

RICH Status

Tyler Lemon

Detector Support Group

Introduction

- DSG met with RICH collaborators on 4/26/2016.
- ERR will be held for detector on 6/13/2016.
- DSG asked to assist with information needed for review.

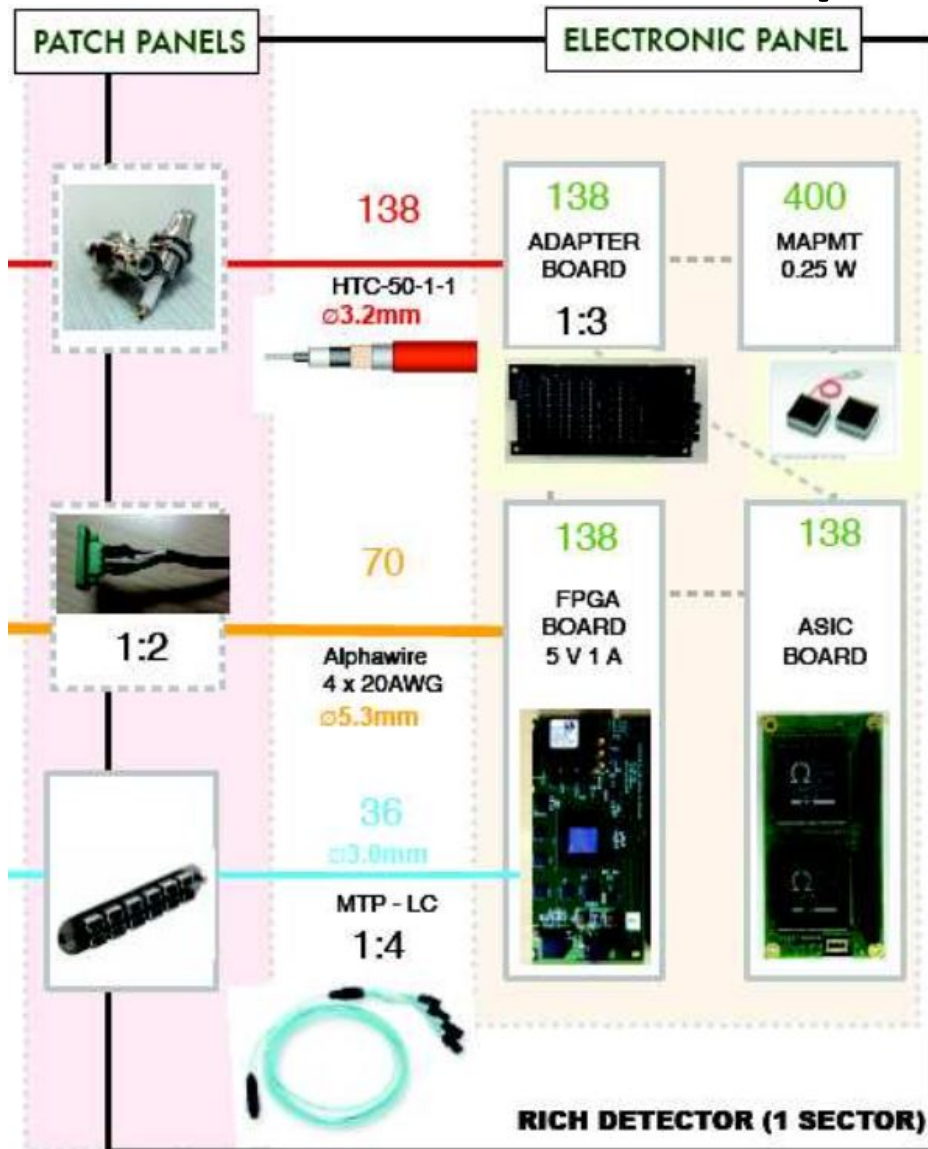
DSG-RICH Meeting

- Held on 4/26/2016 with Sandro Tomassini and Dario Orecchini.
- Discussed:
 - Electronics cooling system.
 - layout of clean rooms for testing and assembly.

