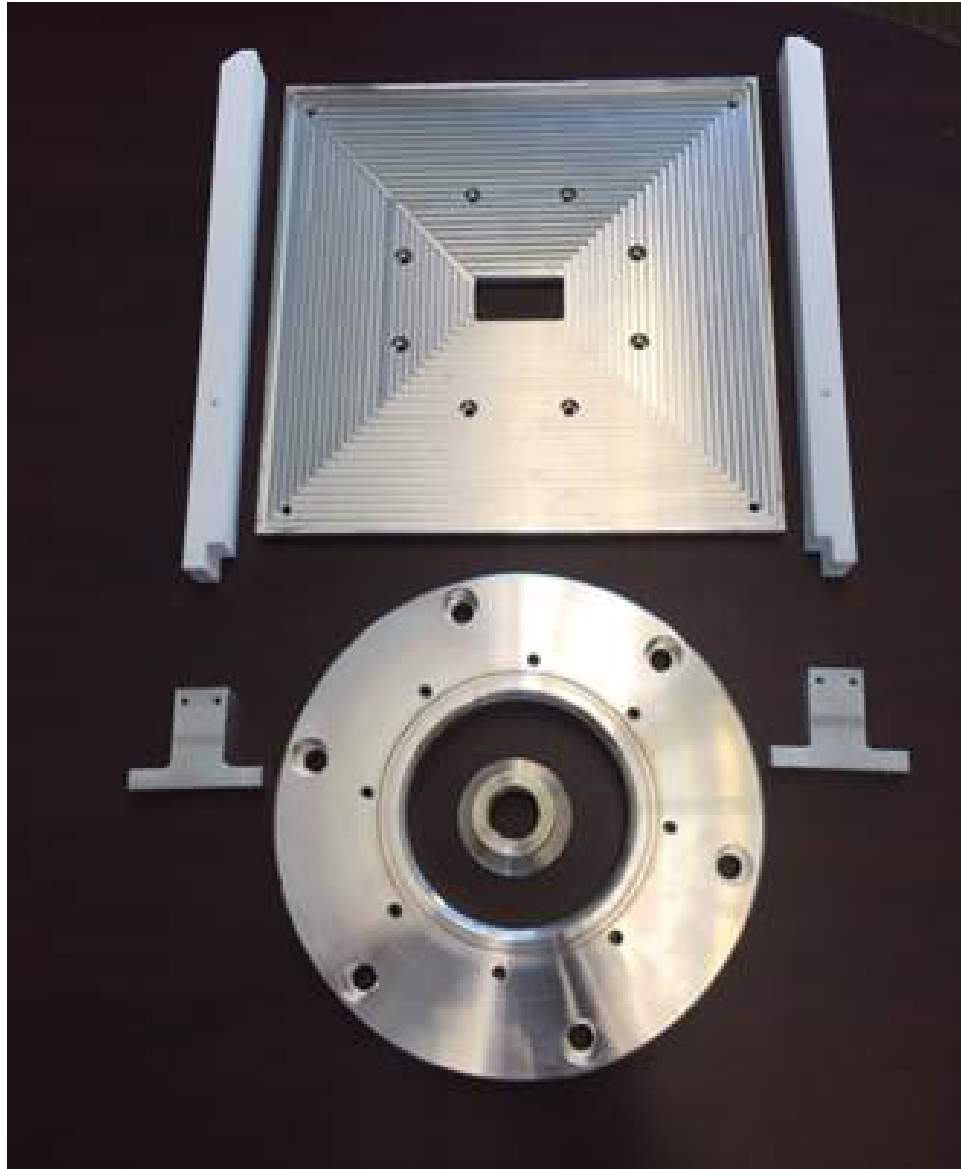


***NScD Upgrade Projects Status Report  
May 2016***



**Window assembly for POWGEN's upstream optics**

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# 1. Instrument Upgrades Summary Status Table

		New FY16													FY15 Pilot Projects		
Beamline(s)/Area		CG2/4A	CG2	CG4B	HB2C	1B	1B	4A	6	11A	12	15	17	SE	18	CG2	CG3
Title		5T mag for pol. Ref/SANS	GPSANS collimator replacement	Larmor Dev. Beamline	WAND Phase II upgrade	NOMAD background reduction	NOMAD sample changer	Mag. Ref. Improvement Project	EQ-SANS detector vessel/sample area modifications	POWGEN Upgrade	TOPAZ Goniometer	NSE Magnetism Capability	SEQUOIA vacuum upgrade	14T SNS magnet	ARCS vacuum upgrade	MagG (11T)	BioSANS detector
Project Lead		Fitzsimmons	Crow	Robertson	Frontzek	Tucker	Everett	Fitzsimmons	Heller	Huq	Huq	Ehlers	Jones	Stone	Jones	Armitage	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						20		41	100				100	100	100
	Equipment installation complete														✓		
	Equipment ready for integrated testing														✓		
	Commissioning complete														✓		
Closeout	Completion Report													✓			
Accounting	Funding (Capital (C) or Operating (O))	O	C	C	C	O	C	C	O	C	O	O	C	C	O	C	C
	Account open	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	Project complete	✓	✓

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

2.1 Project Lead: M. Fitzsimmons

2.2 Estimated Total Cost

- \$256K

2.3 Progress

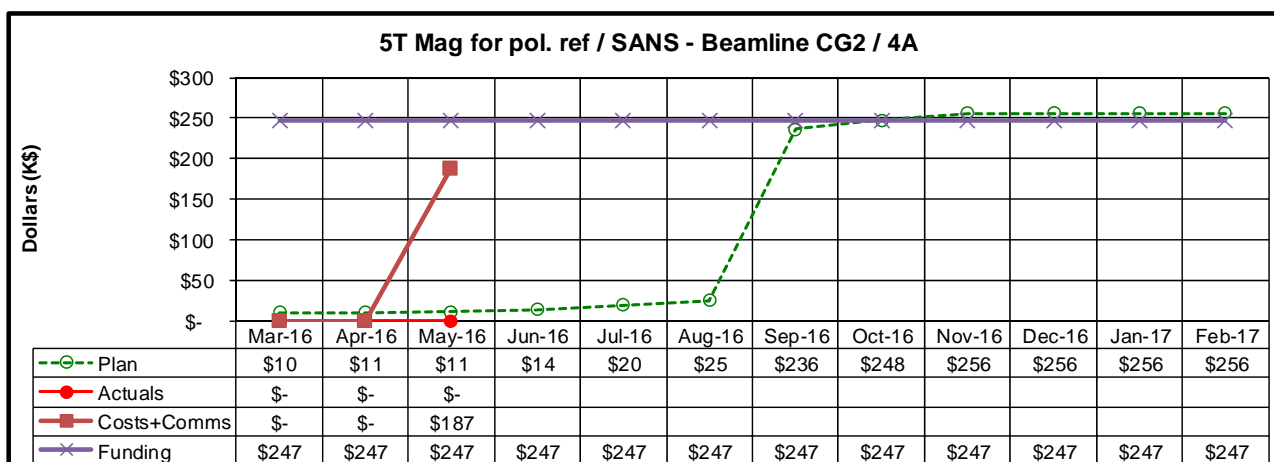
- The contract for the 5 Tesla magnet system has been awarded.

