



HEAVY PHOTON SEARCH

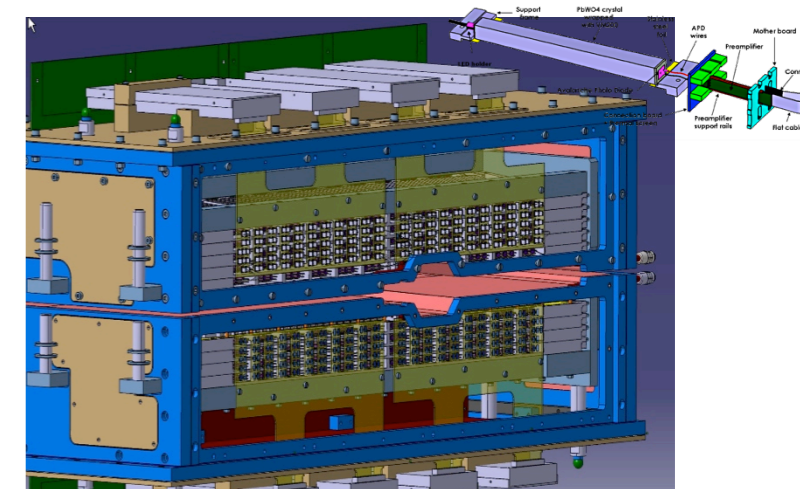
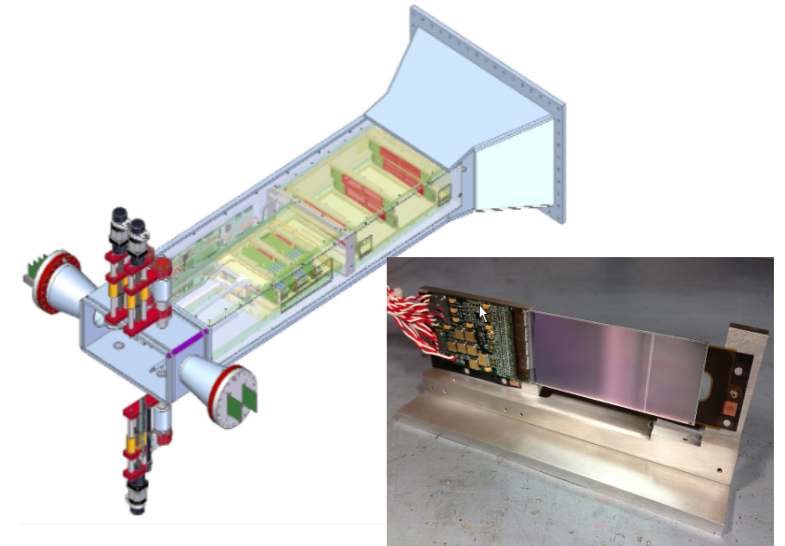
AT JEFFERSON LAB

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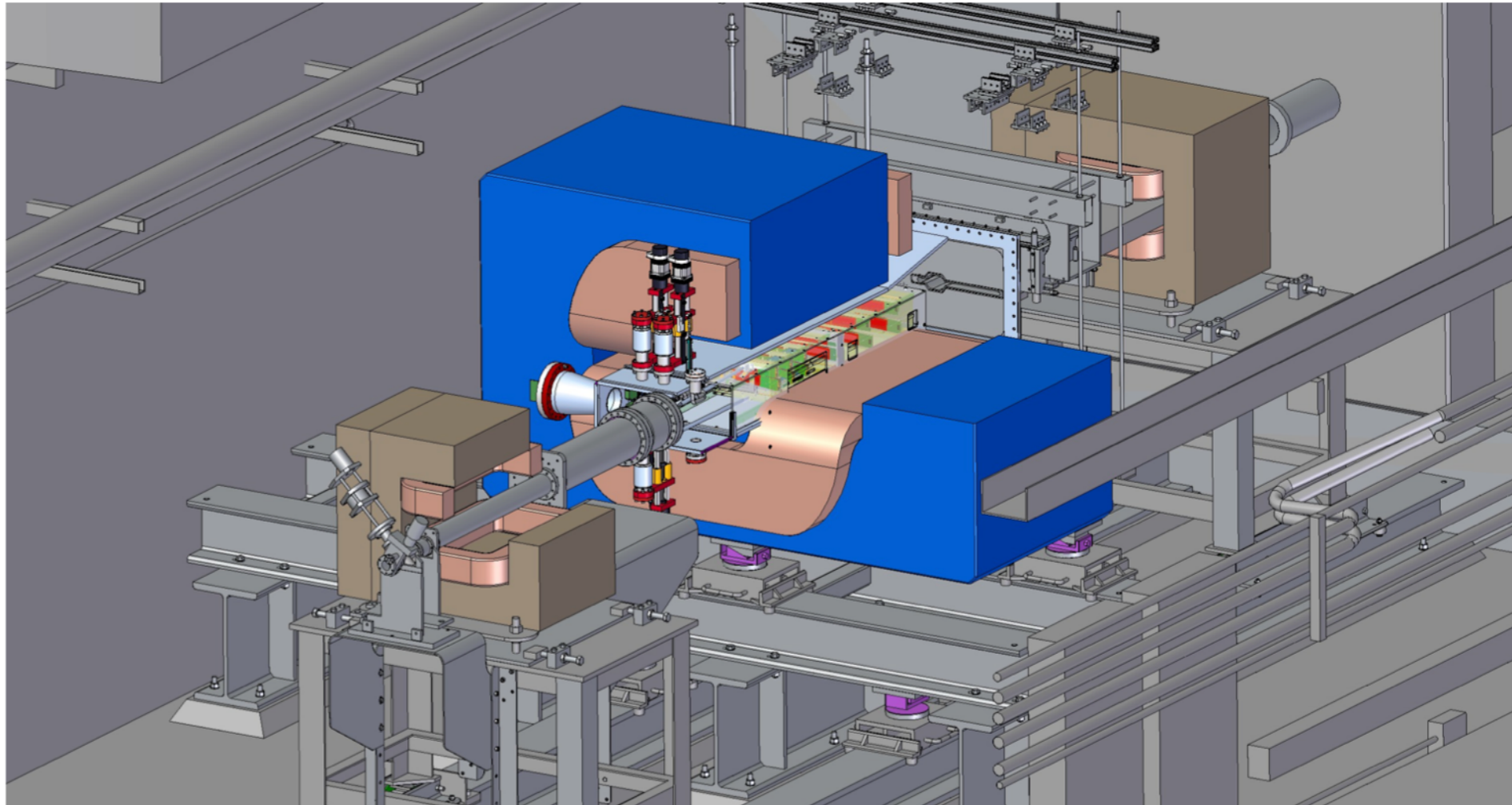
HPS equipment installation,
checkout, Experiment Readiness Review

Outline

- **HPS - SVT**
 - Design & Status
 - Equipment Installation
 - Checkout & Commissioning
- **HPS - ECAL**
 - Equipment Installation
 - Checkout & Commissioning
- **HPS Experiment Readiness**
 - DAQ Test Results
- **HPS Integration with JLab**



