

# NSLS-II Update

*J.P. Hill, Director, NSLS-II*

*UEC Town Hall meeting December 9<sup>th</sup> 2016*



# Outline

- Electrical shock at NSLS-II
- Accelerator operations
- Beamline construction
- Beamline operations
- User program
- Taskforces
- Budget and FY17 activities



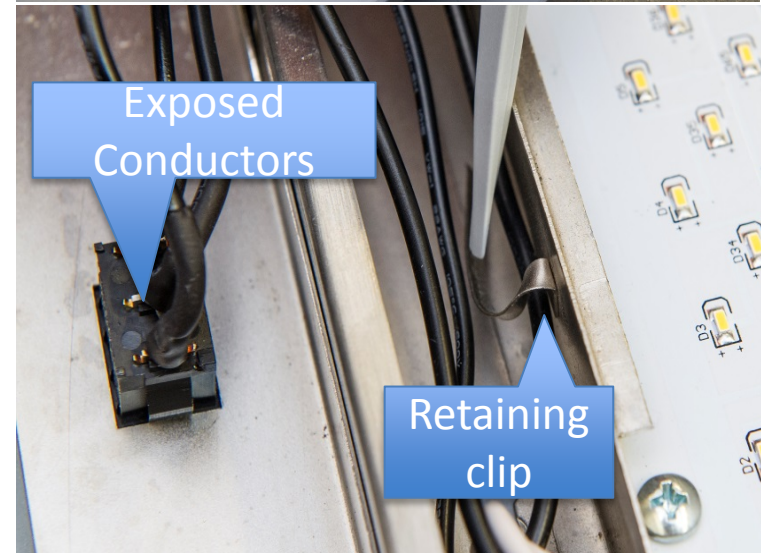
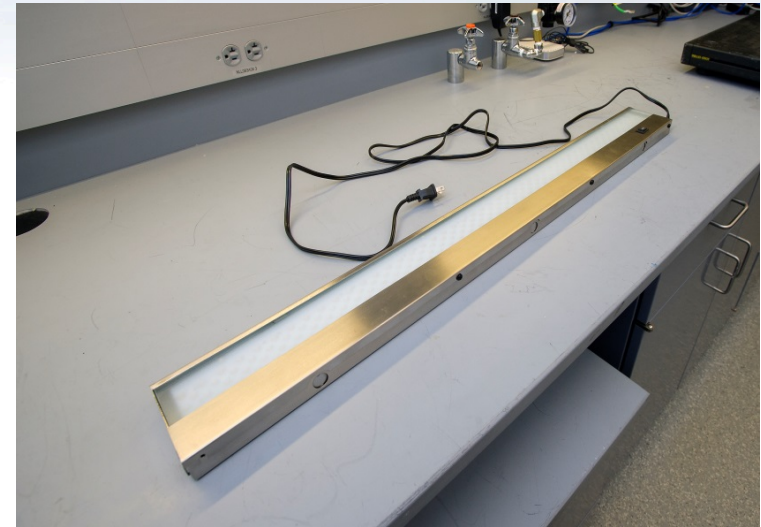
# Employee Receives Electric Shock 9/27/16

**Description:** An employee received a shock when simultaneously touching a portable work station shelf and an under-cabinet light fixture. Investigation showed exposed conductors on the backside of the light switch and a metal retaining clip. Contact between the retaining clip and the exposed wires energized the housing. Three identical lights were identified in nearby labs and removed.

**Cause(s):** Root cause: Poor fixture design. Although the fixture is NRTL (ETL) listed, the fixture is undergoing re-evaluation by Intertek. Results pending

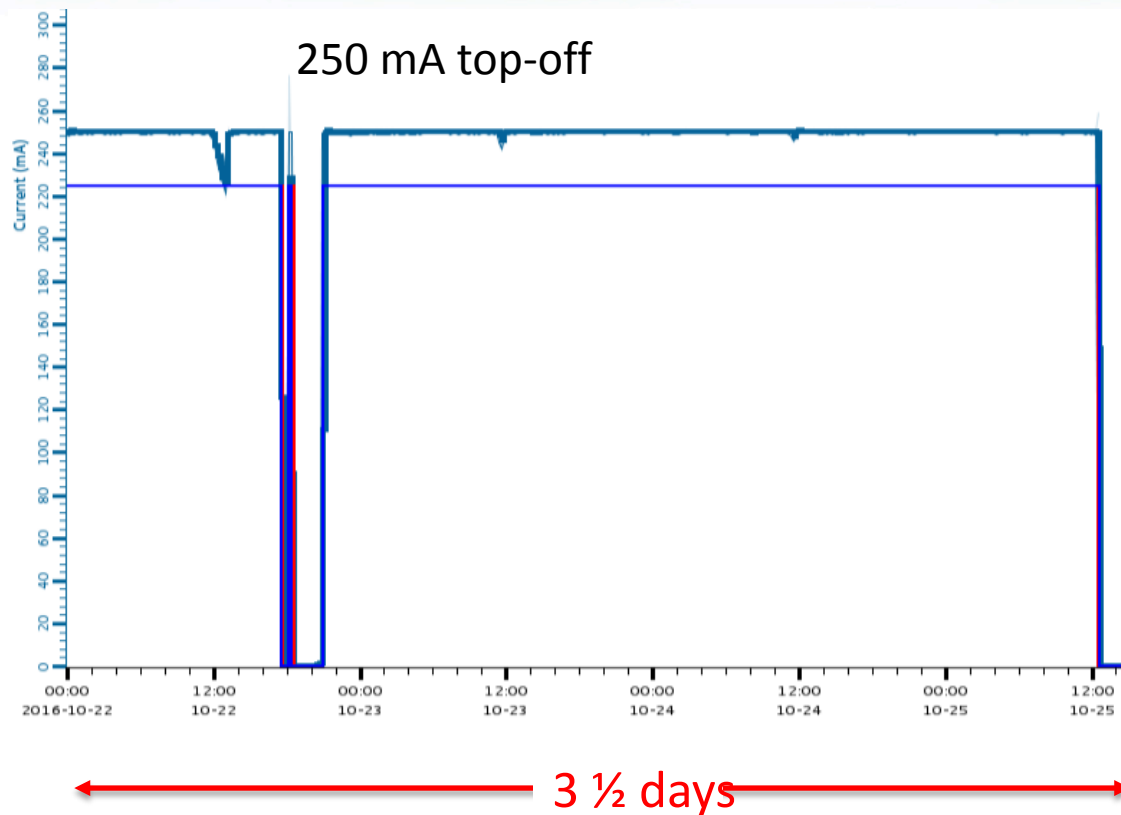
## Action items for you:

- Inspect areas lab-wide for similar lights (16 found and removed from service)
- Look out for indicators of poor design (e.g. two wire conductor and metal housing).



