

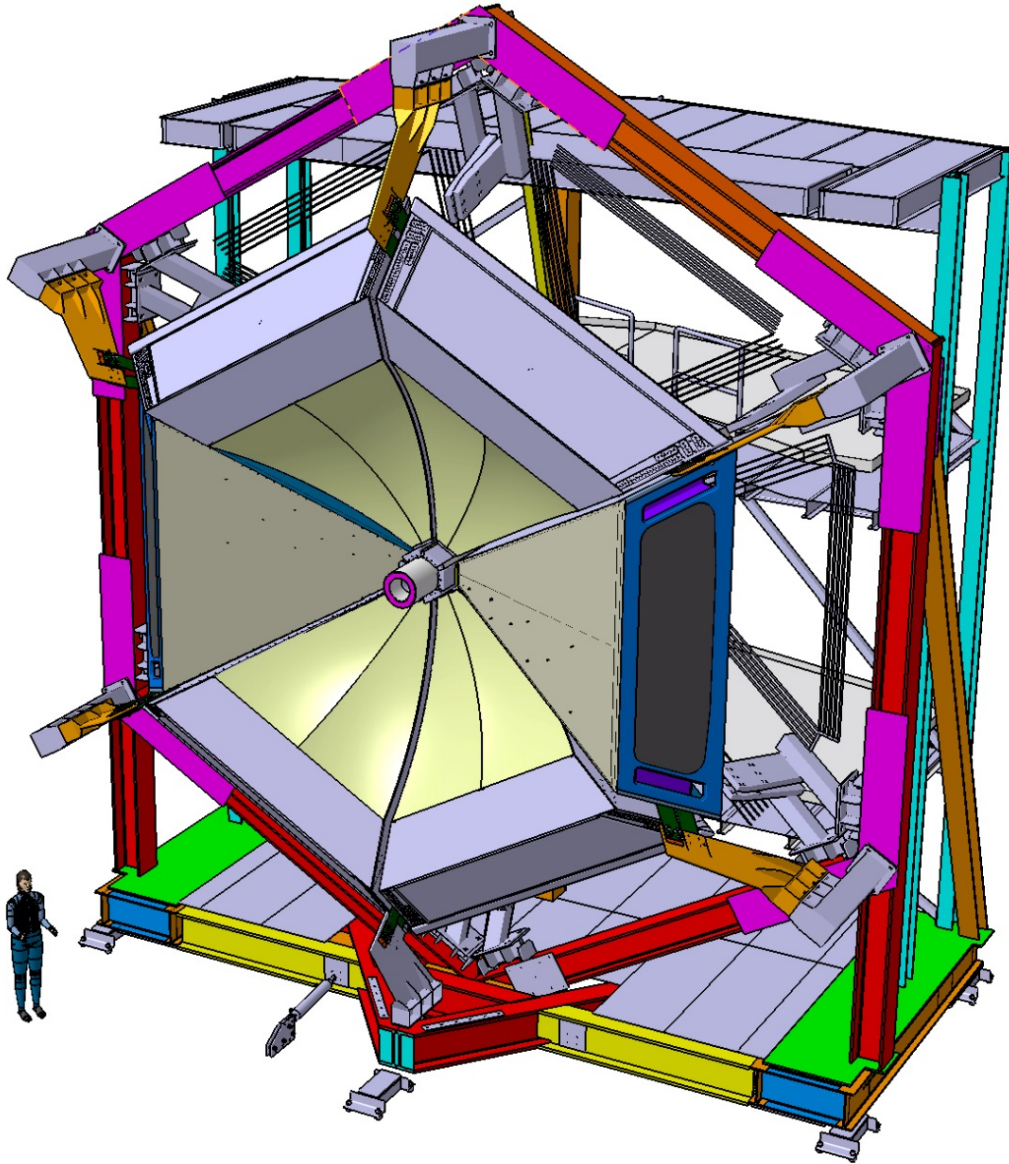
CLAS12-RICH

Responsibility, Manpower & Summary

June 13th 2016

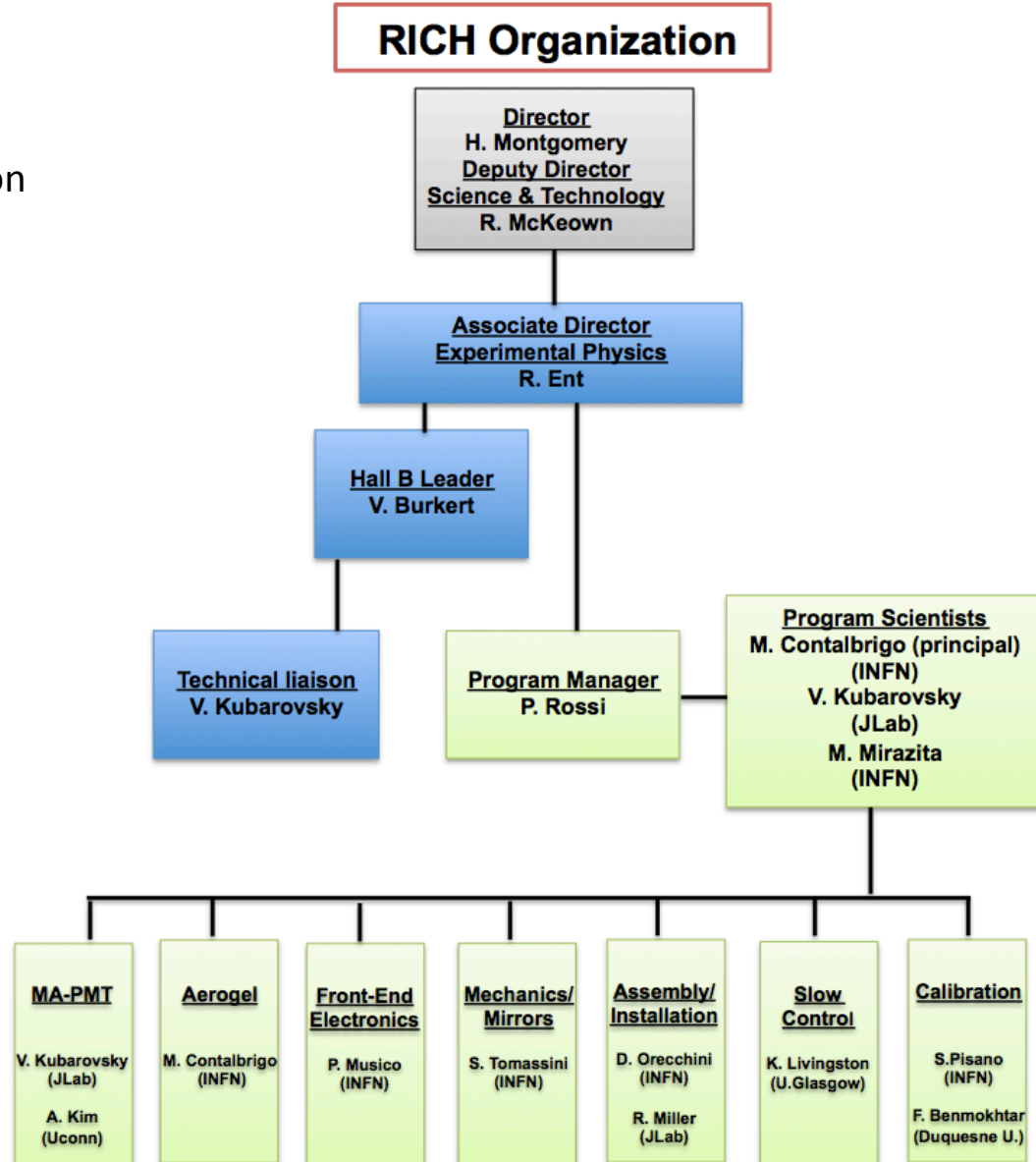
Charge 6:

Are the responsibilities for carrying out each job identified, and are the manpower and other resources necessary to complete them on time in place?



