

# APS-U Forum Update

**Dean R. Haeffner**

**APS-U Forum**

March 23, 2016

# Beamline Selection Process

- **Call** for White Papers for possible beamlines for inclusion in the APS-U Project
  - Deadline Jan. 25, 2016
  - 36 received
- **Review** of White Papers
  - APS-U Beamline Review Committee (Feb. 8 & 9, 2016)
  - Followed by APS/APS-U Management Review/Feedback
  - Discussion with APS Scientific Advisory Committee (SAC) (Mar. 9 & 10, 2016)
    - Active discussion, but basically in agreement with presented plan
  - Final APS/APS-U Management discussions
- **Call** for Full APS-U Beamline Proposals from the approved White Papers
  - Results of White Paper process and feedback are being sent out this morning



# Beamline Selection Process (cont.)

- **User Meeting Workshop**
  - Presentations & discussion on each proposal
  - May 10, 2016 (Tuesday)
  - Approximately 30 minutes each
  
- **Review of Full APS-U Beamline Proposals**
  - Deadline – June 6, 2016
  - APS-U Beamline Review Committee (June 22 – 24, 2016)
    - Short presentations of each proposal to committee
  - APS/APS-U Management Prioritization/Selection
  - Presentation of Prioritization/Selection to the APS SAC for comment
  - Finalization of the Prioritization/Selection by APS/APS-U Management
    - Announcement tentatively – July 18, 2016
  
- Selected Proposals developed to DOE Conceptual Design level



# Guidelines for Full APS-U Beamline Proposals

30 pages max

- Brief Science Case (~10 pages)
- Explicit explanation of use of APS-U characteristics (1 - 5 pages)
  - Should include comparison to similar facilities and evaluate “world class/world leading” status
- Beamline description (10 - 15 page)
  - General layout
  - General discussion of optics
  - List of major components
  - No ray tracing/costing
- R&D needs, if any (2 pages)
- Community/Stakeholder discussion (2 pages)
- Details for proposals will be sent to proposers in the next few days

APS-U will provide  
engineering, optics, ID  
calculation support



# Beamline Enhancement Data Gathering & Meetings

- Gather self-evaluation information from existing beamlines
  - Requests to CATs and XSD beamlines in early December
    - Beamline Fact Sheet
    - Beamline Enhancement Questionnaire
- Series of meetings with the staff of every beamline
  - Dean Haeffner, Mohan Ramanathan, Gary Navrotski
    - + XSD management for XSD beamlines
  - All beamlines covered – 33 total meetings
  - Generally, 60 to 90 minutes
- Main Topics
  - Explanation of Beamline Enhancement process
  - Discussion Tier 1/Tier 2 philosophy, identification of possible items
  - Current understanding of APS-U effects on timing, beamline realignment, stability, etc.
  - Extensive discussion of insertion devices and/or bending magnet sources
    - Revolvers, superconducting undulators, horizontal devices, special polarization devices



# Timeline/Process

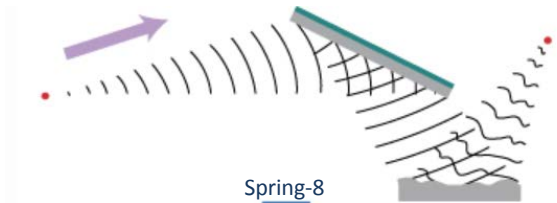
- Oct.: Initiate a beamline technical evaluation and needs process
  - “Beamline Enhancements”
  - Data will provide a basis for a bottom up cost determination
- Feb. 1: Deadline for individual beamline self assessments
  - Self-assessment scope includes optics, stability, and source
  - Items fall into two types
    - Tier 1: Minor upgrades that are essential in order to be able to utilize beam from the APS-U – “Do no harm”
    - Tier 2: Further upgrades that are desirable to be able to make the most out of the APS-U – “Bang for the buck”
- Jan. – Mar.: Meetings with beamline staff
- Feb. – Apr. : APS-U/APS evaluation of self-assessments
  - Harass (gently?) delinquent beamlines to get data sheets, questionnaires
  - Iterate with beamline staff
  - Assemble prioritized Tier 1 and Tier 2 minor upgrade lists
- May – July: Assemble conceptual design and basis of estimate beamline-by-beamline
- July 26-28 – DOE Status Review



