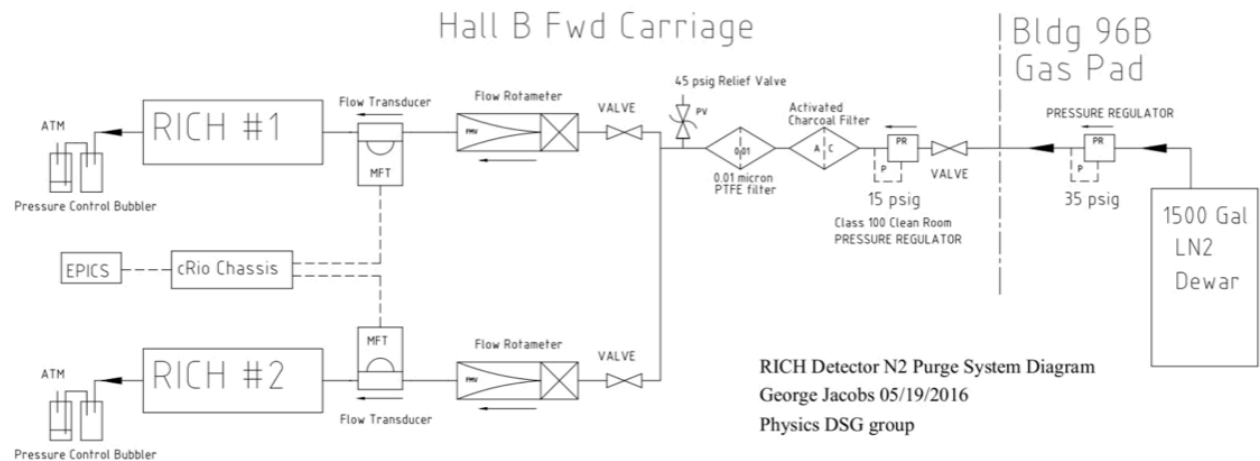
# Services: Gas Systems

George Jacobs 05/12/2016  
Physics DSG

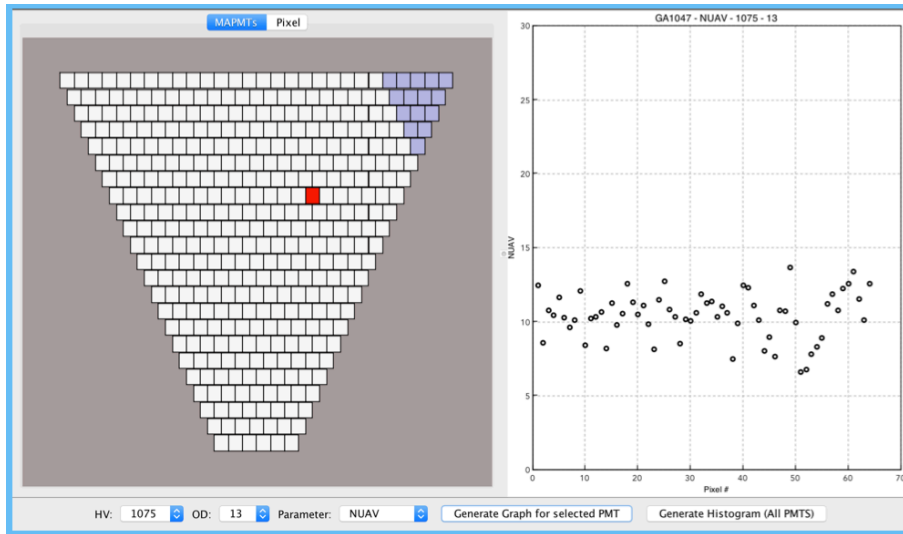


RICH Cooling Circuit  
Diagram with Interlock  
(G. Jacobs)

RICH N<sub>2</sub> Pure Gas  
System Diagram  
(G. Jacobs)



# Software



## DAQ and Calibration:

- Tested on PCI-e optical link

Next: SSP and CODA

## Reconstruction:

Full chain under development:

- gemc simulation
- coatjava based reconstruction
- java based event display

Next:

