

Photon Sciences Update



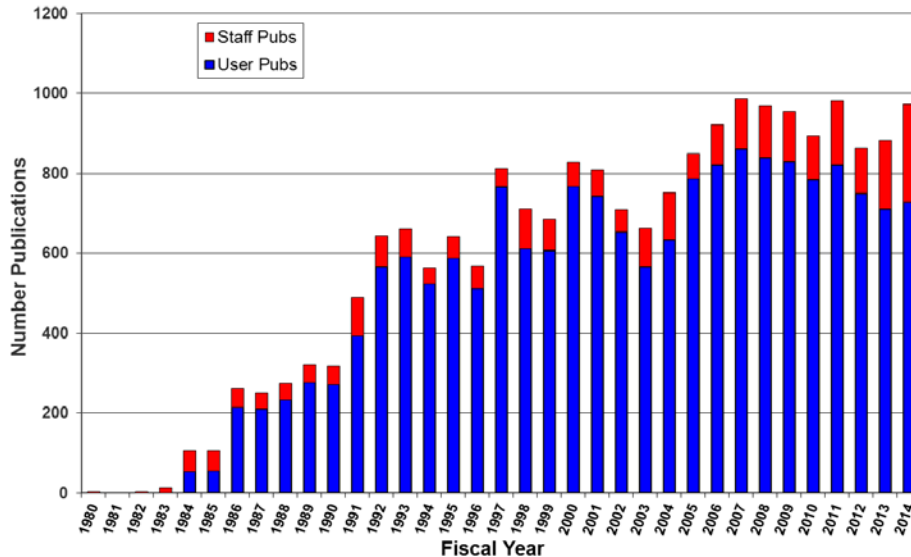
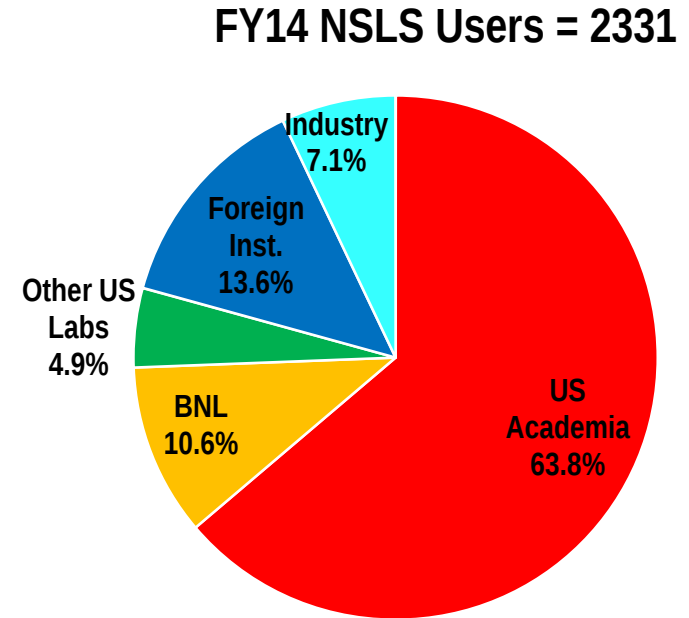
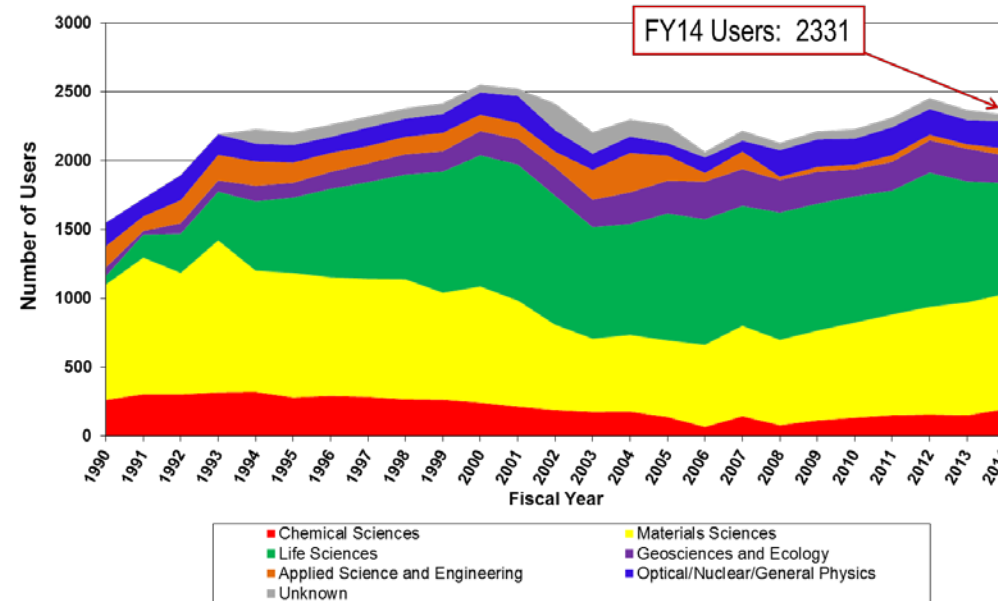
Steve Dierker
Associate Laboratory Director for Photon Sciences
UEC Town Meeting
Oct 28, 2014



