NSLS-II

J.P. Hill, Director, NSLS-II

UEC Town Hall August 1st 2018

Topics for Discussion

- Safety update
- Accelerator update
- Beamline programs update
- User counts
- Beamline construction update
- Data
- Budget
- Look ahead

NSLS-II Safety Statistics (FY18)

- FY18 Hours Worked: 468,306 hours (YTD as of 6/30/18)
- FY18 Recordable Cases: 1 Rate: 0.43 (12-month rolling rate = 0.60)
- FY18 DART Cases: 1 Rate: 0.43 (12-month rolling rate = 0.30)
- FY18 First Aid Cases: 1
- Last Recordable/Last DART Injury: 10.24.2017/10.24.2017

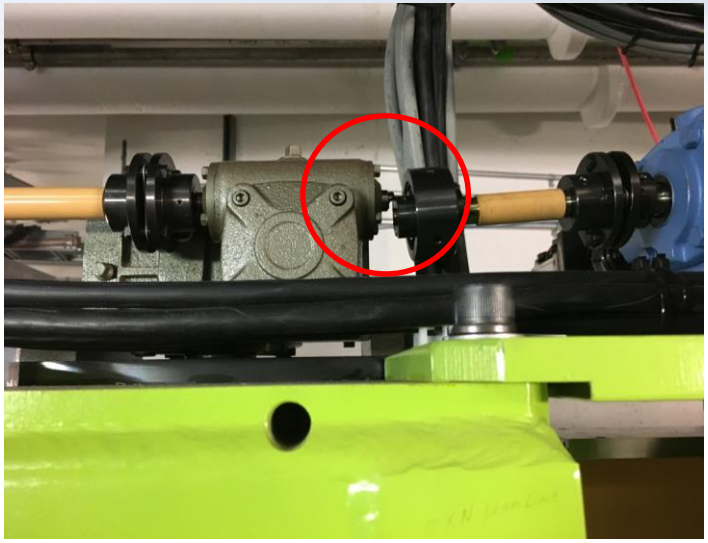
NSLS-II Events FY-to-date: 20 (2 injury and 18 non-injury events)

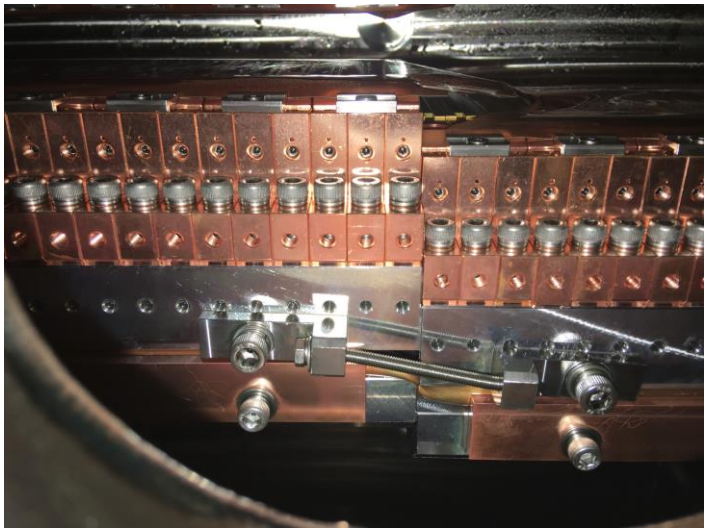
NSLS-II Recent events

- May: During restart of beamline 6-BM a PPS test fixture was found in the user labyrinth. The fixture was discovered when the beamline staff could not secure the hutch.
- June: Vendors were found working in the LOB 1 Receiving Room unescorted and without the requisite ODH-0 training.
- June: An employee complained of heel pain and attributed the pain to the aggravation of a bone spur caused by the extended wearing of safety shoes during the long maintenance period.
- July: Control room staff reported that the Accumulating Charge Monitor Interlock did not trip the Linac gun upon a high charge injection (>16 nC). The Linac ICT disabled further injection. A mis-wired relay was identified as the cause for this malfunction.
- Two occurrences (May, July) of people on the experimental floor without TLDs

HXN IVU Failure

- On midnight of Sunday 7/1/2018 a drive shaft of 3-meter long IVU broke during motion of the ID gap, severing the water pipe inside vacuum, causing a water leak and vacuum intervention
  - Gate valves around IVU closed isolating the straight section. Water leak followed.
  - ID cell-3 removed from the ring on Sunday evening,
  - Spool piece is installed on Monday, baked overnight,
  - Operations restored on Tuesday afternoon.
- IVU Cell 3 is being disassembled in the ID lab. Planning repair / measurements. Install and recommission in December shutdown.
- HXN will resume user operations after the December shutdown. Users have been informed.