2.4 Issues/Concerns

- None

2.5 Milestones

CG2/4A: 5T mag for pol. Ref/SANS	Current planned date	Actual completion date
Define requirements	Feb-16	Feb-16
Issue RFP	Feb-16	Mar-16
Select vendor and award contract	May-16	May-16
Acceptance testing at vendor	Sep-16	
Receive magnet and complete acceptance testing on site	Nov-16	
Perform first experiments at HFIR	Nov-16	
Perform first experiments at BL4A	Nov-17	



## 3. Project: GPSANS collimator replacement

3.1 Project Lead: L. Crow

3.2 Estimated Total Cost

- \$1,025K

3.3 Progress

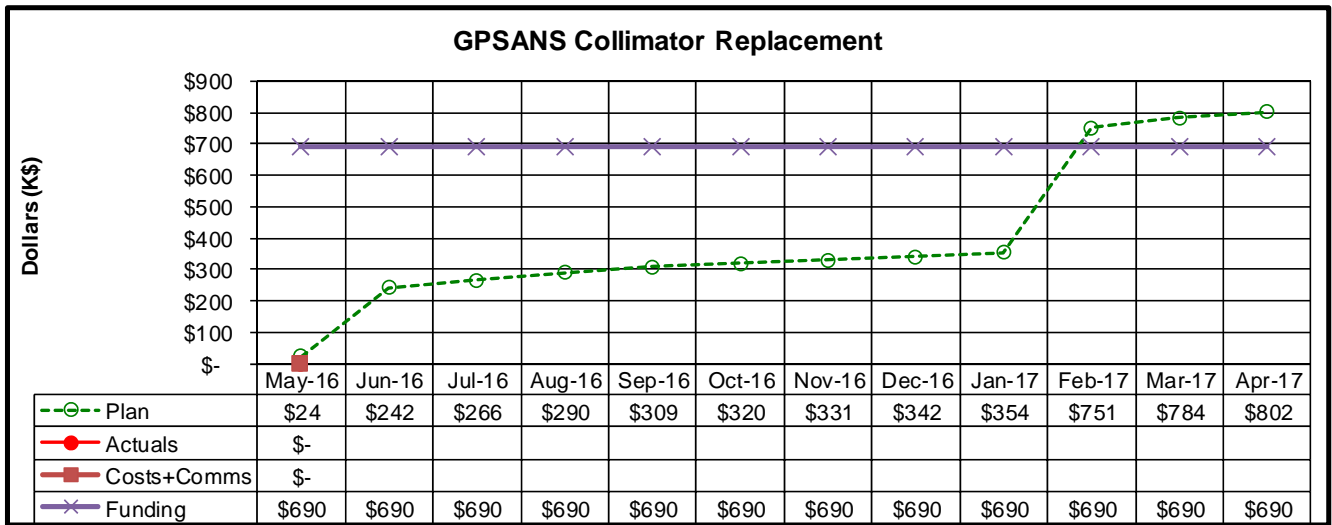
- The NIST visit helped the team move forward on the conceptual design. Two new design milestones have been added to reflect this plan.

3.4 Issues/Concerns

- None

### 3.5 Milestones

CG2: GPSANS collimator replacement	Current planned date	Actual completion date
Make decision on conceptual design format	Jun-16	
Award contract for new guide	Jul-16	
Complete conceptual design	Aug-16	
Complete detailed design	Nov-16	
Award contract for new collimator sections	Jan-17	
All equipment on site	Jun-17	
Complete offline assembly and alignment - decision point for installation in Oct - Nov -2017	Aug-17	
New collimator guide assemblies installed at the beamline	Nov-17	



## 4. Project: Larmor Dev. Beamline at CG4B

4.1 Project Lead: L. Robertson

4.2 Estimated Total Cost

- \$500K

4.3 Progress

- Design of the monochromator test stand is underway. Timing of initial monochromator test is dependent on HFIR outage planning.

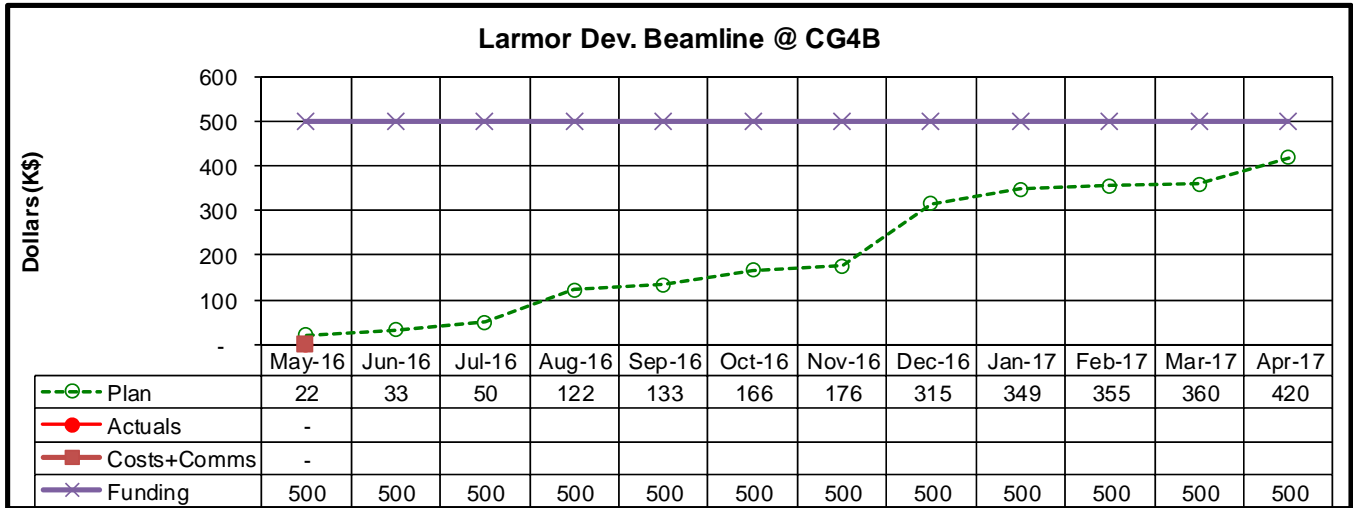
4.4 Issues/Concerns

- None

4.5 Milestones

CG4B: Larmor Dev. Beamline	Current planned date	Actual completion date
Award contract for monochromator	TBD	
Install monochromator	Aug-16	
Award contract for shield wall	Mar-17	

CG4B: Larmor Dev. Beamline (cont'd)	Current planned date	Actual completion date
Install shield wall	May-17	
Award contract for shutter	Mar-17	
Install shutter	May-17	
Award contract for beamstop	Mar-17	
Install beamstop	May-17	
Award contract for support rail	Mar-17	
Install support rail	May-17	



## 5. Project: WAND Phase II upgrade

5.1 Project Lead: M. Frontzek

5.2 Estimated Total Cost

- \$712K

5.3 Progress

- The team decided that the simplest way to meet the transportation requirements for the Los Alamos detector was to remove the detector gas by pressure equalization into empty gas cylinders. The small amount of 3-He gas lost in this process will be replenished here at ORNL.
- The required training (e. g. PSO and ESO certification at LANL, Pressure Safety training at LANL for BNL personnel) will be held at Los Alamos on the 8th and 9th of August and the detector will be prepared for shipment that same week.