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ENERGY

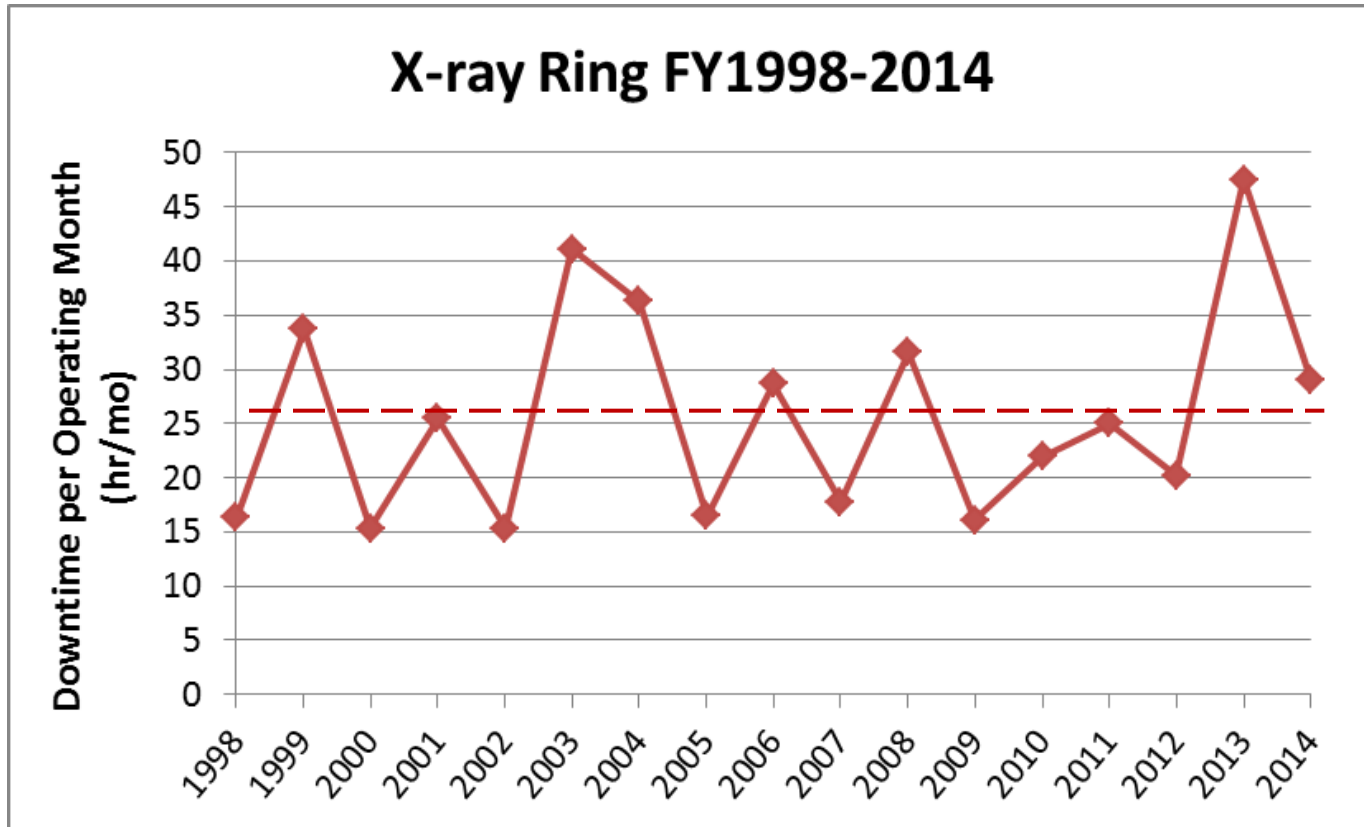
Office of
Science

NSLS User Program Remained Strong in FY14



FY14 Publications: 973
Premier: 197 (~20%)

NSLS X-ray Ring Downtime Stayed Close to Historical Average in FY14



- X-ray ring downtime average = 25.8 hours/month

NSLS Last Light Celebration

September 30, 2014



- Last Light celebration held on Sep 30, 2014, at 4:00 pm, in NSLS Control Room
- About ~500 staff, users, and colleagues as far as California, France, UK attended celebration
 - Live webcast from control room captured closing remarks and shutdown, watched on large screens in multiple locations around Brookhaven campus, accessed online by 274 viewers
 - Video of more than 60 interviews of staff and users on NSLS experimental floor, shown before and after closing ceremony
 - BBQ dinner for 500 guests (25% from off site), jointly sponsored by PS and UEC
 - Souvenirs: “*Save the last photon for me*” T-shirt; *NSLS history timeline* bookmark; temporary tattoo
- Very joyful occasion set the stage to focus everyone’s attention on the future – NSLS-II

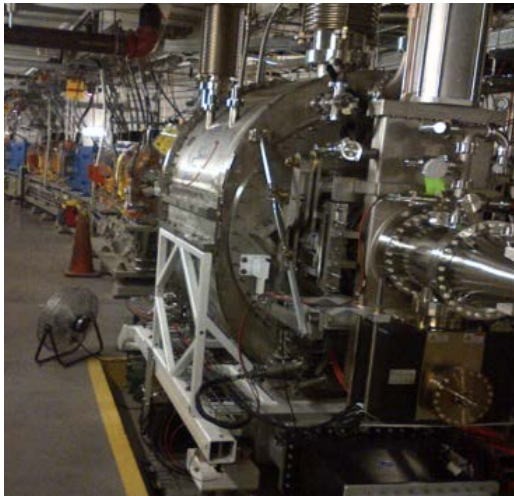


“Save the last photon
for me” T-shirt



NSLS-II Accelerator Readiness - IRRs and ARR

- **Accelerator IRR/ARRs:**
 - Linac IRR & ARR
 - Booster IRR & ARR
 - Storage Ring IRR & ARR
 - Superconducting RF Cavity IRR
 - Routine Operations IRR & ARR
- **Status:**
 - *DOE Approved Routine Operations - September 22, 2014*
 - *Accelerator operating at 25mA with 8-10 hr beam lifetimes*

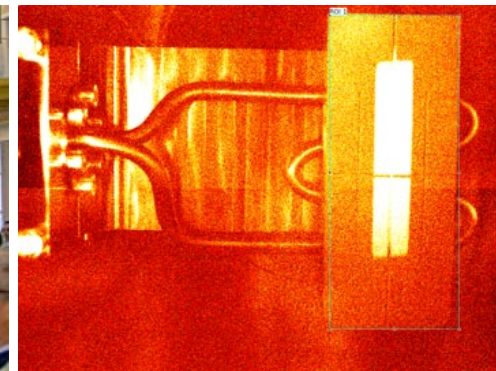


NSLS-II Beamlines, Sources, Front Ends IRRs

- **IRR for Beamlines 23-ID (CSX) and 28-ID (XPD) conducted Sept 9-10, 2014**
 - Oct 10th - Insertion devices and front ends for 23-ID and 28-ID authorized to start commissioning
 - Oct 16th - Beamline 23-ID authorized to start commissioning
 - Oct 24th - Beamline 28-ID authorized to start commissioning
- **IRR for Beamlines 3-ID, 5-ID, 10-ID and 11-ID conducted Oct 14-17, 2014**
 - Working on closing pre-starts



NSLS-II First Light!!!!