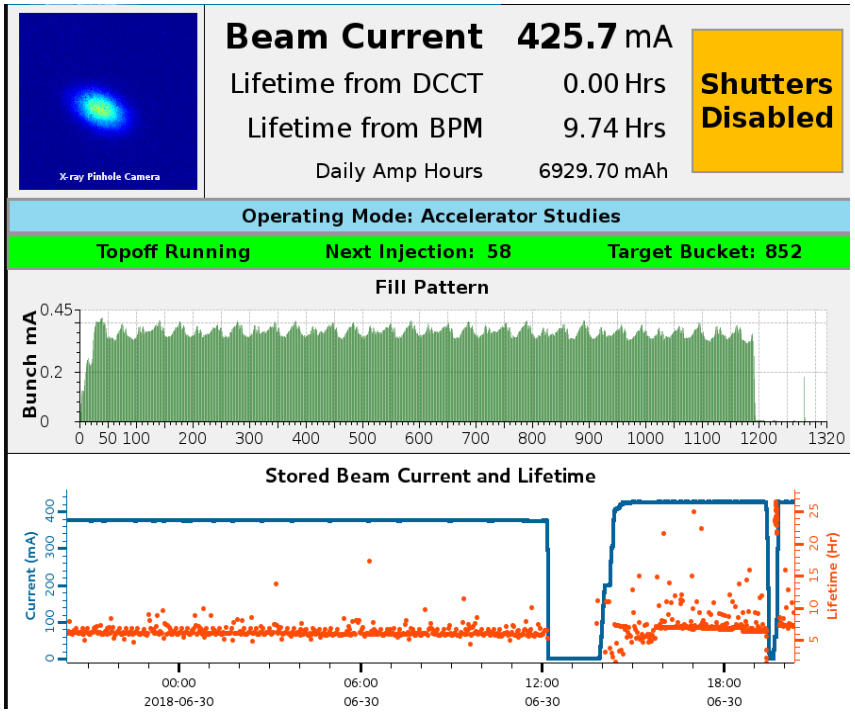




NSLS-II Accelerator Update

- Accelerator continues to run well, delivering user operations at 375 mA top-off
- FY18 reliability as of 7/27/18 is 96.4%
- Successfully conducted high-current studies at 425 mA top-off for ~10 hrs
- Plan to increase current to 400 mA for user ops on August 9th

Stored beam at 425 mA during studies June 30, 2018



Status of 3rd RF System Project

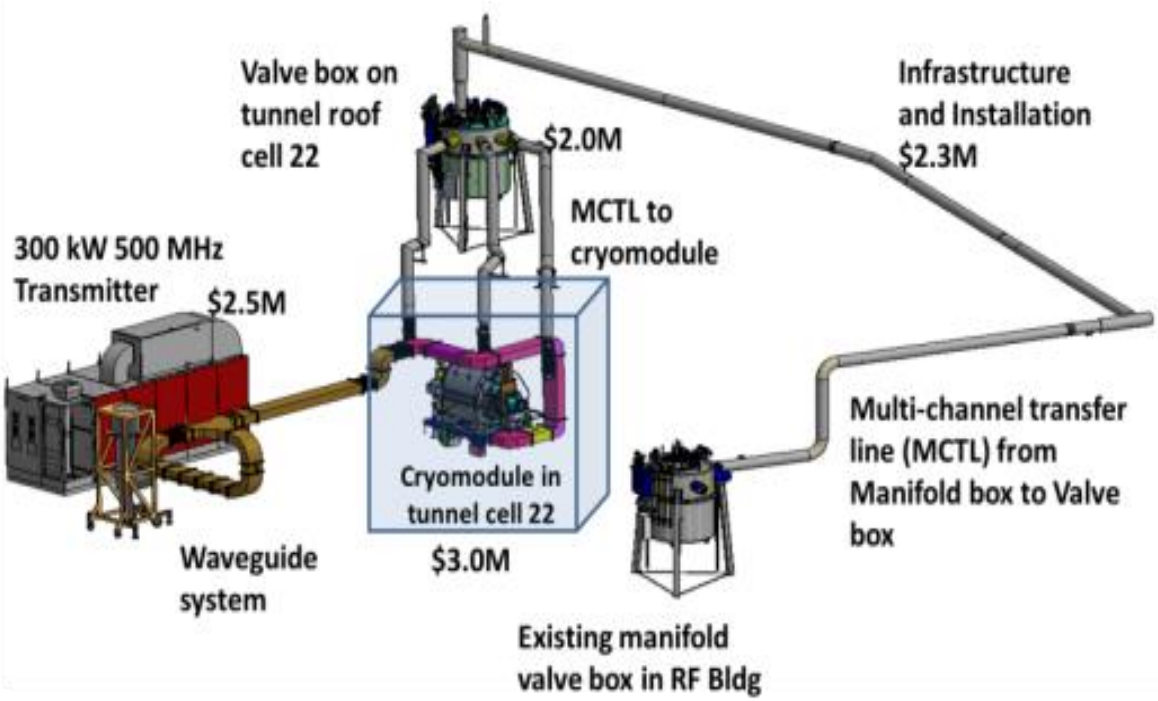
3rd RF system required for 500 mA User ops and for reliability. Goal is to have this in FY20