Installation & Commissioning

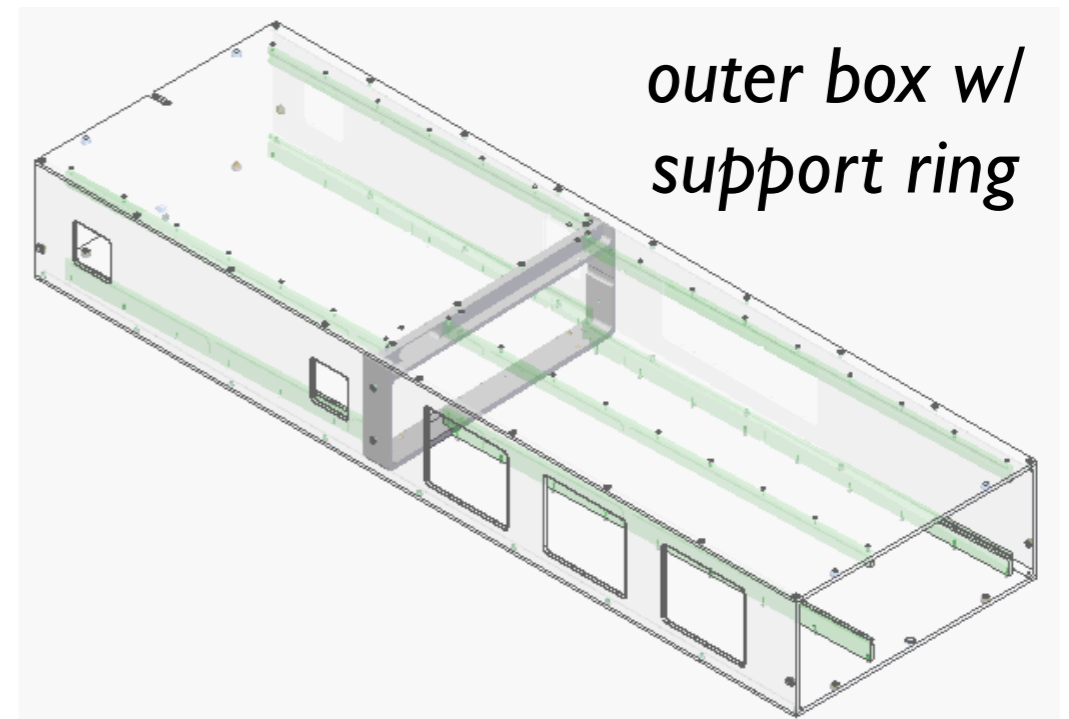
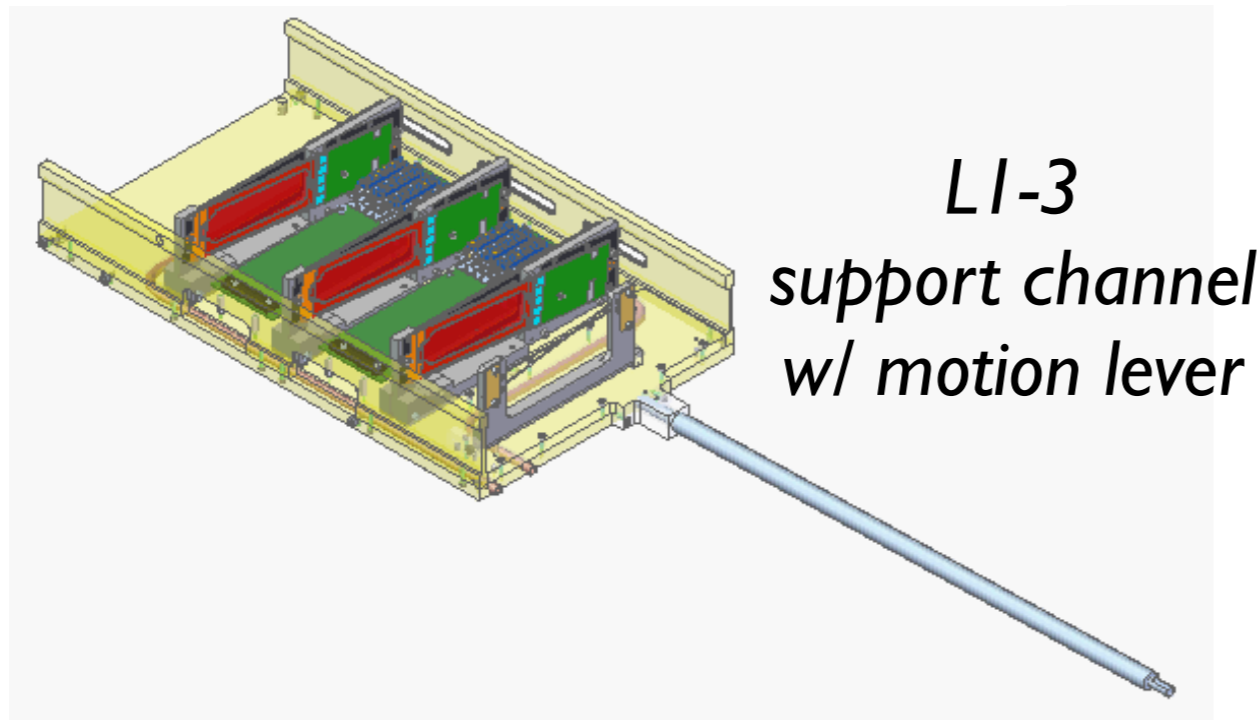
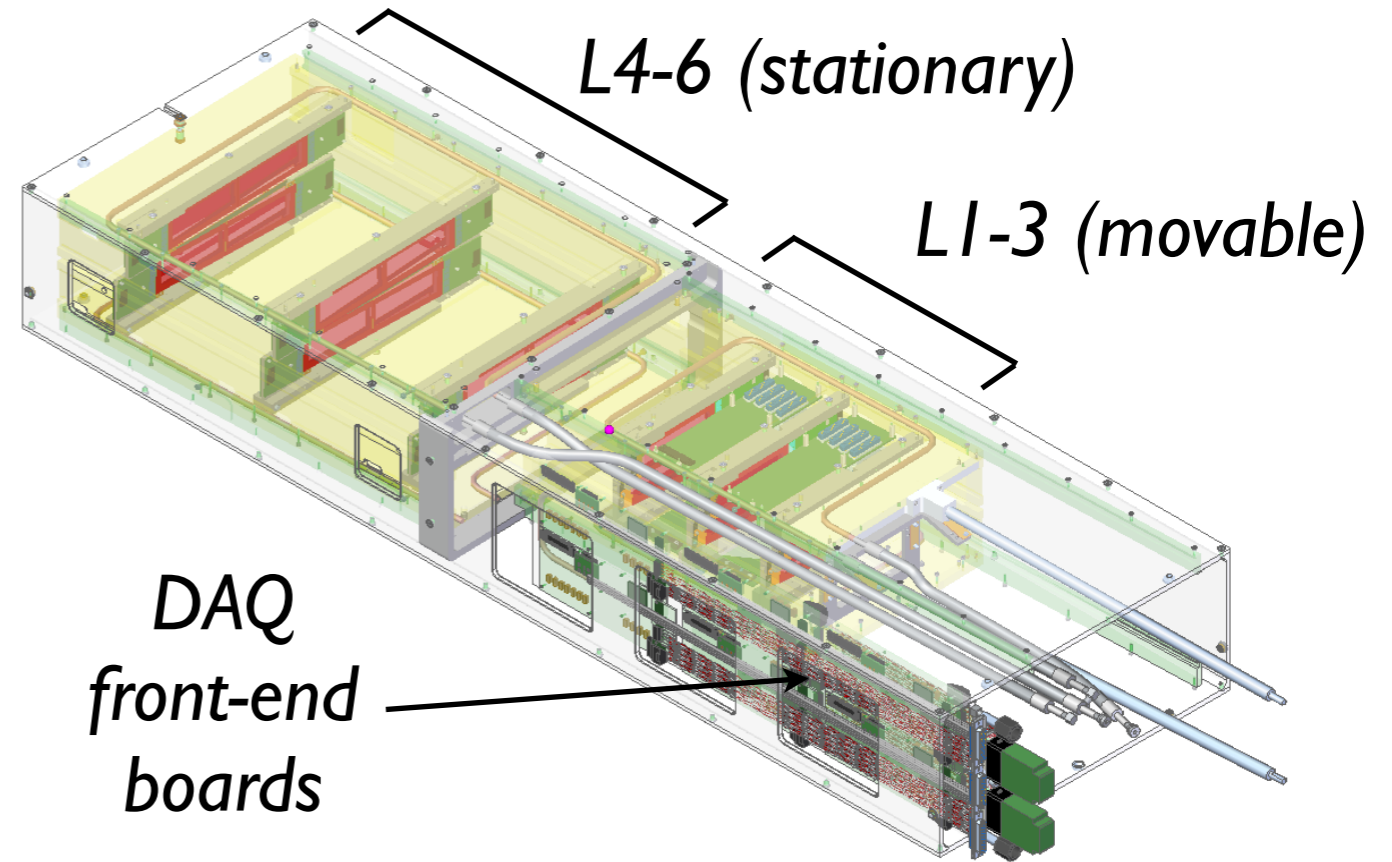
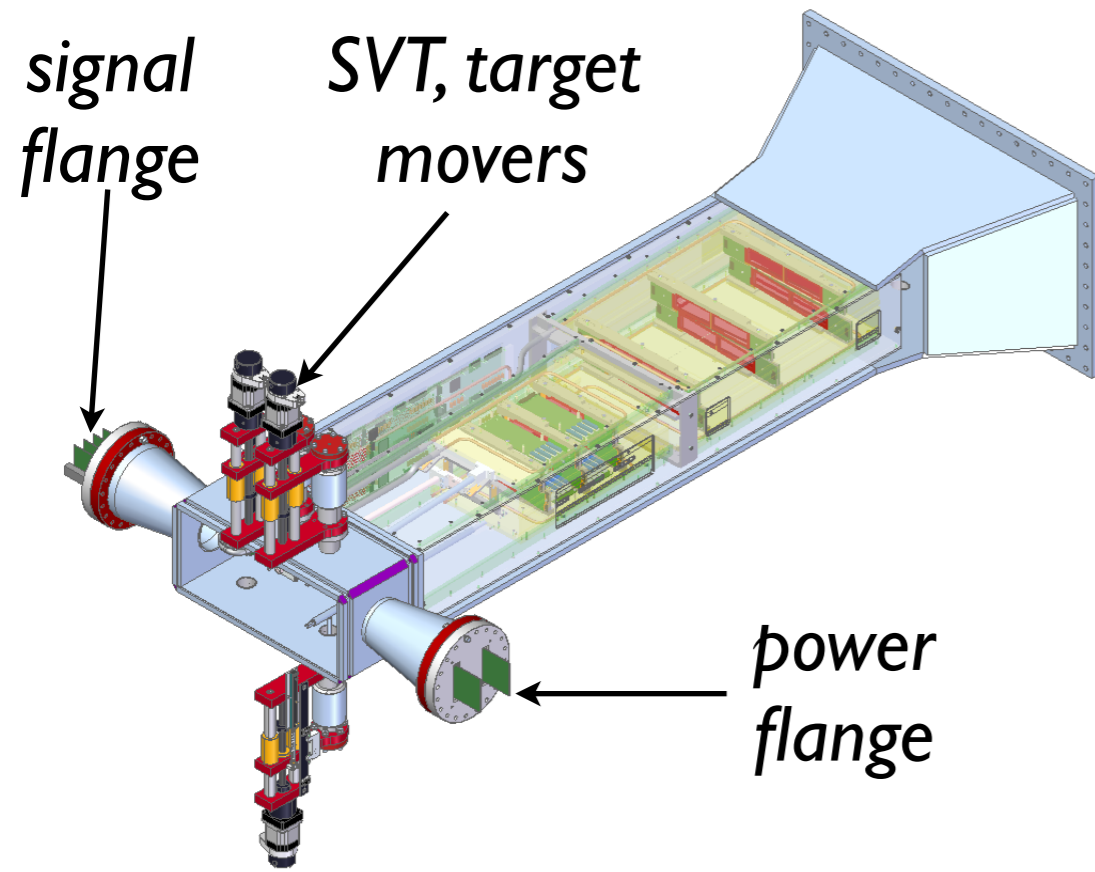