“First light” was observed in the
FOE at 23-ID on the morning of
Thursday, October 23, 2014

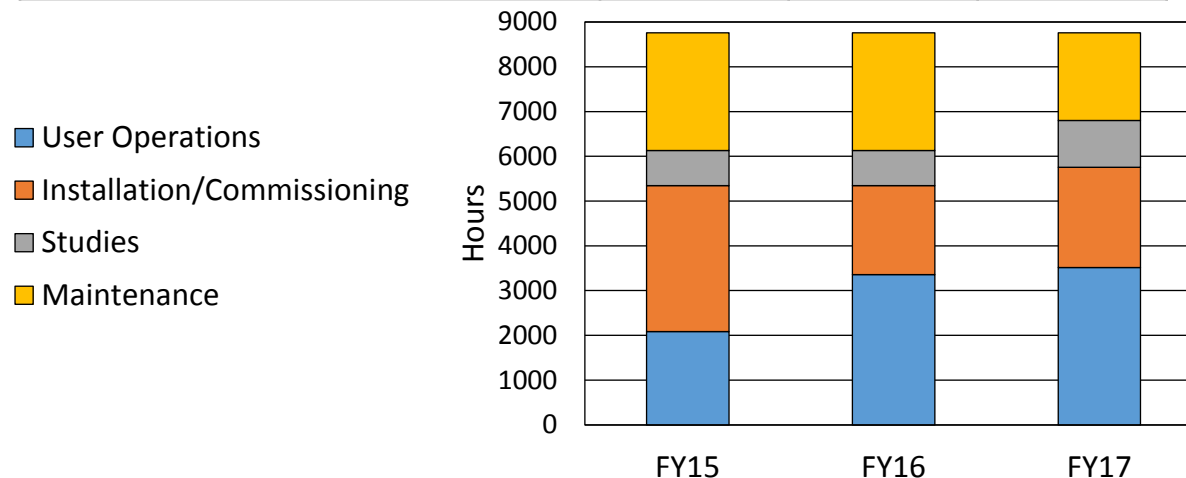


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Early Storage Ring Operations

	FY15	FY16	FY17
Current (mA)	50-300	300-400	400-500
Reliability (%)	85	90	95
Schedule (hrs)			
User Operations	2087	3357	3517
Installation/Commissioning	3260	1986	2240
Studies	783	786	1042
Maintenance	2630	2631	1961



Challenge: Significant time will be required in FY15 - FY17 to install and commission insertion devices, front ends, and beamlines and to commission higher current

Mitigation: Optimize installation schedule and coordinate with beamline operations

NSLS-II FY15 Monthly Ops Schedule – Preliminary

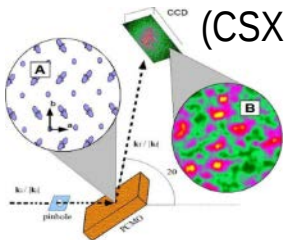
FY 2015	Mainten/Studies	Install/Comm.	Operation (hrs)
October	200	548	0
November	216	536	0
December	336	404	0
January	528	208	0
February	240	280	160
March	136	0	560
April	224	0	492
May	309	308	123
June	364	412	0
July	232	0	480
August	250	222	272
September	378	342	0
Total	3413	3260	2087
Shutdowns:	Late Dec -	Late Jan	
	Mid May -	Mid June	
	Mid Aug -	End Sep	



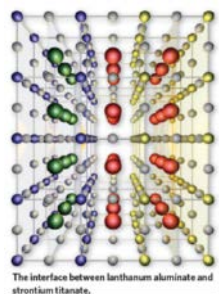
NSLS-II Project Beamlines

Coherent Soft X-ray Scattering (CSX-1)

World-leading coherent flux
XPCS, CDI



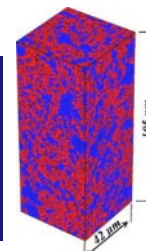
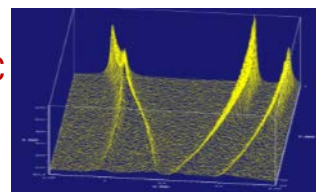
Imaging & dynamics in strongly correlated and magnetic materials



Fast Switching Polarization (CSX-2)

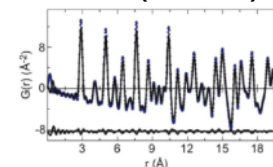
Resonant magnetic scattering, spectroscopy, XMCD

X-ray Powder Diffraction (XPD-1)



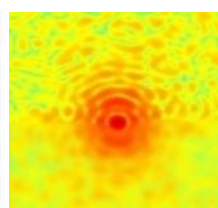
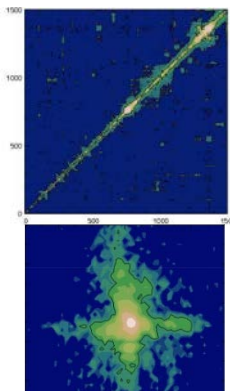
Time-resolved in-situ in-operando extreme conditions
Understanding complex nanostructured materials

PDF (XPD-2)



Powder diffraction, scattering, PDF 30-80 keV

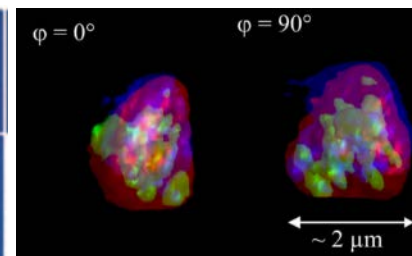
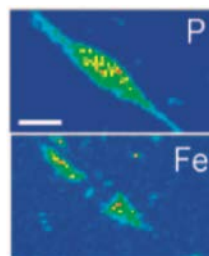
Coherent Hard X-ray Scattering (CHX)



100x greater time resolution in XPCS studies of dynamics

Non-equilibrium and heterogeneous dynamics in soft matter, at buried interfaces, biomaterials, glasses, driven systems