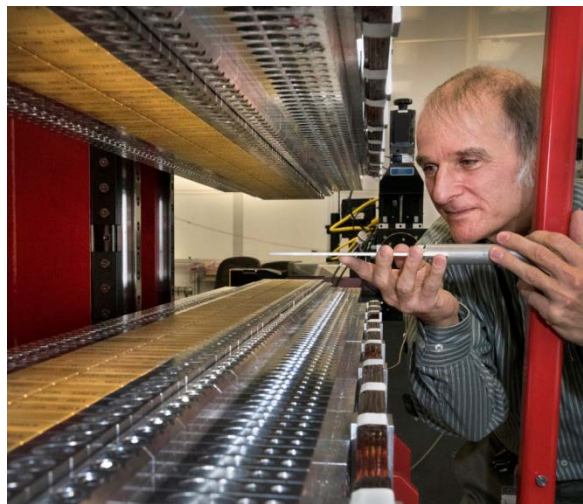
# NSLS-II Accelerator Operations

- Accelerator continued to run well with stable ops of the RF cavities
- Encountered low-lifetime issues – under investigation
- Continue 250 mA top-off ops while monitoring reliability
- Goal is to be > 300 mA by end of FY
- 95.9% reliability for 2016-3.
- Goal for FY17 is > 95 %

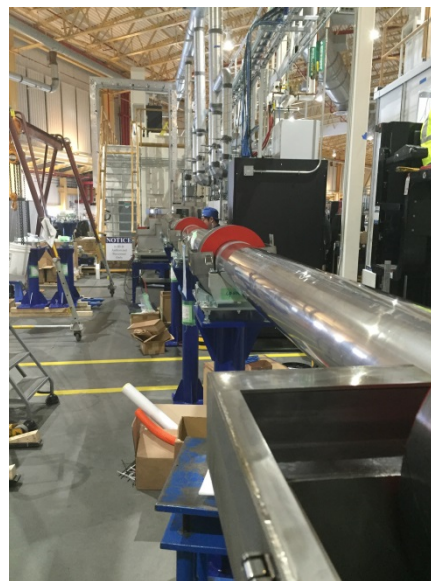


# NSLS-II Beamline Construction

- ABBIX: Project essentially complete. 3 beamlines taking users.
- NEXT: 5 beamlines. 4 have taken first light. Early project completion is Jan 2017
- Partners: 5 beamlines: XFP taking users, NYX in commissioning.
- BDN: 8 beamlines: CMS, TES in commissioning,
- HEX: pre-conceptual design advancing. Waiting for money.