Installation coordinated with Hall-B

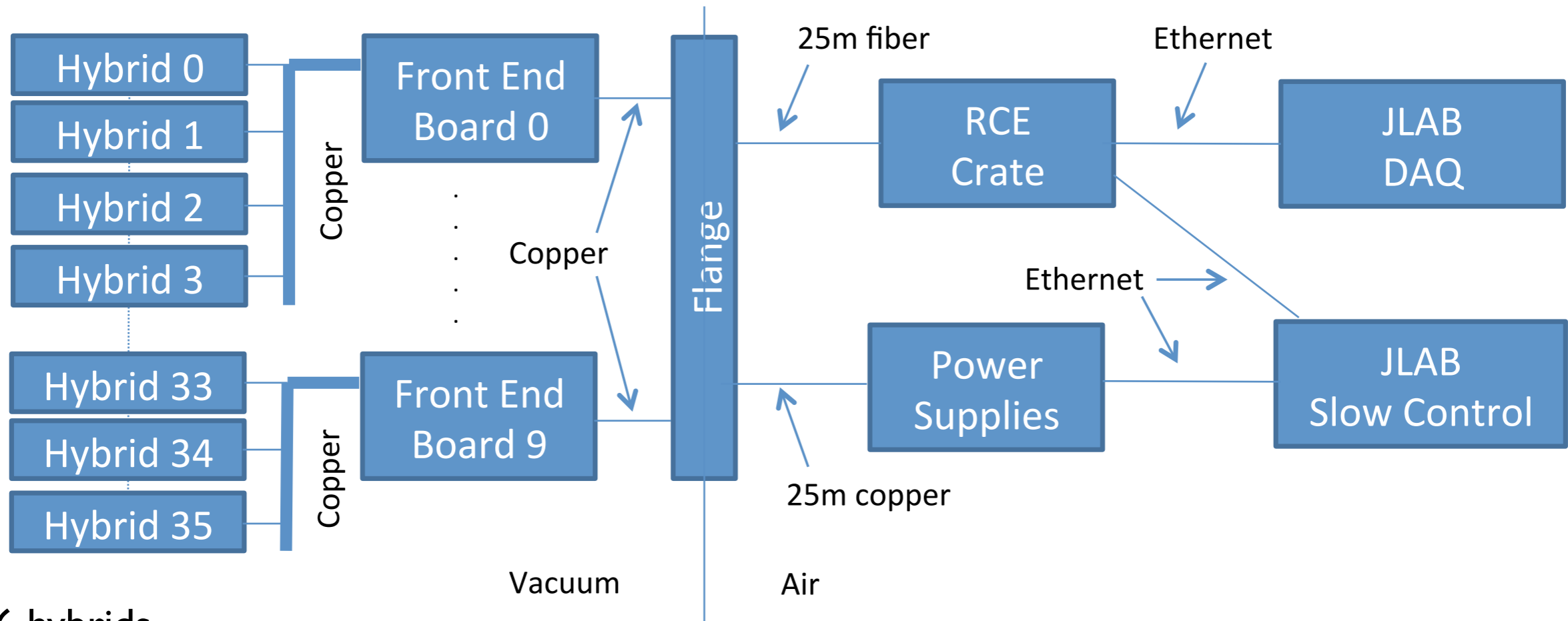
Commissioning Documents at:

https://wiki.jlab.org/hps-run/index.php/Main_Page

HPS SVT Design



SVT DAQ Design



- 36 hybrids
 - 12 in layers 0 – 3 (2 per module)
 - 24 in layers 4 – 6 (4 per module)
- 10 front end boards
 - 4 servicing layers 1 – 3 with 3 hybrids per board
 - 6 servicing layers 4 – 6 with 4 hybrids per board
- RCE crate: data reduction, event building and JLab DAQ interface

Raw ADC data rate (Gbps)	
Per hybrid	3.33
Per L1-3 Front end board	10
Per L4-6 Front end board	13

SVT Current Status

SVT

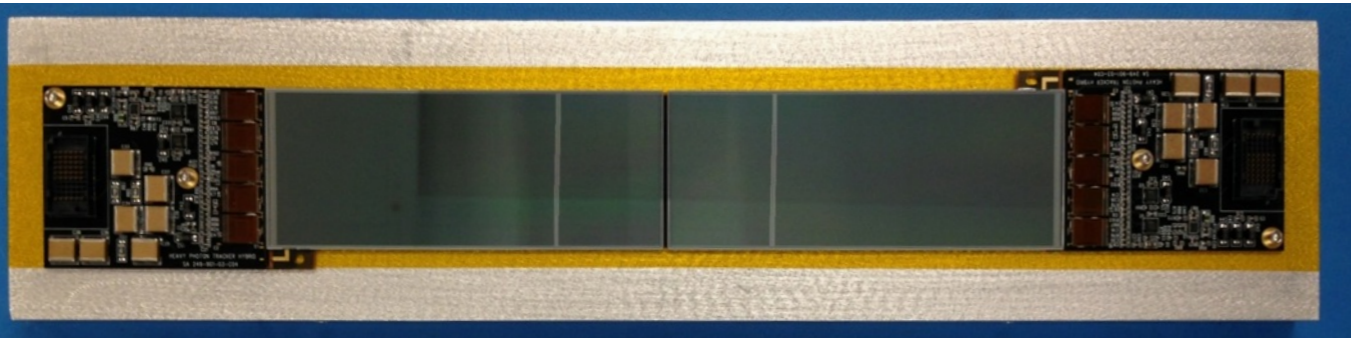
- building last spares for L4-6 sensor modules this week
- mounting modules (L1-3 and L4-6) to support structure
- preparing for detector integration, testing, survey
- once final FEBs are validated, FEB cooling will be completed

SVT DAQ

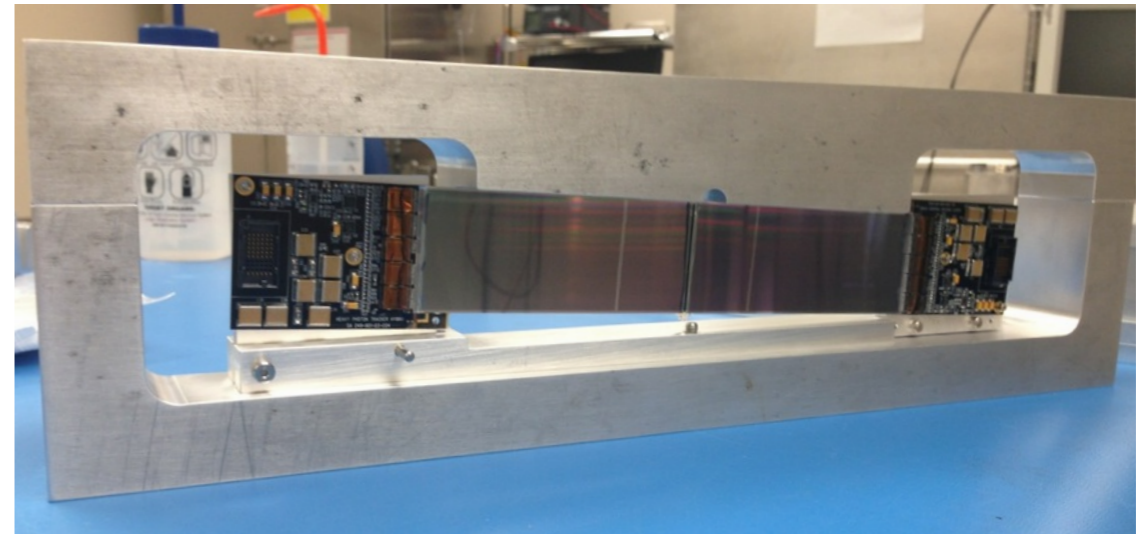
- Final FEB in-hand: testing changes for improved noise performance
- Power flange complete and packed for shipping: assembling spare
- Signal flange boards in-hand ready for assembly (+spare)
- Interface cards (3 types) will be ready for assembly of final high-density cables in 1-2 weeks.
- All components of RCE DAQ are in place and undergoing testing.