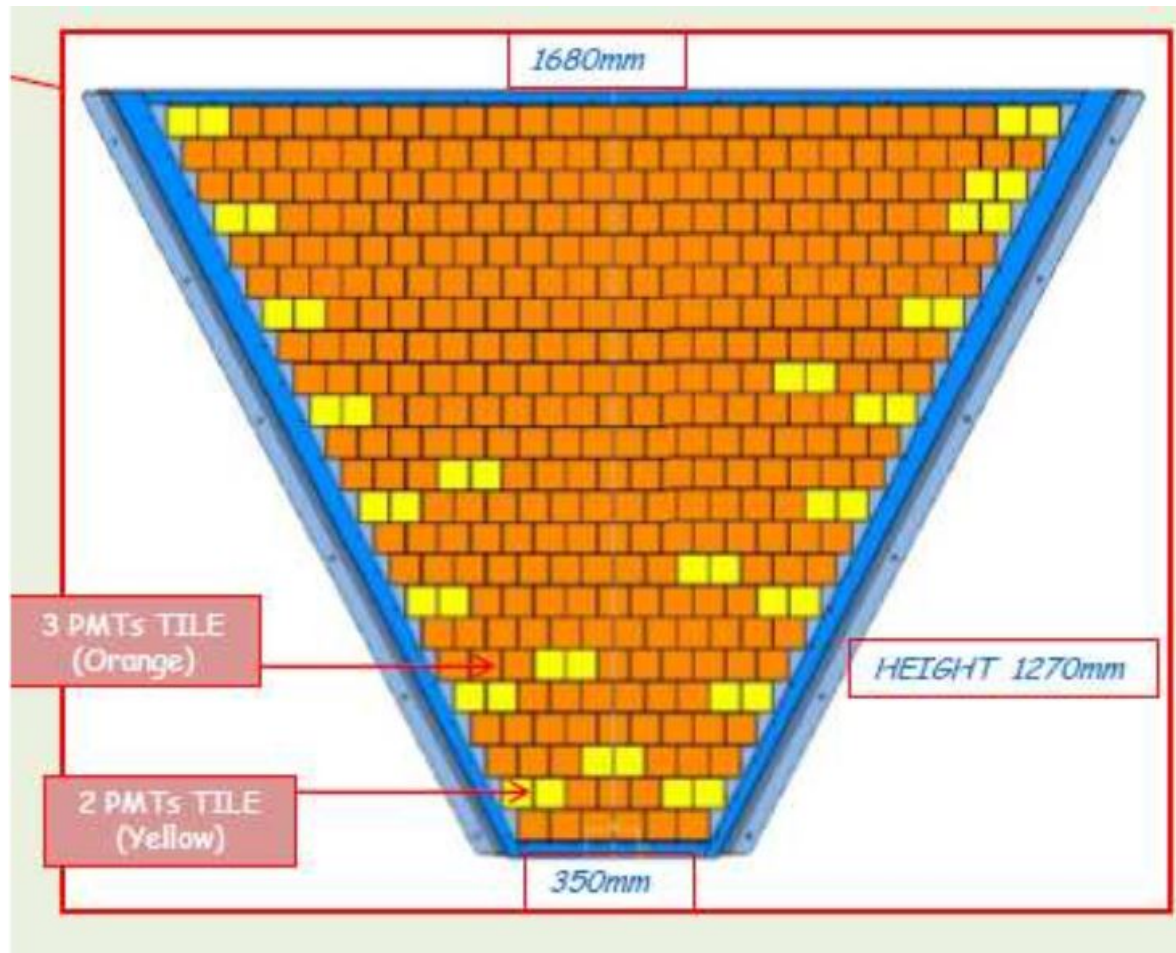
Air Cooling System

- Electronics panel needs to be kept $<100^{\circ}$ F.
 - ~ 500 W generated by electronics.
- Uses air compressors to cool electronics panel.
- Components:
 - Two air compressors.
 - One air tank.
 - Manual valves.
 - Pressure and flow monitors.

