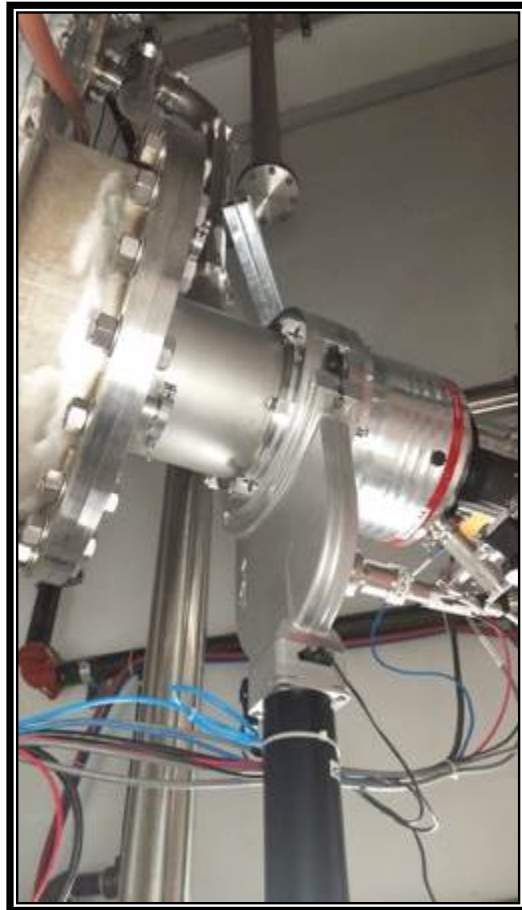


# ***NSCD Upgrade Projects Status Report***

***January 2016***



New turbo pump installed on ARCS detector vessel

# Instrument Upgrade Projects Summary Table

		New FY16										Ongoing			
Beamline(s)/Area		CG2/4A	CG2	CG4B	HB2C	6	15	17	18	4A	SE	18	CG2	11A	CG3
Title		5T mag for pol. Ref/SANS	GPSANS collimator replacement	Larmor Dev. Beamline	WAND Phase II upgrade	EQ-SANS detector vessel/sample area modifications	NSE Magnetism Capability	SEQUOIA vacuum upgrade	NOMAD background reduction	Mag. Ref. Improvement Project	14T SNS magnet	ARCS vacuum upgrade	MagG (11T)	POWGEN Upgrade	BioSANS detector
Project Lead		M. Fitzsimmons	L. Crow	L. Robertson	B. Chakoumakos	W. Heller	G. Ehlers	L. Jones	L. Robertson	M. Fitzsimmons	M. Stone	L. Jones	D. Armitage	A. Huq	V. Urban
Conceptual Design Review	Project organization (team)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Top-down cost estimate (labor and materials)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	High level milestone list	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Risk assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Long lead procurement requests (if applicable)														
Final Design Review	Project Plan											✓		✓	
	Design Criteria Document (if applicable)					✓				✓	✓		✓	✓	✓
	Update cost estimate based on final design											✓		✓	
	Detailed schedule/milestone list													✓	
	Specified completion criteria										✓	✓	✓	✓	
Project Execution	Submit request/documents for procurement funds													✓	
	% of major procurement (>\$25K) contracts awarded (\$ awarded/\$ estimated )											100		39	
	Equipment installation complete											✓			
	Equipment ready for integrated testing											✓			
Commissioning complete															
Completion	Completion Report														
		✓	not required complete												

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## 1. Project: 5T mag for pol. Ref/SANS for CG2/4A

1.1 Project Lead M. Fitzsimmons

1.2 Progress:

- The specifications have been written and reviewed by many parties

## 2. Project: NOMAD background reduction

2.1 Project Lead: L. Robertson

2.2 Progress:

- We had examined the collimator test measurements and concluded we need to also test 4 or the remaining 5 collimator geometries required in order to perform a meaningful cost/benefit analysis.
- We are exploring the possibility of using 3-D printing to fabricate a test piece for the final (backscattering) collimator geometry.
- We have completed several beam diagnostic measurements aimed at better understanding the anomaly in the beam position/spectrum observed at the sample position.