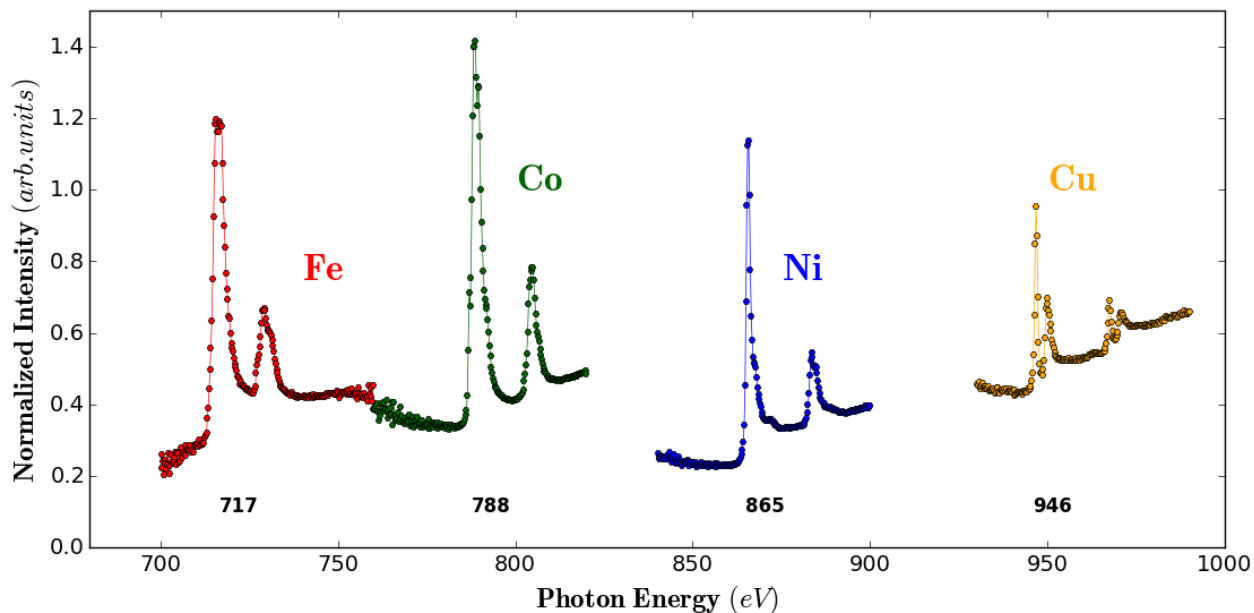
ESM undulator



ISS Photon  
Delivery System

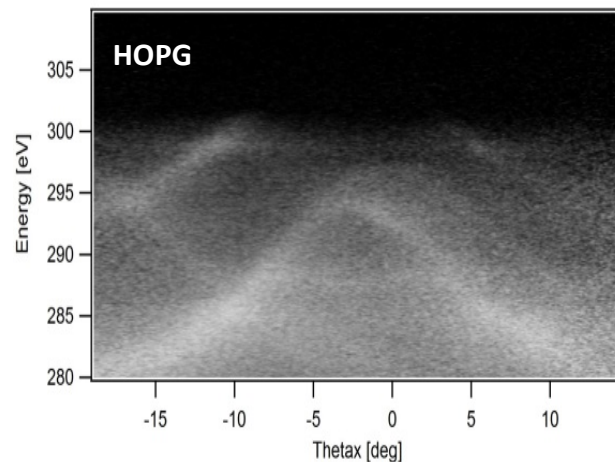
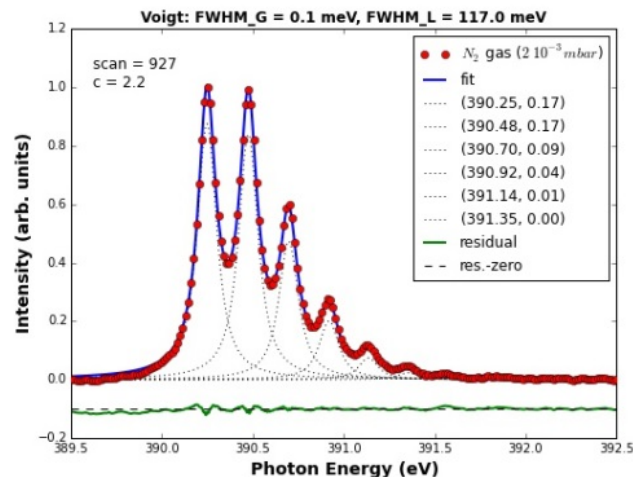
# Electron Spectro-Microscopy (ESM)

- Commissioning going well.
- First users in end of 2017-1



**XAS L-edges**

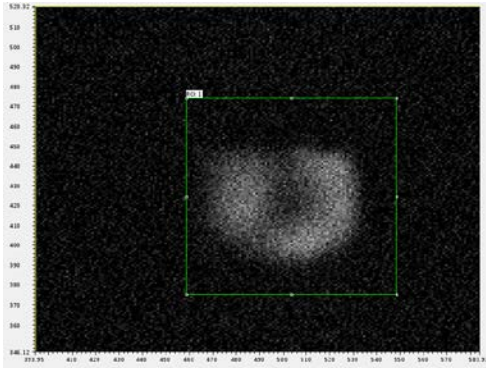
**N<sub>2</sub> – gas: resolution < 30 meV @ 400 eV**



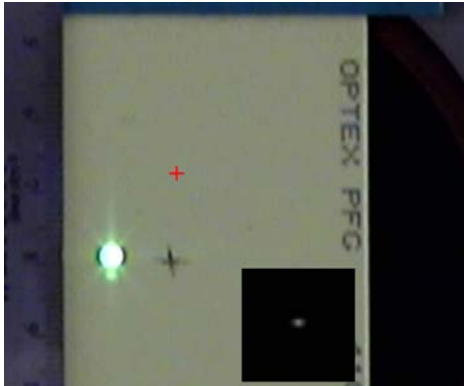
**Room Temperature ARPES @ 300 eV**



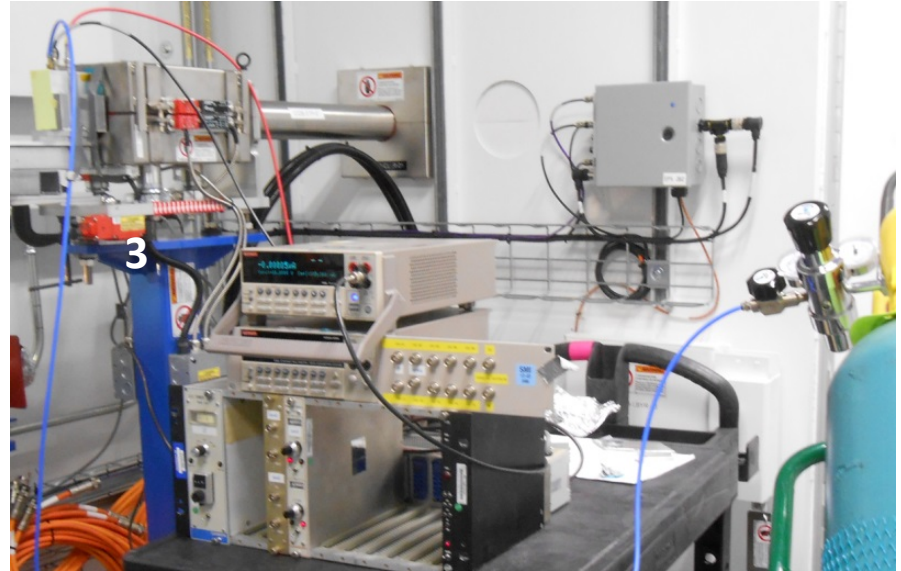
# SMI First Light: $1 \times 10^{12}$ ph/s @ 250mA



Mono beam, 16keV (15th IVU harmonic).



Beam after FOE mirrors, in B endstation:



Measure 6.8 mA in ion chamber  
-> Key Performance Parameter  
achieved!

12/3/16 – last weekend of beam!

