

NSLS-II Update

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NSLS-II Director

UEC Town Hall Dec 11th 2018



U.S. DEPARTMENT OF
ENERGY

Office of
Science

BROOKHAVEN
NATIONAL LABORATORY

Outline

- Safety
- Beamlines update
- “NEXT-II”
- Budget
- Look ahead

Operational Discipline

There have been several recent events which appear to reflect a lack of Operational Discipline: “doing the right thing all the time”

- Shielding blocks inadvertently moved and not reported
- Visitors allowed on the floor without escorts and paperwork
- Alarm on the experimental floor ignored

In each case, I believe we knew what we should have done and yet chose not to do the right thing. Perhaps due to schedule pressure, or fear of negative consequences, or because one felt that the procedure/policy did not make sense.

Our policies and procedures are not optional. We must follow them. They keep us safe, and compliant with requirements.

If you feel that there are ways to improve them please let us know, but until they are changed, we must follow them. Always.

NSLS-II Beamlines Status

General User Operations (22)

CSX, IOS, XPD, HXN, SRX, IXS, CHX, LIX,
AMX, FMX, ISS, XFP, CMS, ISR, TES,
SMI, ESM, BMM, QAS, FXI, XFM, SIX

Science Commissioning (1)

PDF

Technical Commissioning (5)

NYX, SST-1, SST-2, FIS, MET

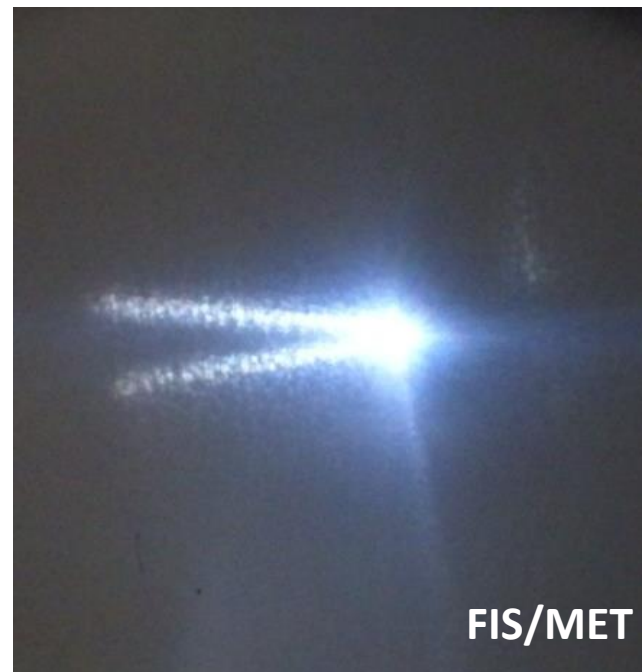
Completion* in FY21-22 (1)

HEX

* Defined as having completed IRR

28 beamlines operating/commissioning
– 22 beamlines in GU ops, 1 in SC
1 beamline under development