Cryomodule:

- Being leak checked and tested now. Initial indications are good. **Should be available as a spare in Dec 2018**

Valve box:

- Preliminary design review completed and the report approved.
- Final design review scheduled for August 1st.



Transmitter:

- Decision made to buy solid state amplifiers. Lower noise, cheaper to run, higher reliability

NSLS-II Beamlines Status

General User Operations (18)
CSX, IOS, XPD, HXN, SRX, IXS, CHX, LIX, AMX, FMX, ISS, XFP, CMS, ISR, TES, SMI, ESM, BMM

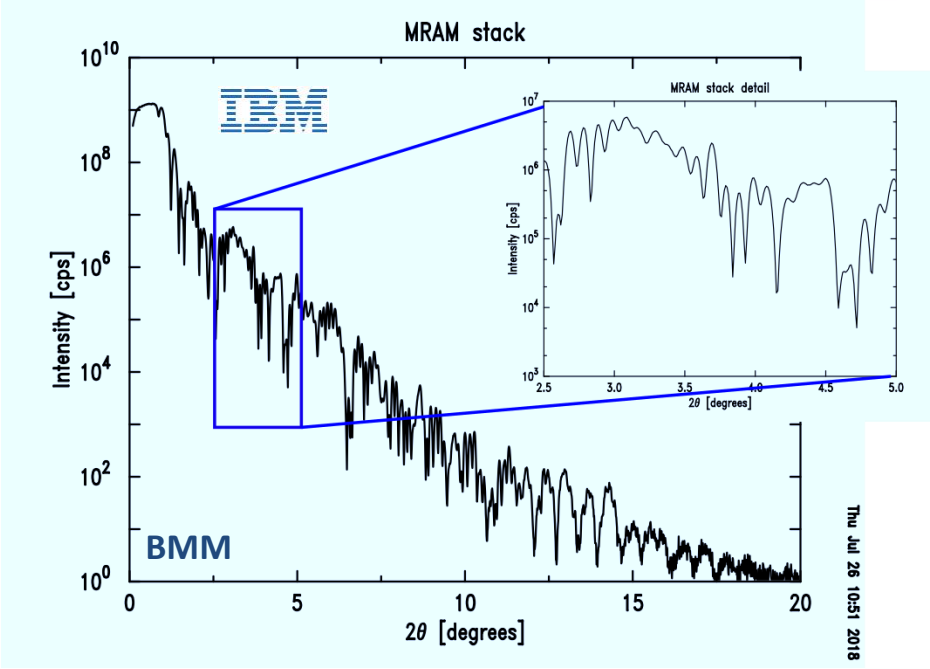
Science Commissioning (5)
QAS, XFM, FXI, PDF, SIX