# NEXT Key Performance Parameters

Performance Measure	Threshold KPP	Objective KPP
Number of beamlines designed	6	6
Number of beamlines installed and ready for commissioning with x-ray beam	5	6
Number of photon delivery system branches installed and accepted* by NSLS-II facility operations	5	6
Number of endstations installed and accepted** by NSLS-II facility operations	5	7
Synchrotron flux value measured at an endstation position of ESM	$10^{10}$ photons/s	$10^{11}$ photons/s
Synchrotron flux value measured at an endstation position of ISR	$2 \times 10^{11}$ photons/s	$2 \times 10^{12}$ photons/s
Synchrotron flux value measured at an endstation position of ISS	$2 \times 10^{12}$ photons/s	$2 \times 10^{13}$ photons/s
Synchrotron flux value measured at an endstation position of SIX Jan-17	$1.5 \times 10^{10}$ photons/s	$1.5 \times 10^{11}$ photons/s
Synchrotron flux value measured at an endstation position of SMI Dec-16	$10^{12}$ photons/s	$10^{13}$ photons/s
On-axis spectral angular intensity capability at 1 keV for a delivered EPU insertion device (photons/sec/0.1% bw/mrad <sup>2</sup> )	$2 \times 10^{17}$	$8 \times 10^{17}$

\* Scope complete, IRR completed successfully, KPP measurements achieve threshold value or greater

\*\* Scope complete, Experimental Safety Review completed successfully

KPP achieved



# Beamline Buildout

Port: Instrument	FY Cycle	2014			2015			2016			2017			2018			2019		
		13-3	14-1	14-2	14-3	15-1	15-2	15-3	16-1	16-2	16-3	17-1	17-2	17-3	18-1	18-2	18-3	19-1	19-2
23-ID-1: Coherent Soft X-ray Scat					●														
23-ID-2:Coherent Soft X-ray Spectr & Pol					●														
10-ID: Inelastic X-ray Scattering					●														
11-ID: Coherent Hard X-ray Scattering					●														
28-ID-2: X-ray Powder Diffraction					●														
3-ID: Hard X-ray Nanoprobe					●														
5-ID: Sub-micron Res X-ray Spec					●														
16-ID: X-ray Scattering for Biology								●											
8-ID: Inner Shell Spectroscopy									●										
17-ID-1: Frontier Macromolecular Cryst									●										
17-ID-2: Flexible Access Macromolecular Cryst									●										
21-ID: Photoemission-Microscopy Facility										●									
11-BM: Complex Materials Scattering										●									
4-ID: In-Situ & Resonant X-Ray Studies										●									
8-BM: Tender X-ray Absorption Spectroscopy										●									
17-BM: X-ray Footprinting										●									
12-ID: Soft Matter Interfaces											●								
2-ID: Soft Inelastic X-ray Scattering												●							
19-ID: Microdiffraction Beamline												●							
6-BM: Beamline for Mater. Measurements													●						
7-BM: Quick X-ray Absorption and Scattering													●						
4-BM: X-ray Fluorescence Microscopy													●						
7-ID-1: Spectroscopy Soft and Tender														●					
7-ID-2: Spectroscopy Soft and Tender														●					
28-ID-1: Pair Distribution Function Diffraction														●					
18-ID: Full-field X-ray Imaging														●					
22-BM-1: Frontier Synchrotron Infrared Spectroscopy																●			
22-BM-2: MET*																●			

# FY17 IRR Schedule

Beamline IRR	IRR Scheduled Date	Expected First Light
SIX (ID/FE)	October 18, 2016 – complete	—
SMI (PDS/PPS)	Oct 18 & Nov 3, 2016 – complete	Nov 7, 2016 – actual
NYX (ID/FE, PDS)	November 8-9, 2016 – complete	Nov 26, 2016 – actual
SIX (PDS/PPS)	Nov 8-9, 2016 & Jan 10, 2017	January 2017
BMM (ID/FE, PDS)	May 2017	June 2017
XFM (ID/FE, PDS)	August 8-9, 2017	September 2017
QAS (ID/FE, PDS)	August 8-9, 2017	September 2017
SST1&2 (ID/FE, PDS)	September 2017	October 2017
PDF (PDS)	September 25-26, 2017	October 2017
FXI (ID/FE, PDS)	September 25-26, 2017	October 2017

# Beamlines Operations

## General User Operations

CSX-1, CSX-2, XPD, HXN, SRX, IXS, CHX,  
LiX

LiX Approved for General User  
Operations, October 29, 2016

## Science Commissioning

AMX, FMX, ISS, XFP, TES,

## Technical Commissioning

CMS, ESM, ISR, SMI, NYX

## Completion\* in FY17

SIX, BMM, SST-1, SST-2

## Completion\* in FY18

XPD-2, QAS, XFM, FXI, FIS, MET

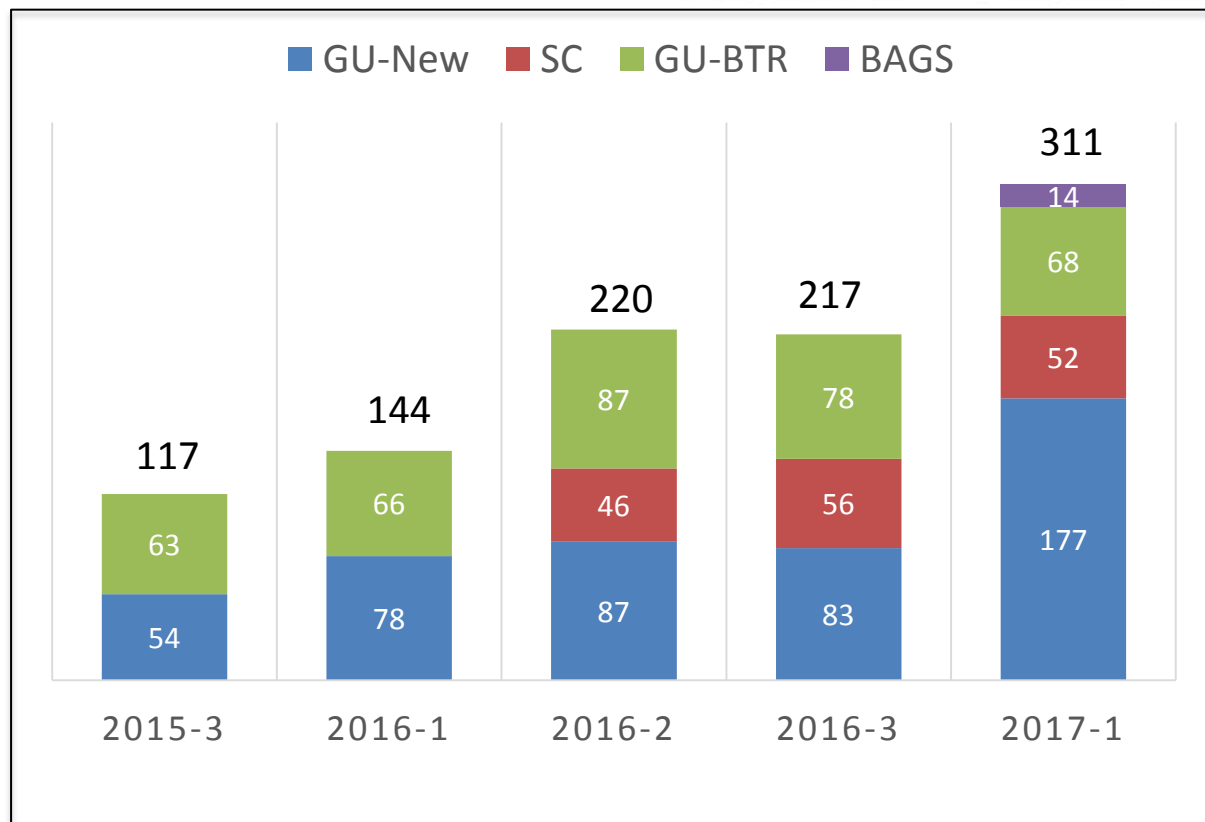
18 beamlines in operations/commissioning