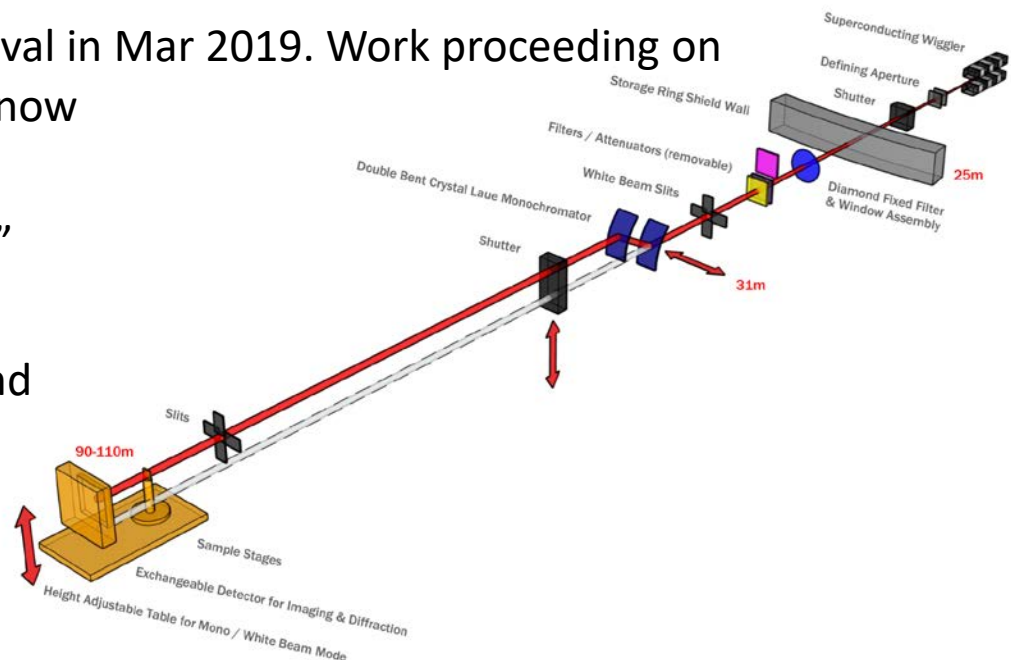
First Light at FIX/MET
October 26, 2018



Visible light image

Partner Beamline - HEX

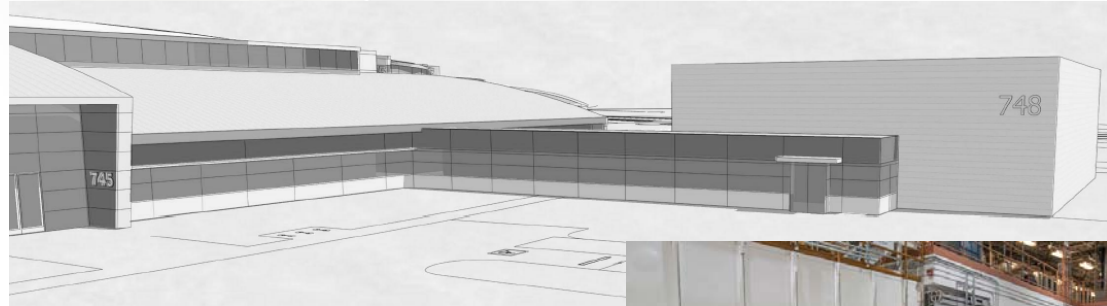
- Working to the accelerated schedule. Milestones 1-4 complete.
- MS #5 Jan 2019: Hutches. Contract to be placed before end of Dec (target).
- MS #7 Feb 2019: Satellite building. RFQ received and checked for compliance, target is to place this contract before the end of Dec 2019.
- Superconducting wiggler Spec/SOW complete, and about to be released to bidders. Revised plan calls for SCW contract placement in early CY19 (expected Mar-19).
- MS #6: (and go/no-go #3) "FDR" approval in Mar 2019. Work proceeding on the FDR report; ~75% of the writing is now complete. On target.
- MS #8: "Optical components procured" April 2019.
- Shielding design now well advanced and first review by the RSC completed.



CryoEM

ESD funded Scope-

- Two CryoEMs
- Building 748



Status –

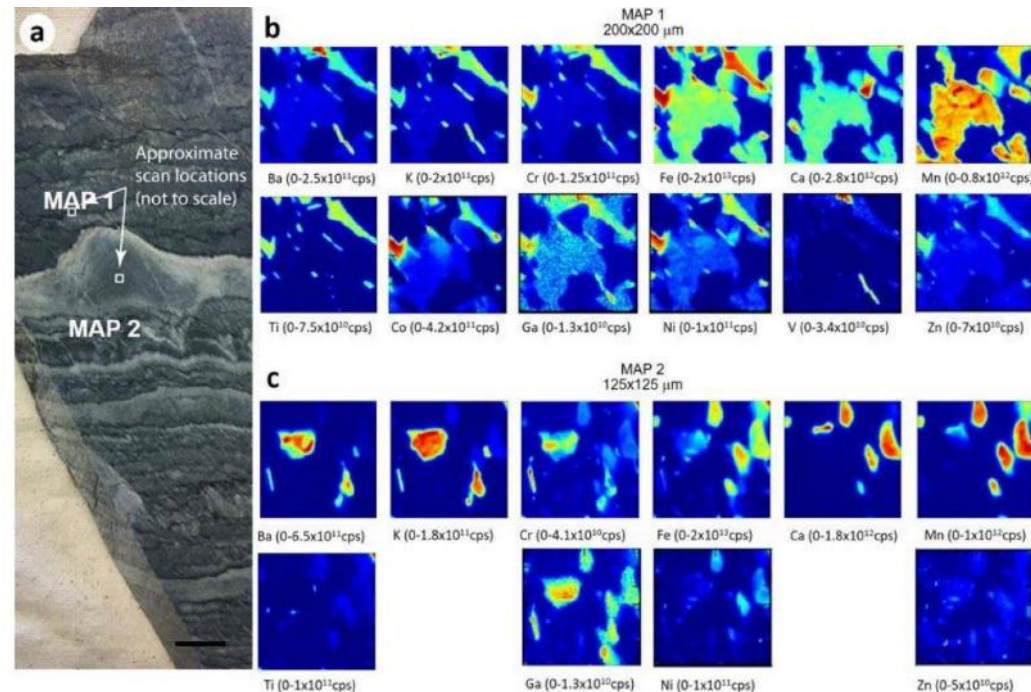
- Microscopes ordered in September (\$8.3M)
 - Talos (screening microscope)
 - Received November 29th
 - Lab finishing being completed
 - Installation scheduled January 2019
 - Krios (high resolution) ~1 year later - to be installed in building 748 when completed
- Building 748 ~\$4.6M
 - Awarded at \$1.3M under phase funded contract (5 December 2018)
 - \$3.7M advance from ESD is in process to extend planned FY19 work
 - Construction start after beginning of shutdown (December 17th)
- Groundbreaking ceremony scheduled for December 13th