5.4 Issues/Concerns

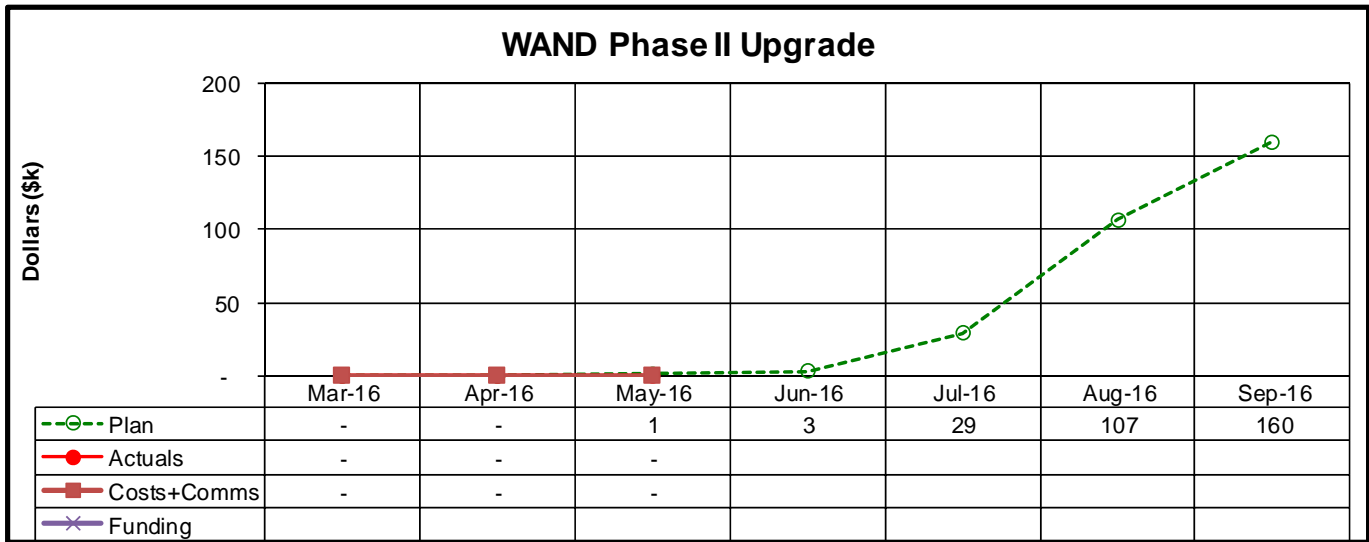
- None

5.5 Milestones

HB2C: WAND Phase II upgrade	Current planned date	Actual completion date
Receive detector from Los Alamos (with BNL support)	Aug-16	
Set-up detector offline	Sep-16	
Design phase completed (Electronics, detector housing, detector table, collimator, software)	Feb-17	



HB2C: WAND Phase II upgrade (cont'd)	Current planned date	Actual completion date
Fabrication/procurement completed	Sep-17	
WAND <sup>2</sup> implementation in Mantid functional	Feb-18	
Start installation of WAND <sup>2</sup>	Oct-17	
Complete installation of WAND <sup>2</sup>	Feb-18	
Testing and commissioning complete	Mar-18	
Return to user program	Apr-18	



## 6. Project: NOMAD background reduction

6.1 Project Lead: M. Tucker

6.2 Estimated Total Cost

- \$143K (Phase 1)

6.3 Progress

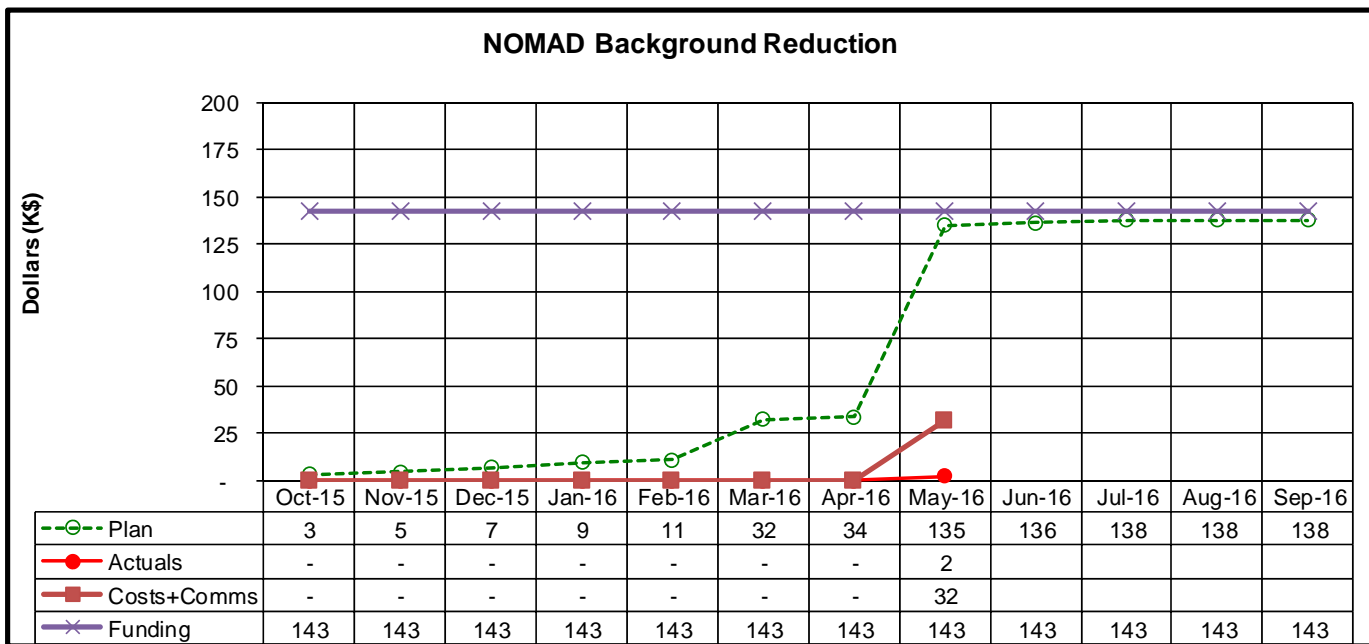
- The new corrective sample well flange was not received before the June maintenance outage. It will be installed in July, after the new DAS system has been tested.
- The incident collimation and sample well are being redesigned so that they are not mechanically coupled and will allow the incident collimation to be adjusted in-situ.
- The old reentrant well has had its old windows removed and new vanadium windows fitted. This will allow the background to be characterized with the beam travelling through just vanadium to the beam stop. At present, there is no clear path to the beam stop without passing through the aluminum back of the current reentrant well.

6.4 Issues/Concerns

- The windows in the new sample well design may generate unacceptable additional background initially until secondary collimation is installed. The windows will facilitate the removal of the in-well "beam-catcher", a known contributor to background scattering.
- The get lost tube may need to be expanded and the low angle detectors may need to be shifted several degrees to allow the direct beam to pass unhindered.