\* Completion defined as having completed IRR



# Beam Time Proposals



- Proposals continue to increase every cycle.
- Dramatic increase in new General User proposals in 2017-1.
- 14 BAG proposals submitted in 2017-1.

*BTR: Beam Time Request (against existing proposal)*

*GU = General User*

*SC = Science Commissioning*

*BAGs = Block Allocation Groups*

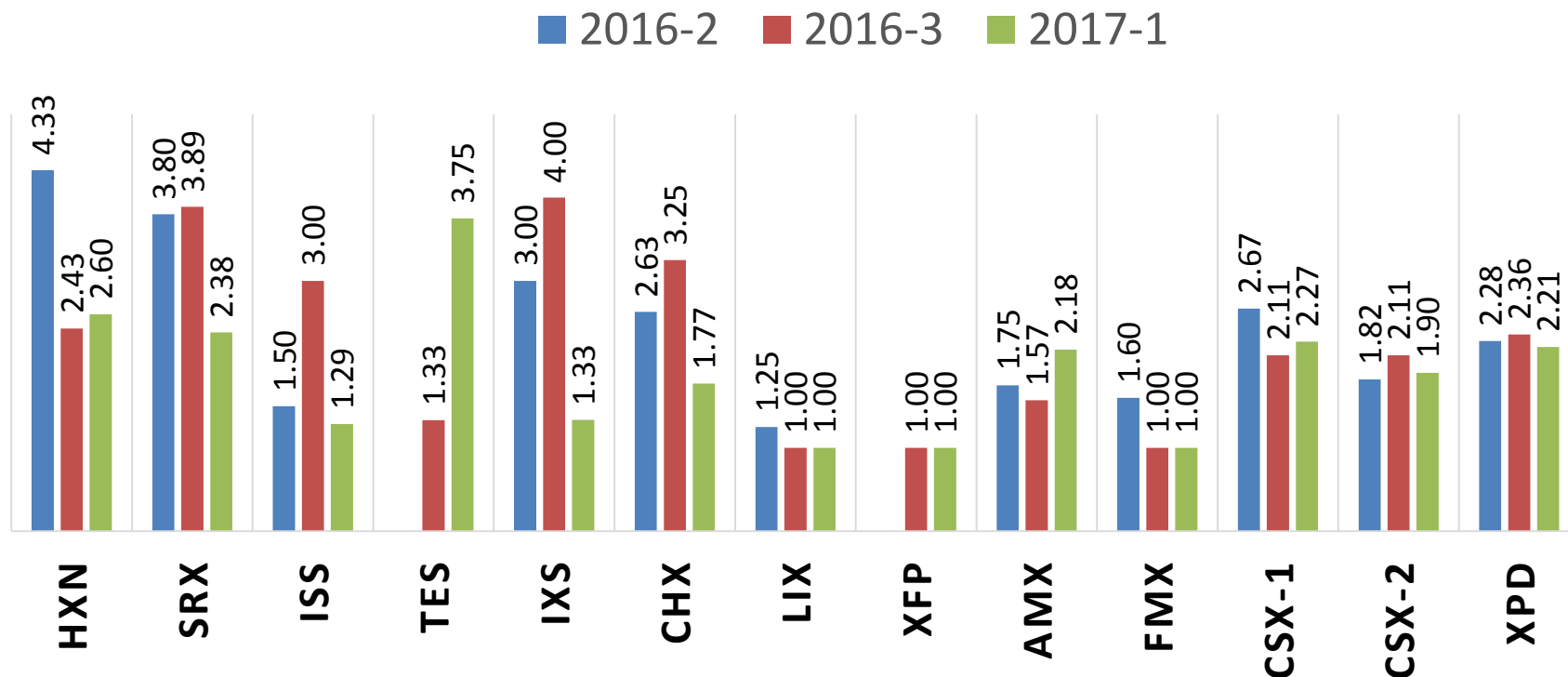
*2016-1: Jan-Apr 2016*

*2016-2: May-Aug 2016*

*2016-3: Sept-Dec 2016*

*2017-1: Jan-Apr 2017*

# Subscription Rates

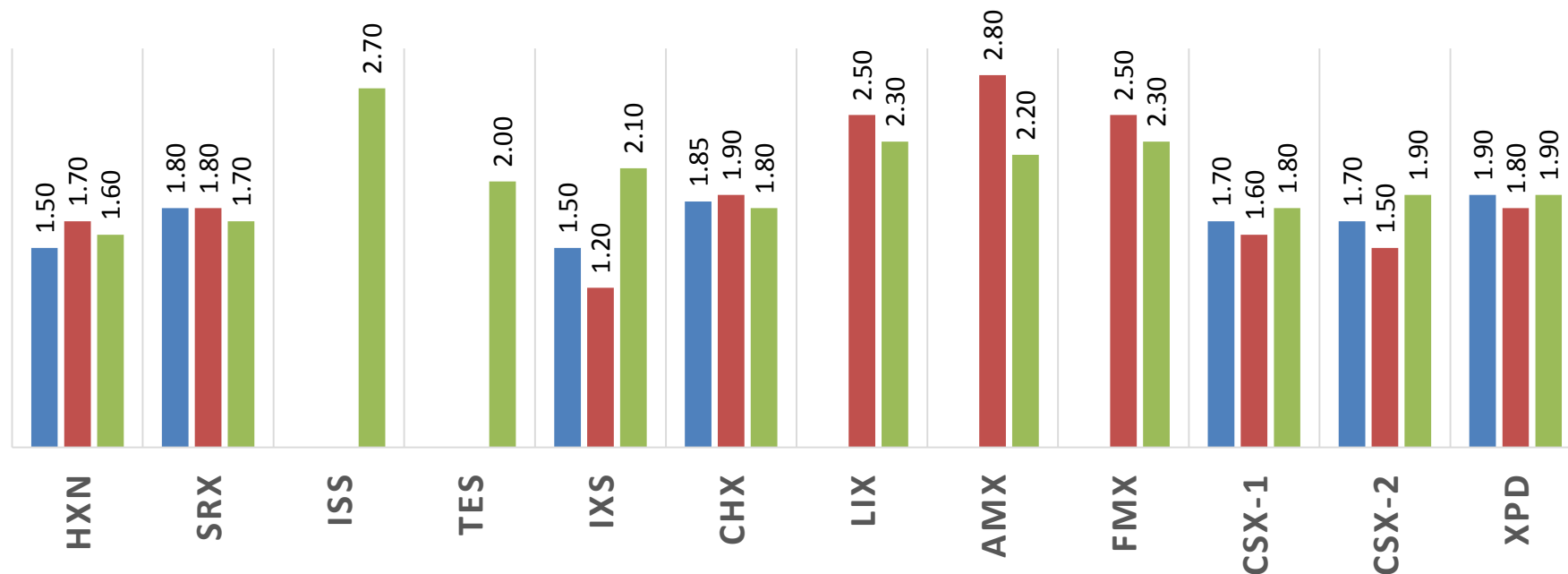