2.3 Issues/Concerns:

- We have observed three serious optical issues that need to be addressed:
  - The detector vessel is not aligned with the incident beam. It appears to be off by ~10mm in both the horizontal and vertical directions. A rotation of the tank may also be needed.
  - The beam divergence at the sample position exhibits a strong asymmetry at long wavelengths.
  - The secondary shutter is not fully open. This condition prevents us from accurately determining the distance the detector vessel needs to be moved in (1). It may contribute to the divergence asymmetry see in (2). We are planning to unstack the shielding and correct the shutter position during the Jan-Feb outage. We are also exploring strategies for the shutter position if it is lost again in the future.

### **3. Project: Larmor Dev. Beamline at CG4B**

3.1 Project Lead: L. Robertson

3.2 Progress:

- We submitted RRD Modification Request 5307 to design, build, and install the components need for the monochromator interference tests.
- Initial design work began on the monochromator assembly.

3.3 Issues/Concerns:

- An engineer has been assigned to the job but is currently working on other projects

### **4. Project: Sample changer for NOMAD**

4.1 Project Lead: J. Carruth

4.2 Progress:

- The DCD for the sample changer is in draft at the moment. I need to gather further input from the instrument team.
- Procurement documents are also in the draft phase.

4.3 Issues/Concerns:

- None

### **5. Project: EQ-SANS detector vessel/sample area modifications**

5.1 Project Lead: W. Heller

5.2 Progress:

- The DCD is complete and ready for final signatures
- Design of the cone replacement is progressing
- Information has been provided to Neutronics for calculating radiation fields with the new cone
- Andre Parizzi was consulted about magnetic field issues. He brought a strong magnet and tested various components around the EQ-SANS sample area
  - Most of the area near the sample area is non-magnetic, or slightly magnetic as a result of machining and welding. The immediately adjacent parts of the flooring and substructure are also non-magnetic. Some small magnetic parts (bolts, etc.) could be replaced with non-magnetic equivalents

### 5.3 Issues/Concerns:

- The casing on the final piece of the upstream shielding block is magnetic

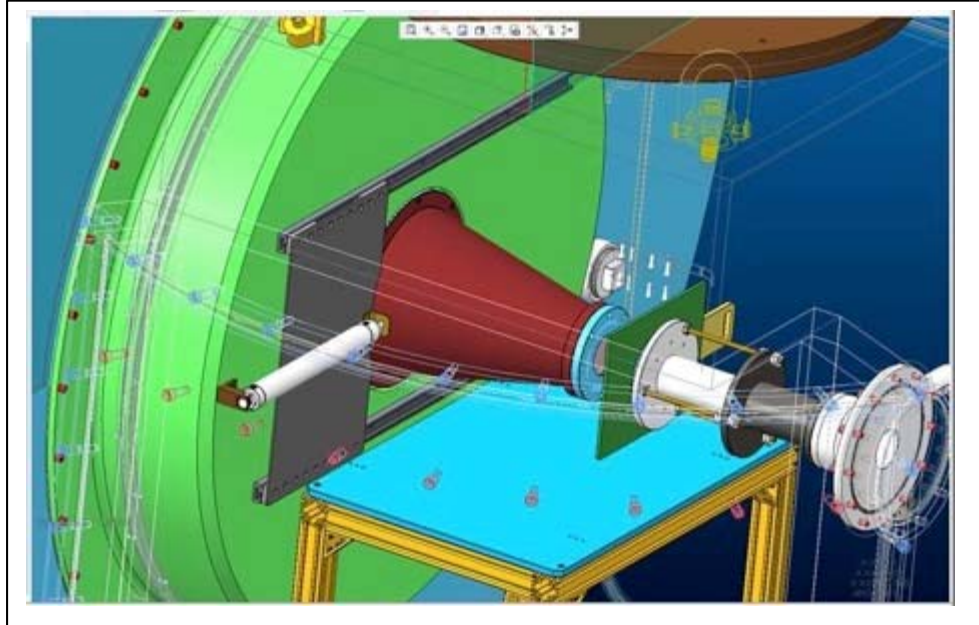


Figure 1: An automated window protection mechanism similar to those used on the SANS at HFIR has been developed (the 30cm silicon window is fragile)

## 6. Project: 14T SNS magnet

6.1 Project Lead: M. Stone

6.2 Progress:

- The 14 T magnet project procurement documents have been reviewed by the entire team and is ready to be sent to procurement once funds are received.