SVT construction in Pictures

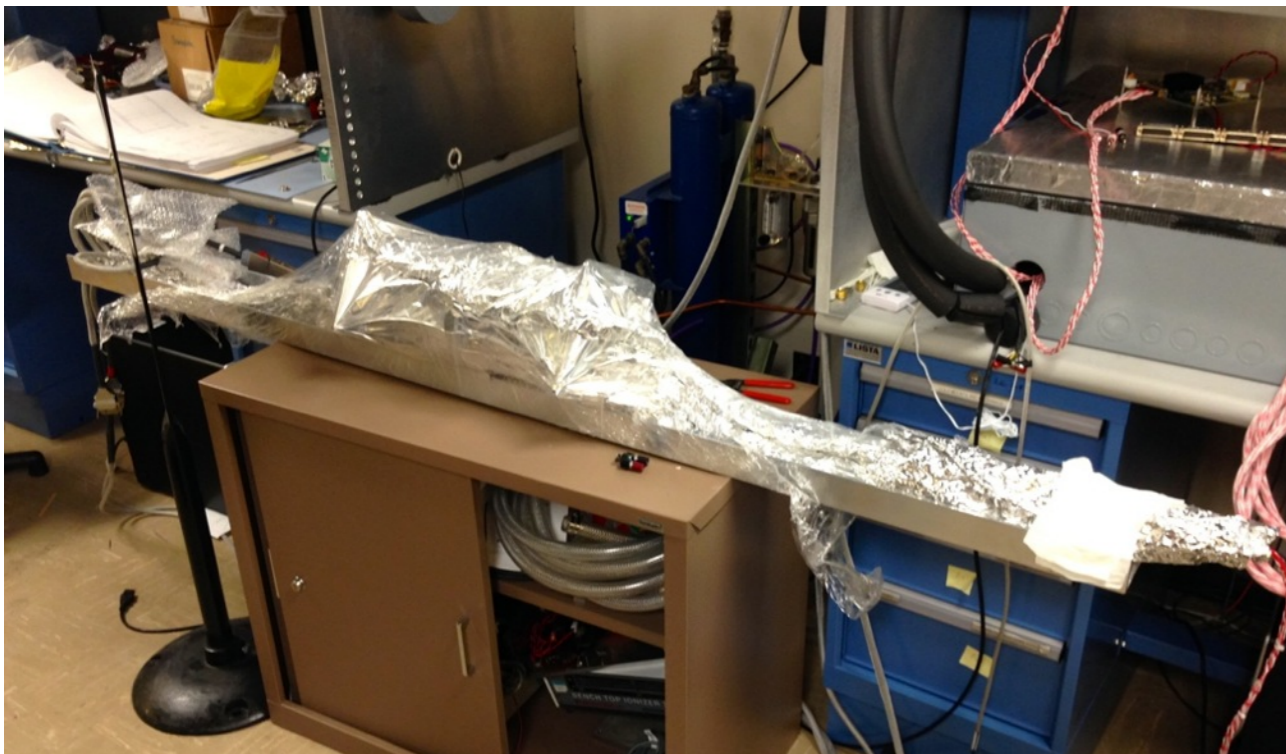
Double width module



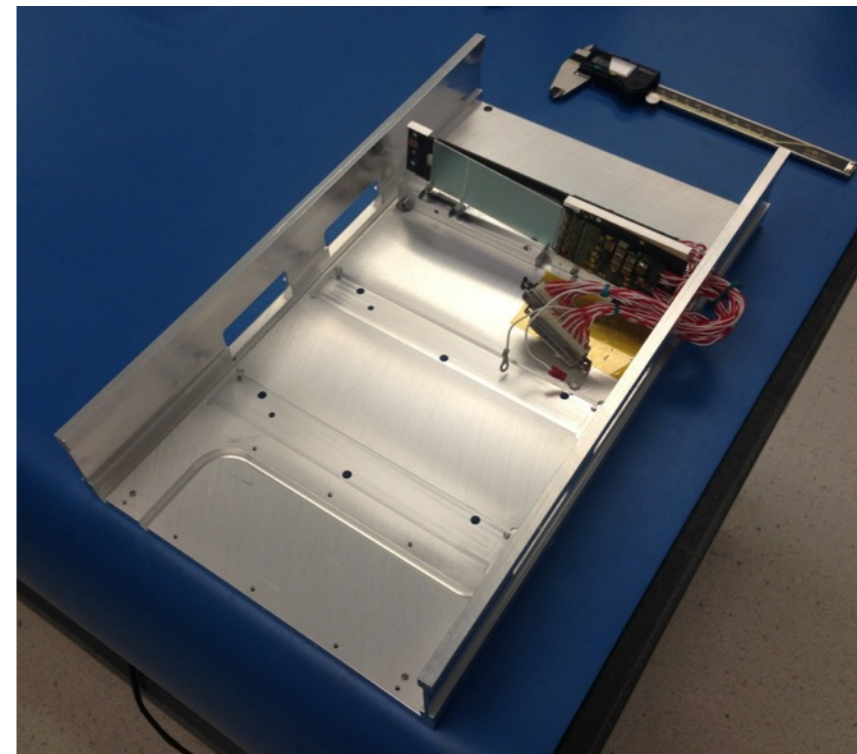
Double width module mounted



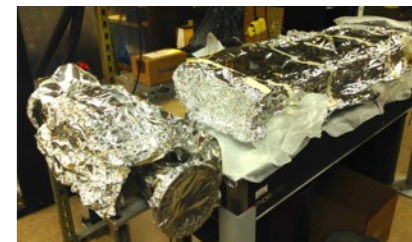
Flange + Flange Board



SVT Support Channels



Vacuum components



Chiller



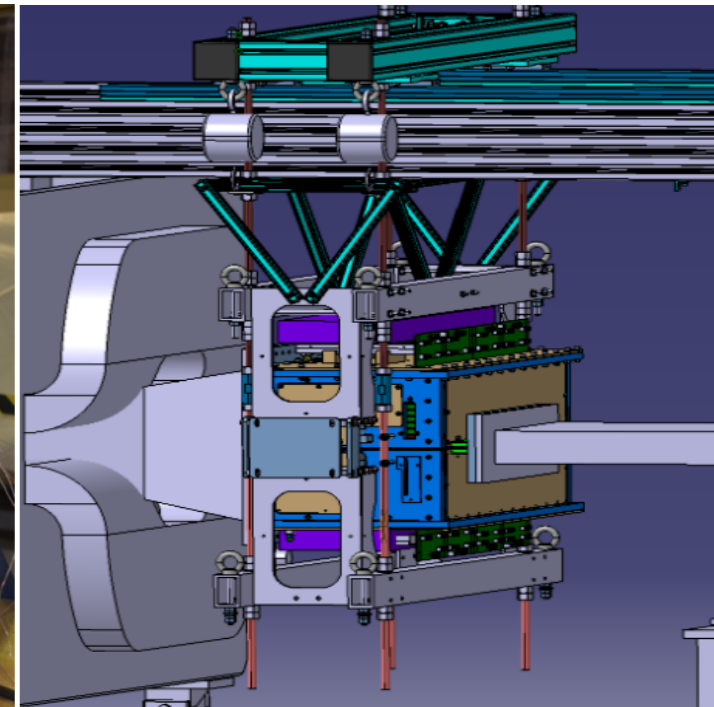
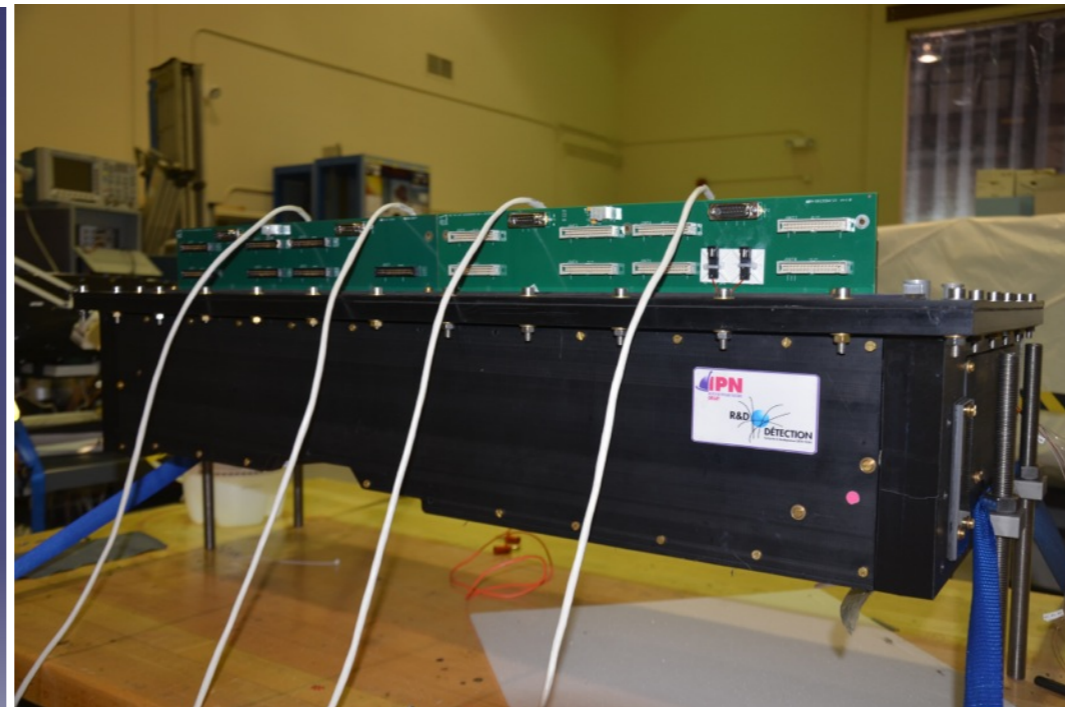
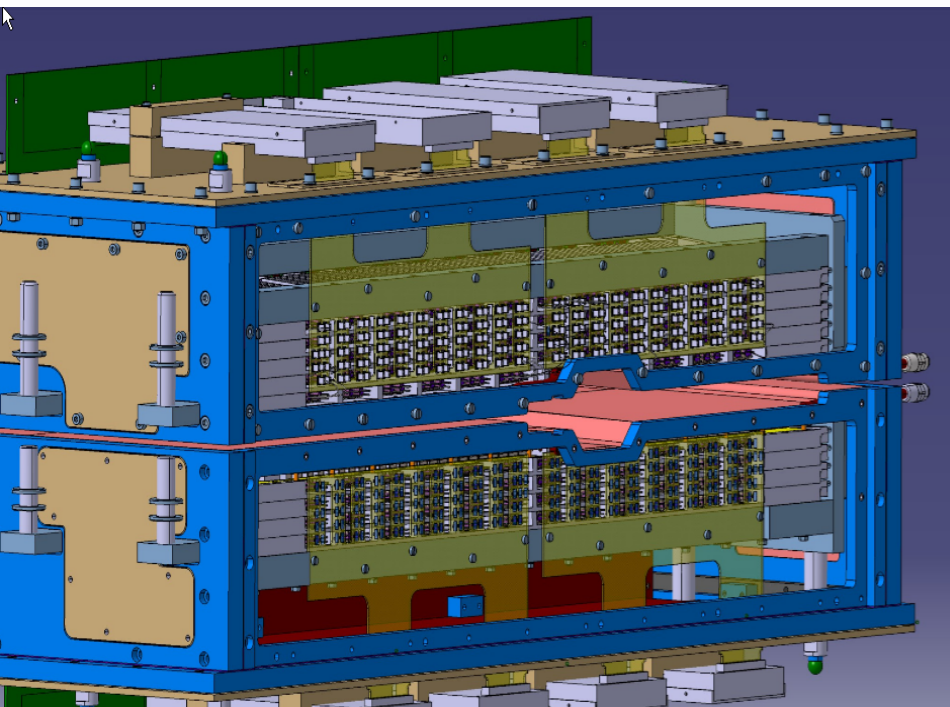
RCE DAQ Status

- *RCE Development at SLAC*
 - All components of DAQ (both generic RCE and HPS specific) are in hand
 - Finalizing implementation of block readout mode.
 - Integrating FEBs as available.
- *JLab DAQ Integration*
 - New multi-ROC (per trigger-interface) implementation complete and tested
 - RCE DAQ shipped to Jlab for ongoing testing achieved a major milestone during “integration week” (August 11-15): ~130 KHz stable trigger rate (~200 MB/sec) with realistic data emulation from 60% of the SVT (21 hybrids across 7 data processing nodes)
 - Full JLab DAQ system being set up at SLAC to facilitate optimization.
- *New power supplies successfully tested*