## 6.5 Milestones

1B: NOMAD background reduction	Current planned date	Actual completion date
<i>Phase 1</i>		
Diagnostic measurements complete	Jul-16	
Vessel re-alignment complete	Aug-16	
Characterize background after re-alignment	Aug-16	
Modify existing tank and detector components	Oct-16	
<i>Phase 2</i>		
Design primary beam defining collimation	Aug-16	
Award procurement of primary beam defining collimation	Sep-16	
Design new re-entrant well solution	Sep-16	
Award procurement of new re-entrant well solution	Oct-16	
Design secondary collimation	Oct-16	
Award procurement of secondary collimation	Nov-16	
Install and test primary beam defining collimation	Mar-17	
Install and test new re-entrant well solution	Mar-17	
Install and test new secondary collimation	Mar-17	
Project complete	Oct-17	



## 7. Project: NOMAD Sample changer

7.1 Project Lead: M. Everett

7.2 Estimated Total Cost

- \$591K

7.3 Progress

- The NOMAD sample changer project team met with the Science Productivity Steering Committee on May 26 to present a plan for modifying the goals for the NOMAD sample changer. The team presented the case to include a higher temperature capability to 600 K that would then be able to address approximately

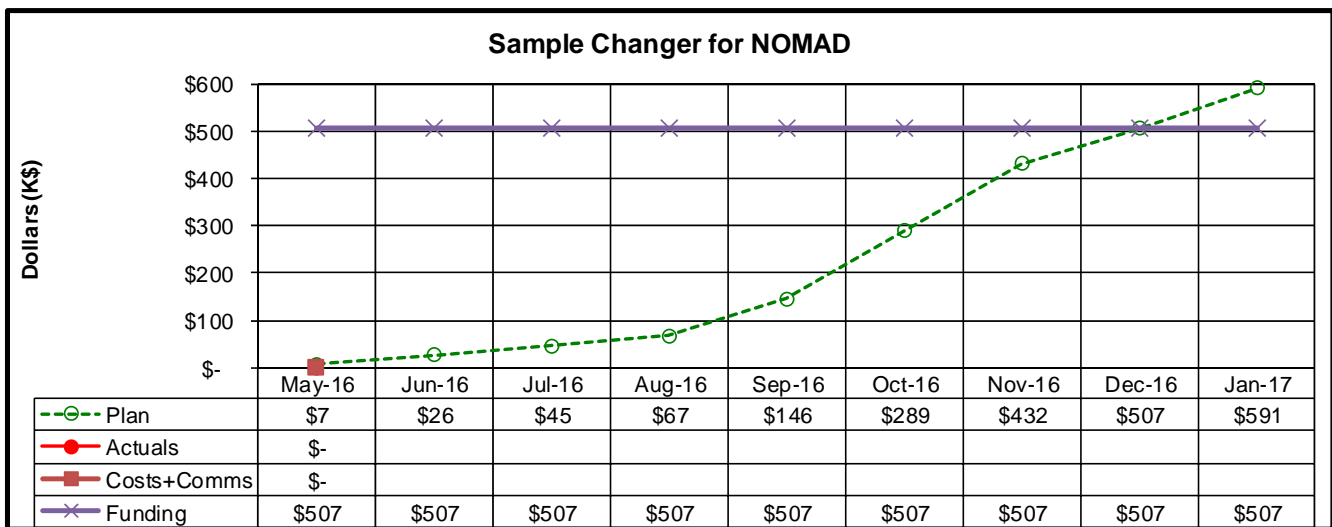
70 – 80 % of the instrument’s current science portfolio. A plan was presented to collaborate with an outside vendor on producing the device. The committee discussion was favorable.

7.4 Issues/Concerns

- No input this month

7.5 Milestones

1B: NOMAD sample changer	Current planned date	Actual completion date
Requirements complete and contracts awarded	Sep-16	
All equipment on site	Jul-17	
Testing complete	Oct-17	
Commissioning complete	Nov-17	
Ready for user operation	Dec-17	



8. Project: Mag. Ref. Improvement Project

8.1 Project Lead: M. Fitzsimmons

8.2 Estimated Total Cost

- \$1,478K

8.3 Progress

- The contract for the hexapod was awarded at the beginning of June.

8.4 Issues/Concerns

- None

8.5 Milestones

4A: Mag. Ref. Improvement Project	Current planned date	Actual completion date
Complete conceptual design review	Jan-16	Jan-16

4A: Mag. Ref. Improvement Project (cont'd)	Current planned date	Actual completion date
Award contract for hexapod cryostat mount	Jun-16	Jun-16
Complete final design review	Jun-16	
Award contract for remaining components	Jul-16	
Assemble detector table and complete offline testing (location TBD)	Oct-16	
All equipment installed at the beamline	Dec-16	
Systems testing at the beamline	Feb-17	
Commissioning with neutrons complete	Apr-17	