6.3 Issues/Concerns:

- None

## 7. Project: SEQUOIA vacuum upgrade

7.1 Project Lead: L. Jones

7.2 Progress:

- Design work has started after a team meeting with electricians, sensible chill water system, controls, vacuum, engineering, and installation instrument technician groups.

- We are planning for two phases of the project:
  - Phase one in summer 2016 to bring into operation the currently installed turbo pump on the sample environment chamber by supplying power, cooling, air, and controls;
  - Phase two will be rerouting the sample environment chamber roughing line, installing and connecting two turbo pumps on the detector chamber, and rewriting the controls and separating the controls from the high voltage cabinet.
- Funding has been requested for three subcontractors for this project in 2016 and 2017: controls programmer, vacuum designer, and chill water designer.
- No DCN work is underway yet, although the engineer has started looking at the BL17 3D model for accuracy.

### 7.3 Issues/Concerns:

- None

## 8. Project: ARCS vacuum upgrade

8.1 Project Lead: L. Jones

8.2 Progress:

- Mechanical work, electrical work, and sensible chill water work is completed. Controls have been installed and are currently being tested.
- A potential 3 week schedule delay was avoided by using off the shelf vacuum piping unistrut. Design engineer will update the drawings after the installation is complete.

8.3 Issues/Concerns:

- The project is approximately two weeks behind schedule and over spent. An additional \$15,000 will be required to complete the project. Electrical work scope and interference in cave was underestimated.
- Testing was almost delayed by a miscommunication between groups on the sensible chill water outage. The plan was a 2 week outage, but was requested as 4-6 weeks. The installation and RAD groups worked together to provide water separately for this project.



Figure 2: New utility penetrations, cabling, cable tray and vacuum lines outside the ARCS basement



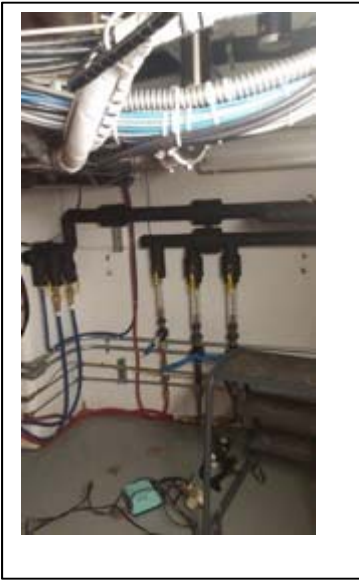


Figure 3: New sensible chilled water line in the ARCS basement



Figure 4: New mechanical vent valve installation with additional access port (below) for vacuum troubleshooting. Located in the sample room, it will pop open when the sample chamber vents, providing a clear indicator that sample chamber has been vented for sample changes.