SVT Commissioning

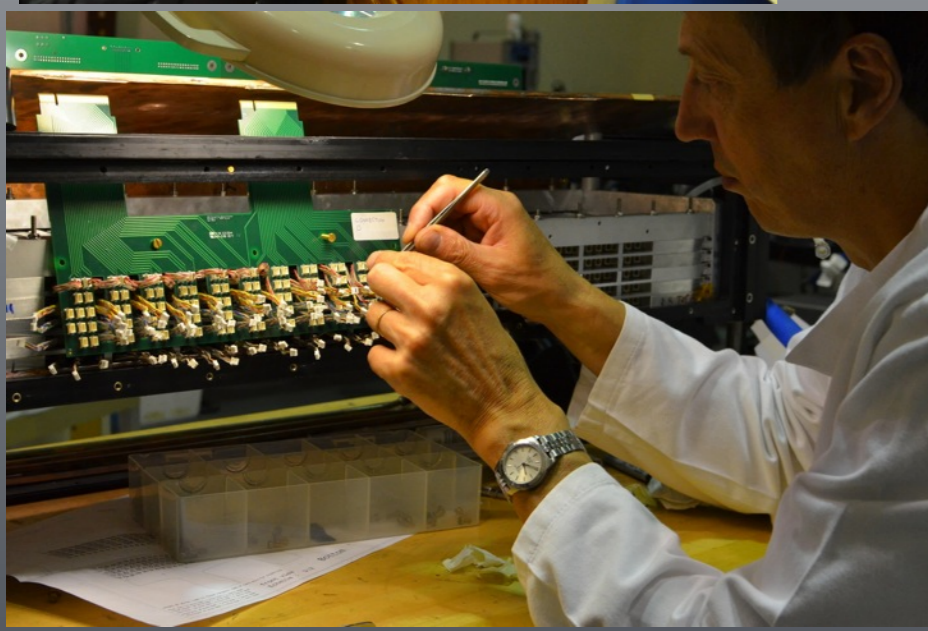
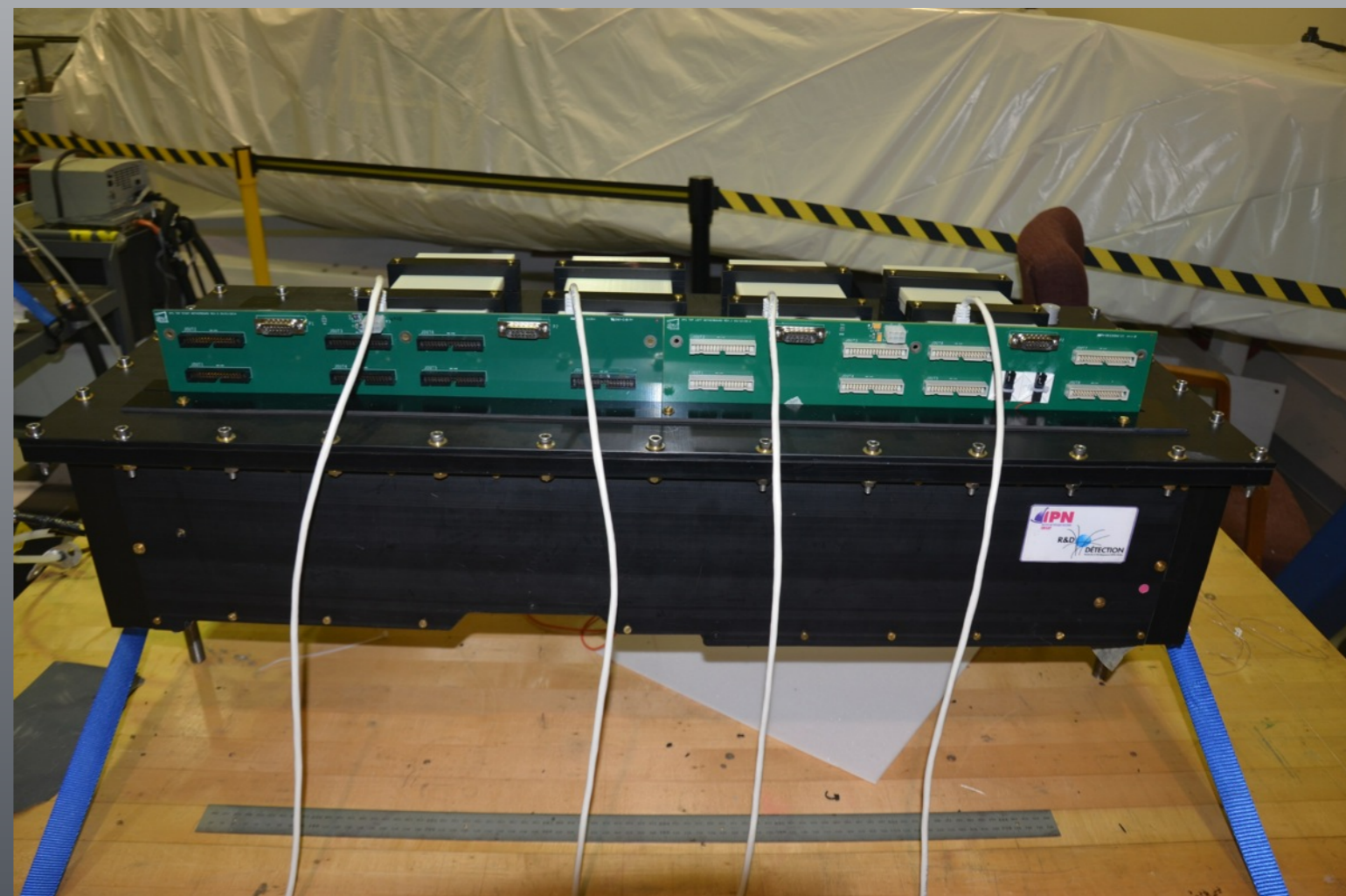
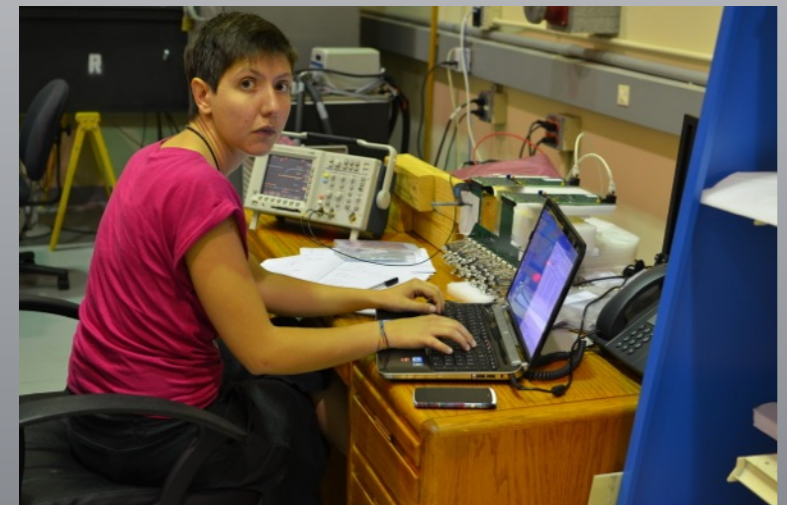
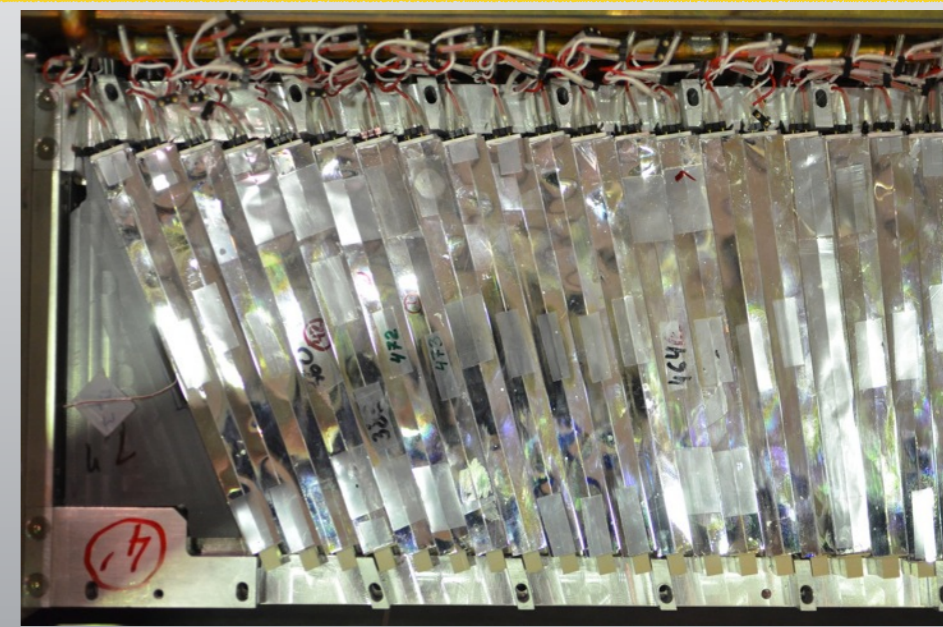
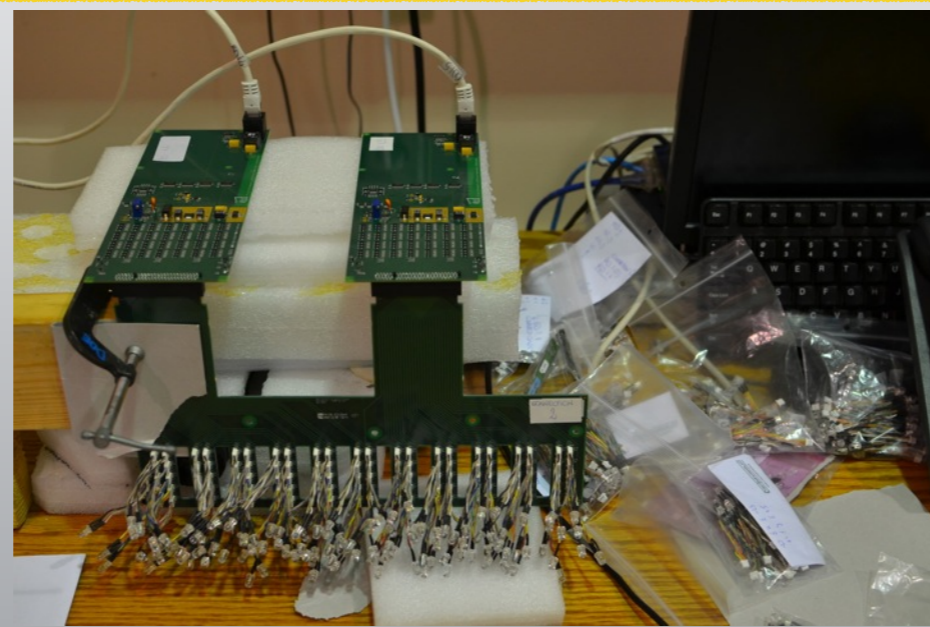
- Plan: https://wiki.jlab.org/hps-run/index.php/Main_Page
- SVT assembly and full system test at SLAC
- SVT crated and shipped to JLab
- Reassembled & full standalone SVT test at JLab
- Installation into vacuum chamber inside analyzing magnet & cabling.
- Full system test and regular calibration runs without beam.
- Commissioning with beam.
 - Very low current initial checks of system.
 - Procedures for verifying beam attributes.
 - Calibration runs for alignment and timing.