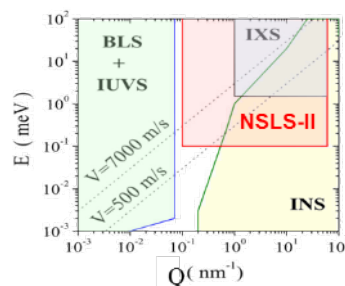
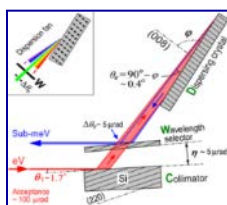
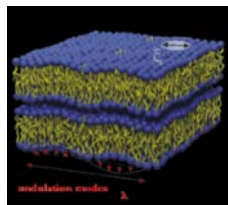
Sub-um Resolution X-ray Spectroscopy (SRX)



World-leading spectroscopy in sub-100 nm spot

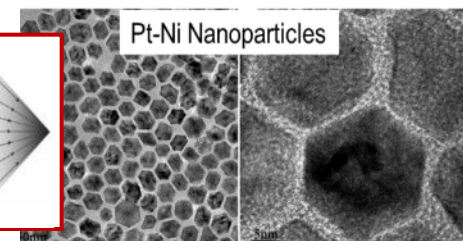
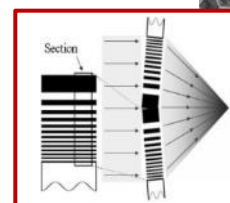
3D chemical imaging and speciation at the nanoscale

Inelastic X-ray Scattering (IXS)

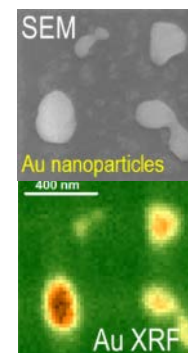


THz dynamics in liquid, glassy, and crystalline materials with nanoscale inhomogeneities

Hard X-ray Nanoprobe (HXN)



100m long beamline
~10 nm baseline
~1 nm ultimate goal

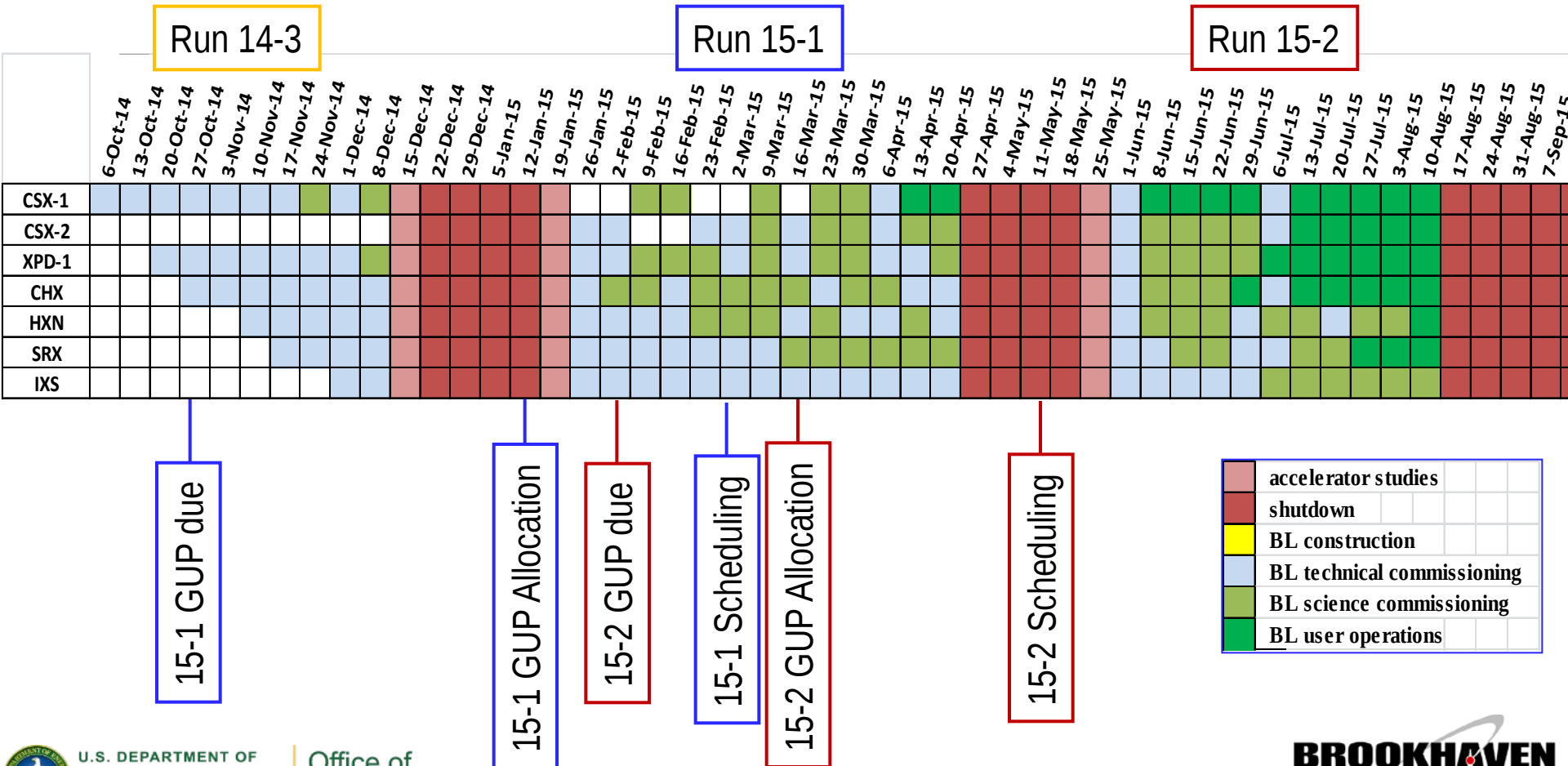


Nanoscale imaging with fluorescence and diffraction

~1 meV baseline
~0.1 meV ultimate goal

NSLS-II GU Program Ramp-up in FY15

- NSLS-II will operate in a regular 3-run/yr pattern starting in FY15
- Proposal submission and reviews will follow a regular schedule



New User Portal for NSLS-II

- NSLS Proposal, Allocation, Safety, Scheduling (PASS) system has served user community well since May 2004
- Over the decade in service, NSLS users and staff have provided valuable feedback and suggestions for improvements, taking into account experience at other newer SR facilities
- In 2012, PS formed a PASS Advisory Committee consisting of representative scientific staff and users to evaluate the needs for a new PASS system and to provide recommendations to User Admin office on specific improvements
- New PASS has been developed in modern programming language, with:
 - Enhanced flexibility for a user to enter required information in parallel
 - Full capability for beamline staff to review experiment feasibility
 - Enhanced proposal meta data incorporable into a relational data base and data collection
 - Improved connection to publications and end-of-run reports database
 - Capability for multi-technique proposals and multi-cycle proposals



New PASS Launched – Taking GUP Submissions



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PASS

Proposal Allocation, Safety, and Scheduling System

All General User proposals for NSLS-II beamlines must be submitted through the PASS system. For those users familiar with the original NSLS PASS system, it has been retired. Authentication through the new PASS system can be completed with either (1) a BNL domain account or (2) a Google account. If you do not have one of these accounts, you'll need to [sign up for a free Google account](#) before continuing.