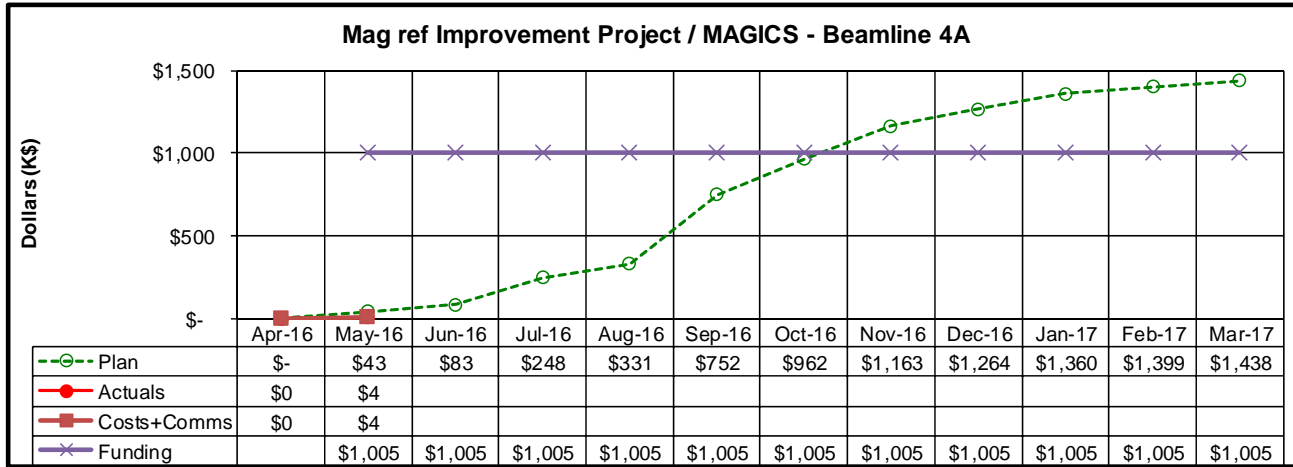


Figure 1: Vendor photo of hexapod

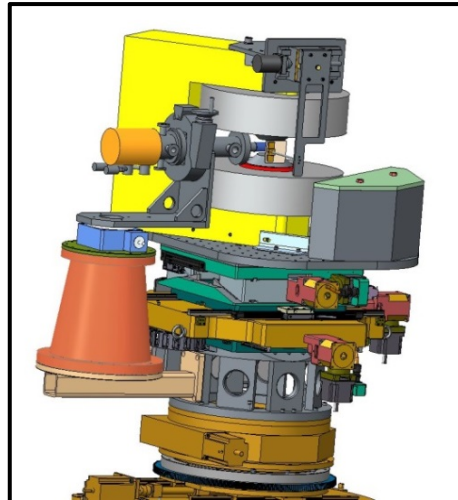


Figure 2: Orange cone schematically represents hexapod

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

9.1 Project Lead: W. Heller

9.2 Estimated Total Cost

- \$353K

### 9.3 Progress

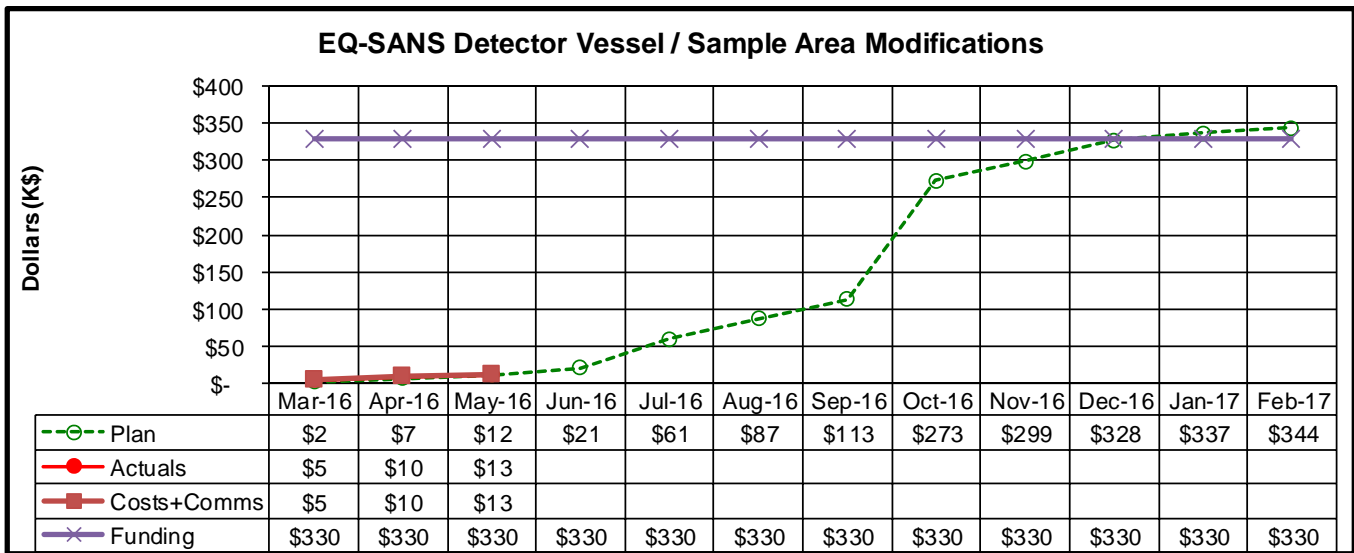
- Two of three bids for the replacement cone and associated hardware have been received. The final bid is expected during the week of June 6, 2016.
- The paperwork required for procurement of the large, neutron transparent windows has been initiated.

### 9.4 Issues/Concerns

- A concept for an enclosure that will allow for mounting of magnets, cryostats and similar samples environments must be developed.

### 9.5 Milestones

6: EQ-SANS detector vessel/sample area modifications	Current planned date	Actual completion date
Complete design of cone replacement	Apr-16	Apr-16
Verify radiological safety/operating constraints	Apr-16	Apr-16
Award contract for cone fabrication	Jun-16	
Award contract for sample table and sample environment mounting apparatus	Aug-16	
Award contract for shield plug and flange adapters	Jun-16	
Award contract for telescoping beam extender	Jun-16	
All equipment on site and ready for installation	Oct-16	
All equipment installed and ready for operation with neutrons	Feb-17	
Complete radiological survey	Mar-17	



## 10. Project: POWGEN Upgrade Project

### 10.1 Project Lead: A. Huq

### 10.2 Estimated Total Cost

- \$3,661K

### 10.3 Progress

- The installation of the slit control panel has been completed.

- The upstream optics support and window assemblies have been received.
- The design model for the detector stand has been completed.

#### 10.4 Issues/Concerns

- None

#### 10.5 Milestones

11A: POWGEN Upgrade	Current planned date	Actual completion date
Sample vessel ready for installation (assembled-tested-fiducialized)	Oct-16	
Optics ready For installation (assembled-tested-fiducialized)	Sep-16	
10 New modules assembled & tested	Jan-17	
Begin removal of existing detector modules	Apr-17	
Complete modification of existing modules	Jun-17	
Begin reinstallation of modified detectors and new detectors	Aug-17	
Complete IRR for modified instrument	Aug-17	
Project complete	Sep-17	