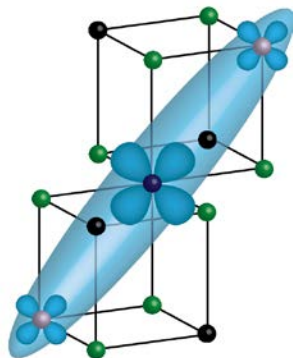
SRX shows that early “fossils” are in fact rock formations

- Greenland contain Earth’s oldest rocks - prime target in search for the earliest evidence of life on Earth
- Previous studies based on ~mm scale information using *e.g.* laser ablation analysis
- μ -XRF analysis at NSLS-II SRX revealed crucial new evidence leading to new conclusions
- Highlighting the importance of integrative analysis of morphology, rock fabrics and geochemistry at appropriate scales
- High relevance to searching for past life on Mars

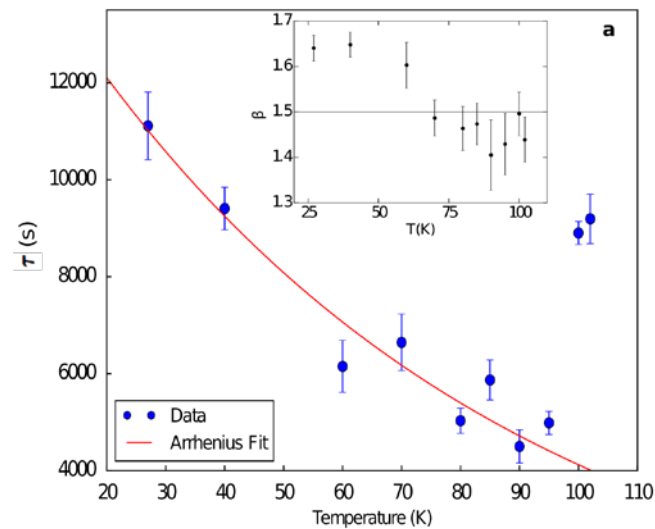
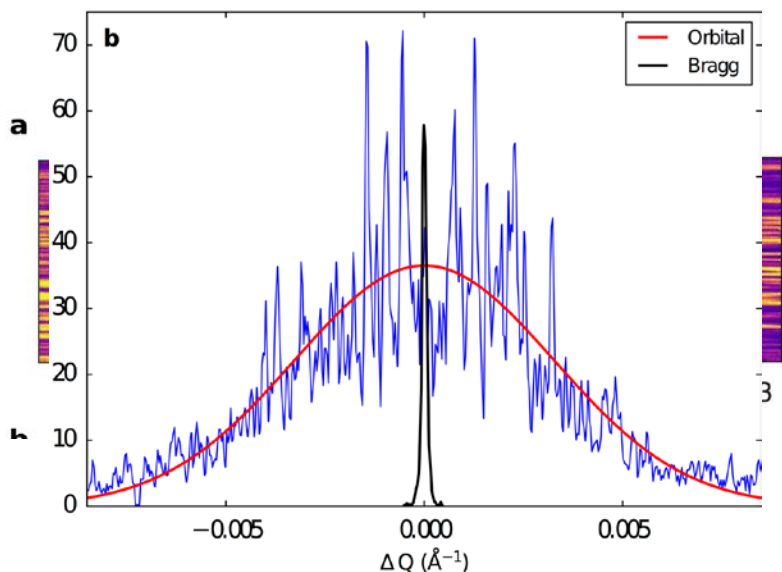
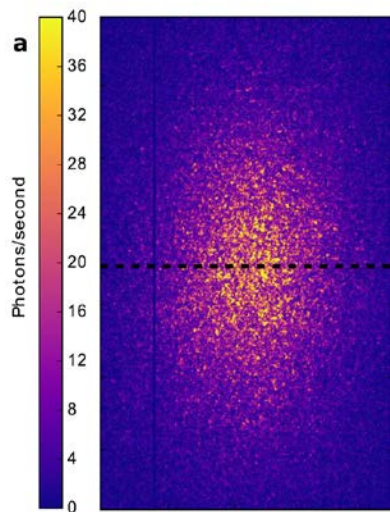
*Allwood et al., “Reassessing evidence of life in 3,700-Myr old rocks of Greenland”, **Nature 563, 241 (2018).***