proposals submitted / proposals allocated

2016-2: May-Aug 2016  
 2016-3: Sept-Dec 2016  
 2017-1: Jan-Apr 2017

# Proposal Cutoff Scores

■ 2016-2 ■ 2016-3 ■ 2017-1



Posted online at: <https://www.bnl.gov/ps/access/scoring.php>

2016-2: May-Aug 2016  
 2016-3: Sept-Dec 2016  
 2017-1: Jan-Apr 2017



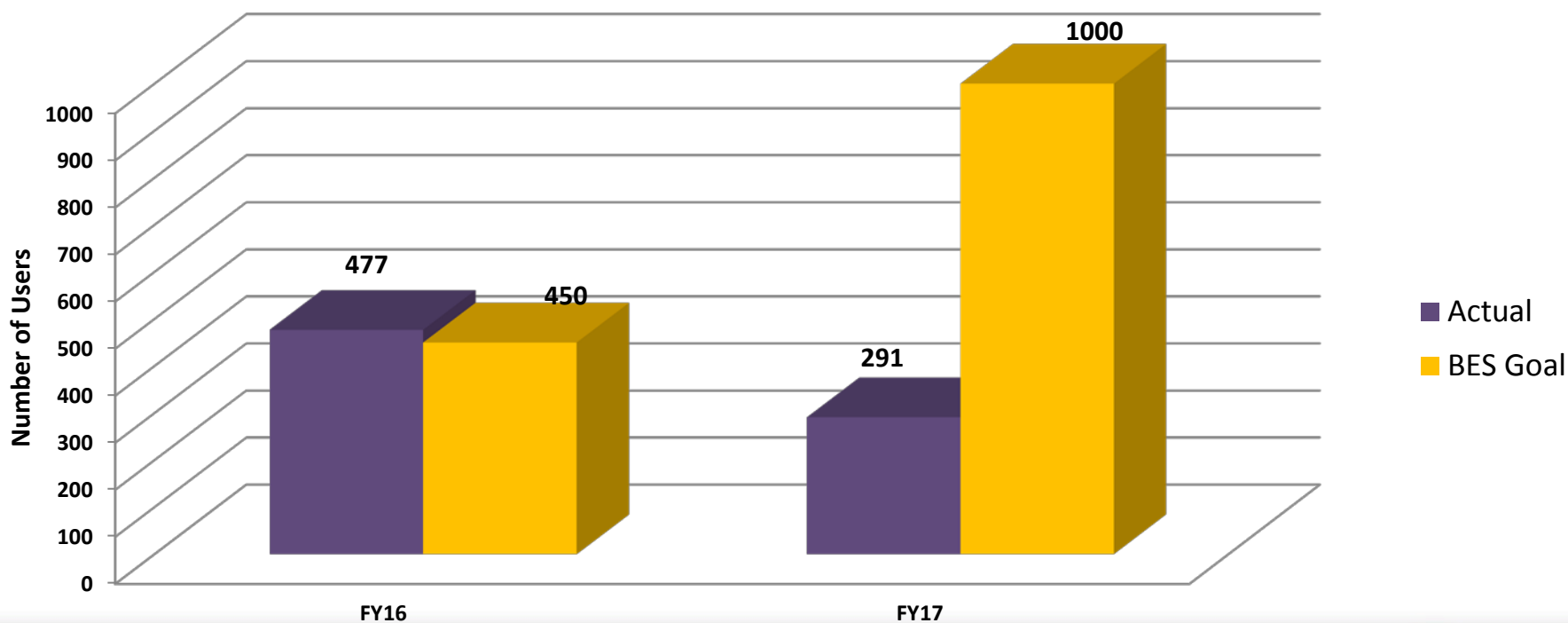
# NSLS-II Users

- Unique users in FY16: **477**
- Unique users in FY17: **291\***
  - First-time users in FY16 = 395
  - First-time users to date = 134