The RICH Management Plan

Responsibility during construction identified in the RICH Management Plan



The RICH Crew

MA-PMTs

V. Kubarovsky (JLab)
A. Kim (UCONN)
++ students

Software

F. Benmokhtar (DU)
S. Pisano (LNF)
K. Livingston (UG)
N. Baltzell
M. Turisini
B. Raydo
++ students

Mechanics & Gas

S. Tomassini (LNF)
D. Orecchini (LNF)
G. Fuga (LNF)
S. Squerzanti (INFN-FE)
V. Lucherini (LNF)
R. Perrino (INFN-BA)
K. Bailey (ANL)
T. O'Connor (ANL)

Electronics

B. Raydo (JLab)
M. Turisini (INFN-FE)
P. Musico (INFN-GE)
C. Cuevas (JLab)
R. Malaguti (INFN-FE)
G. Mini (INFN-GE)
E. Cisbani (ISS)

@ JLab:

Hall-B liaison V. Kubarovsky
Gas system: G. Jacobs (DSG)
Component validation, storage: L. Tyler et al. (DSG)
Power lines: C. Cuevas & B. Raydo (FE)
Installation: R. Miller

Mirrors

M. Mirzita (LNF)
S. Tomassini (LNF)
I. Balossino (INFN-FE)
L. Barion (INFN-FE)
G. Angelini (GWU)
++students

Aerogel

M. Contalbrigo (INFN-FE)
M. Mirazita (LNF)
A. Movsysian (INFN-FE)
L. Pappalardo (INFN-FE)
++students

The RICH Crew

MA-PMTs

V. Kubarovsky (JLab)
A. Kim (UCONN)
++ students

Software

F. Benmokhtar (DU)
S. Pisano (LNF)
K. Livingston (UG)
N. Baltzell
M. Turisini
B. Raydo
++ students

Mechanics & Gas

S. Tomassini (LNF)
D. Orecchini (LNF)
G. Fuga (LNF)
S. Squerzanti (INFN-FE)
V. Lucherini (LNF)
R. Perrino (INFN-BA)
K. Bailey (ANL)
T. O'Connor (ANL)

Electronics

M. Turisini (INFN-FE)
B. Raydo (Jlab)
P. Musico (INFN-GE)
C. Cuevas (JLab)
R. Malaguti (INFN-FE)
G. Mini (INFN-GE)
E. Cisbani (ISS)

@ JLab:

Hall-B liaison: V. Kubarovsky

Gas system: G. Jacobs (DSG)

Component validation, storage: L. Tyler et al. (DSG)

Power lines: C. Cuevas & B. Raydo (FE)

Installation: R. Miller

Mirrors

M. Mirzita (LNF)
S. Tomassini (LNF)
I. Balossino (INFN-FE)
L. Barion (INFN-FE)
G. Angelini (GWU)
++students

Aerogel

M. Contalbrigo (INFN-FE)
M. Mirazita (LNF)
A. Movsysian (INFN-FE)
L. Pappalardo (INFN-FE)
++students

Responsible during
Physics run and
Maintenance

CLAS12 RICH Recommendations

Several recommendations referred to the Management Plan and Schedule [PR 2013, MR 2014, PMR 2015]

- ✓ Accomplished in accordance to JLab management and DOE
- ✓ DOE relaxed supervision after project mid-term review

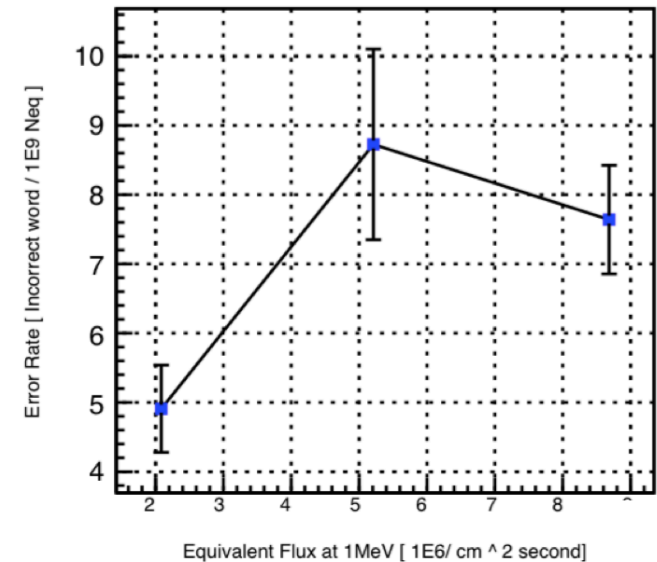
A more quantitative evaluation of the front-end electronic FPGA board design and component choices such as the FPGA and the fiber transceiver should be made to establish that radiation effects in close proximity to the beam line will not compromise the performance of the readout electronics. [PR 2013]

Radiation tests performed with neutron and gammas:

- ✓ ~ 1 error/day in the FPGA volatile configuration over the full RICH
- ✓ No error in the non-volatile memory after ~ 50 years*
- ✓ Hardware issues only after 20 years* [*CLAS12 years at full lumi] transceiver (with n) and voltage regulators (with γ)

Cabling, PMTs and electronics were mentioned, so ensure the procurements of these items are acceptable per JLab electrical and fire protection guidance. [MR 2014]

- ✓ We accounted for the cable fire rating requirements and RICH services design was reviewed by C. Cuevas.