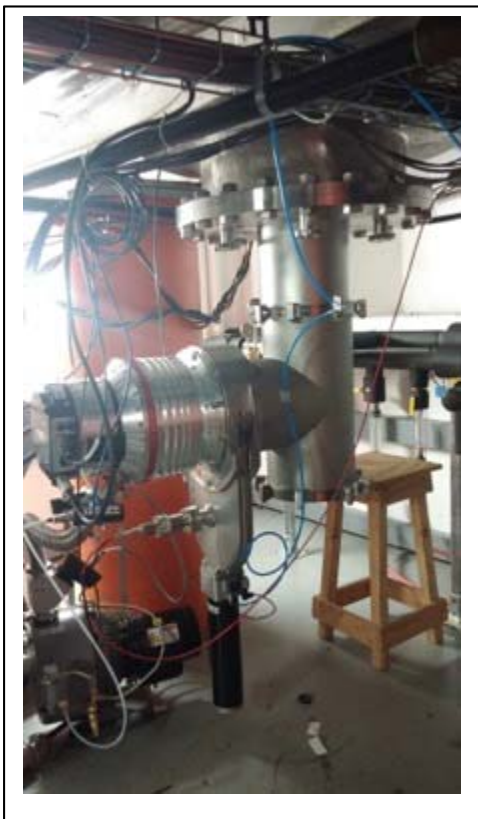


Figure 5: Left side of new turbo pump (see cover for right side) with new sensible chilled water lines in the background

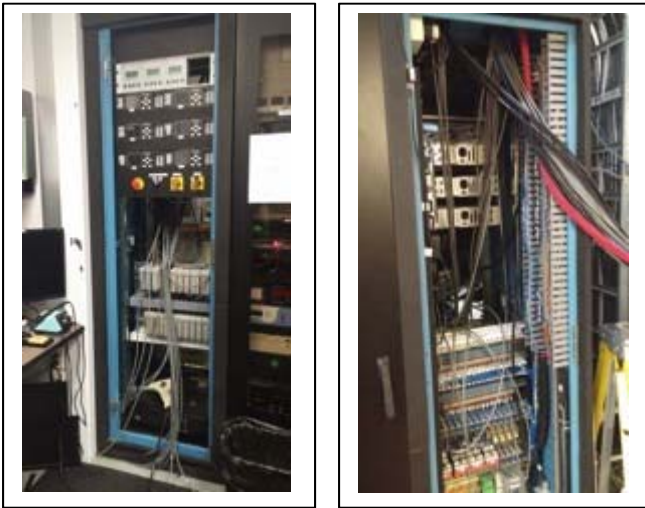


Figure 6: Front and back of the new PLC rack in the ARCS control room

#### 8.4 Lessons Learned:

- Project needs additional engineering support for vacuum design activities. Design work should be started months in advance to make sure procurements are not delayed by waiting on drawing changes. As-built drawings (modified after installation is completed) should also be utilized when appropriate. Installation engineer should not have to double-check drawings for unrealistic options as by the time the drawing is at the installation check, weeks have been lost.
- Compressed air changes were not realized until installation, due to unspecified operations requirements. This error has been noted for the BL17 vacuum upgrade project.
- Project lead should check the budget on a more frequent basis.