Electronics Panel Components



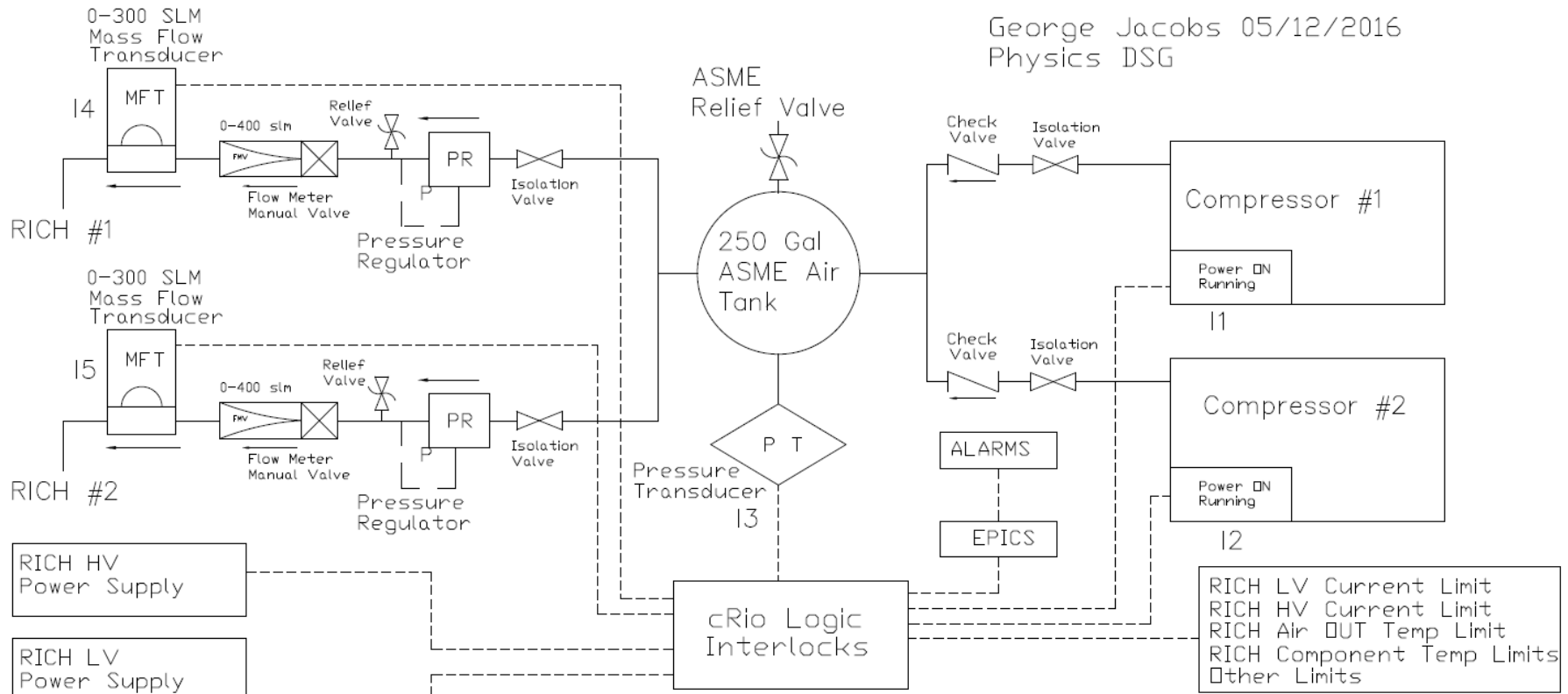
Electronics Panel



Air Cooling System

RICH Cooling Circuit Diagram with PS Interlocks (Preliminary)

George Jacobs 05/12/2016
Physics DSG



Cooling Circuit Interlocks for RICH HV and LV Power to be Enabled
 Air Compressor Power ON Interlock – I1 and/or I2 or PS Power is Disabled
 Air Pressure Interlock – 13 > 100 psi (TBD) or Power Disabled
 Air Flow Interlock RICH #1 Power – 14 > 90 slm (TBD) or Power to RICH #1 Disabled
 Air Flow Interlock RICH #2 Power – 15 > 90 slm (TBD) or Power to RICH #2 Disabled

Gas System: Compressor Layout

<http://www.atlascopco.com/us/>



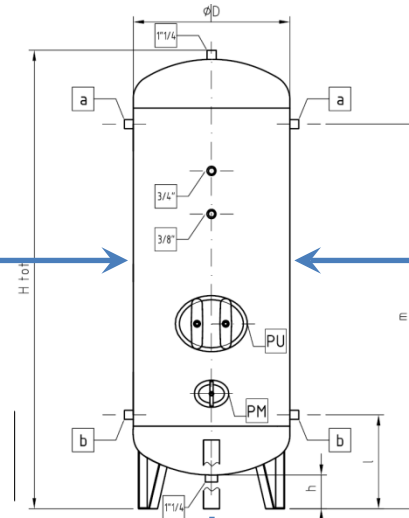
SF11-8 MC FF



SF11-8 MC FF



http://www.atlascopco.us/Images/SF%20series%20brochure%20English_tcm795-1701214.pdf