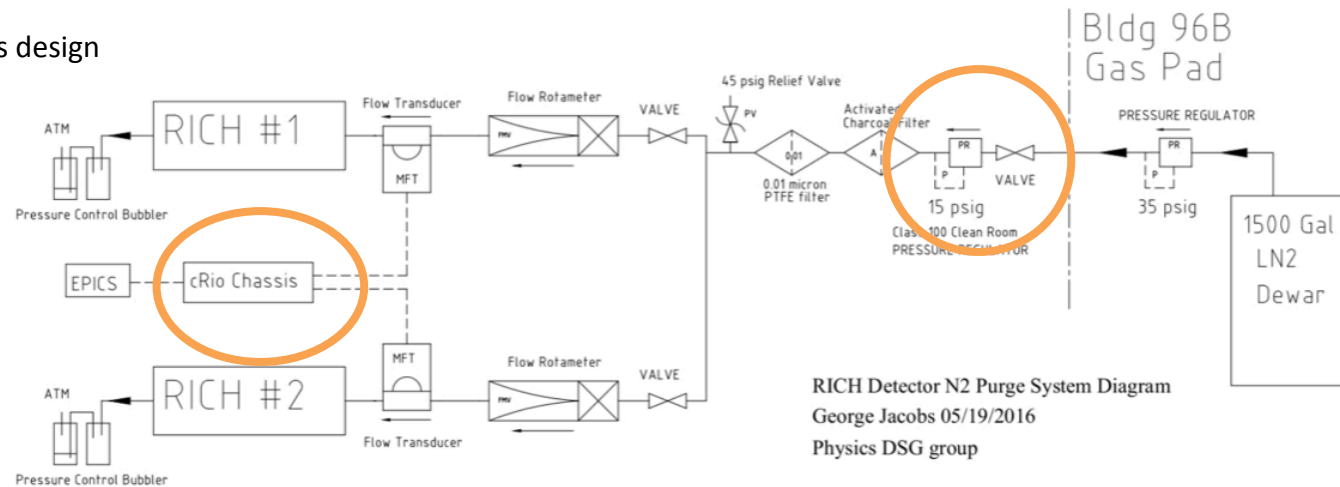


CLAS12 RICH Recommendations

A properly sized relief valve will be required after the pressure regulator, preferably a properly sized 15 psig relief to eliminate pressure system requirements downstream. The pressure regulator used must be for pure gas and have the proper outlet pressure range of 0-15psig. [MR 2014]

The controller for the N2 system shall be an Allen Bradley CompactLogix to match the other Hall B gas system controllers for ease of programming and maintenance. [MR 2014]

✓ accounted for in the G. Jacobs design



The internal pressure of the RICH detector from the N2 dry gas system shall be included in the FEA analysis of the detector. The statement: “pressure: wanted levels of ~30-40 mbar are not expected to affect mechanics significantly” must be confirmed via analysis. [MR 2014]