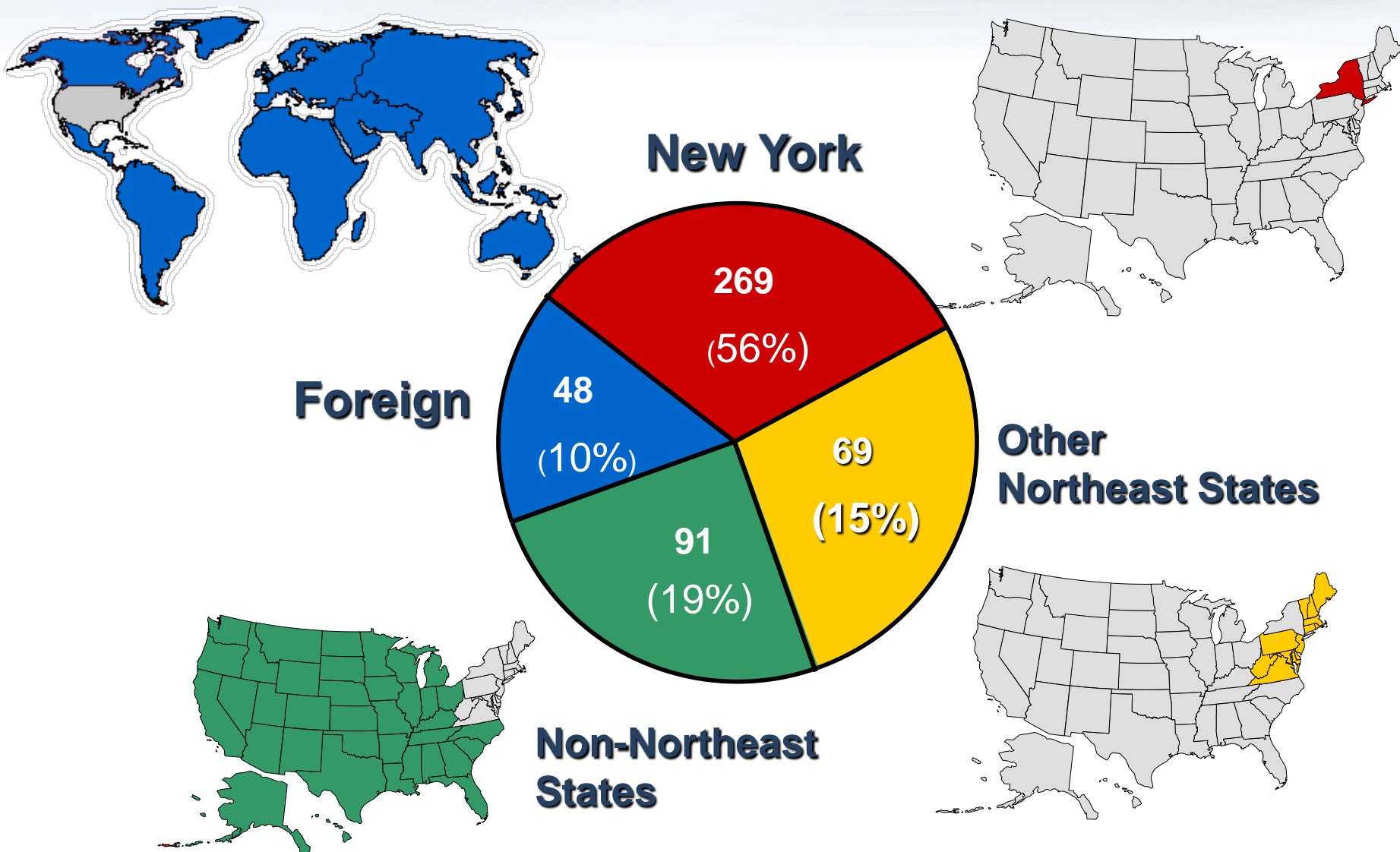
Exceeded DOE Goal for FY16

- as of December 6, 2016  
(we had 112 this time last year)