ECAL Installation



- Calorimeters Assembled, APDs tested and grouped.
- All Channels checked with pulsed light.
- Move ECAL to Hall (week of 09/01)
- ECAL Mounting structure installed (week of 09/22)
- ECAL Connections (2 weeks from 09/29)

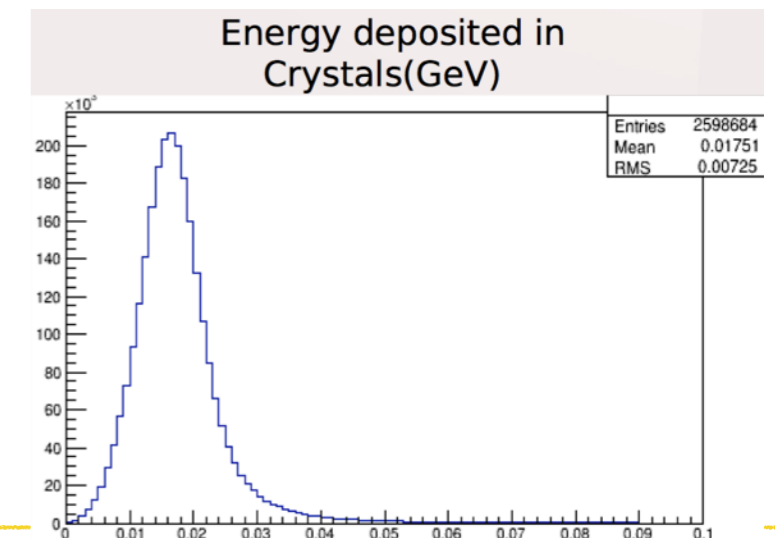
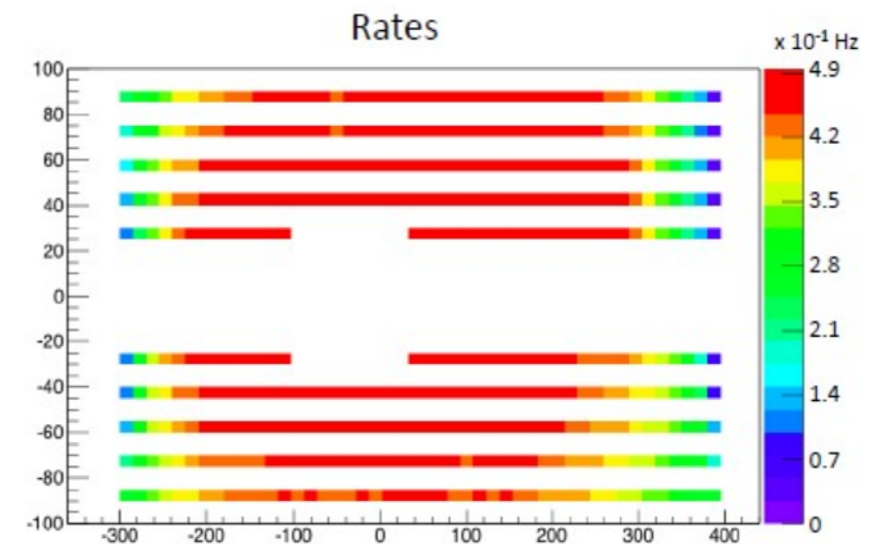
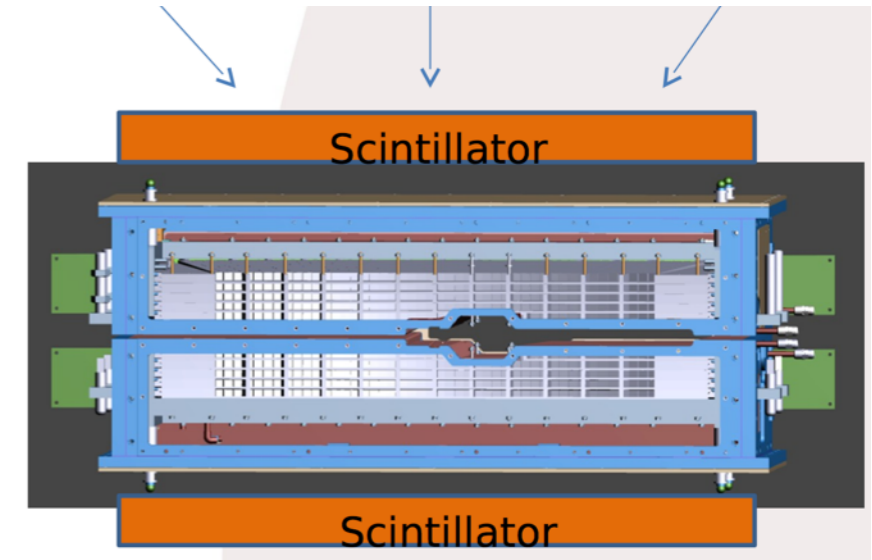
ECAL construction in Pictures



ECAL Commissioning

Cosmics Calibration

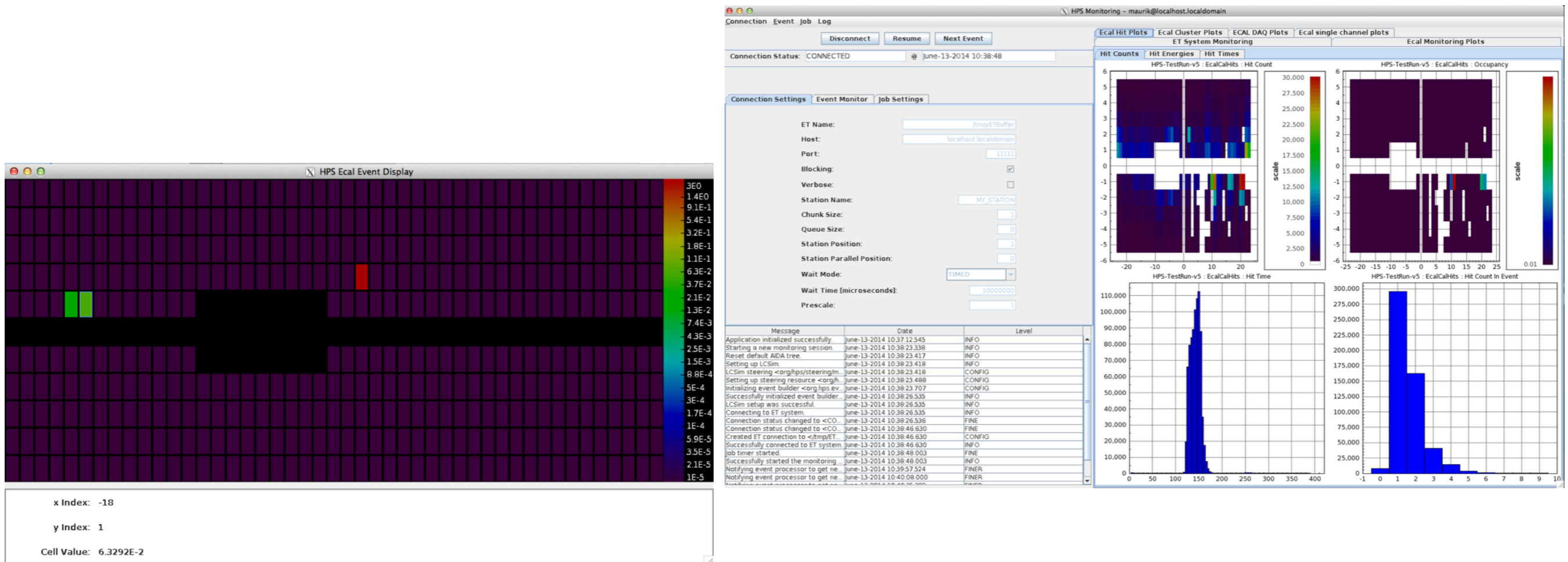
- Plan: https://wiki.jlab.org/hps-run/index.php/Main_Page
- Before Beam:
 - Test Data Acquisition - week of 10/13
 - LED data - monitor gain variations.
 - Cosmic Ray data
 - 5 hour runs to calibrate all channels.
 - Establish initial FADC calibration map
- With Low Current Beam:
 - Verify rates in crystals
 - Coulomb scattered full beam energy electron calibration.
 - Adjust thresholds for FADCs.
 - Verify trigger rates of main and auxiliary triggers.



Online Monitoring

During the commissioning and the run, monitoring tools are available:

- Slow control monitors (<https://confluence.slac.stanford.edu/display/hpsg/Slow+Controls>)
- Live data monitors



HPS Experiment Readiness

Passed Experiment Readiness Review, July 2014.