Once you log in to PASS, you will be able to view a list of your proposals and submit new proposals. You may find it convenient to complete the General User proposal using [this MS Word template](#) prior to login, and then copy/paste the information into the proposal form online. (See the [NSLS-II User Guide](#) for details of the General User proposal submission process.) Please note that other features of the PASS system, including the Safety Approval Form (SAF) system, are still under development and will be made available to users in time for proposal allocation.

[Enter PASS](#)

[Questions](#)

User Administration Office

Run	Run Dates	GU Proposal Deadline	Beamlines Available
2015-1	Jan—April 2015	October 27, 2014	CSX1 , CSX2
2015-2	May—Aug 2015	February 7, 2015	CSX1 , CSX2 , CHX , HXN , XPD , SRX
2015-3	Sept—Dec 2015	June 1, 2015	CSX1 , CSX2 , CHX , HXN , IXS , XPD , SRX

During the first year of operations, the initial suite of seven beamlines at the National Synchrotron Light Source II will be open for General User proposals as indicated in the table above. NSLS-II currently has 30 beamlines under various stages of development. See [the beamlines page](#) for details.

In addition, for those beamline programs that will not be available for several years, NSLS-II has coordinated with other DOE facilities to make specific near-term arrangements to support former NSLS users at these other facilities. In some cases, the PASS system will be used for proposal submission. See more details on [transition programs](#).

- GUP submission can be for NSLS-II beamlines as well as for our user transition beamlines at SSRL and ALS

Update on User Support Programs at Other Facilities

- X-ray Spectroscopy: SSRL BL2-2 (~80% available beamtime);
 - User support staff: 0.75 FTE (PS), Case Western (NSLS X3A), SCC; Total support ~1.5 FTEs
 - Former NSLS users submit proposals through NSLS-II PASS and review process
 - SSRL BL 2-2 – gas handling system installed, FE modification ongoing, commission starts Nov
- Protein Crystallography at Westcoast: SSRL BL14-1 (50%)+ ID beamtime; plus BCSB at ALS
 - User support staff: 1 FTE (PS) will relocate to SSRL
 - SSRL BL 14-1 is operating and ready to host users
 - Former NSLS users submit proposals through SSRL system; PS allocates time for NSLS users
 - Expect small amount of beam time at ALS: to be supported by the same PS staff
- Energy Dispersive XRD: APS 6-BM (~58%), to be operated as mini-CAT
 - Ron Pindak serves as the Co-Director along with Jay Bass / Don Weidner (COMPRES)
 - User support staff through the EDX collaboration: 1 FTE (COMPRES), 0.5 FTE (APS), ~0.5 FTE (PS)
 - Former NSLS users go through APS proposal system, and PS/COMPRES staff allocate time
 - Endstation installation and commissioning in current run-cycle; taking users in Jan 2015
- Infrared Program: ALS 1.4 & 5.4 (~15%)
 - AP approved by ALS effective Oct 2014; PS staff & 3 user groups took the first beam time Oct 3-11
 - Perspective NSLS users go through NSLS-II PASS to apply for beam time
- Transmission X-ray Microscopy: TXM relocates to APS 8-BM; SSRL BL 6-2 (~15% GU time)
 - Relocate X8C TXM to APS 8-BM, with ~1.5 FTEs (PS) to support nano-CT users
 - Management Plan drafted by APS received, going through 2nd iteration, and to be finalized soon



New PS Website!

- New website reflects the closure of NSLS and our focus on NSLS-II
- Updates content
- Adds new pages
- Streamlines navigation
- Links to new PASS system
- Prominent buttons for Machine Status, Operating Schedule, User Guide
- Material from old website archived at www.bnl.gov/ps/NSLS-archive.php
- New website is a work in progress, and we welcome your feedback (cwhyte@bnl.gov)

BROOKHAVEN NATIONAL LABORATORY *Photon Sciences* U.S. DEPARTMENT OF ENERGY

Home About For Users & Staff For Industry Beamlines Research News & Publications People Intranet

National Synchrotron Light Source II
NSLS-II is a state-of-the-art 3 GeV electron storage ring. The facility offers scientific and industrial researchers an array of beamlines with x-ray, ultraviolet, and infrared light to enable discoveries in clean and affordable energy, high-temperature superconductivity, molecular electronics, and more. [Overview](#)

The next NSLS-II General User and Partner User proposal submission deadline is **October 27, 2014** | [Proposal Submission Details](#)

NSLS users please note: The original National Synchrotron Light Source has permanently ceased operations. All future synchrotron studies at Brookhaven National Lab will be carried out at NSLS-II. [Transition information](#)

Become a Facility User
Beamlines at the National Synchrotron Light Source II are open to academic and industrial users for scientific research. All research proposals are subjected to peer review and ranked against competing proposals based on scientific merit.

[Apply for Beamtime](#) [NSLS-II User Guide](#) [Beamlines Overview](#)

Beamline Projects
When fully built out, National Synchrotron Light Source II will accommodate approximately 60 to 70 beamlines. Thirty beamlines are currently in various stages of development and will provide significant research capacity in early operations.