- Installation area: ~ 12 m²

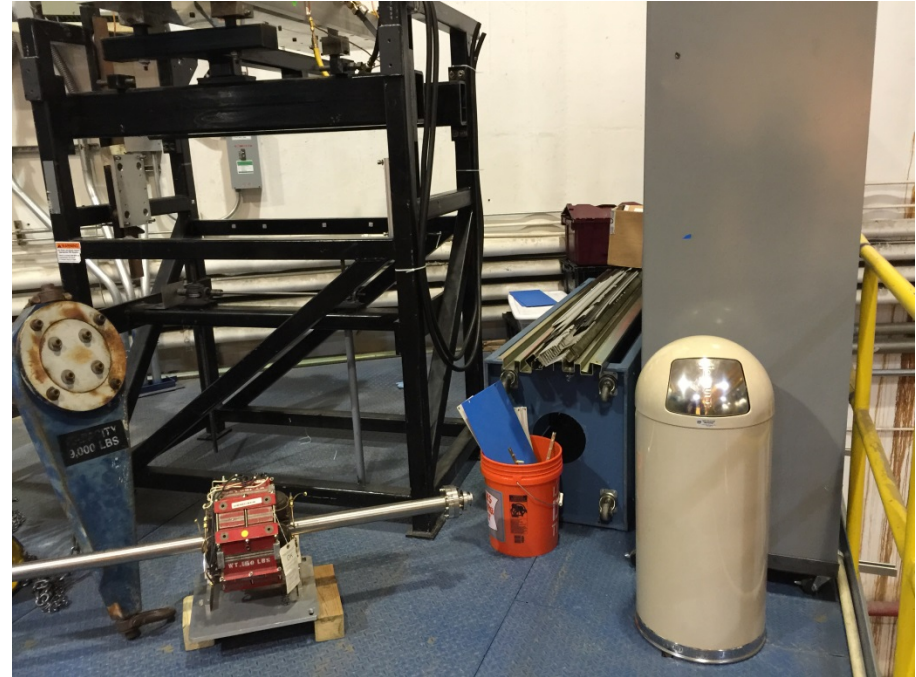
Single Unit Parameters

Flow rate	20,2 l/s
Elec. Power	10,4 kW
Dew Point T	3 °C
Dimensions	1,4x0,7x1,8m
Weight	515 kg
Noise Press	60 dB(A)

Detector Group Meeting- S. Tomassini, D. Orecchini

M. Mirazita, V. Lucherini

Pie Tower Level 3

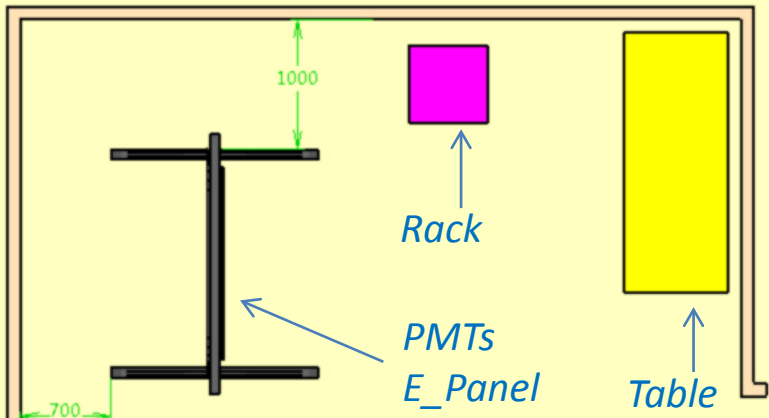
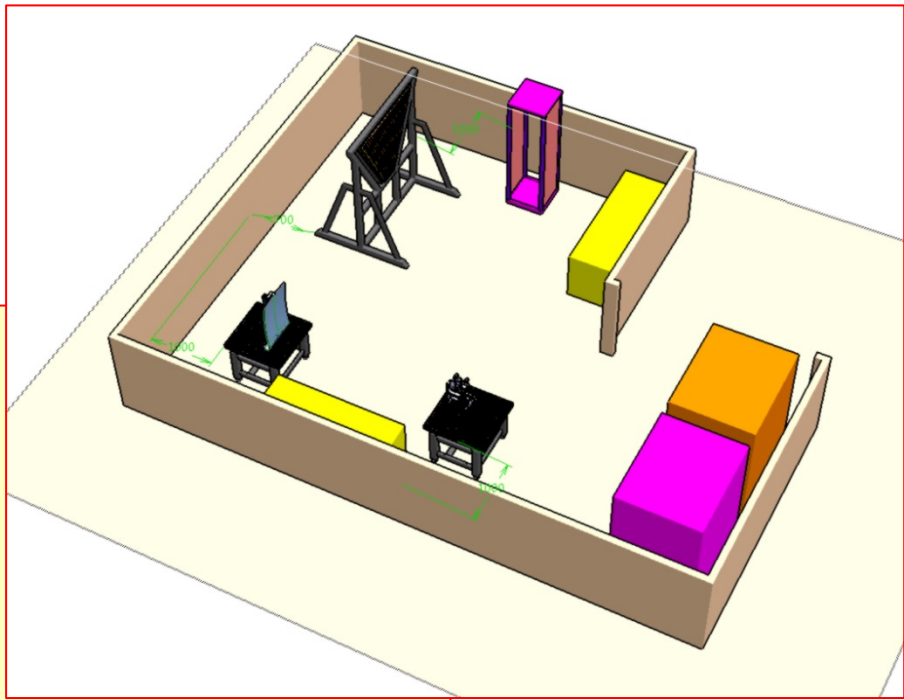