Technical Commissioning (3)
NYX, SST-1, SST-2

Completion* in FY19 (2)
FIS, MET

* Defined as having completed IRR

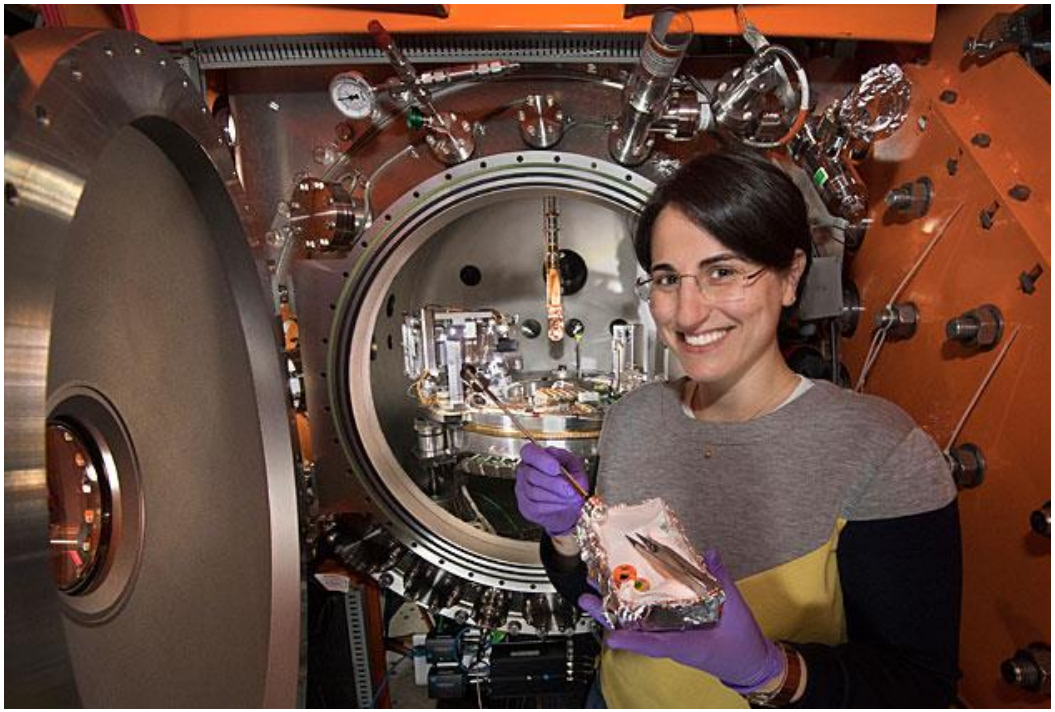
26 beamlines operating/commissioning
– 18 beamlines in GU ops, 5 in SC
28 beamlines operating by end CY18



Jean Jordan-Sweet (IBM): 1st results from the XRD endstation at BMM, as part of partnership with IBM through NIST

Reflectivity measurements on a magneto-resistive random access memory (MRAM) with hundreds of thin-film layers

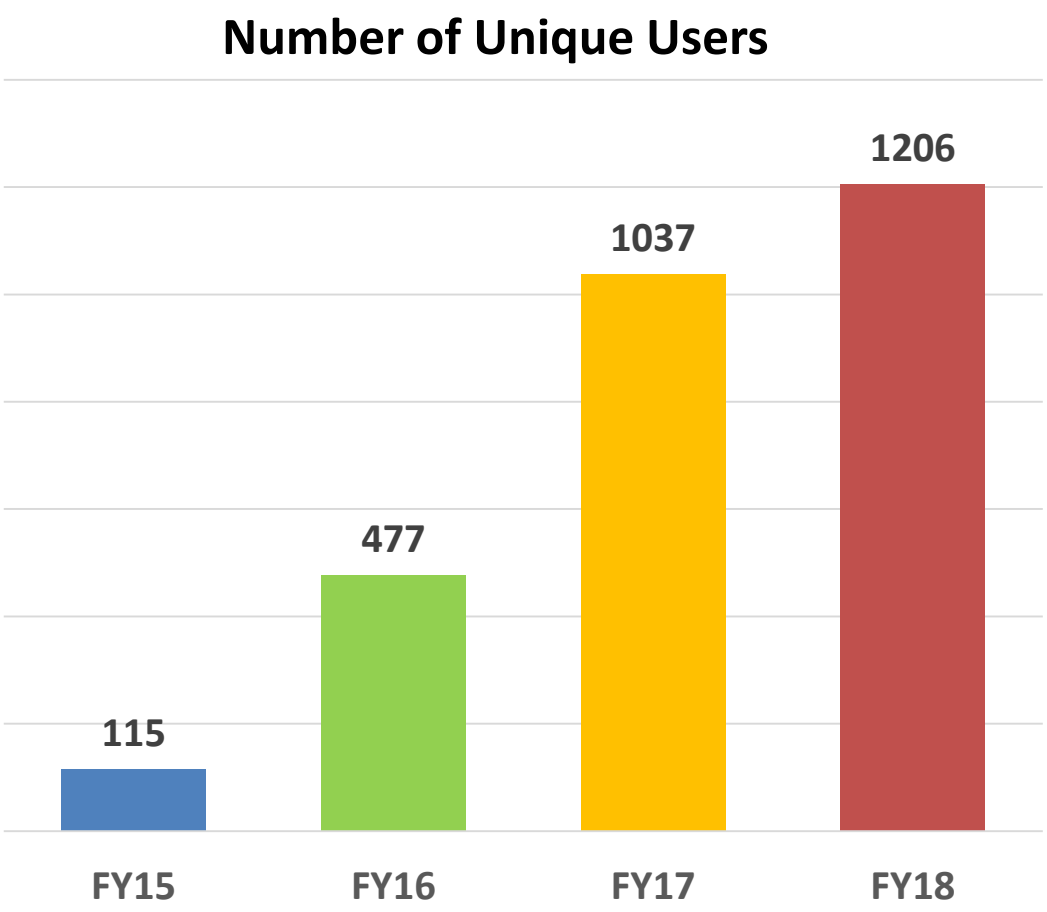
Valentina Bisogni wins Early Career Award