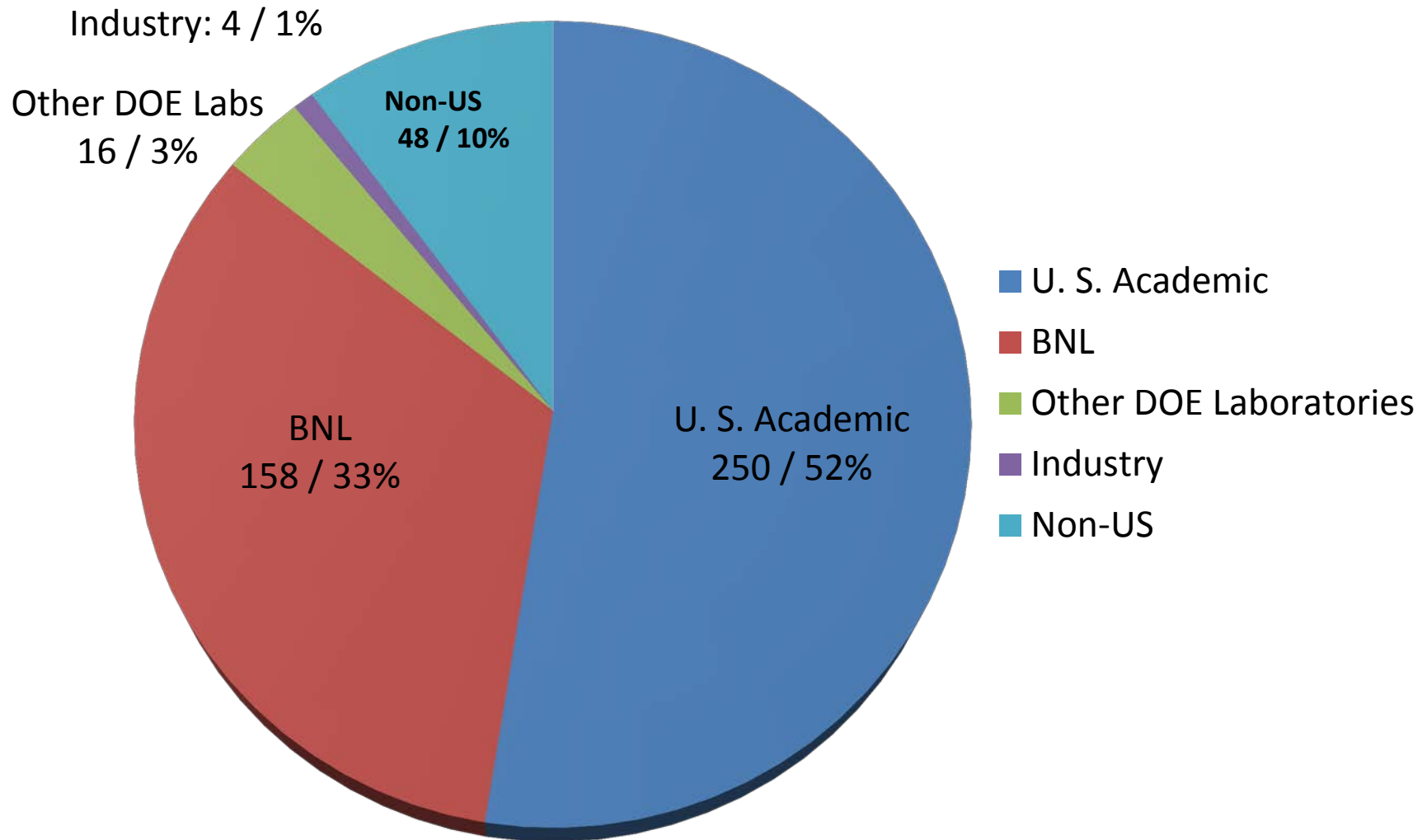
## NSLS-II Facility Users



# NSLS-II User Distribution (FY16)



# NSLS-II Users by Institution Type (FY16)





# NSLS-II Publications

	CY15	CY16
<b>Total</b>	143	148
DOE High Impact	17	8
NSLS-II Premier	33	19

Publications submitted through December 8, 2016

Please submit your publications – it is vitally important to us!

# Taskforces

- **Beam Stability** Boris Podobedov (Chair)
  - to identify and diagnose issues associated in the intensity, positional and angular stability of the electron and photon beams
- **User Issues:** Lisa Miller (Chair)
  - to identify the issues involved in User access, experience, communications and educational outreach
- **Multimodal:** Karen Chen-Wiegart (Chair)
  - to identify the issues involved in utilizing techniques across multiple beamlines at NSLS-II, and in combining synchrotron techniques with other techniques

Task forces will report on 6 monthly intervals

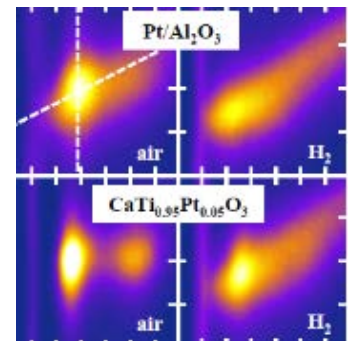
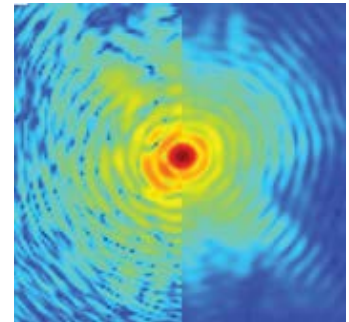
# FY17 Budget

**FY17 Budget**: Plan to President's budget (\$111.8 M), authorize to CR (\$109.7 M). Spend down carryforward to end FY17 at 1.5 months

- Accelerator operations to achieve > 95% reliability
- Develop the 3<sup>rd</sup> RF cavity with a technically-limited schedule
- Continue to develop 3<sup>rd</sup>-harmonic cavity
- Develop and install new kicker chambers to mitigate overheating
- Ramp-up to 300 mA top-off operations
- Efficient operations of existing beamlines. Ramp-up user program
- Develop BDN and NPB beamlines including pull-forward plans
- Start to develop new beamlines (see next slide)

# New Beamline Development Plan

- **FY15-16** Worked with the user community and SAC to identify 6 start-of-the-art beamlines to complement current capabilities:
  - Hard X-ray Bragg Coherent Diffraction Imaging (BCDI)
    - Nanoscale imaging *in operando* of catalysts, electrodes, SOIs,...
  - Soft X-ray Spectro-Microscopy Facility (SMF)
    - Nanoscale imaging of Li-based batteries, complex materials..
  - ARPES and RIXS Nano-Imaging (ARI)
    - Unique combined instrument for inhomogeneities in quantum materials
  - Quick Resonant Inelastic X-ray Scattering (QIX)
    - Time-dependent measurement of catalytic materials *in operando*
  - Infrared Near Field Nanospectroscopy (INF)
    - Nanoscale IR spectroscopy of quantum materials
  - Processing and Liquid Surfaces (PLS)
    - Thin films and interfaces
- **FY16**: Taskforce made preliminary estimates of cost, scope and schedule for each of these.



# New Beamline Development Plan

**FY17** – use carryforward funds to further develop the design of these six beamlines (each closely aligned with BES mission needs)

- Goal is to advance beamline cost, scope and schedule estimates to the point where they can be executed as defined projects
- Not all will be developed equally. Priorities placed on those that align with the strategic interests of the facility and with funding strategies
- Expect a plan for FY17 shortly.
- In parallel we will pursue:
  - i) Beamline value engineering process with other facilities to reduce costs for these (and other) new beamlines
  - ii) Additional funding opportunities for these beamlines, in particular NSF, BER, Foundations and NNMI



# Summary

- Accelerator is performing well, goal is >95% reliability, >300 mA for this FY.
- 8 Beamlines are in GU program, 10 more are in commissioning. Science results coming out.
- User numbers are growing. This is wonderful!
- Budget for this year not fully clear, but big picture is settled
- Task forces launched to improve quality of user experience and impact of science
- Focus in the coming cycle will be in ramping up the number of users and ensuring they have a good experience at NSLS-II.