Cooling System Status

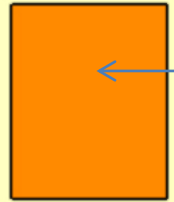
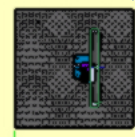
- Contacted Hall B Engineering about using Pie Tower Level 3 for the compressors and air tank.
- George has created a preliminary diagram, parts list, and interlocks overview.

The small clean room EEL-121

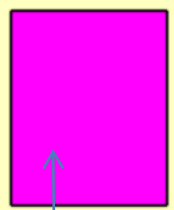
- Test the CFRP Mirrors (DO measurement)
- E-Panel assembly and test



Spherical Mirrors Test Station



PMTs Box



Sub Mirrors Box

DSG has:

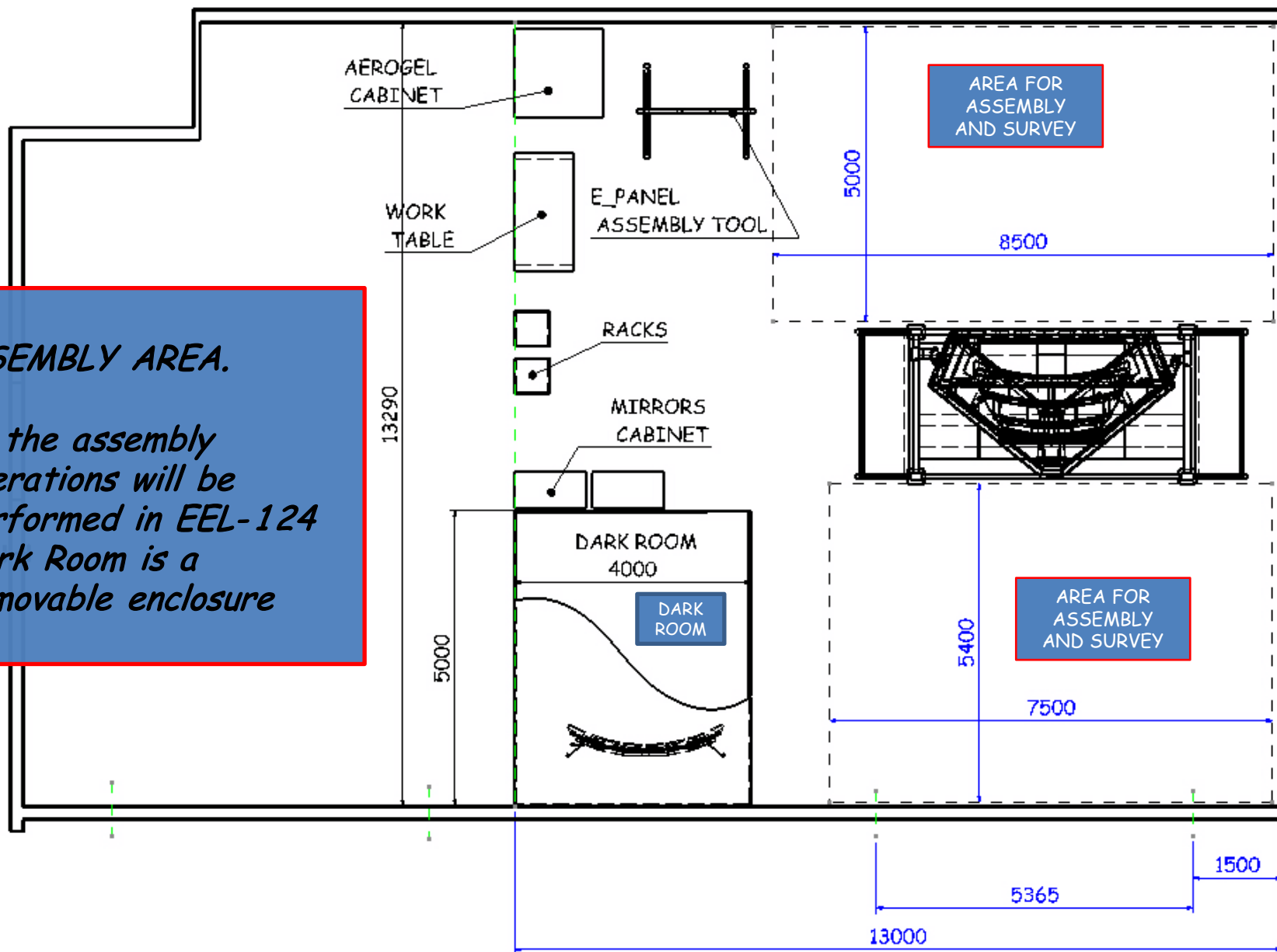
- Darkened cleanroom
- Removed excess tables and instruments