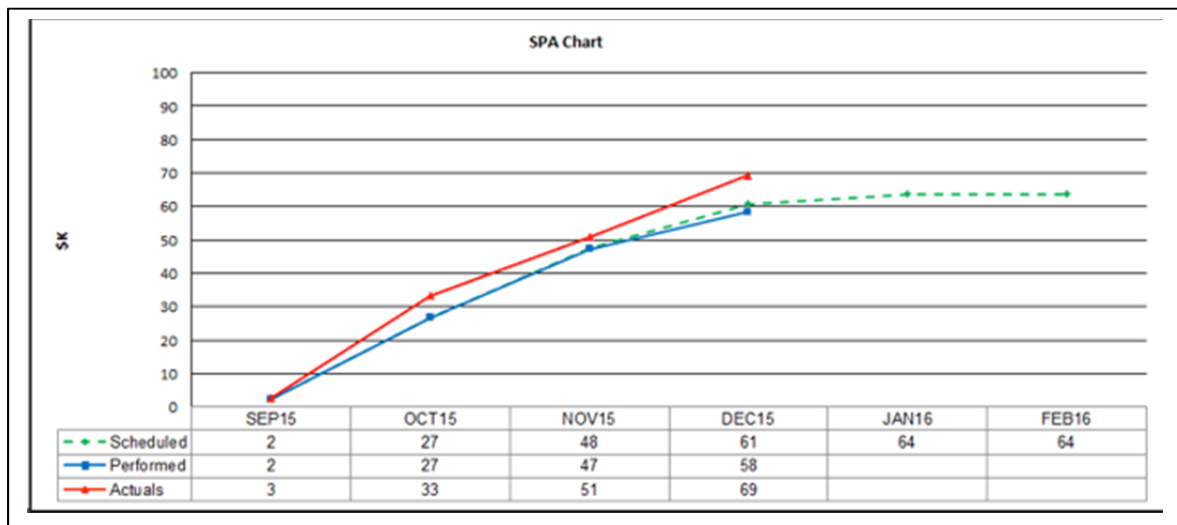


Figure 7: Project earned value through December 2015

## 9. Project: GPSANS collimator replacement

9.1 Project Lead: L. Crow

9.2 Progress:

- We had a meeting 12/3 to discuss the status of the prototype design and identify items with long lead times. The new nonpolarized guides and the first article vacuum chamber have been identified as items which need to be specified in the near future.
- The prototype design is advanced, but we need to make some decisions about polarizer configuration and guide fields to complete the design. We had a polarization-specific meeting in December and began examining polarizer, flipper and guide field options.
- The DCD is in review.

9.3 Issues/Concerns:

- None

## 10. Project: NSE Magnetism Capability

10.1 Project Lead: G. Ehlers

10.2 Progress:

- Hardware was completed and installed.
- The first experiment was successfully concluded in December 2015.
- I had a chat with Alan Tennant and a post-doc who will be the user.