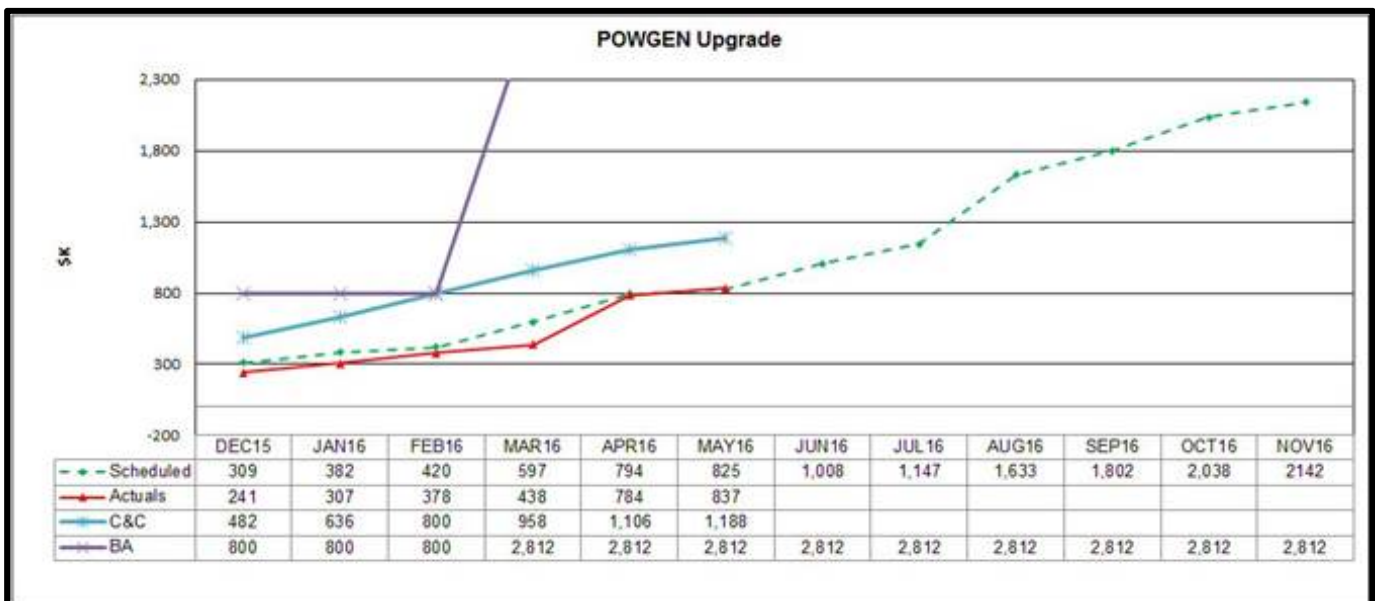




Figure 3: Control panel for slits



Figure 4: Support assembly for upstream optics

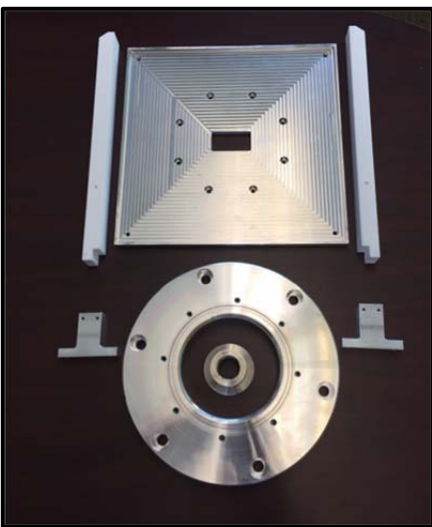


Figure 5: Window assembly for upstream optics

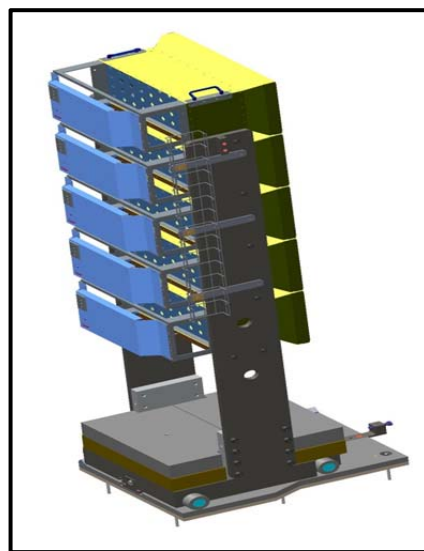


Figure 6: Detector stand

## 11. Project: TOPAZ Cryo – Goniometer Project

11.1 Project Lead: A. Huq

11.2 Estimated Total Cost

- \$205K

11.3 Progress

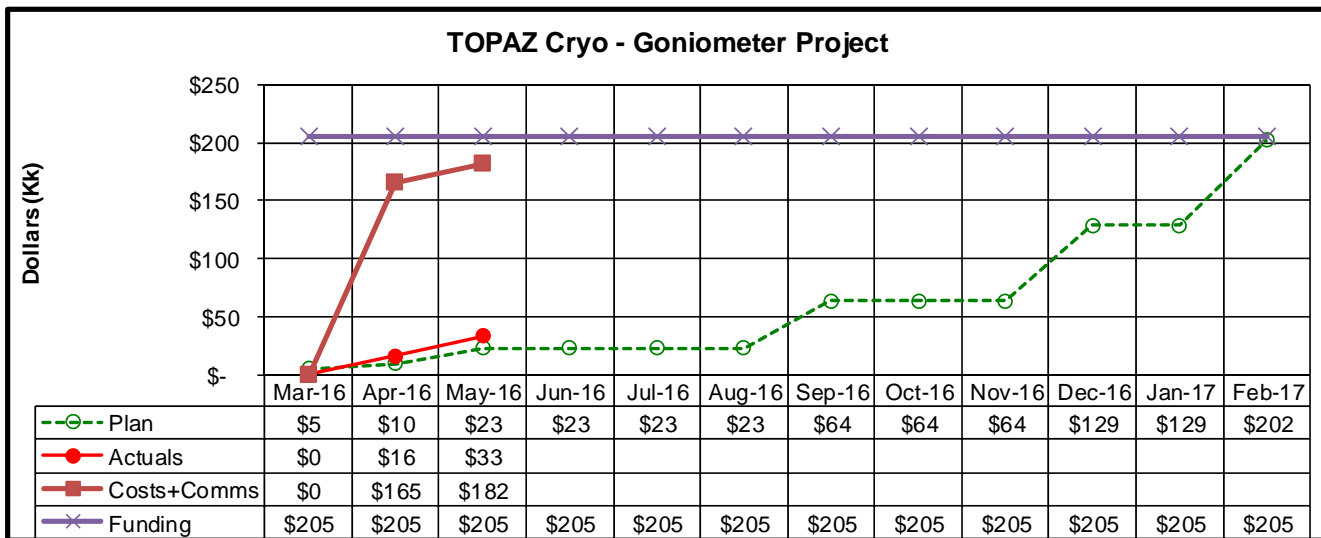
- Awarded the second milestone payment approving the detailed design and authorizing the start fabrication.
- The paperwork required for procurement of the goniostat software has been initiated.

11.4 Issues/Concerns

- None

## 11.5 Milestones

<b>12: TOPAZ Cryo - Goniometer Project</b>	<b>Current planned date</b>	<b>Actual completion date</b>
Award contract for cryo-goniometer	Mar-16	Apr-16
Presentation of design by vendor to SNS staff	Apr-16	May-16
Approve detailed design and start fabrication of goniostat	May-16	May-16
Complete factory acceptance test of goniostat in vacuum chamber	Sep-16	
Approve vendor design of cryostat	Sep-16	
Cryo-goniometer on site	Jan-17	
Off-line acceptance testing complete	Mar-17	
Commissioned and ready for use by TOPAZ users	May-17	



## 12. Project: NSE Magnetism Capability

12.1 Project Lead: G. Ehlers

12.2 Estimated Total Cost

- \$194K

12.3 Progress

- The project team is researching alternative technical solutions.

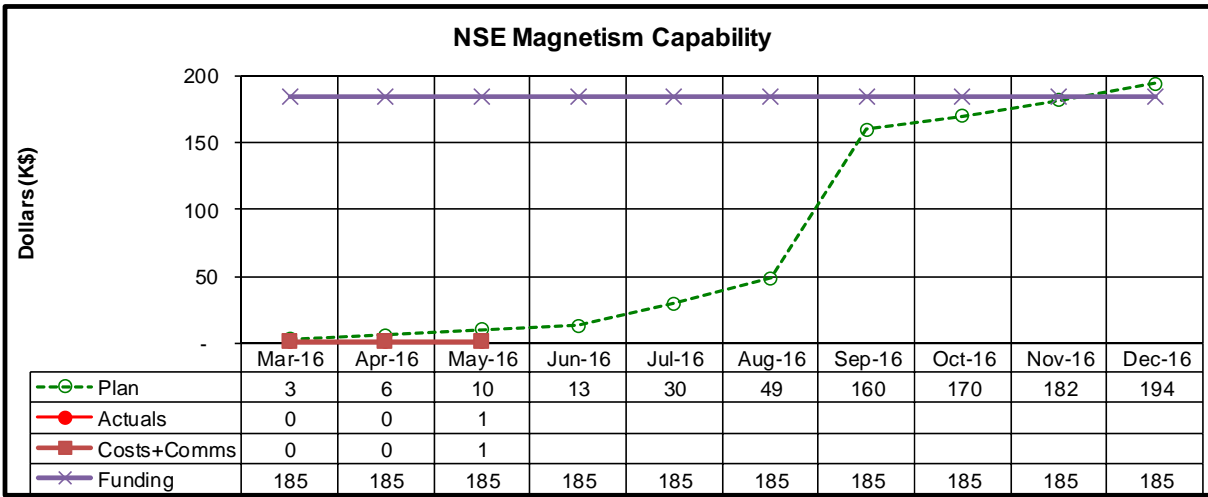
12.4 Issues/Concerns

- None.