✓ We reduced the overpressure to 0.5 mbar

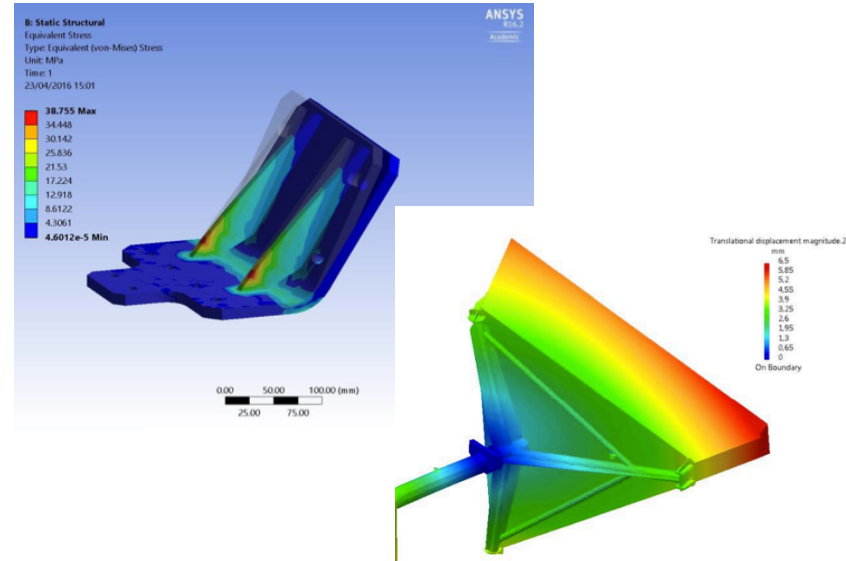
The dry nitrogen volume, albeit relatively small, shall have an approved oxygen deficiency hazard safety review per JLab ODH guidance. [MR 2014]

✓ no need as we are going to replace a volume of LTCC freon with the same volume of RICH nitrogen

CLAS12 RICH Recommendations

Studies of **mechanical deformations** and resulting stresses on the entire detector should include operation, installation, transportation, maintenance (local fixture(s)), and earthquake loads. [PR 2013].

The RICH project should provide all **engineering calculations** necessary to demonstrate code compliance for all appropriate equipment and operating conditions thereof. [PMR 2015]



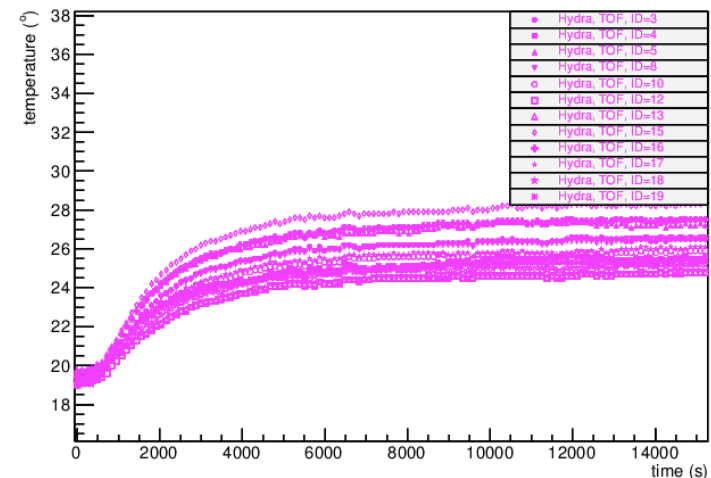
- ✓ Relevant calculations has been performed at each stage of the project and reviewed by JLab experts (B. Miller)
- ✓ RICH underwent a mechanical review in June 2014.

The RICH detector group should show by analysis that the steady state temperature of the FTOF panel 1B will not exceed 30C. It is acceptable to extend the RICH detector 1 inch downstream at the electronics box location to install insulation to reduce the **heat load on the FTOF**. The insulation must not interfere with the FTOF panel 1B cables. [MR 2014]

- ✓ Maximum temperature value revised to 100 F
- ✓ Air-cooling validated by extensive tests performed at LNF Final optimization before entering the Hall

The final design of the dry nitrogen piping and ventilation systems shall be reviewed by a Jlab engineering subject matter expert(s).