Announcements
Photon Sciences Town Meeting on Tuesday, October 28th
The Photon Sciences staff and user community are invited to a Town Meeting on Tuesday, October 28, from 1-3 p.m. in the Large Conference Room, Bldg. 703. Watch webcast at 1 p.m. by clicking [here](#)

Lectures [Full Calendar](#)
Photon Sciences Town Meeting
1 pm, Large Conference Room, Bldg. 703

Meetings & Workshops [Archive](#)
Short Course: Methods and Applications of X-Ray Absorption Fine Structure Spectroscopy
11/13/2014 - 11/15/2014

News Releases [See all](#)
National Synchrotron Light Source II Achieves 'First Light'

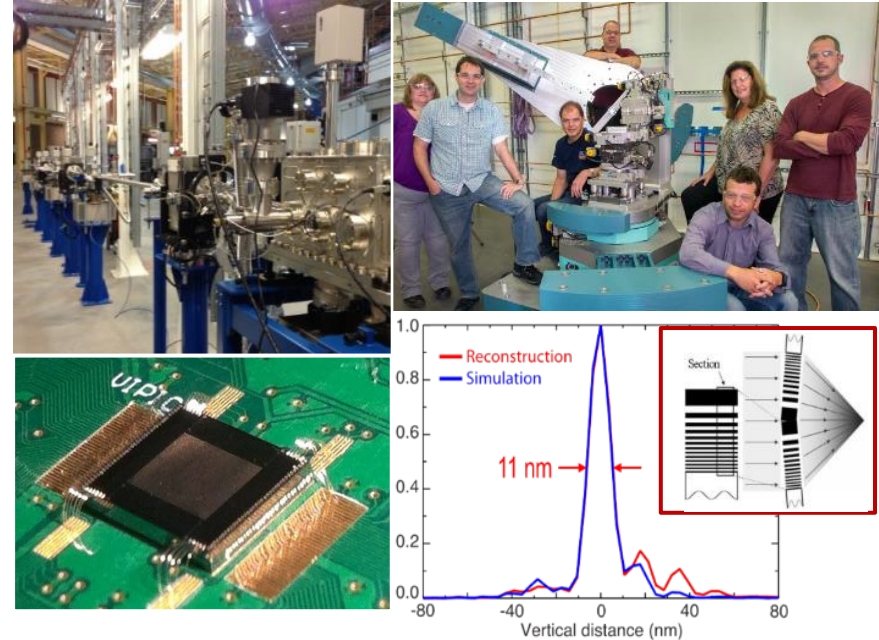
Feature Stories [See all](#)
Tracking Heat-Driven Decay in Leading Electric Vehicle Batteries

Brookhaven Lab's National Synchrotron Light Source II Approved to Start Routine Operations

Women @ Energy: Nathalie Bouet

NSLS-II Vision and Strategy

- The NSLS-II vision for the next decade is to be an internationally renowned synchrotron facility with world leading capabilities enabling a broad range of high-impact and discovery-class science and technology programs
- In order to achieve this vision, NSLS-II has developed a four-fold strategy:
 - creating a vibrant environment that attracts world class scientists pioneering new and high-impact research areas
 - developing and operating world class beamlines with breakthrough capabilities
 - advancing enabling technologies in optics, detectors, instrumentation, methods, and analyses
 - catalyzing innovation and facilitating university-industry-government collaborations to identify needs and opportunities that support the theme of discovery to deployment



Discovery Research

Use-inspired Basic Research

Applied Research

Technology Deployment



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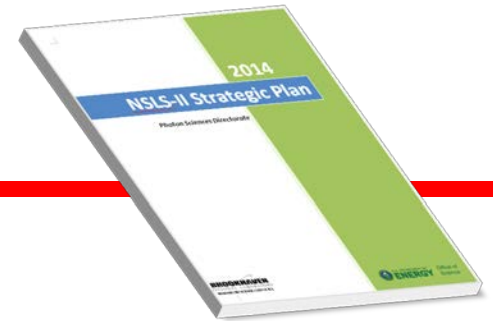
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Community Engagement in Strategic Planning

- NSLS-II scientific strategic planning is informed by many years of community engagement during the conceptualization and construction phases of NSLS-II, including:
 - Community input from a large number of scientific workshops for strategic planning, beamline development, first experiments, & other topical forums
 - Advice and input from Science Advisory Committee, beamline development review panels, and Beamline Advisory Teams
 - Scientific grand challenges identified by DOE-BES, Priority Research Directions in Basic Research Needs series, and grand challenges in other areas of science (DOE-BER, NIH, NAS, ...)



2014 NSLS-II Strategic Plan



<http://www.bnl.gov/ps/docs/pdf/NSLS-II-Strategic-Plan-2014.pdf>

- Executive Summary
- Vision, Strategy, and Approach
 - Vision and Strategy
 - Strategic Approach
 - Grand Challenge Science
 - Critical and Relational Analysis
 - Cooperative Partnership with Community
 - Crosscutting Themes and NSLS-II Strategic Objectives
- Current State of NSLS-II
 - NSLS-II Accelerator System
 - Current Beamlines Portfolio
 - Beamline Acquisition Strategy
- Science Priority Areas
 - Emerging Behavior from Complexity
 - Mastering Materials Discovery & Processing
 - Catalysis and Energy Systems
 - Environment and Climate Science
 - Structures and Functions of Life
- Developments for Next Five Years
 - Developing Additional Beamlines
 - Scientific Computing & Data Management
 - Advanced R&D and Support Laboratories
 - Accelerator Science and Technology
 - Managing the NSLS to NSLS-II User Transition
- Initiatives to Enhance Productivity and Impact
 - Integrated Research Consortia & Partnerships
 - Industry Research
 - Enhancing User Access
- Facility Management and Support
- Summary Outlook

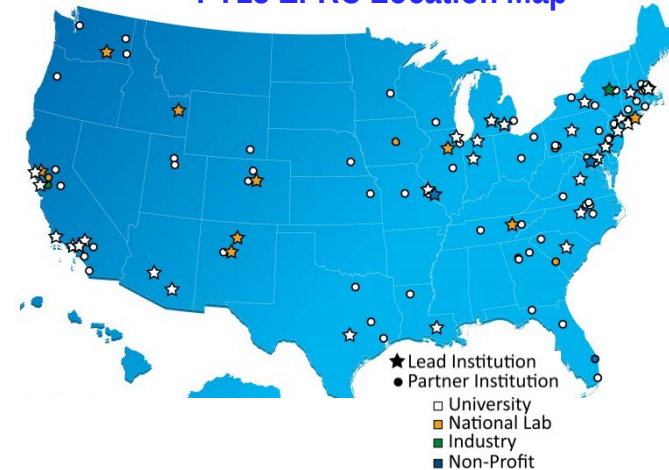


NSLS-II Strength Builds on NSLS Traditions

NSLS-II Strengths:

- World-leading low emittance, high brightness, broad spectrum range, large capacity, long beamlines, and stability
- Advanced beamlines with cutting-edge optics, detectors, and instrumentation
- Outstanding expert staff with experience at NSLS and at other facilities worldwide
- Ideally located in vibrant Northeast US where a strong and experienced community already exists, both in academia & in industry:
 - highly engaged and productive for past 32 years at NSLS
 - strong interests in developing new science programs and partnerships at NSLS-II
 - world-renowned universities and industries – including 7 universities in the US top-ten, and Fortune 500 companies including Pfizer, Merck, Bristol-Myers, Honeywell, Corning, DuPont, GE, IBM, ...
 - strong and engaged BNL and SBU community in science departments and CFN with interests in leveraging NSLS-II in their research programs

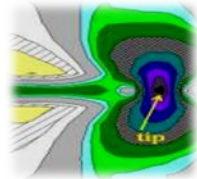
FY13 EFRC Location Map



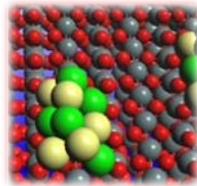
Scientific Disciplines Where NSLS-II Will Make Critical Contributions



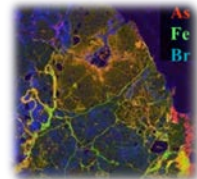
Emergent Behavior
from Complexity



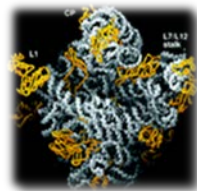
Mastering Materials
Discovery &
Processing



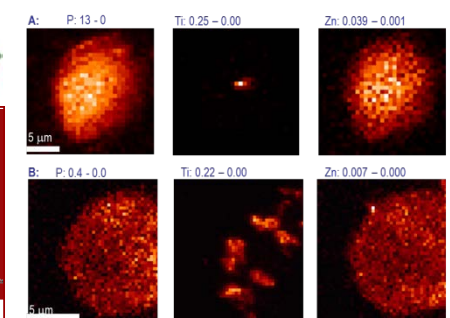
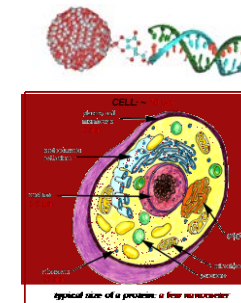
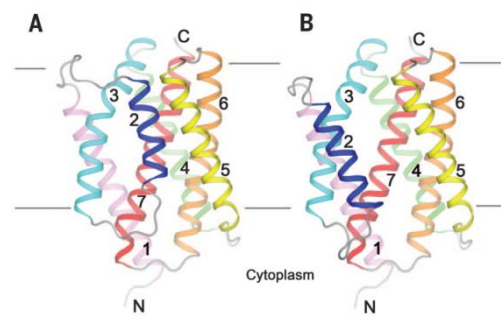
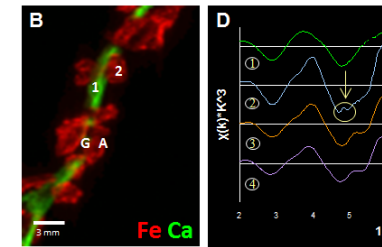
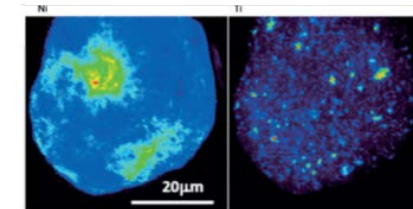
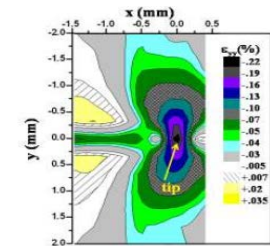
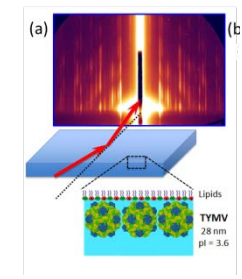
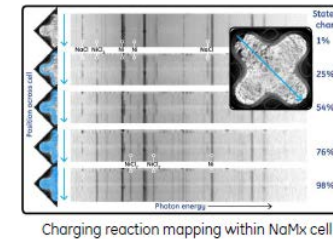
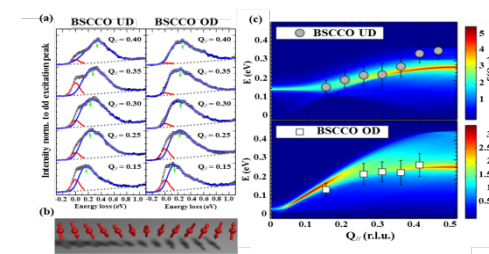
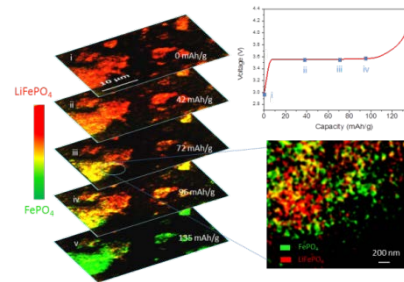
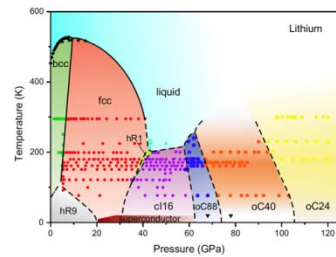
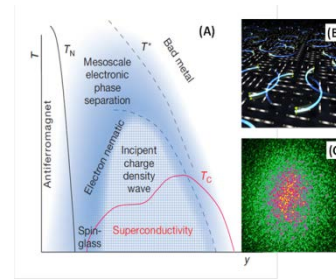
Catalysis and
Energy Science



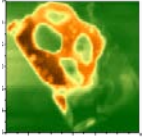
Environment and
Climate Science



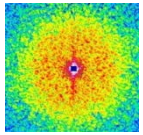
Structures and
Functions of Life



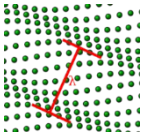
Science Drivers Have Led the Development of the Current NSLS-II Beamline Portfolio