SIX update: First science commissioning expts in July

"Revealing collective spin dynamics under device operating conditions to enhance tomorrow's electronics"

NSLS-II Facility Users (as of 7/20/18)



FY15
- unique users: **115**
- 100% were first-time users

FY16:
- unique users: **477**
- 83% were first-time users

FY17
- unique users: **1037**
- 66% were first-time users

FY18 (*as of 20-Jul-2018)*
- unique users: **1206**
- 54% were first-time users
- On track to exceed FY18 goal of 1300 users

NSLS-II IRR Schedule – FY2017 - 2018

- October 18, 2016: SMI (12-ID) Photon Delivery System (PDS)- Complete
- October 18, 2016: SIX (2-ID) Frontend and Insertion Device - Complete
- November 3, 2016: SMI PPS/EPS verification of completion - Complete
- November 8 – 9, 2016: NYX (19-ID) FE/ID and PDS - Complete
- November 8 – 9,2016: SIX PDS (preliminary review) - Complete
- January 18, 2017: SIX PDS – Complete
- February 15, 2017: SIX PDS Follow-up Review – Complete
- June 1, 2017: ESM (21-ID) EPU105, BMM (6-BM) FE/ID - Complete
- July 19-20, 2017: BMM (6-BM) PDS, DRD (22-BM) FE/ID - Complete
- September 11, 2017: XFM (4-BM) FE/ID and PDS - Complete
- September 11, 2017: QAS (7-BM) FE/ID and PDS - Complete
- October 18 & 25, 2017: FXI (18-ID) FE/ID and PDS - Complete
- November 8, 2017: SST (7-ID) FE/ID - Complete
- February 7 & 8, 2018: SST 1 and 2 (7-ID-1, 7-ID-2) PDS - Complete
- March 15, 2018: PDF (28-ID-1) PDS - Complete
- October 2018: FIS/MET (22-BM) Source, FE and PDS [October 16, 2018]

Beamlines Developed by NSLS-II

FIS/MET

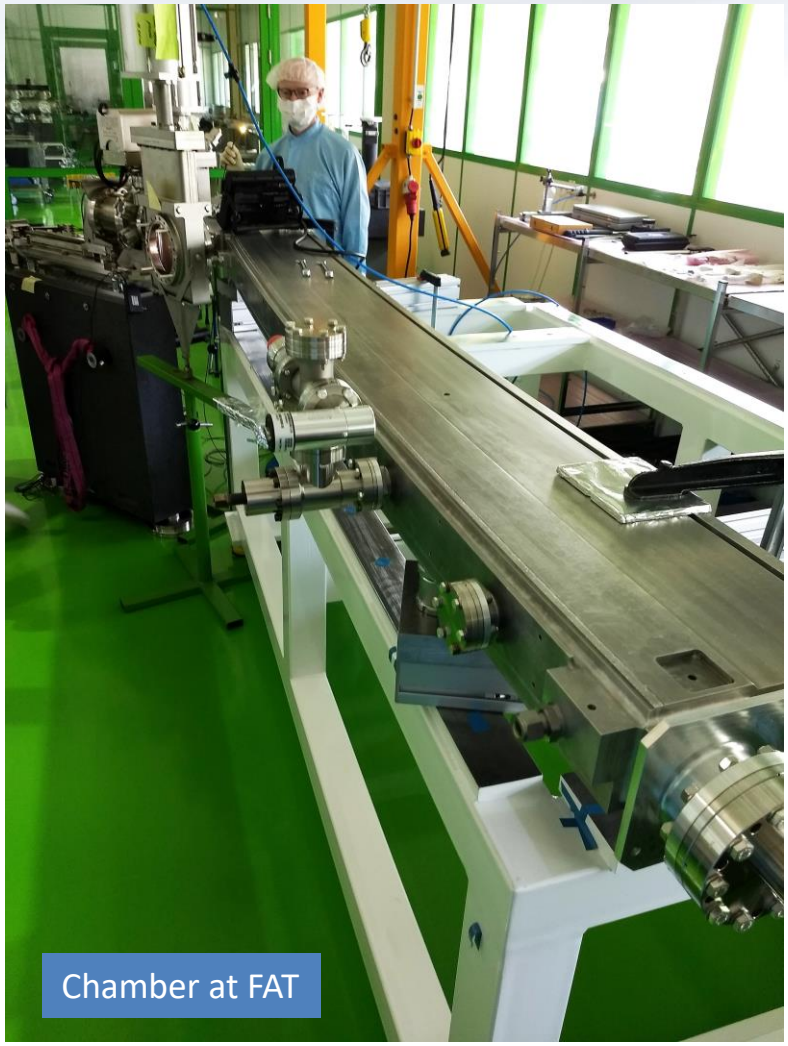
- IR extraction chamber
  - Chamber due at BNL today
- Installation during summer shutdown
- IRR will be in October 2018