<https://confluence.slac.stanford.edu/display/hpsg/HPS+Readiness+Review+July+10%2C+2014>



HPS Readiness Review July 10, 2014

6 Added by [Marco Oriunno](#), last edited by [Marco Oriunno](#) on Jul 09, 2014 ([view change](#))

[Charge and Committe](#)

HallB Run Information (COO, ESAD, RSAD, ERG) <http://www.jlab.org/Hall-B/run-web/>

HPS RUN Wiki (Manuals) https://wiki.jlab.org/hps-run/index.php/Main_Page

Agenda :

8:30 – 9:30 AM	HPS Readiness Review Overview Talk.pptx	John Jaros
9:30 – 10:00 AM	Machine status and expected beam properties	Mike Tiefenback
10:00 – 10:30 AM	Coffee break	
10:30 – 11:30 AM	Hall-B beamline, the completion and commissioning schedule. Run documentation	Stepan Stepanyan
11:30 – 12:00 PM	Radiation safety aspects of the experiment	George Kharashvili
12:00 – 1:00 PM	Lunch	
1:00 – 2:00 PM	HPS Construction and Schedule	Marco Oriunno

Major ERR Review Findings

- ★ *The Fast Shut Down system, using the 2 or 3 mm collimator upstream of the target and beam dump interlocks based on halo counters needs to be thoroughly tested and understood.*
 - This system will be thoroughly tested at the end of the beamline commissioning
 - The test will include moving the beam up and down and recording its vertical position and the corresponding halo counter rates as the beam is moved.
 - These rates will change when beam gets closer to the collimator edges (the beam tails will interact with the collimator).
 - The FSD trip limits can be set to limit beam vertical motion based on these studies.
 - The procedures are included in the HPS beamline commissioning document.

Major ERR Review Findings

★ *Concern about single event upsets, single event latchups, and total dose failure of the in-vacuum SVT electronics.*

- HPS front-end (FE) electronics are used in an LHC detector where the radiation environment is harsher than that at JLAB.
- Studies have already demonstrated that FPGAs are robust at radiation levels in excess of 100 krads.
- The expected dose from x-rays is at most at the 50 rads/hour level at 200 nA.
- We plan to install a 2mm-thick copper or titanium plate to absorb x-rays, further reducing the flux by two orders of magnitude.
- The neutron background is described in RSAD. We plan to install 50cm-long shields inside the first Frascati magnet on either side of the beam pipe to absorb neutrons produced in the collimator, reducing the neutron flux at the FE boards by two orders of magnitude, bringing them to a negligible level.
- We are evaluating neutron shield options for neutrons from the target, but note that the flux is expected to generate only 0.1 SEU/day/cm², so is not considered a serious background. Even so, we'll add shielding if it is practicable to do so.

Major ERR Review Findings

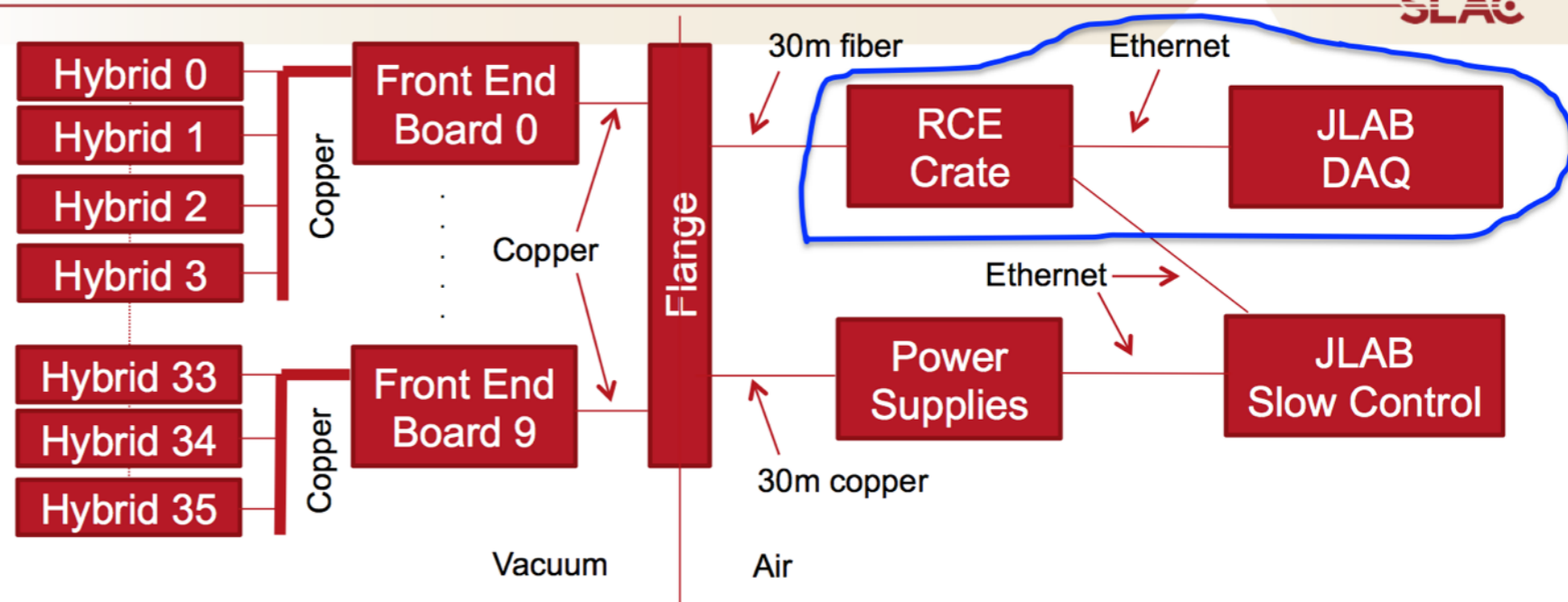
★ *Recommendation to test the SVT readout.*

- First sets of test of SVT readout system have already been completed successfully.
- SVT DAQ integration test with JLab DAQ completed August 15th. (see next slide)
- September 15 - October 15: Full SVT testing at SLAC. This will establish the noise and overall electrical performance of the system as a whole.
- Beam with the detector is not expected until November 22.

DAQ Integration Test

- SVT (ACTA) Crate shipped to JLab for integration testing
- Smooth Setup
- Data emulation on SVT = expected occupancy
- Pulser for triggers (instead of ECAL)
- Full Multi-ROC test
- Achieved:
 - **130 kHz trigger**
 - 200 MB/sec data rate
 - 13 kHz readout of 10 event blocks
 - Emulated 21 hybrids across 7 DPMs
 - Limit was CODA event builder machine

SVT DAQ Overview



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- RCE crate: data reduction, event building and JLab DAQ interface

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Documentation

All required documentation exists and has been reviewed and approved during the ERR:

- Location of docs:
 - Documents (COO, ESAD, RSAD, and ERG):
<http://www.jlab.org/Hall-B/run-web/>
 - Checklists, manuals, procedures, and commissioning plans:
https://wiki.jlab.org/hps-run/index.php/The_HPS_Run_Wiki

Jefferson Lab > Physics > Hall B

Privacy and Security Notice

Experimental Hall B

Hall B Main CLAS CLAS12 Other Expts Run Info Publications Public

print version

Current Run Information

- [HPS Run page](#)
- [HPS Conduct of Operations \(COO\)](#)
- [HPS Experiment Safety Assesment Document \(ESAD\)](#)
- [HPS Radiation Safety Assesment Document \(RSAD\)](#)
- [Hall-B Emergency Response Guidelines \(ERG\)](#)
- [Electronic Logbook Entries](#)
- [Accelerator and Experimental Schedule \(1995-2012\)](#)
- [HPS Shift Schedules](#)
- [HPS Collaboration page](#)
- Email archives: [HPS](#)

12000 Jefferson Avenue, Newport News, VA 23606
Phone: (757) 269-7621 Fax: (757) 269-7848

contact Volker Burkert
updated June 9, 2014

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The HPS Run Wiki

Shift Documentation Short Term Schedule Long Term Schedule [edit]

Accelerator Monitoring Collaboration

Phone/Pager Numbers

Checklists

- Shift-Taker's Checklist
- Hall-B Checklist Preparing for Beam

Procedures

- Commissioning Plans:
 - Beamline
 - Trigger
 - ECal
 - SVT
- Beam Trip Recovery
- SVT TOSP (pdf: 1,2,3)

Manuals

- SVT
- ECal
- DAQ
- CLAS Wiki (copy)
- Beamline
- Slow Controls

JLab Logbooks

- MCC
- Hall-A
- Hall-B
- Hall-C
- Hall-D

Navigation

- Main page
- Community portal
- Current events
- Recent changes
- Random page
- Help

Toolbox

- What links here
- Related changes
- Special pages
- Printable version
- Permanent link

Accelerator/HPS Integration

- HPS collaboration with Hall-B and Accelerator:
 - Technical Coordinator: Stepan Stepanyan
 - Regular presentations at Hall-B Meeting.
(Minutes at: http://clasweb.jlab.org/group_meeting_minutes/Physics/2014)
 - HPS schedule coordinated with CLAS12 installation schedule.
 - “Running would occur during evenings and weekends or during other periods when it would not conflict with the regularly scheduled assembly of the CLAS12 Torus coils.”
 - Regular meetings with Accelerator and Physics division.
 - Technical coordination meetings with CLAS12 and ACC

HPS Meetings

- HPS:
 - Twice yearly Collaboration Meetings
 - Includes accelerator, Hall-B & physics division representation.
 - Weekly web enabled meeting for all HPS.
 - Weekly web enabled meetings for each sub system.

Meeting notes and Presentations on Collaboration Wiki:

<https://confluence.slac.stanford.edu/display/hpsg/Meetings>

Dashboard > Heavy Photon Search Group > ... > Meetings

Search/Navigation:

Search

Physics

HPS Collaboration

HPS Proposals

Publications and Presentations

HPS Collaboration Membership List for 2014-2015 Engineering Run

HPS Executive Committee

Collaboration meetings

Meetings

Research Opportunities

Images

Operations

HPS Detector

Computing and Software

Project Management

Related:

SLAC/PPA
Jefferson Lab/Hall B

Meetings

4 Added by Tim Nelson, last edited by Maurik Holtrop on Jun 30, 2014 (view change)

The HPS Collaboration holds weekly meetings on Tuesdays at 10AM PDT. Remote participation is available via WebEx. Please see the link below for connection details.

