

CLAS12-RICH

Project-Status & Tasks Towards Completion

June 13th 2016

Charge 3:

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

Project Milestones

Activity Name	Date	MS Lvi	Finish Date			FY 14			FY 15					FY 16				FY	′ 17	F	3		
				4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
RICH Milestone Schedule							\square		\top	-													
Start of US Scope of RICH Project	9/30/13	1	9/30/13																				
PMT Contract Awarded	9/30/13	1	9/30/13		•										tart Milestone with Float						Т		
Start Aerogel Procurement	12/31/13	1	1/31/14			-									1	tart	in milestone with Float						
Start PMT Production	1/1/14	1	1/31/14			-							- Fin				Finish Milestone with Floa						
FE Interfaces Defined; Preliminary Electronics Design Completed	3/31/14	2	4/30/14			•	•	Γ,	Т	T												-17	
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				٠																
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	3/31/16	2	5/31/16												-								
Start Electronic Panel Procurement	4/1/15	2	5/1/15								-												
Start First Spherical Mirror Characterization	3/31/16	2	6/30/16																				
FE and DAQ FPGA Boards: Production Completed	4/29/16	1	6/30/16												◀-								
2 m2 Aerogel Acceptance Tests Completed	4/29/16	2	6/30/16												┫-								
External Frame & Electronic Panel Completed	3/31/16	2	6/30/16																				
Mirror Production Completed	11/30/16	1	2/28/17														•						
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	6/1/16	2	8/1/16													-							
PMT Characterization Completed	3/31/16	2	4/29/16																				
Mechanical Assembly Survey of Spherical Mirrors Completed	3/31/17	2	4/28/17															•	•				
3 cm Thickness Aerogel Production Completed	9/30/16	2	11/30/16													•	<u> </u>						
Mirrors/Ext Frame/Elect Panel Arrive at JLab	8/31/16	2	12/30/16													•							
Start RICH Assembly	10/3/16	2	11/2/16														-						
Aerogel Production Completed	3/31/17	1	7/31/17															•	-	-			
RICH Assembly Completed	8/1/17	2	9/1/17																				
Start RICH Installation	8/1/17	2	9/1/17																	-			
RICH Project Completed	9/29/17	1	3/30/18																	•	-		
				4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
	-	-							-														

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





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 95 Residual (um) Transmission (%) 15.00 10.23 1200 90 5.45 0.68 1000 -4.10 **ptA** 85 -8.87 ptB -13.65 <u> (</u>mm) 800 -18.42 80 ptC -23.20 600 ptD 75 P-V (um): 34.44 ptA2 RMS (um): 6.83 400 Max Abs Slope Error (mrad): 0.139 70 RMS Slope Error (mrad): 0.050 300 400 500 600 700 200 Scale Wavelength (nm) 100 X Scale -600 -400 -200 X (mm)



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

Next (LNF):

- Validate aerogel assembling procedure

MA-PMT Photon Detector







Full characterization done on a pulsed-laser bench

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

Succesfully Test-Beam @ Fermilab

Next (FE):

- Complete production before summer

Electronics







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)





HTC-50-1-1 Ø3.2mm, 138 cables



5 SSP Fiber-Optic DAQ (compatible with CLAS12)











HV

Services: Backend Electronics



Services: Gas Systems



Pressure Control Bubbler

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