B-CDI (Bragg - Coherent Diffraction Imaging

- Conceptual design development (pre-baseline) continues
  - Significant effort into analysis and specification of stability requirements
- CDR early November
  - Intended to determine preferred optical configuration and possible need for a satellite building

J-PLS (Jumpstart Processing and Liquid Scattering)

- Procurement of support granites and rails under way
- FDR for JPLS is scheduled for July 31st


Chamber at FAT

Partner Beamline - HEX

- Attempting to accelerate schedule by 6 months. NYSERDA reviewing it now.
- Superconducting wiggler Spec/SOW complete and provided to potential bidders for review and comment.
  - Several companies have now expressed an intention to bid.
  - Procure / Make decision report almost complete
- Front End design review planned for September 2018.
- Work proceeding on the FDR report (FDR Milestone May 2019, may move to March 2019).
- Review of the 90% design for the satellite building was held on 11th June. Design now being finalized.
- Next milestones:
  - #3: “SCW Procure/Make Decision” (Go/no-go decision 2) August 2018.
  - #4: “Front End Design Review” October 2018.

- Project on schedule and looking to accelerate

Response to BES Data Questionnaire

- In 1-3 years, NSLS-II will generate 10's of PB/yr, have peak computing needs of 10-100 of PFlops and require bandwidths offsite of 400 Gb/s. In 5-10 years these will all be 10x higher
- Highest priority needs for NSLS-II:
  - Build-out of computational and data storage resources that are sufficient to meet the facility requirements. These resources could be situated at the NSLS-II and/or elsewhere
  - Seamless access of user data and analysis resources for post-experiment data analysis
  - Advanced experimental steering and feedback
  - On-demand access to computing facilities for real-time data analysis
  - Data management workflows that span across beamlines and facilities (both user and computing)
- Working in close coordination with other BNL and BES facilities to meet our needs