10.3 Issues/Concerns:

- None

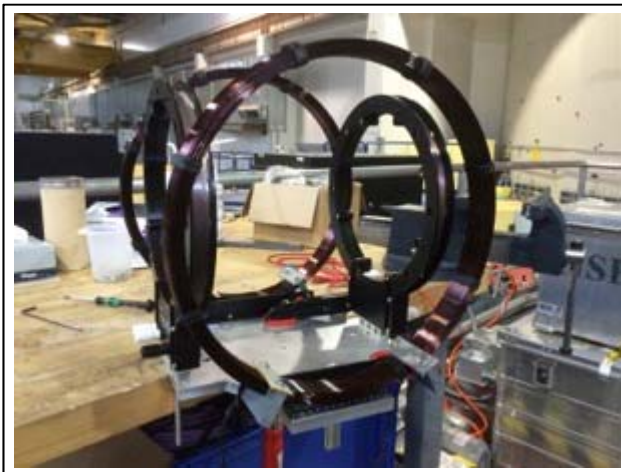


Figure 8: Coils for the first experiment ready for installation

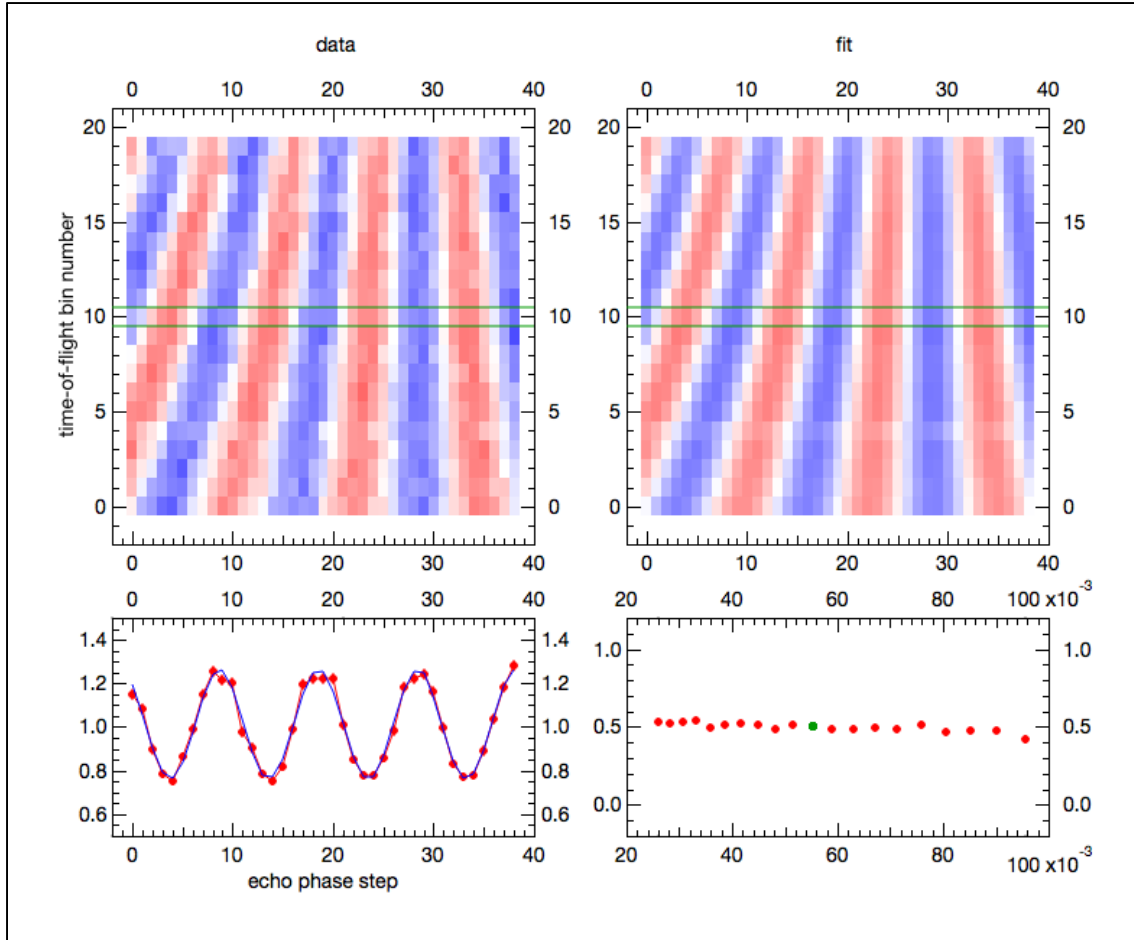


Figure 9: Raw data and basic reduction fit of a suitable standard sample for magnetic NSE.

This measurement shows that polarization can be transferred to the detector and magnetic correlations in the time domain can be measured (this measurement covers ~30 ps to ~100 ps). Top left: raw data binned in time of flight (equivalent to wavelength) and echo phase current. Top right: 2D fit to an oscillation. Bottom left: 1D cut through the data for one time of flight bin. Bottom right: Time range covered in nanoseconds.

## 11. Project: WAND Phase II upgrade

11.1 Project Lead: B. Chakoumakos

11.2 Progress:

- Work on this project will be on hold until the instrument scientist is on board.

11.3 Issues/Concerns:

- None

## 12. Project: BioSANS detector expansion

12.1 Project Lead: V. Urban

12.2 Progress:

- Components for the new detector frame have been received.
- Upgrades to the instrument air system are in progress.
- Design of a modified cooling air control cabinet is underway.
- The detector cart has been ordered.
- Production parts for 2 of the detector module contracts were received. Remaining parts on are track for delivery in mid-January.
- The 1<sup>st</sup> phase of the DAS (data acquisition system) upgrades are complete and ready to support integration of new detector array.
- Installation of peripheral equipment including DAS racks and cable trays is underway.

12.3 Issues/Concerns:

- None



Figures 10 and 11: Production parts on site

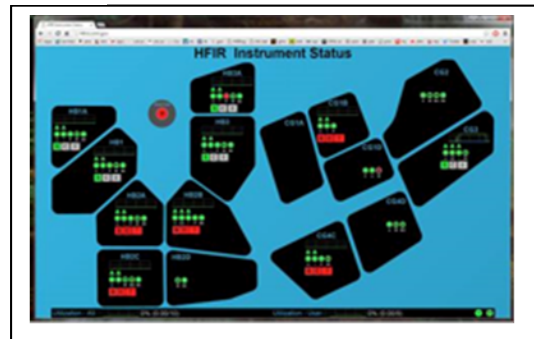
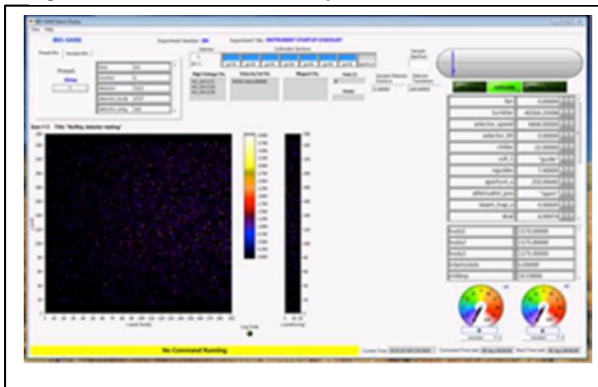