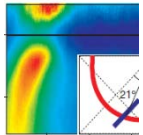
- Nanoscale and Mesoscale Imaging



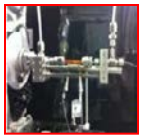
- Coherent Scattering and Imaging



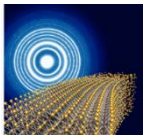
- Inelastic X-ray Scattering



- Photoelectron and Soft X-ray Spectroscopy



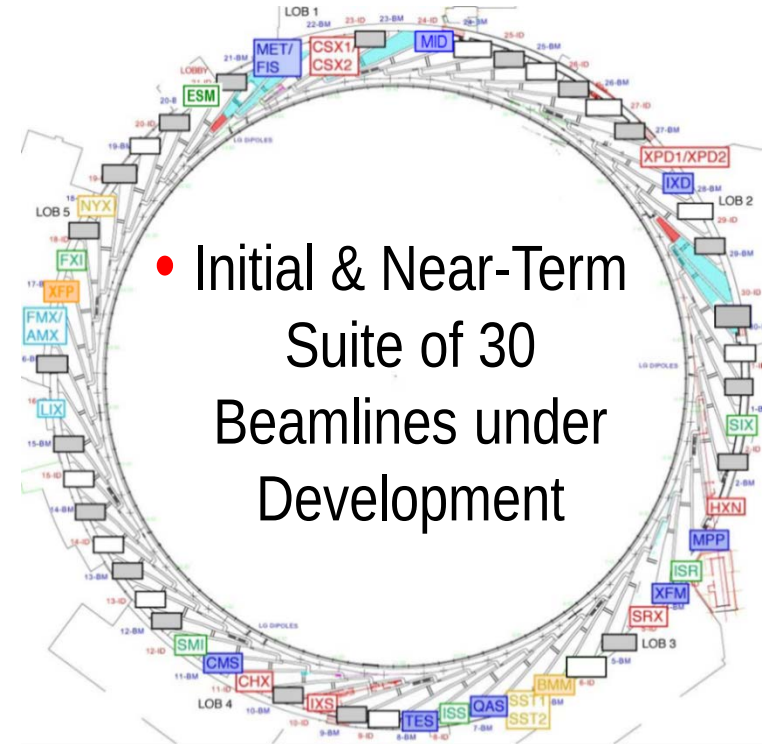
- In-situ & In-operando
Diffraction & Spectroscopy
(from IR to X-rays)



- X-ray Scattering for Soft Matter



- Structural Biology

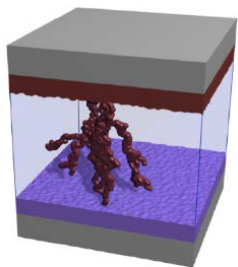


2013	2014	2015	2016	2017	2018	2019
NSLS-II Project Beamlines						
ABBIX Beamlines						
NEXT Beamlines						
NxtGen & Partner Beamlines						
XPD-2 and CSX-2 Upgrade						

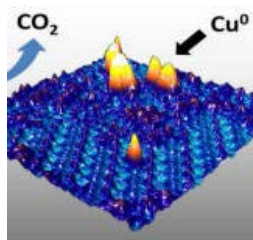
Achieving Scientific Excellence

- NSLS-II recognizes that development of cutting-edge synchrotron beamlines and enabling capabilities is only one necessary ingredient of producing discovery-class and high-impact science at NSLS-II
- Scientific research in the 21st century has become increasingly interactive and interdisciplinary, and often relies on a large team of researchers with complementary expertise to achieve the best possible research objectives
- In response to this trend, one of the key elements of the NSLS-II strategy involves *people* – creating a vibrant environment to attract the best researchers (staff and users) to the facility, and facilitating university-industry-government partnerships to catalyze innovation in support of the discovery to deployment theme
- Several strategic initiatives are under discussion with the community that NSLS-II plans to pursue to leverage the intellectual power and resources in the community to enhance scientific productivity and impact of NSLS-II

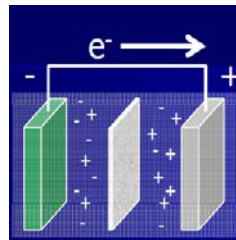
Initiatives Being Developed in Partnership with Scientific Community



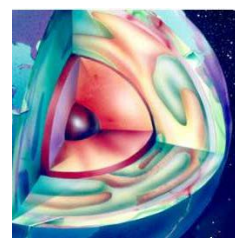
Nanoscience
Synergy with
CFN



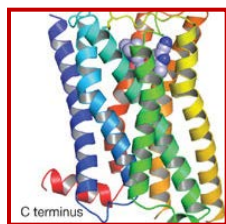
In-situ
Catalysis



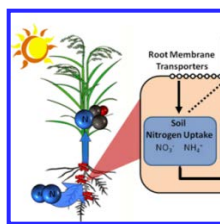
Energy
Storage



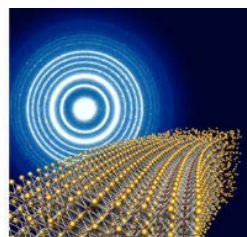
High
Pressure
Research



Protein
Factory



Mesoscale
Bioscience



Polymer
Consortium



Industry
Research

Key Elements

- Strong community – present and future
- Strong interests by PS scientific staff
- Leveraging strategic partnerships within BNL and in the US / Northeast
- Leveraging NSLS-II leadership capabilities

Summary and Outlook

- The next five years will be truly exciting for NSLS-II and its community
 - It will be a crucial time period for NSLS-II to achieve its vision, to accomplish its capabilities goals, to develop and mature its science programs and communities, to demonstrate its high scientific and societal impact, and to position NSLS-II as the leader in internationally recognized areas
- Overarching goals for next five years:
 - Ramp-up NSLS-II accelerator to its full design capabilities and mature its operations
 - Complete the constructions of the 30 beamlines currently under development, and ramp-up science programs at these beamlines
 - Develop and mature beamline science programs and community partnerships, including programs and partnerships with industry, in areas strategic to NSLS-II mission
 - Advance R&D in areas critical to meeting the research needs & NSLS-II capability goals
 - Begin development of additional beamlines along the NSLS-II strategic directions
- We look forward to working with our community and stakeholders to make these goals a reality