Electronic texture: Dynamics



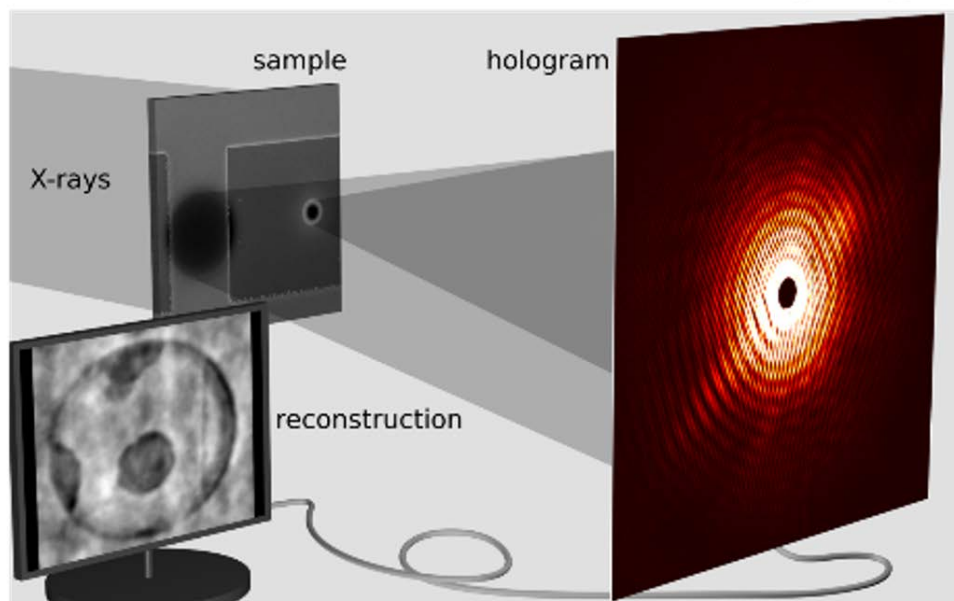
- Charge and orbital order in magnetite, Fe_3O_4
- This ordering drives the classic metal-insulator transition
- Data taken at beamline CSX
- Studies enabled by the very high coherent flux at NSLS-II



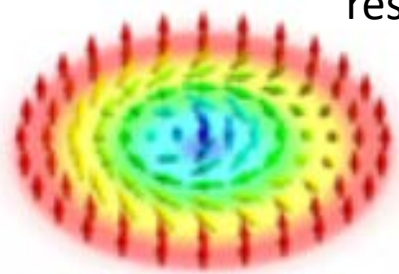
Kukreja et al. PRL (2018)

Electronic texture: Structure

Use coherent x-rays, tuned to charge, magnetic or orbital resonance to produce a hologram:



10 nm spatial resolution



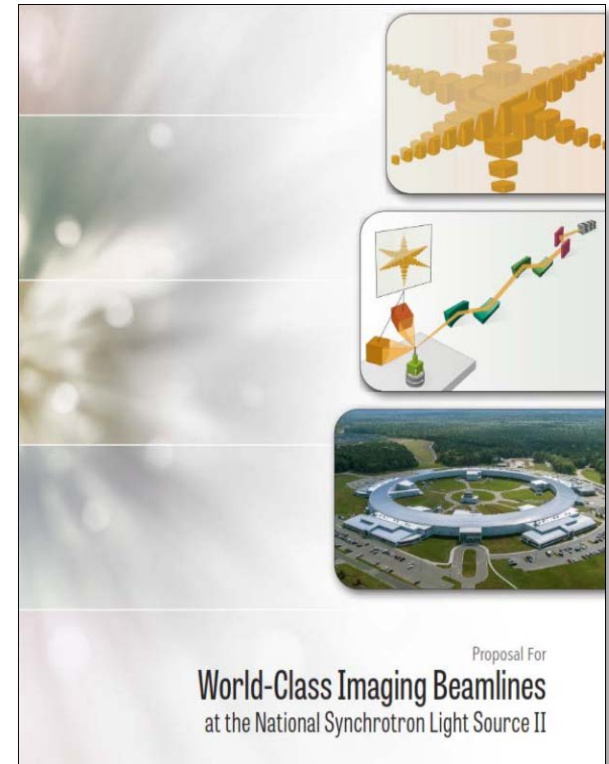
Examples:

- Skyrmions
- Orbital domains
- Stripe order in cuprates and nickelates

G. Breach (MIT), W. Hu (NSLS-II) et al. unpublished

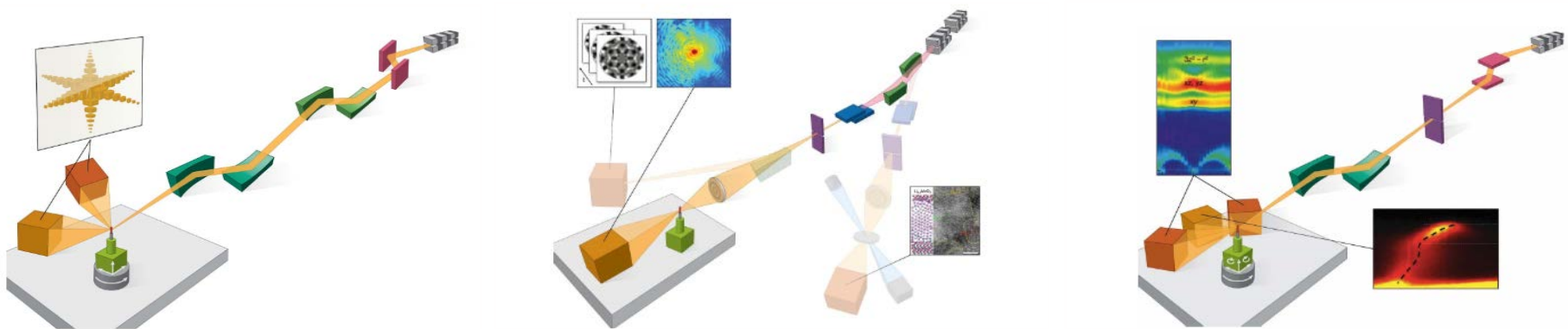
NEXT-II

- CD-0 proposal submitted Oct 1st
- Proposal makes the case for “Mission Need” for additional imaging beamlines to fill capability gaps in NSLS-II portfolio
- Science case based on quantum information science, energy storage and catalysis
- MIE for 3 beamlines, \$60 M



NEXT-II

- Three example beamlines were used to illustrate the case
 - Bragg CDI beamline (BCDI)
 - NanoRIXS and NanoARPES beamline (ARI)
 - Soft x-ray STXM beamline (SMF)



NEXT-II

- What this is:
 - A chance to make the case for additional capabilities at NSLS-II
 - A chance to get a placeholder in out year budgets for such a project
 - A sign our primary sponsor sees the need at NSLS-II for more capabilities
- What this is not (even if CD-0 is approved):
 - Budget: No money would be delivered
 - Schedule: No commitment on when the project might be executed
 - Scope: No decision on which beamlines will actually get built