- ✓ Done by G. Jacobs and reviewed by M. Saptarshi



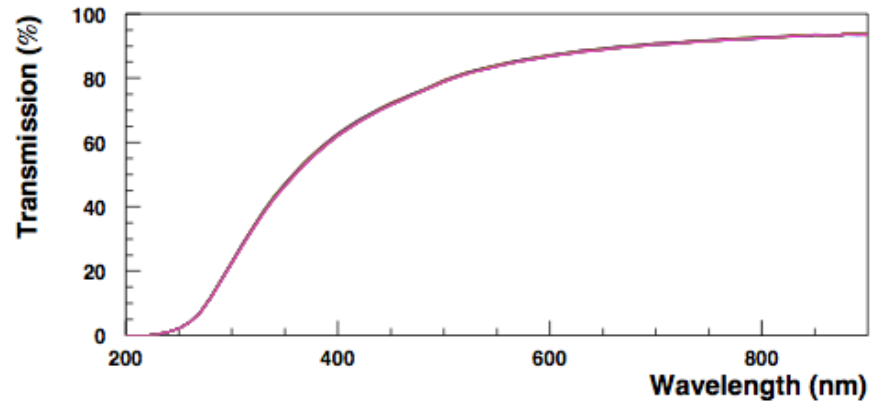
CLAS12 RICH Summary

Goal: RICH ready for October 2017 run

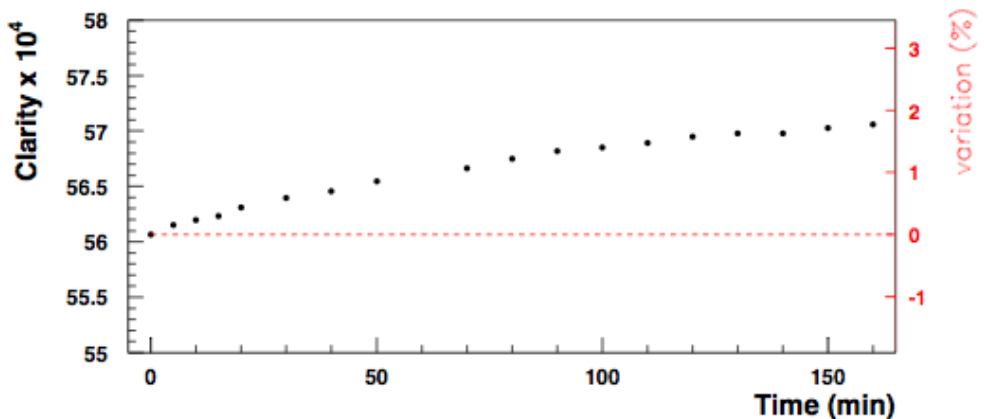
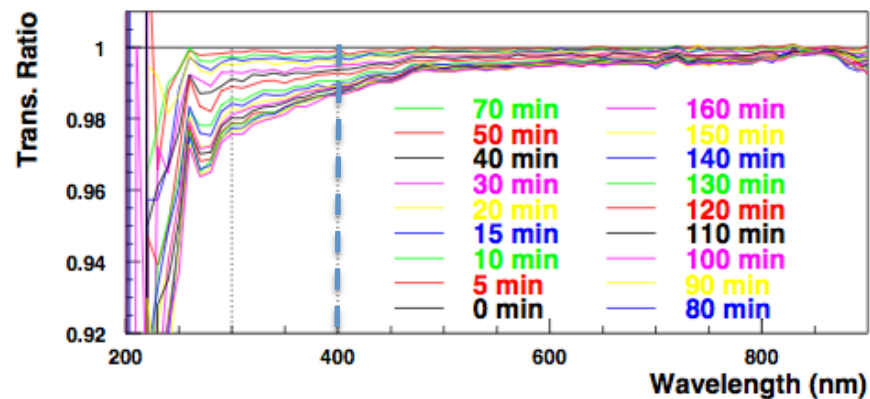
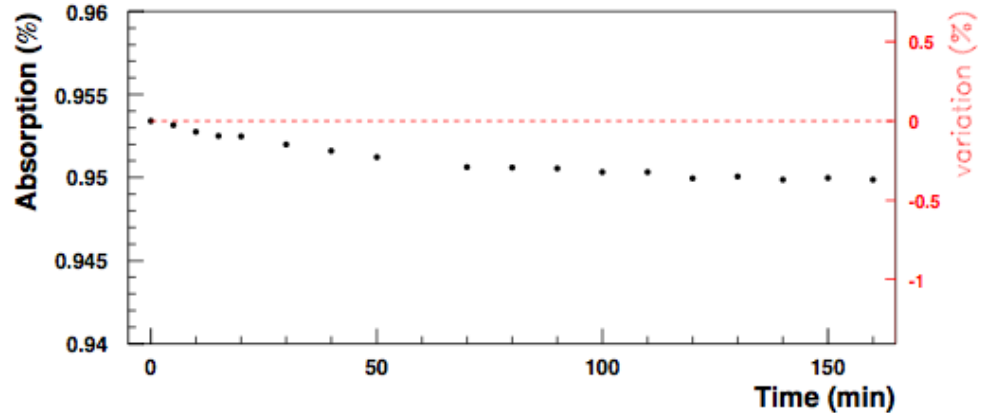
- ✓ Several reviews validated the design and monitored the progresses (DOE has relaxed the supervision after mid-term review)
- ✓ Construction follows a Management Plan
- ✓ Assembling planned and described in a dedicated document
- ✓ Installation procedure derived from LTCC in collaboration with JLab
- ✓ Safety considerations accounted and documented
- ✓ A (preliminary) Task Hazard Analysis has been performed:
gas system risk code after mitigation = 1