S. Tomassini,
D. Orecchini

RICH ASSEMBLY AREA LAYOUT IN EEL-124

ASSEMBLY AREA.

- 1. all the assembly operations will be performed in EEL-124*
- 2. Dark Room is a removable enclosure*



REPORT DETECTOR SUPPORT GROUP MEETING

Rossi Patrizia
Tomassini Sandro
Orecchini Dario
George Jacobs
Lemon Tyler
Pablo Campero
Amrit Yegneswaren
Marc McMullen
Brian Eng
Amanda Hoebel
Peter Bonneau

Clean Room EEL121b:

- The Clean Room relative humidity is 50% +/- 5%; It can be adjusted and lowered.
- The space seems absolutely appropriate and the room is equipped with two optical tables Thor Labs and two service tables. All these equipments are available for us. Some photos from Lemon Tyler are at this link: <https://www.dropbox.com/s/g1gvc4oqjgccguy/Clean%20Room%20EEL121b.rar?dl=0>

Clean Room EEL124:

- The electric forklift cannot enter directly in the EEL124. The RICH case parts must be brought into the clean room by means of a cart or a trans pallet. At the end of the mechanical installation it is recommended to clean the room.
The RICH, positioned on the cart, will be moved out of the clean room by hand and attached to the fork lift just outside the room.

Support provided from the Detector Support Group

- The Detector Support Group provided a general assistance for what regard the activity in the Clean Rooms.
- The transfer of RICH components from storage areas to the clean rooms, the management of the equipment (scaffolding, others, ...) probably will be in charge of the Hall B manpower;
- the operation made with the gantry crane must be performed by Hall B manpower (under the responsibility of Bob Miller and his collaborators).
It's also possible that someone of the RICH Collaboration participate in qualification courses about the use of it.

Consequently to the considerations above, the RICH Collaboration must organize the manpower necessary to the assembly operations, taking into account the different skills (mechanics, electronics, etc.).

Air Compressed System

- At JLab an acceptance test is mandatory for pressure vessels for higher values than 15 PSI (1 Atm).
- The Air Compressed System will be positioned in Hall B. A candidate area to install the compressed air system might be the "Pie Tower lever 3", on the right side of Forward Carriage (see attached photo).
<https://www.dropbox.com/s/xo2iudo7otm4yo7/Pie%20Tower%20lever%203.rar?dl=0>

DSG-RICH Meeting Report Summary

- EEL 121b humidity possibly adjusted to be lower.
- **DSG will provide general assistance** on all tasks in clean rooms.
- Hall B Engineering to transfer RICH components from storage to assembly area – **DSG will assist.**
- Gantry crane in EEL 124 will need to be operated by Hall B Engineering – **DSG can also assist.**
- **DSG will assist** in developing interlock systems.

Experimental Readiness Review

- Review will be held on 6/13/2016.
- Marco Contalbrigo and Marco Mirazita requested assistance with tasks for review.