Beamline staffing update

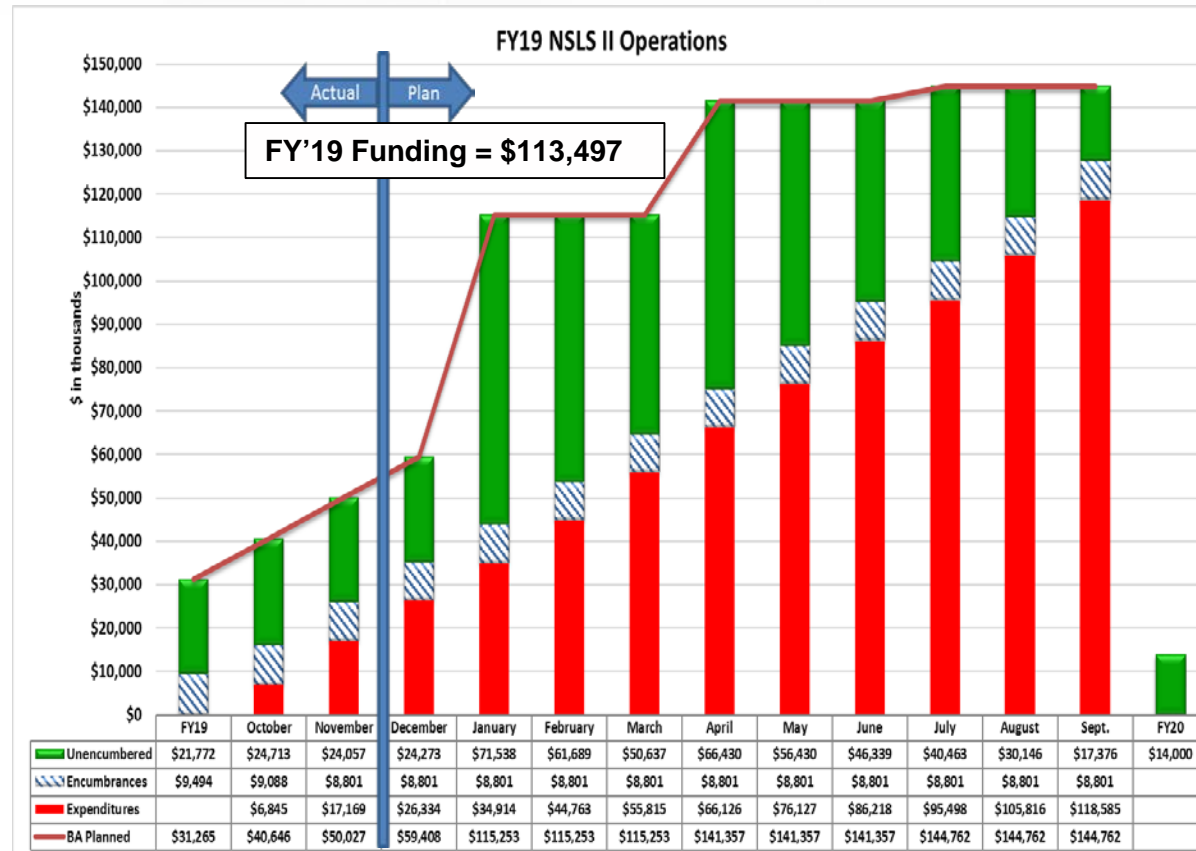
There are a number of open positions within the Photon Science Division currently:

- TES lead beamline scientist: Offer being prepared
- ISS lead beamline scientist: Position about to be posted. Eli Stavitski will be Interim LBS. Ron Pindak will be Interim Program Manager
- QAS: Position has been reposted to obtain a larger candidate pool.
- XFM: Beamline scientist filled (12/10/18): Sarah Nicholas
- HEX: Lead beamline scientist: Offer extended
- SIX, SRX, CDI: Open beamline scientist positions
- DAMA: 2-3 open positions

FY19 Operations Budget

Good news!
We have an FY19 budget:

FY16 \$110 M
FY17 \$112.5 M
FY18 \$110.8 M
FY19 \$113.5 M



2.4% increase same as other light sources

FY19 Strategic Plan

- Draft plan posted for comments 11/1/18
- Comment period closed 12/1/18
- Comments now being incorporated
- With budget known, FY19 plans being finalized in each area of the organization
- FY20 plan to be published 10/1/19



Summary

- Accelerator running extremely well.
- Currently on schedule to re-install the HXN IVU
- Beamline development has completed first 28 beamlines. HEX is underway
- MIE CD-0 proposal for “NEXT-II” submitted - for 3 beamlines
- User program continues to grow rapidly
- Controls issues continue to be worked on. ITD to formally take responsibility for network 12/17/18
- Budget is known and FY19 plans being executed