Aerogel Characteristics in the Air

Transmission vs Time

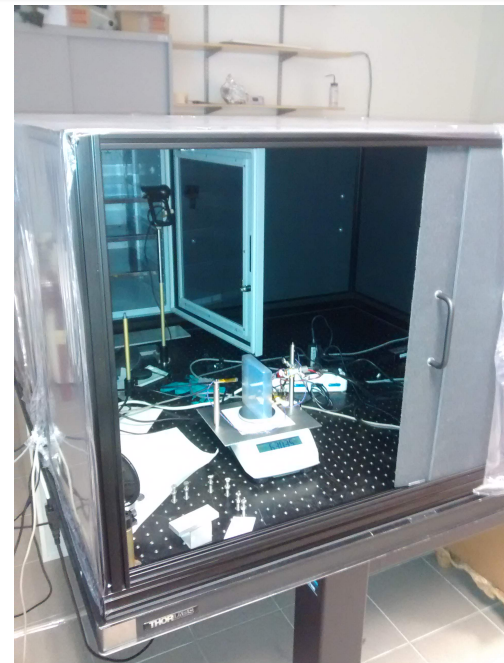
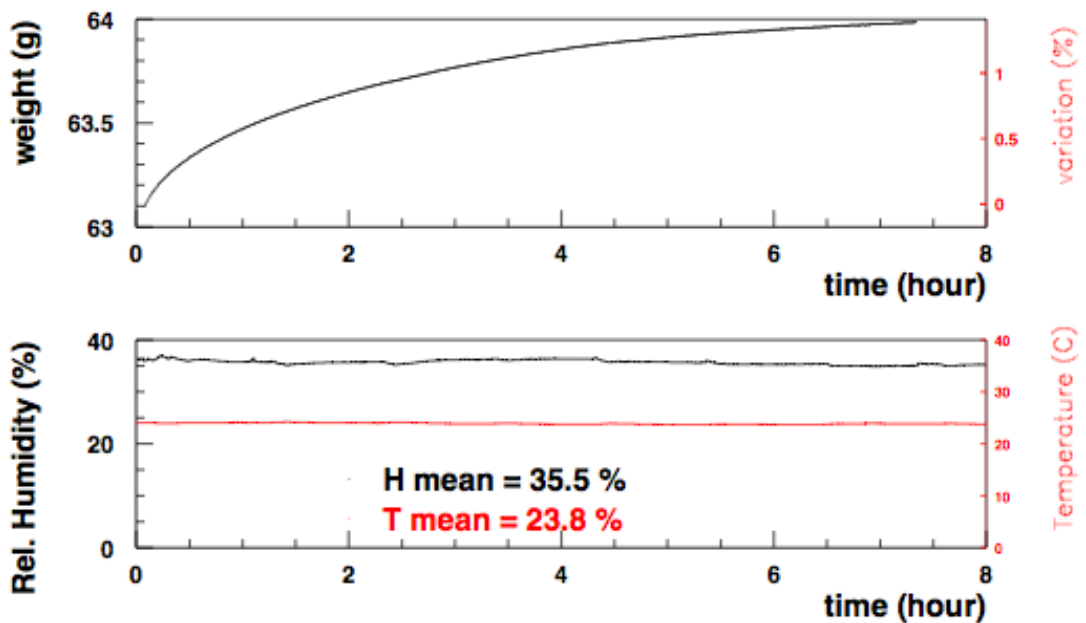