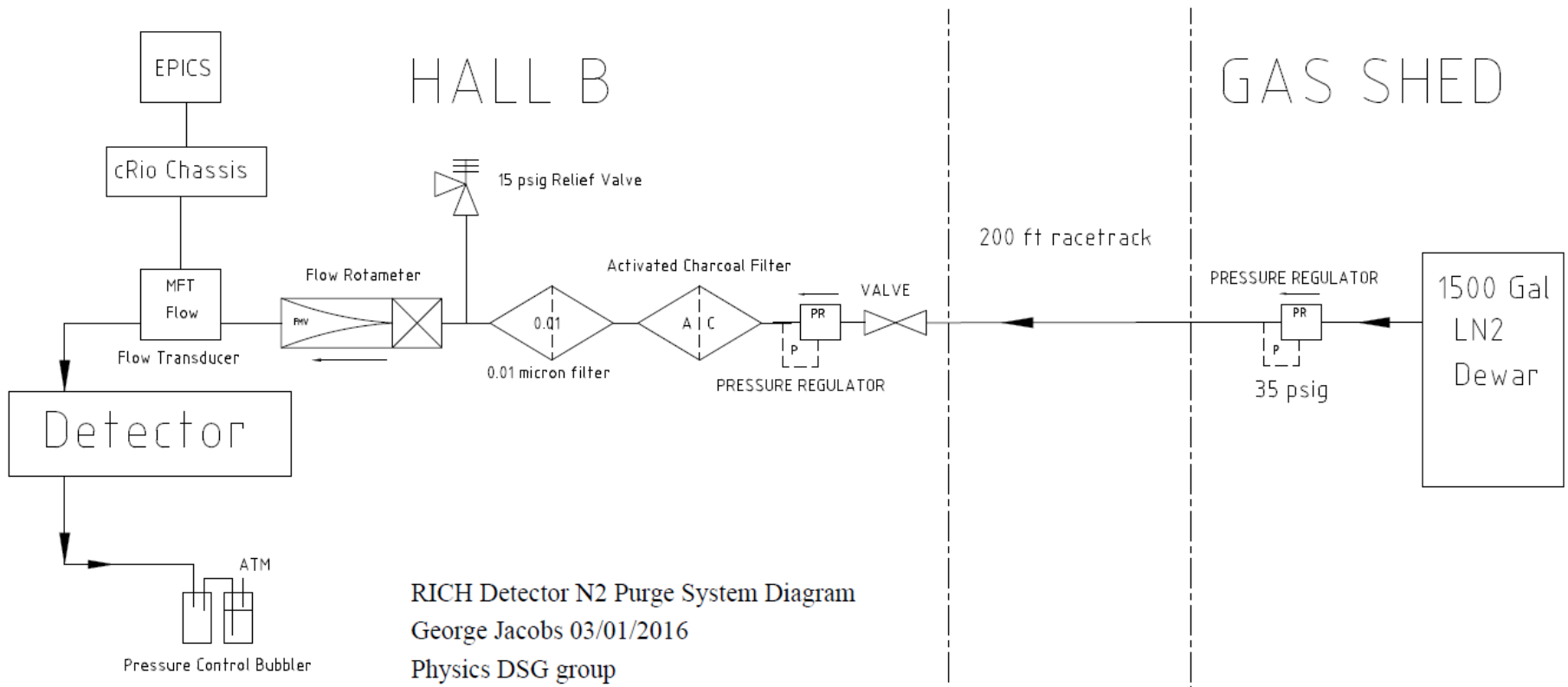
Equipment and Information Requested by RICH Group

Task/Equipment	Status
Two Debian Linux PCs with two USB3 ports and two PCI-ex 16x slots	Will use SVTSystem2 and PCAMPERO (both meet specs); both run RHEL, need to install to Debian
→ Rack for mirror storage	Type of rack needed unknown, will be determined on mirror arrival.
Procure scale for aerogel test	Max weight 300 g, precision 0.01 g
Gloves and masks for aerogel test	Gloves in cleanroom, masks can be ordered from stock room
LV supply (5 V, minimum 2 A, 2 channels)	DSG has LV supply available
Oscilloscope	DSG has scopes that can be used
Multimeter	DSG has multimeters that can be used
Define anchoring system for assembly structure	Engineering drawing with Hall B Engineering, needs approval for bolt size, structure will be bolted to floor
→ Define services	Clarification needed.
Finalize gas system	George has created preliminary drawing
Finalize cooling system	George has created preliminary drawing, awaiting approval
Finalize interlock system	Researching cRIO interfaces needed for instruments
Create list of hardware for gas system	George will compile based on drawing
Create list of hardware for cooling system	George has compiled a preliminary list, asked RICH group for verification on 5/13/2016
Create list of hardware for interlock system	Began compiling preliminary list, will share with RICH group when complete
Determine Interlocks available in CAEN SY4527 HV power supply	Internal interlocks in all versions

→ More information needed.