Controls Issues at NSLS-II

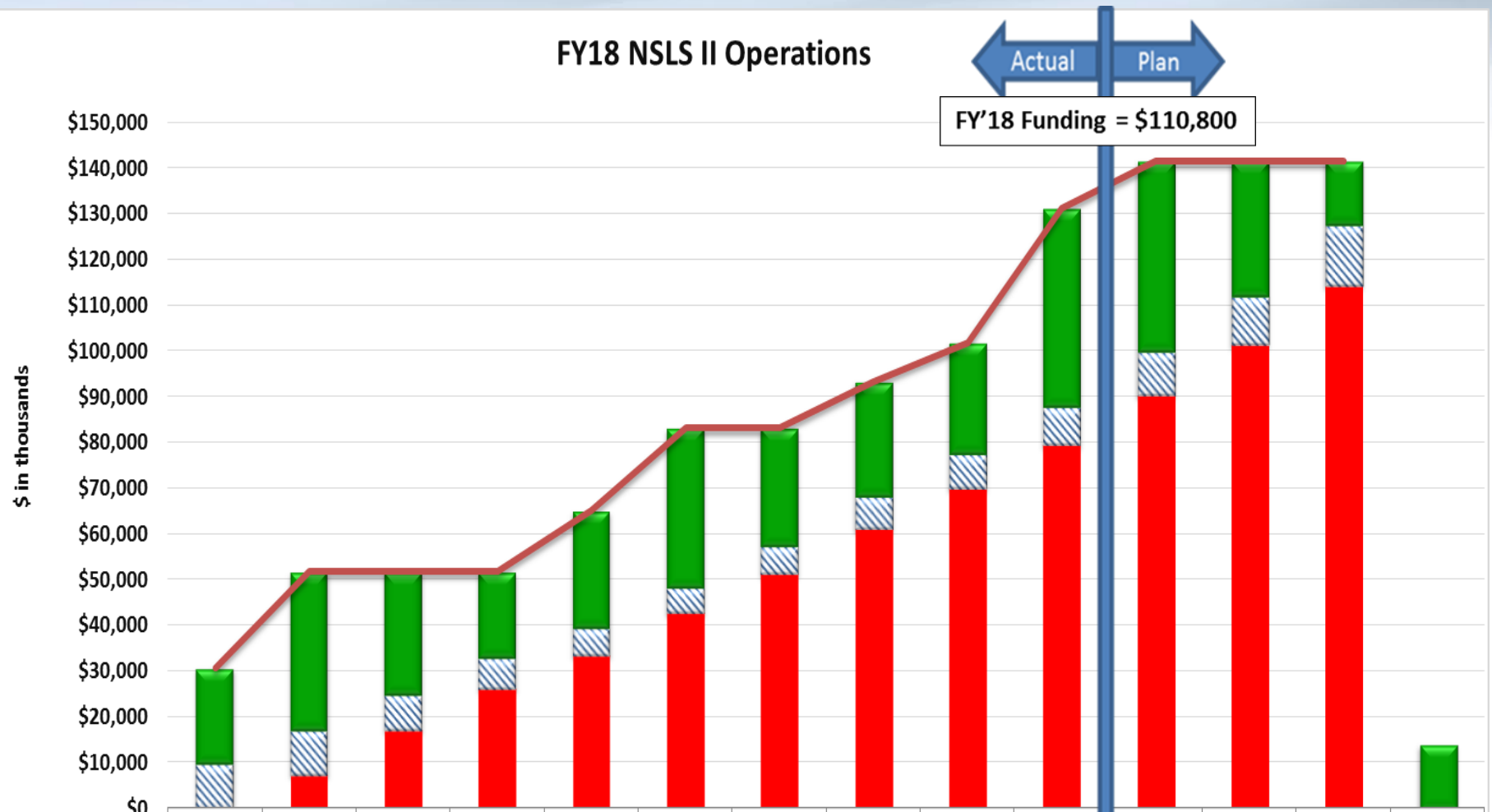
We are aware we have significant issues with the control system at NSLS-II, particularly related to the transfer and storage of beamline data.

- The system is not as robust or as smooth as it needs to be and in extreme cases it has prevented data being taken or analyzed.
- We recognize that this is not an acceptable situation.
- Root causes may be related to the network itself and/or to GPFS tuning.

Immediate actions:

1) Controls action plan (derived from external reviews, SAC advice and internal brainstorming) underway and being tracked
2) Controls communications (internal and external) improving (e.g. town hall, program meetings, newsletter)
3) Adding SSD “front layer” to the local GPFS, should be much faster
4) ITD performing an assessment of our network. Management will use the review to decide how best to support the network going forward
5) External GPFS contractor to be hired to consult on GPFS implementation
6) Tracking system in place and formalized. Tickets are tracked to completion.
7) Reorganization of “common systems” function within the controls program
8) BL Program “Point of contact” system in place and maturing. First port of call for beamline controls issues.

NSLS II Operations FY2018 Budget Planning & Spending (k$)



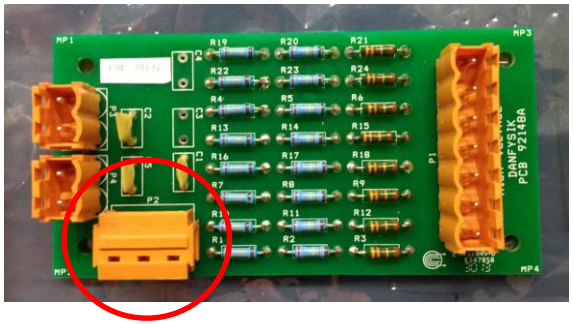
	FY18	October	November	December	January	February	March	April	May	June	July	August	Sept.	FY18
Unencumbered	$20,893	$34,651	$26,926	$18,907	$25,652	$34,962	$25,868	$25,182	$24,523	$43,544	$41,753	$29,807	$14,000	$14,000
Encumbrances	$9,774	$9,837	$7,840	$6,804	$5,957	$5,555	$6,122	$7,199	$7,473	$8,350	$9,500	$10,500	$13,333	
Expenditures		$7,271	$16,993	$26,049	$33,395	$42,575	$51,102	$60,925	$69,825	$79,230	$90,214	$101,160	$114,135	
BA Planned	$30,667	$51,759	$51,759	$51,759	$65,004	$83,092	$83,092	$93,306	$101,821	$131,124	$141,467	$141,467	$141,467	