Absorption and Clarity @ 400 nm



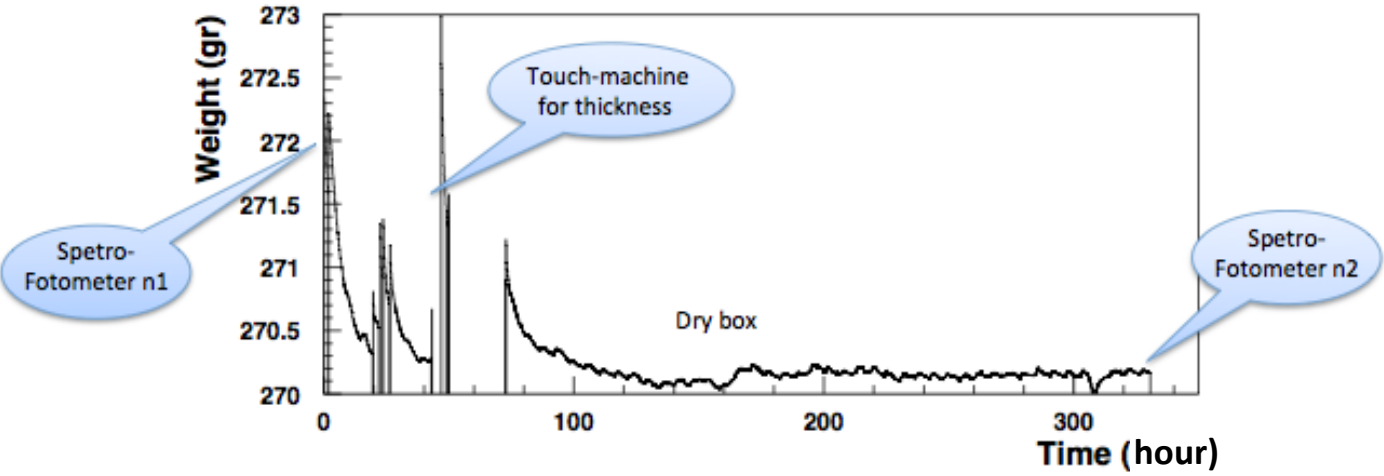
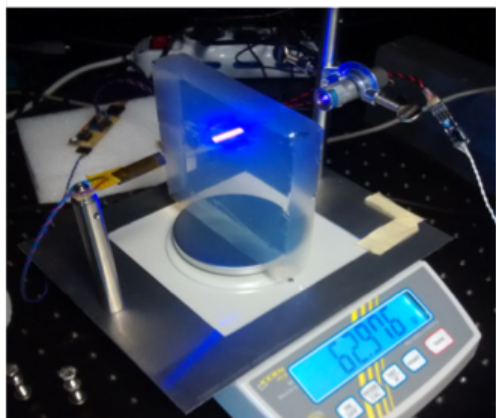
Monitoring the time dependence of the transmission of aerogel tile in environment of non-zero relative humidity (~ 40 %)

Aerogel Weight



In Air (≈ 40 % RH)

Inside Dry-Box (≈ 1 % RH)



CLAS12 RICH Project Midterm Status

Charge 1:

Have the ESH&Q considerations been properly included in the design of the detector?

No hazardous material

Gas and Cooling systems authorized by design authority (in progress)

Interlock for cooling implemented

Reviewed by M. Saptarshi:
Tank (200 psi): McMaster Part # 9554K71
Relief (90 psig): McMaster Part # 4700K83
Relief (175 psig): McMaster Part # 4700K15

Charge 2:

Are the specific documentation and procedures to operate safely and efficiently the detector, in place and adequate? This includes initial operation.

ESAD document

RICH Operational Manual

Commissioning Document

CLAS12 RICH Project Midterm Status

Charge 3:

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

Detector under construction

A Management Plan define responsibilities and milestones

Hardware and software tasks have been identified

Detailed schedule exists for construction, assembling, installation

Charge 4:

Have all the jobs that need to be done to safely mount the detector been identified and defined adequately?

All systems are verified prior of installation

Installation procedure derived from the LTCC

Special care planned during transportation and lifting

The space for services has been allocated

Charge 5:

Has the detector ownership, maintenance and control been defined during beam operations?

Slow control and interlock ensure safety
RICH run is a shared duty between INFN and JLab

Charge 6:

Are the responsibilities for carrying out each job identified, and are the manpower and other resources necessary to complete them on time in place?

All phases have a plan with assigned manpower

BACKUP SLIDES

CLAS12 RICH Readiness Review

Answer to the Review Committee