Gas System

RICH Detector N2 Purge Gas System Diagram



RICH Detector N2 Purge System Diagram
George Jacobs 03/01/2016
Physics DSG group

Air Cooling System Components

Component	Part Number	Details	Unit Price	Units Required
Air Tank Pressure Transducer (I3)	MKS 722B24TBA2A	range 400 psi, 1/2" tube, 0-10 vdc out, 9 pin D type,	\$1,500.00	1
Air Flow Transducer (I4 and I5)	MKS 0579A 01332LS3BV	range 0-300 slm, 1/2" swagelock fitting, 15 pin D type	\$1,700.00	3
Flow Control Rotameter	Dwyer RMC-121-SSV	0-10 scfm (283 slm), SS control valve	\$140.00	2
High Purity Pressure Regulator	McMaster Carr part # 49305K23	5-55 psi range, 1" FPT	\$226.00	2
Local Pressure Gauges – Tank	McMaster Carr part # 4000k791	0-200 psi	\$12.03	1
Local Pressure Gauges – Supply	McMaster Carr part # 4000k721	0-100 psi	\$10.14	2
Check Valves	Swagelock # SS-CHS16-1	1" valve, 1 psid	\$283.00	2
Fittings Estimate	TBD	Compression and pipe fittings	\$50.00	30
Isolation Valves	In House Supply	Valves are on hand and available	\$0.00	0
SS piping	1" SS tubing	Estimate Required		
Fittings	Pipe Fitting to connect tubing	Estimate Required		
ASME Relief Valve for Tank	Requires Analysis	Pressure System Requirements		1
Relief Valves for Supply	Requires Analysis	Pressure System Requirements		2
Compressor Running Transducer	Atlas Copco	Atlas Copco		2
Air Supply Flex Lines	TBD	Need Layout with Routing to Estimate lengths		
Detector Air Out Temp Sensor	TBD	RICH group		2
Detector Air In Temp/H2O	TBD	RICH group /DSG		2
Compressors	RICH Group	Atlas Copco		2
ASME Air Tank	RICH Group	ASME Tank		1

Interlock System

- cRIO-based system to monitor.
- Will turn off power to electronics if:
 - Temperature reaches $\sim 100^{\circ}$ F.
 - Both compressors lose power.
 - Pressure in air tank is too low.
 - Cooling airflow is too low.
- Warning levels for airflow and tank pressure yet to be determined.

Preliminary List of Interlock Components

Item	Model Number	Description	Quantity
Controller	cRIO-9035	cRIO 9035 Controller and Chassis	1
Solid State Relay	NI 9485	8-Ch, ± 60 VDC, 750 mA (60V Ch-Ch, 250Vrms Ch-Earth Isolated) SSR C Series Module	1
RTD Module	NI 9217	4-Ch PT100 RTD 24-bit, 100S/s/ch, Analog Input Module	2
Analog input	NI 9219	4 Ch-Ch Isolated, 24-bit, ± 60 V, 100S/s Universal AI Module	1
ADC	NI 9239	4-Ch ± 10 V, 50 kS/s/Ch, 24-bit, Ch-to-Ch Isolated AI Module	2
Serial Interface	NI 9871	4-Port RS422/RS485 Serial Module	1
Blanks	NI 9977	Blank cRIO modules	1
Power Supply	RHINO PSP05-DC24-5	Rhino DC-to-DC converter, 18-74 VDC input, 5 VDC output, 5A, 25 W	1
Power Supply	NI PS-16	Power supply, 24 VDC, 10A, 100-120/200-240 VAC Input	1
Rack Mount	—	NI Rack Mount Kit for cDAQ/cRIO	1
Rail kit	NI 9915	NI 9915 DIN Rail Mounting Kit for 8-slot cRIO/cDAQ Chassis	1
Fuse holder	HTT Series	HTT Series In-Line Fuse Holders	10
Temperature Sensor	RTD-3-F3105-36-T-B	Omega 4-wire RTDs, 5 pack	2
Humidity Sensor	HIH 4030/31	Honeywell humidity sensor	10
Air flow sensor		Sensor for interior detector airflow to be determined, example given to generate total cost	3
Key Switch	Allen Bradley 800T-H33B	Key switch to bypass power to allow cRIO to be rebooted without crashing power supplies	1
Wiring	EXTT-4CU-26S	Omega 100 ft spool of 4-wire extension wire for RTDs	1
Wiring	EXTT-3CU-26S	Omega 100 ft spool of 3-wire extension wires for Humidity Sensors	1
Cabling		Cabling for sensors and components to be determined, total cabling cost estimated	1
Ferrules		Ferrules needed for connections to be determined, total ferrule cost estimated	1
Connectors		Connectors needed to be determined, total connector cost estimated	1
PC	Dell T5810	Dell Precision Tower 5810 for LabVIEW development	1
PC monitor	ViewSonic VX2770SMH-LED	ViewSonic VX2770SMH-LED Black 27" Black IPS Panel Widescreen LED Backlight LCD Monitor	1

Upcoming Tasks

- Mirror delivery and testing.
 - Expected in May 2016.
- Electronic panel assembly and testing.
- Procurement of hardware for cooling system, gas system, interlocks, and testing.