12.5 Milestones

<b>15: NSE Magnetism Capability</b>	<b>Current planned date</b>	<b>Actual completion date</b>
Complete first experiment with existing CCR	Dec-15	Dec-15
Award contract for compact bottom loading CCR	TBD	
CCR on site and ready for installation	TBD	
Complete first experiment at <sup>3</sup> He temperature	TBD	





### 13. Project: SEQUOIA vacuum upgrade

13.1 Project Lead: L. Jones

13.2 Estimated Total Cost

- \$1,339K

13.3 Progress

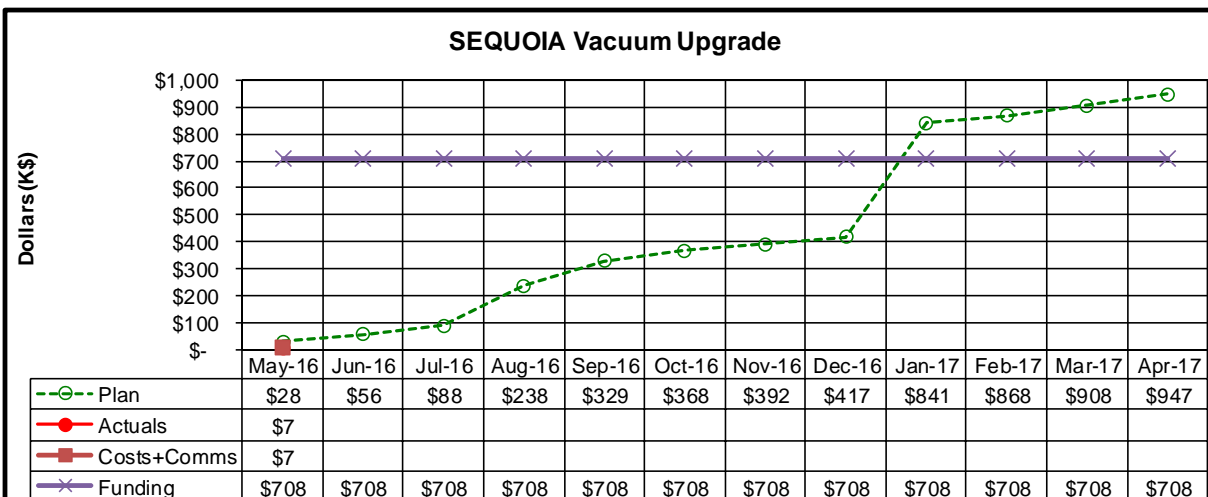
- Phase I of the project (installation of the turbo pump on the sample chamber) is on track to start in the June outage.

13.4 Issues/Concerns

- None

13.5 Milestones

17: SEQUOIA vacuum upgrade – Phase I	Current planned date	Actual completion date
Install and integrate turbo pump	Jun-16	
Procurements awarded	Oct-16	
Installation complete	Jul-16	
Commissioning with neutrons complete	Aug-16	
Project complete	Sep-16	



**14. Project: 14T SNS magnet**

14.1 Project Lead: M. Stone

14.2 Estimated Total Cost

- \$2,165K

14.3 Progress

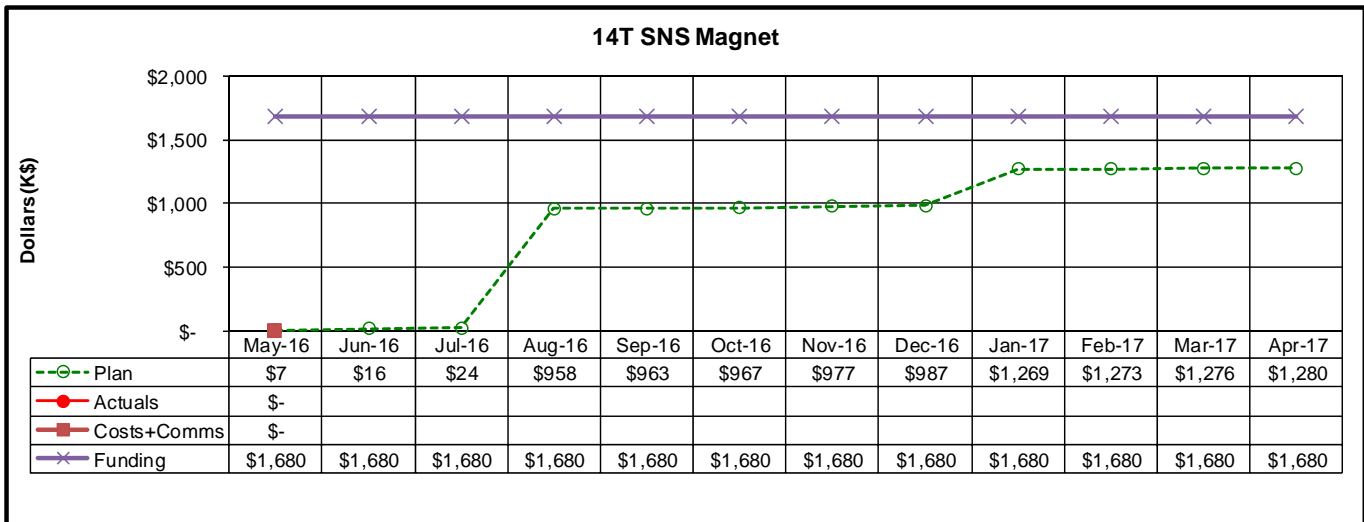
- The requisition for procurement of the 14T magnet was submitted to procurement.

14.4 Issues/Concerns

- None

14.5 Milestones

SE: 14T SNS magnet	Current planned date	Actual completion date
Define requirements	Feb-16	Feb-16
Issue RFP	Jun-16	
Select vendor and award contract	Jul-16	
Preliminary design review ( at Seller’s site or by teleconference at the buyer’s discretion)	Oct-16	
50% design review and document package (at the Seller’s site, or by teleconference, at the buyer’s discretion.)	Nov-16	
Factory acceptance testing at the Seller’s site	Nov-17	
Magnet received	Sep-17	
Commissioning at SNS complete	Nov-17	



**15. Project: ARCS vacuum upgrade**

15.1 Project Lead: L. Jones

15.2 Estimated Total Cost

- N/A

- 15.3 Progress
  - Project is complete
- 15.4 Issues/Concerns
  - None
- 15.5 Milestones