# General Observation - Mirrors

Most beamlines are worrying about their mirrors

- APS-U increased coherence has everyone thinking about their old mirror slope error and roughness values
- 50% of Beamline Enhancement Questionnaires request new or refurbished mirrors
- 30X improvement in X-ray mirrors over the last 15 years is motivating



# Mirror Performance for Coherence Preservation

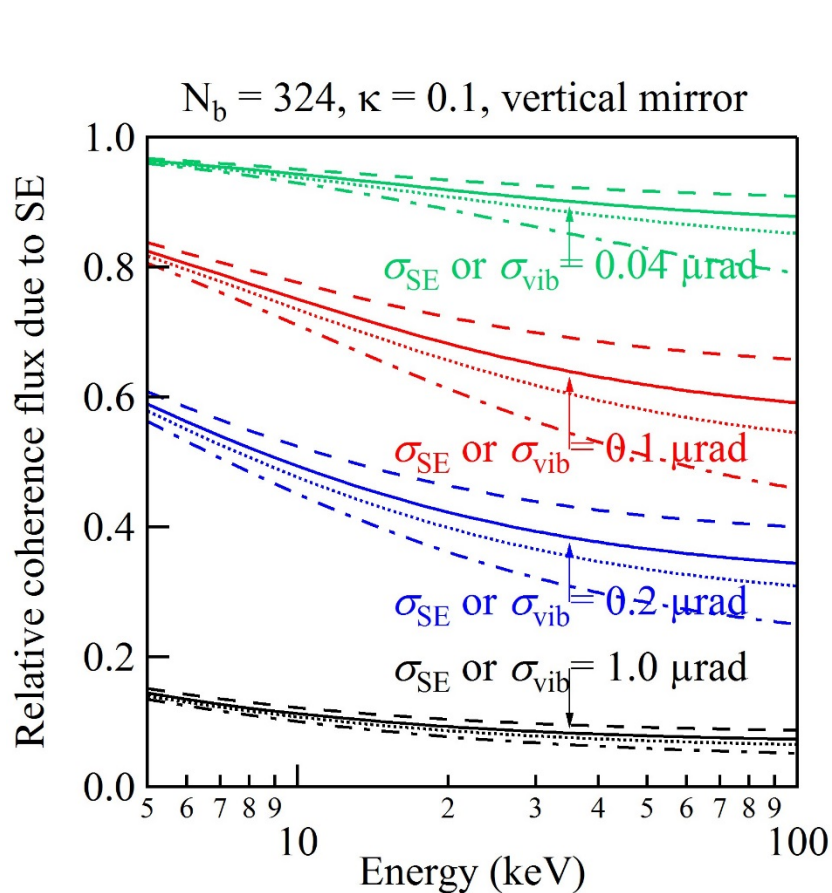


Figure courtesy of Xianbo Shi

Typical mirrors originally installed at the APS had slope errors of 3 or 5  $\mu\text{rad}$

More recently (< 10 years) typically 1 – 3  $\mu\text{rad}$

Many of these are still in use and some have degraded over time

Recently JTEC delivered mirror with 0.04  $\mu\text{rad}$  slope error





# General Observation

Larger variety of IDs = new power loads

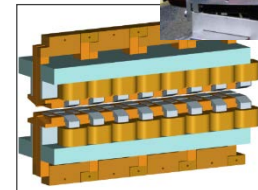
What is the effect on white beam components?

- Systematic FEA analysis of individual mechanical:

- White beam windows
- White beam slits
- Power limiting apertures / Beam defining apertures
- White beam filters
- White beam stops
- Power limiting choppers

- Systematic FEA analysis of individual optical:

- White beam mirrors
- Monochromators

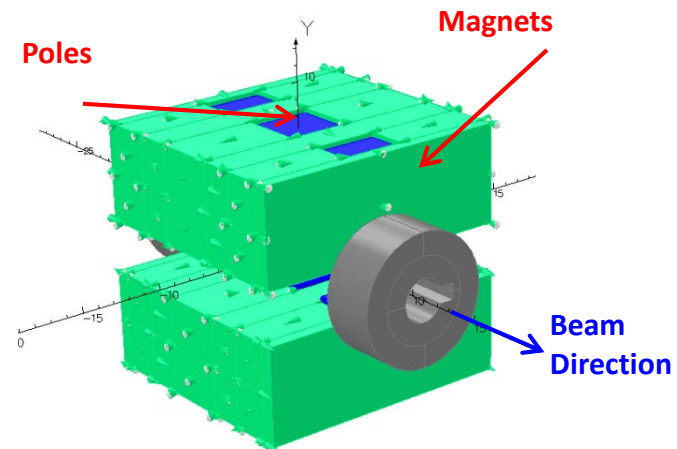


# General Observation - 3 Pole Wiggler BM Lines

## 3PW BM beamlines need white beam component mods

- Bending Magnet lines selecting a 3PW source for hard X-rays will need new 1<sup>st</sup> heat load optics.
- **> 3X more power**

- 3 Pole Wiggler BM Source



Magnet	Field (T)	$E_c$ (keV)	Ave Power (W/mradH)	Peak Power Density (W/mm <sup>2</sup> )
APS BM	0.599	19.519	87	1.24
APS-U 3PW	1.075	25.754	279	3.96

## Front Ends Scope at CD-1

- Install 20 new High Heat Load front ends
- Modify 5 existing high heat load (HHL) front ends
- Install 3 new Canted Undulator front ends
- Modify 7 existing canted undulator (CU) front ends
- Modify and reuse the 23 existing bending magnet (BM) front ends

## Front Ends Scope After Beamline Discussions

- Install 10 new High Heat Load front ends
- Modify 5 existing high heat load (HHL) front ends
- Install 7 new Canted Undulator front ends
- Modify 7 existing canted undulator (CU) front ends
- Additional 6 new CU in place of HHL front ends (5 CATs for future upgrades only CUFE and no straight section modifications)
- Modify and reuse the 23 existing bending magnet (BM) front ends

# Insertion Devices

Device	At CD1	Requested	Comments
Planar	39	21	
Revolver	8	18	2 out of 3 heads populated.
SCU	3 + (2)	6 + (2)	2 locations – 2 devices each in one cryostat (2 devices one each for GSECCARS and HPCAT)
APPLE	4	4	
HGVPU		4	In tandem 2 In canted 2 ?
EMVPU	1 + (1)	1 + (1)	Find a new location
UPSCU		2	2 devices in one cryostat
3PW	23	8	Maybe 2 more for a max of 10

Device count in ( ) is existing and may need minor modifications



# Upcoming Optics Presentations of Interest

- Luca Peverini and James McVea, Thales/Sesso
  - Staying ~ 1.5 days
  - Arrive Monday March 14 morning and leave Tuesday March 15 afternoon
  - Talk Monday, March 14 at 2:00 pm 401-A1100
- Akihiko Ueda, JTEC
  - Staying approx. 3 days
  - Arrives Monday March 28 departs Wed. March 30
  - Talk Tuesday, March 29 at 2 pm 401-A1100
- Ray Barrett, ESRF
  - Staying one 1 week
  - Monday April 4- Friday April 8th
  - Talk Monday, April 4th at 2:00 pm 401-A1100
- Tom Tonnessen, Insync
  - Staying ~1 day
  - Arrives Wed. April 6th morning, departs 5:00 pm same day
  - Talk Wednesday, April 6 at 1:30 pm 401-A1100



# Other Upcoming Events

- Series of APS-U Technical Review – March to May
- IPAC16 (Busan, Korea) – May 8-13, 2016
- APS/CNM Users Meeting APS-U Workshop – May 10, 2016
- Full Proposal Review Committee Meeting – June 22-24, 2016
- DOE OPA Review – July 26-28, 2016
- Denver X-ray Conference – August 1-5, 2016 (Rosemont, IL)
  
- **MS&T16 (Salt Lake City) – October 23-27, 2016**
  - **Symposium on Applications of Low Emittance Synchrotron X-ray Sources to Mesoscale Materials Studies (R. M. Suter & D. R. Haeffner, organizers)**
  - **Deadline March 31, 2016**



# Questions?

- Thanks to Gary and Mohan for slides.