Optimize for KPP

## Slow Control:

Basic hardware supported by CLAS12

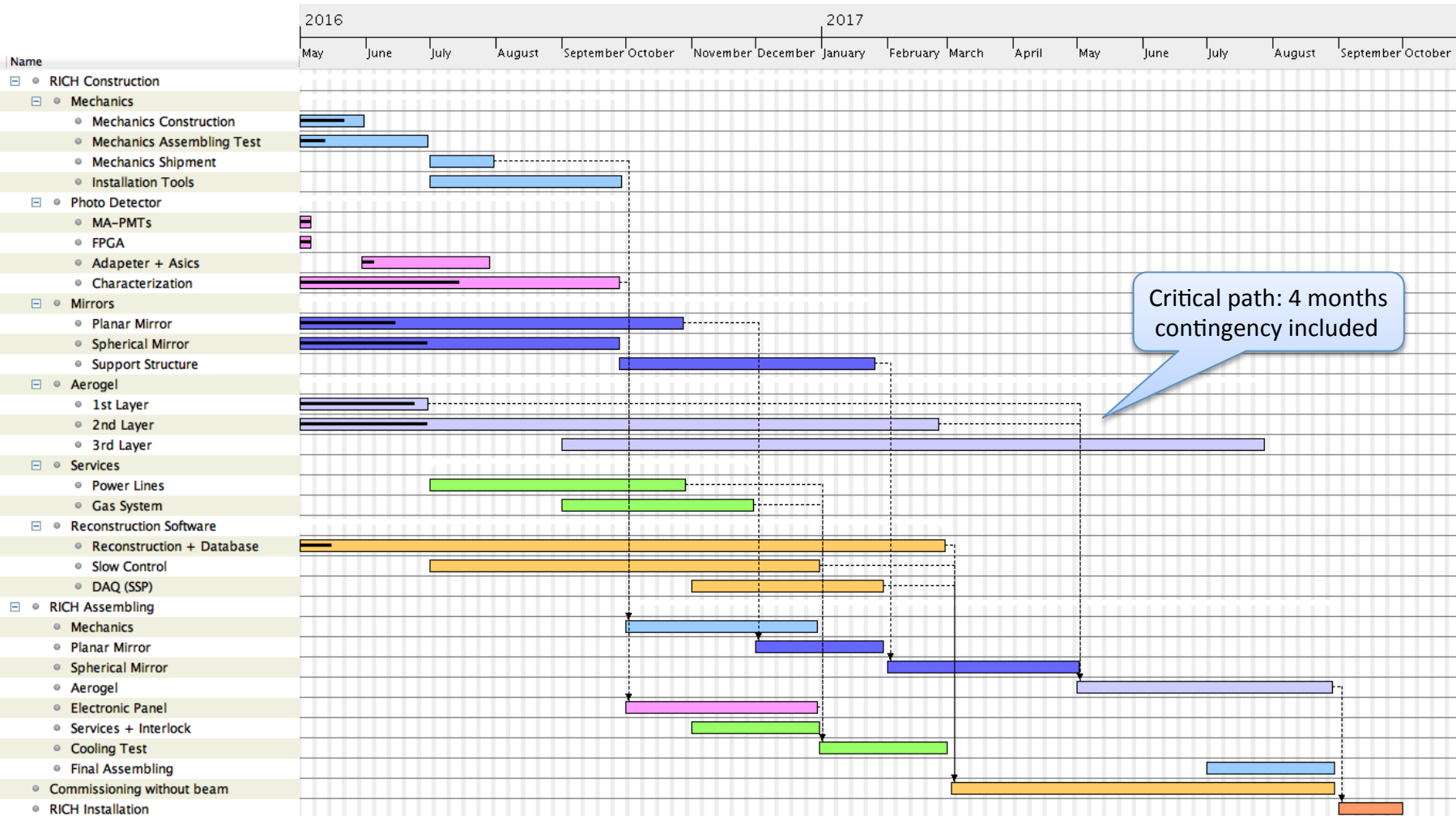
- SY4527 power supply
- cRio for gas systems

SSP will provide temperature and bias voltages for all chips

Next: Implementation within CLAS12

# Tasks Toward Completion

Component production organized subject to assembling schedule



# CLAS12 RICH Status

- ✓ Components
  - Under production
  - Performance in line or better than the design specification
  - Deliveries organized subject to assembling schedule
  
- ✓ Assembling & Installation
  - Start foreseen in October 2016
  - Almost 1 year before installation
  - Comprises commissioning of all systems without beam
  
- ✓ Operation
  - Hazard identified
  - Services defined to be compatible with CLAS12
  - Slow control and Interlock under development
  - Reconstruction software under development