Summary

- Accelerator running extremely well, despite two major events.
- Beamline development on schedule to complete 28 by end of CY18
- User program continues to grow rapidly
- Controls issues being taken seriously
- FY19 budget uncertain. House and Senate marks look OK for us, and Senate requests a plan for more beamlines. However a shutdown is also threatened. Contingency in place
- NSLS-II SAC meeting, September 20-21, 2018
- SAC Triennial Review of NSLS-II beamlines HXN, CXS, IOS, and XPD, September 19-20, 2018

Event on 7/11/2018: Issue with Booster Dipole Power Supply

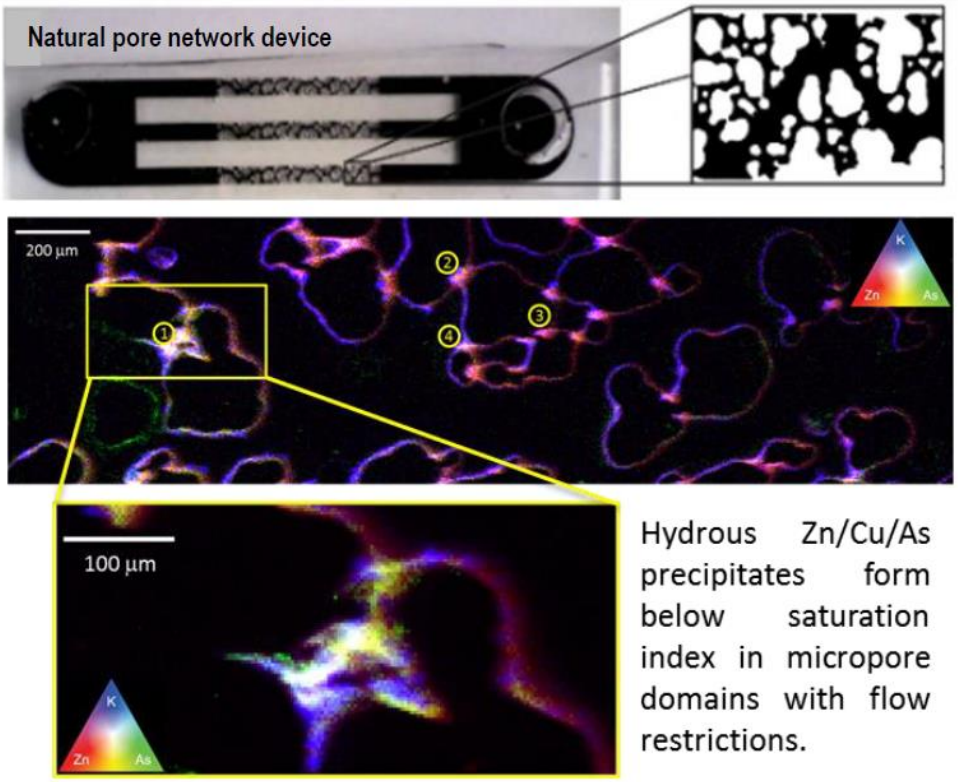
- There are 3 high-power (900 A / 450 V) dipole PS in the booster procured from Danfysik
- The failure with BD1 was identified when the power supply was being turned on after the 2-day maintenance period on 7/11/2018.
  - Manifested itself in audible noise with output voltage oscillating 200 V at 600 Hz
  - Work planning was completed the same evening and investigation / debugging commenced
  - High power system: electrical hazards. Careful planning, barriers, documentation were put in place
  - We contacted Danfysik immediately; some help via teleconferences daily
- 7/13/2018: able to localize the problem to connector on one of the scaling cards: oxidation of contacts
  - Reconditioned the card and restarted operations on Friday evening
- Investigation report is available
  - Will augment maintenance procedures
  - Author of the DPSs from Danfysik is being scheduled for site visit for consultations and preparing needed documentation
  - Project on installing a separate diagnostic monitoring system is pending funding



XFM Beamline (4-BM): *In situ* Microfluidics

Science commissioning – Leslie Shor (U. Conn)

- Science commissioning example at XFM: biomimic microengineering for next generation biomanufacturing
- Leslie Shor group (U Conn): Microfluidic devices with pore networks for testing hypotheses relating to natural phenomenon such as micro-scale redox zonation, microbe-mineral interactions, contaminant transformations, etc.



Hydrous Zn/Cu/As precipitates form below saturation index in micropore domains with flow restrictions.