Collaboration Meetings:

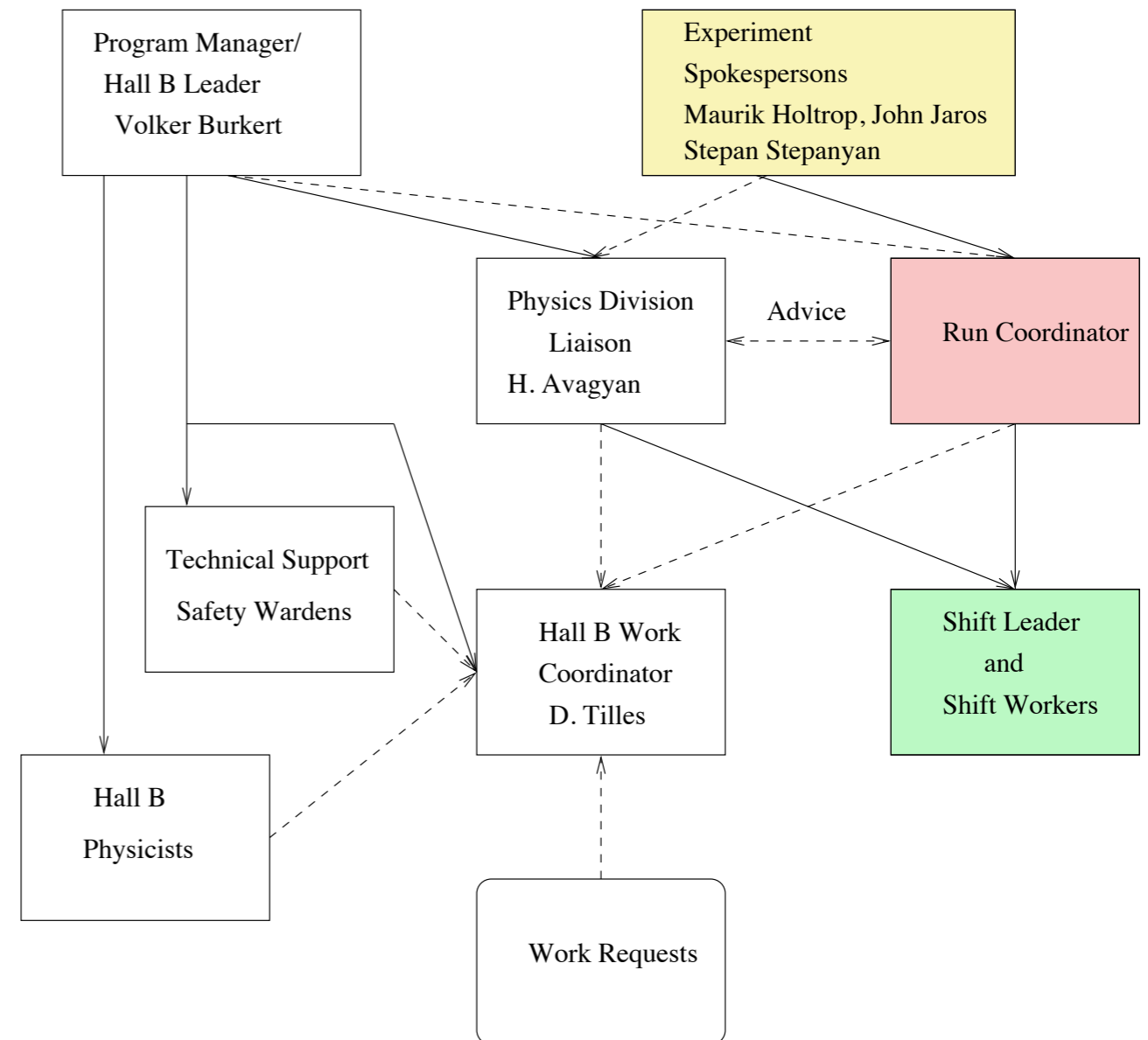
- HPS Collaboration Meeting at JLab May 26-27, 2011
<http://conferences.jlab.org/hps2011/index.html>
- HPS Collaboration Meeting at JLab October 18-19, 2011
<http://www.jlab.org/conferences/hps2011oct/>
- HPS Collaboration Meeting at SLAC September 10-12, 2012
<https://confluence.slac.stanford.edu/display/hpsg/HPS+collaboration+meeting+at+SLAC>
- HPS Collaboration Meeting at JLAB June 4-6, 2013
<http://www.jlab.org/conferences/hps2013june/index.html>
- HPS Collaboration Meeting at SLAC Jan 22-24, 2014
[HPS Collaboration Meeting at SLAC Jan 22-24, 2014](#)
- HPS Collaboration Meeting at JLAB June 16-18, 2014
[HPS Collaboration Meeting at JLAB June 16-18, 2014](#)

Weekly Meetings:

- How To Post Your Talk
- WebEx Connection Details - HPS Weekly
- ▣ 2010 Meetings
- ▣ 2011 Meetings
- ▣ 2012 Meetings
- ▣ 2013 Meetings
- ▣ 2014 Meetings

Experiment Personnel

- **Spokespersons**
 - Physics decisions, overview.
- **Run Coordinator**
 - Coordinates experiment (next slide)
- **Shifters**
 - Execute, Monitor, Log
 - Offline Shifter analyzes data.
 - 8 hour rotations
- **Subsystem Experts**
 - On call 24/7
 - One for each subsystem
 - Responsible for original system commissioning



Organizational Chart of the Hall-B Team
Solid arrows indicate responsibility.
Dashed arrows indicate information flow.

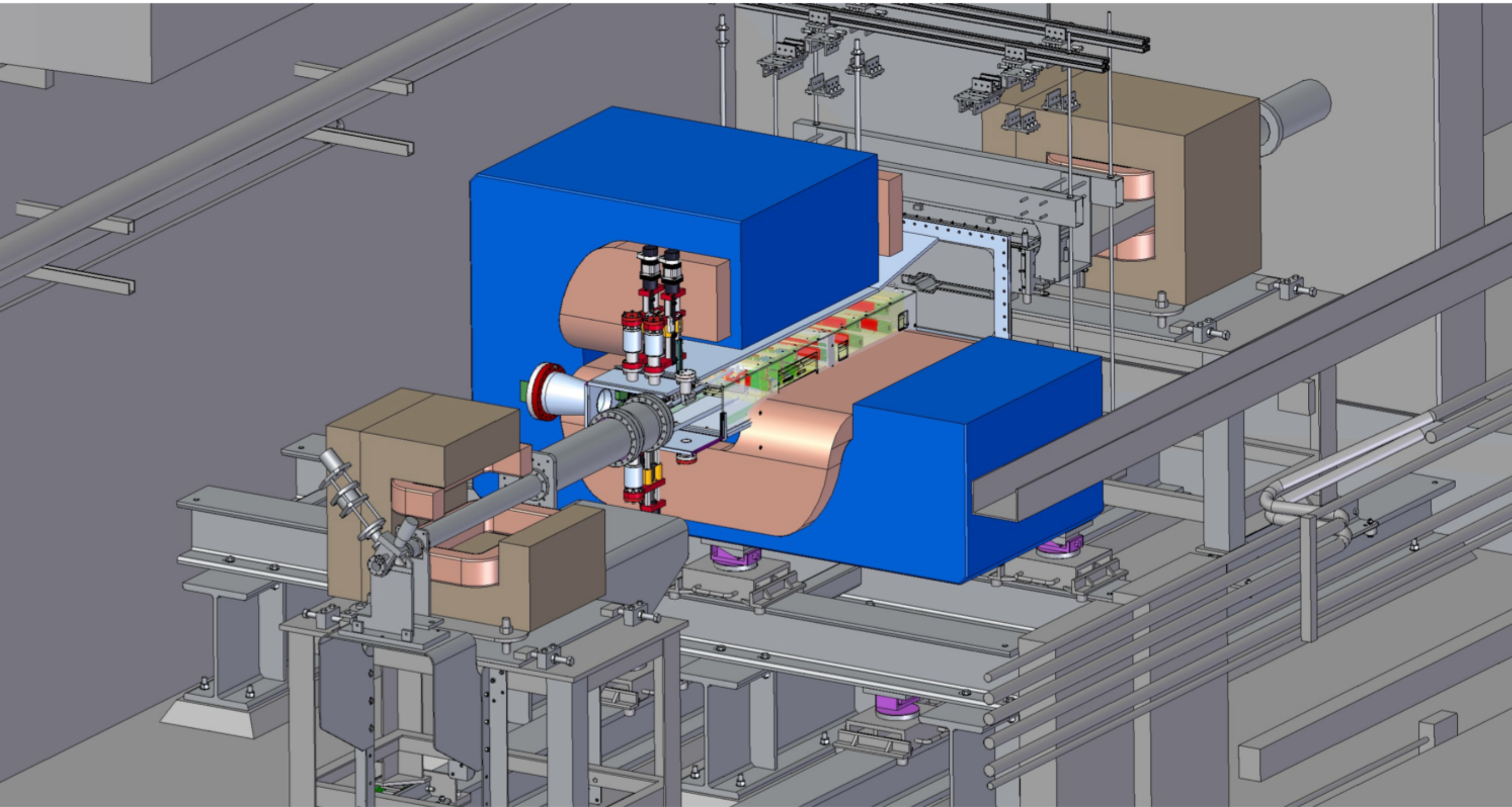
Run Coordinator

- Run coordinator is main contact to accelerator and physics division. From COO document: (<http://www.jlab.org/Hall-B/run-web/>)
 - 24/7 On call, for at least 2 weeks for continuity.
 - The Run Coordinator shall ensure that the Hall Group Leader, Physics Division Liaison, and at least one Spokesperson are aware of all pertinent issues.
 - Attends daily MCC meetings and updates Program Deputy of experiment's status.
 - Attends weekly MCC scheduling meeting.
 - Coordinates work in Hall with Hall Work Coordinator.
 - Present experimental update at Hall-B meeting.

Summary

- HPS successfully passed the ERR.
- The HPS detector is well on track for commissioning with beam in December 2014
- Commissioning schedule and activities are taking clear shape. Documented on run pages.
- HPS has clear communication with Hall-B, Accelerator and Physics Division.
- We're on track for first commissioning in Dec, and in very good shape to be fully ready and checked out before our Spring run.

HPS in Alcove



Engineering Rendering