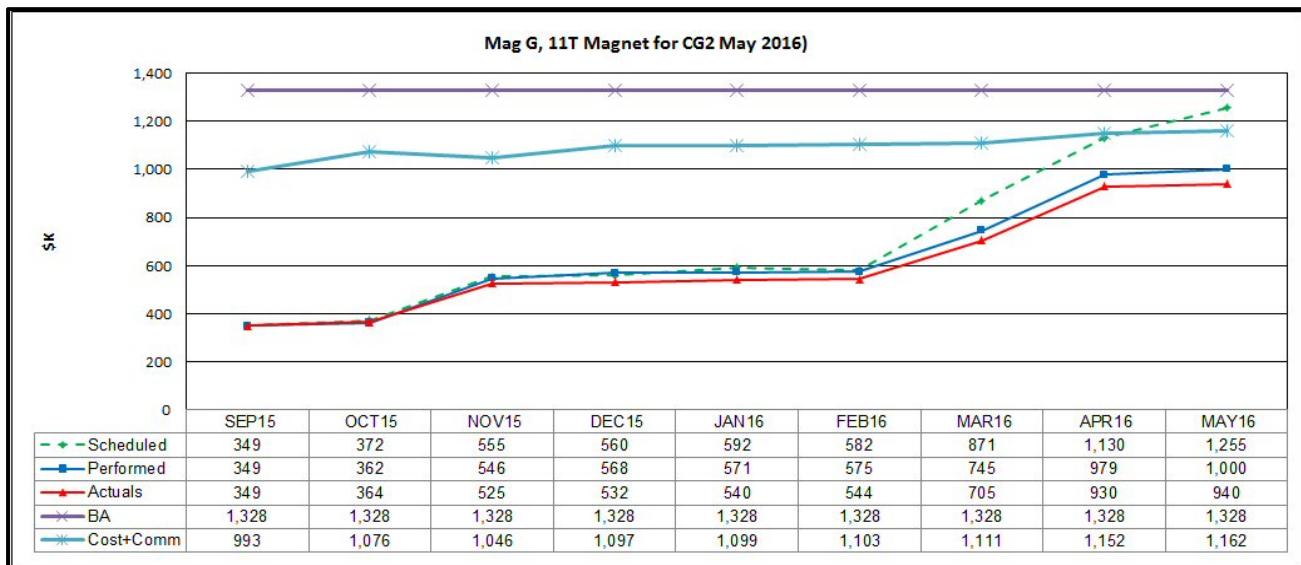
18: ARCS vacuum upgrade	Current planned date	Actual completion date
Install and test upgrade	Feb-16	Feb-16

**16. Project: MagG (11T) for CG2**

- 16.1 Project Lead: D. Armitage
- 16.2 Estimated Total Cost
  - \$1,328K
- 16.3 Progress
  - The magnet was moved to the building 7972 sample environment area where initial setup per the vendor's documentation was performed.
  - Electrical checks and flushing of the pump systems were completed.
  - The magnet was run to 11T per the test plan.
- 16.4 Issues/Concerns
  - The goniometer delivery has been delayed until June 9th. Final installation activities have been rescheduled to accommodate this later delivery.

16.5 Milestones

CG2: MagG (11T)	Current planned date	Actual completion date
Complete acceptance testing at the vendor	Mar-16	Mar-16
Receive magnet	Apr-16	Apr-16
Receive goniometer	Jun-16	
Complete DAS modifications for new goniometer	Jun-16	
Award contract for lifting fixture	Mar-16	Mar-16
Receive lifting fixture	Mar-16	Mar-16
Install goniometer and magnet at beamline	Jun-16	



**17. Project: BioSANS detector expansion**

17.1 Project Lead: V. Urban

17.2 Estimated Total Cost

- \$500K

17.3 Progress

- Installation of all equipment necessary for the new detectors has been completed.
- Commissioning has begun.
- Calibration studies continue.

17.4 Issues/Concerns

- None

17.5 Milestones

CG3: BioSANS detector	Current planned date	Actual completion date
Complete installation of west wing detector upgrade	Jun-16	Jun-16
Complete commissioning of new detectors	Jul-16	

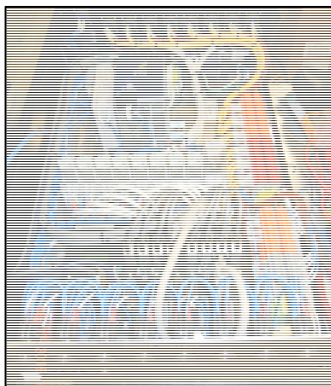
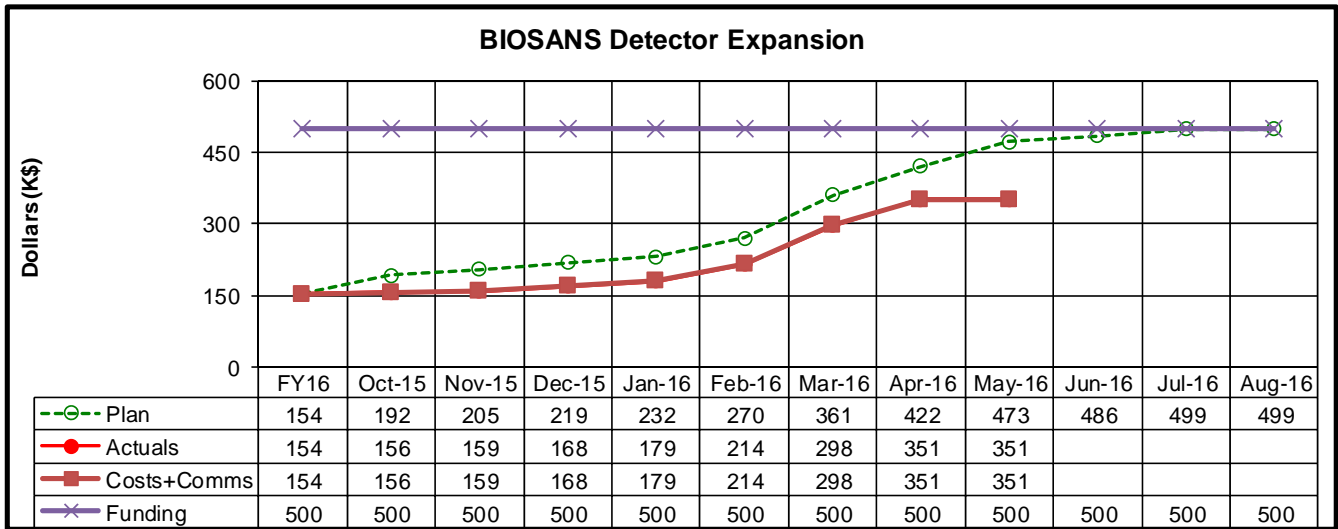


Figure 7: Motion control panel



Figure 8: Detector feedthroughs



Figure 9: Detector prior to installation

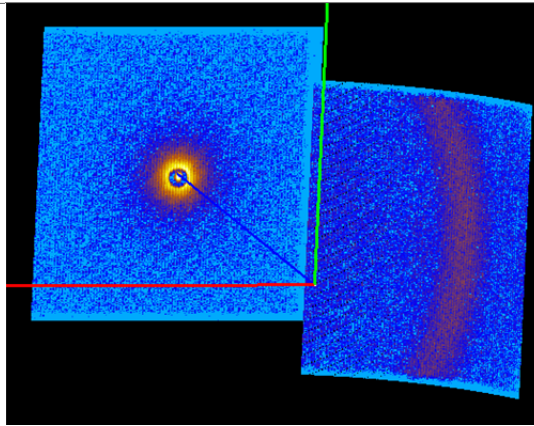


Figure 10: Scattering from C60-fullerenes sample

Scattering ring of  $q \sim 0.78$  previously just beyond BioSANS high- $q$  capabilities

- Now captured by the higher- $q$  wing detector.
- Blue axis denotes the beam path
- Main detector can be observed at its position approximately 1m behind the wing detector (shortest main detector configuration) with the wing detector at its maximum angle of rotation
- The overlap region (or wing shadow) can also be observed at the right edge of the main detector