Figure 12: DAS upgrades



Figure 13: DAS equipment installed

### 13. Project: Mag. Ref. Improvement Project

13.1 Project Lead: M. Fitzsimmons

13.2 Progress:

- The DCD is complete.
- A conceptual design review was held January 7, 2016
- Positive feedback was received.

13.3 Issues/Concerns:

- None

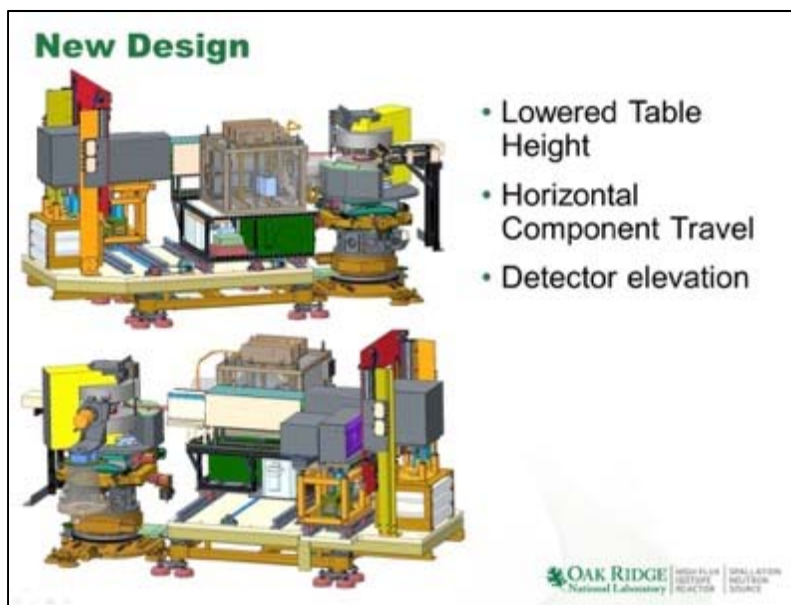


Figure 14: Conceptual design presented at the CDR

## New Design – Sample Support



- Sample and holder separated from the magnet/other devices.
- New slit

Figure 15: Conceptual design presented at the CDR

## 14. Project: POWGEN Upgrade Project

14.1 Project Lead: A. Huq

14.2 Progress:

- The DCD is complete
- The new thin window beam monitor has been ordered.
- Structural analysis of the sample vessel completed.
- The packages for the coarse radial collimator and the upstream and downstream vacuum slits have been released for vendor quote.
- Upgrading the existing detector modules has begun.
- Final design of the upstream optics has begun.

Issues/Concerns:

- None



Figure 16: New beam monitor on order



Figure 17: Upgrading first detector module



Figure 18: Testing argon balloon at the beam line



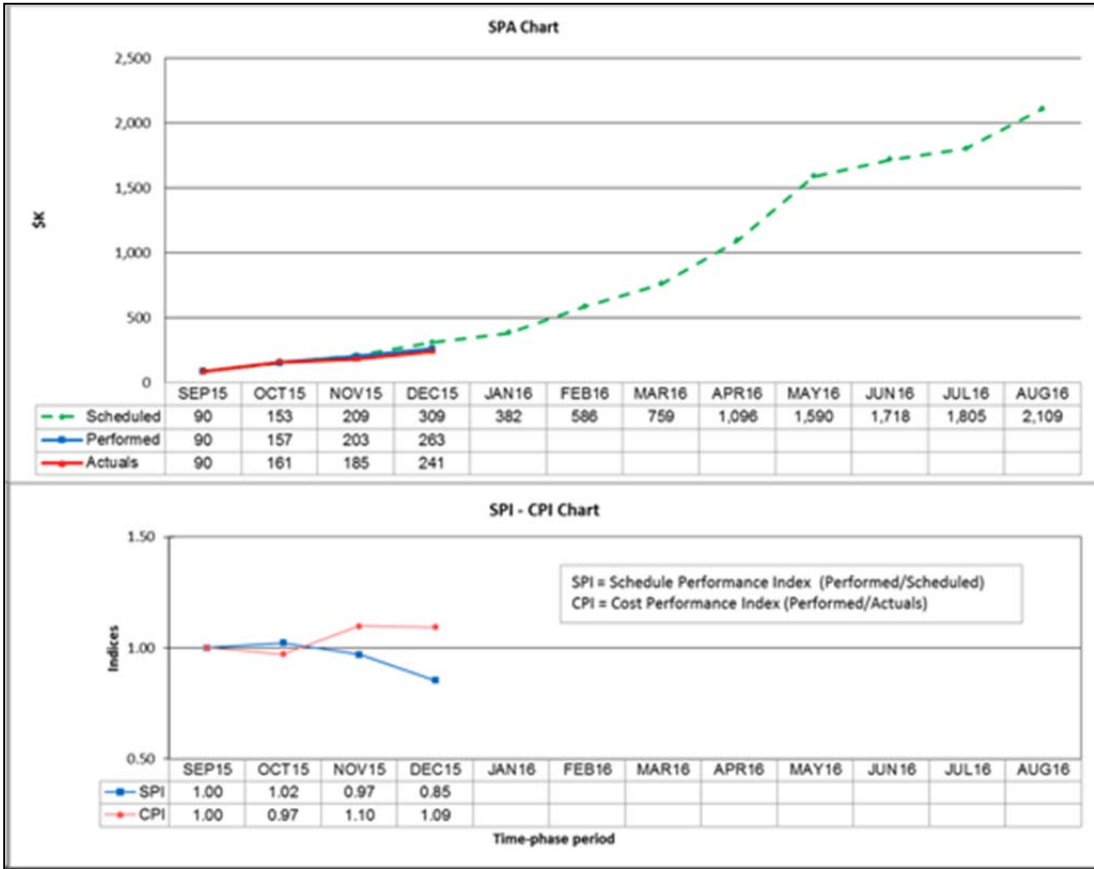


Figure 19: Earned value performance through December 2015

## 15. Project: MagG (11T) for CG2

15.1 Project Lead: D. Armitage

15.2 Progress:

- Magnet acceptance testing at the vendor is planned for February/March 2016 with installation at the beam line in June 2016.

15.3 Issues/Concerns:

- None

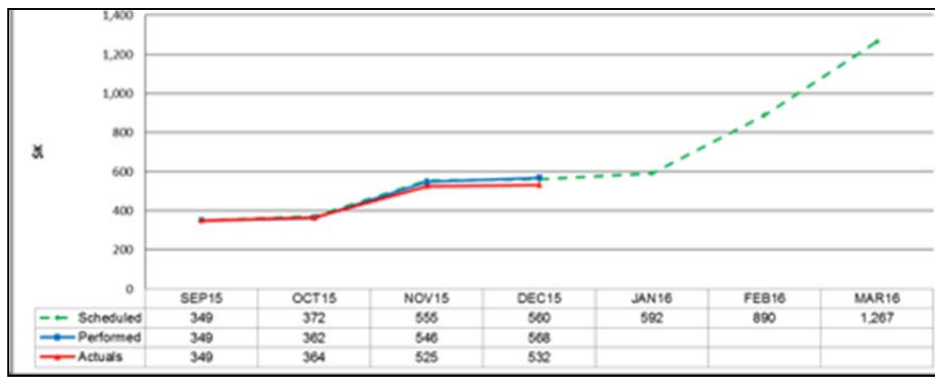


Figure 20: Earned value performance through December 2015