Advanced Photon Source Upgrade Project Update

George Srajer

APS User Monthly Meeting
January 30, 2013

U.S. DEPARTMENT OF ENERGY | Office of Science

Outline

- New Federal Project Manager
- DOE CD-2 Review Follow Up
  - Response to CD-2 Review recommendations
- Beamline Schedule
- Update:
  - Short Pulse X-ray RF Cavity Prototype (SPX0)
  - Superconducting Undulator Prototype (SCU0)

Federal Project Manager for APS Upgrade

Effective January 14, 2013

Joseph May

Recent assignment: Thomas Jefferson Lab 12 GeV Upgrade Federal Project Director

APS Upgrade Status and CD-2 Requirements

DECISION / REQUIREMENTS[1] / APPROVAL[2] \ TOTAL PROJECT COST (TPC)	Less than $400M to $100M	Status
CD-2 --APPROVE PERFORMANCE BASELINE	SC-2	
PRIOR TO CD-2--PRELIMINARY DESIGN		
Approve updated Acquisition Strategy if changes are major	SC-1 with SC-28 concurrence	**COMPLETED** No major change to the strategy
Establish a Performance Baseline (PB)	FPD	Scheduled for 3QFY13
Approve updated PEP	SC-2	**DRAFT COMPLETED** incorporating comments
Prepare a Baseline Fund. Profile & reflect in budget docs. & PEP. Consider full funding if TPC < $50M	SC-2	Proposed funding profile provided by BES
Approval of Long-Lead Procurement	SC-2	**COMPLETED** - CD-3A approved on 8/30/12
Develop Project Management Plan, if applicable	N/A	**COMPLETED** - APS-U developed a Project Implementation Plan (PIP)
Complete Preliminary Design	Project	**COMPLETED**
Incorporate High Perf. & Sustainable Bldg. & Sustainable Environmental Stewardship	Project	N/A
Conduct a Preliminary Design Review	Team external to project	**COMPLETED** (Reviewed 3/2012 to 8/2012)
Complete Preliminary Design Report	Project	**COMPLETED**
Perform Baseline Validation Review	ICE by OECM with OPA	ICE Review conducted 10/2012 - Comments submiktted to DOE APM
Conduct a Project Definition Rating Index analysis as part of an EIR	N/A	N/A
Conduct a Technical Readiness Assessment & develop a Technical Maturation Plan	N/A	N/A
Employ an EVMS compliant with ANSI/EIA-748A, or as defined in the contract	Contractor	**COMPLETED** - APS-U will utilize the currently approved EVMS for Argonne
Prepare a Hazard Analysis Report	Site Office or Lab	Final Draft - Incorporating comments
Continue with Quality Assurance Program	Site Office or Lab	**COMPLETED**
Conduct Preliminary Security Vulnerability Assessment, if necessary	Site Office or Lab	**COMPLETED** - Formal report not required
Issue Final NEPA determination (i.e., FONSI)	SC-1 or Site Office	**COMPLETED** - CX approved
Update budget documents and Exhibit 300 if applicable	SC-AD	**COMPLETED**

DOE CD-2 Review Outcome

- Lehman draft report:

"The Committee determined that the APS-U project is ready for CD-2 approval after addressing the recommendations of the committee."

- Next step(s):
  - *Respond to CD-2 recommendations and requests*
  - Hazard Analysis Report: completed, signed off
  - Project Execution Plan: draft completed
  - Independent Cost Estimate: final report will be provided to Pat Dehmer

CD-2 Review Recommendations: High Priority

Response required by CD-2:

Review the estimates of all of the Insertion Devices (U1.03.04), specifically the APPLE-II devices, to ensure adequacy and consistent contingency/uncertainty scoring before CD-2. ✔ - *Insertion Device estimates reviewed* - *APPLE-II basis of estimate revised downward, PCR to adjust baseline to reflect this in process* - *New risks added to Risk Register to reflect specification uncertainty, small vendor pool and aperture size*
Prior to CD2 approval, write a section of the Preliminary Design Report describing the R+D approaches and goals for nanofocusing R+D. ✔ - *PDR section completed*
Review the effort allocations for the beamline projects with the L3 leads prior to CD2 approval. - *Initial re-estimates received from the level 4 managers* - *Management review in process*
Finalize and approve the draft APS-U Hazard Analysis Report by CD-2. ✔ - *Hazard Analysis Report finalized and approved*
Define the path forward for SPX prior to CD-2

CD-2 Review Comment: High Priority, Continued

Response required by CD-2:

The project scope included both accelerator and beamline hardware that will be turned over to operations. Some elements will require testing and acceptance after initial beams (electron or photon) are transported through the new hardware. There appears to be ambiguity in the handover to operations and their final acceptance of hardware which needs to be resolved.

The Committee suggested the project, APS operation, and DOE/BES office reach a clear agreement collectively on the process of 'transfer' of systems from project to operation.

- *Transition to Operations Document draft in review process*
- *Standard APS processes are used where available*
  - *Vacuum chambers, planar and revolver undulators, front ends and beamlines*
- *APS-U responsible for acceptance testing, magnetic measurements, installation, alignment and system testing without beam*
- *In general, transfer to operations of all APS-U supplied equipment occurs prior to commissioning with beam*
  - *Notable exceptions are shielding enclosures that require low flux photon beam to verify the shielding integrity*
- *New process developed for SCU0*
  - *Plan to follow this outline for other SCUs and SPX*

✔

CD-2 Review Recommendations, Continued

- Response required by the next Status Review:
  - 3 Recommendations
- Response required by CD-3:
  - 18 Recommendations
- Trip to DOE planned on February 4:
  - Address Upgrade readiness status for CD-2
  - Provide technical updates (SCU0, SPX0)

Revisiting Beamline Schedule

Goal:

- Minimize down time for programs affected by Upgrade

Assumptions:

- Conforms to the proposed funding profile
- Final design process duration: ~ 15 months
- Construction of enclosures duration: 6 months
- Commissioning time: 6 months or less
- For roadmap-affected beamlines: existing program(s) moves out first
- Other than for RIXS and ASL, no more early approvals to spend expected

APS Upgrade Beamlines Schedule: User View - DRAFT

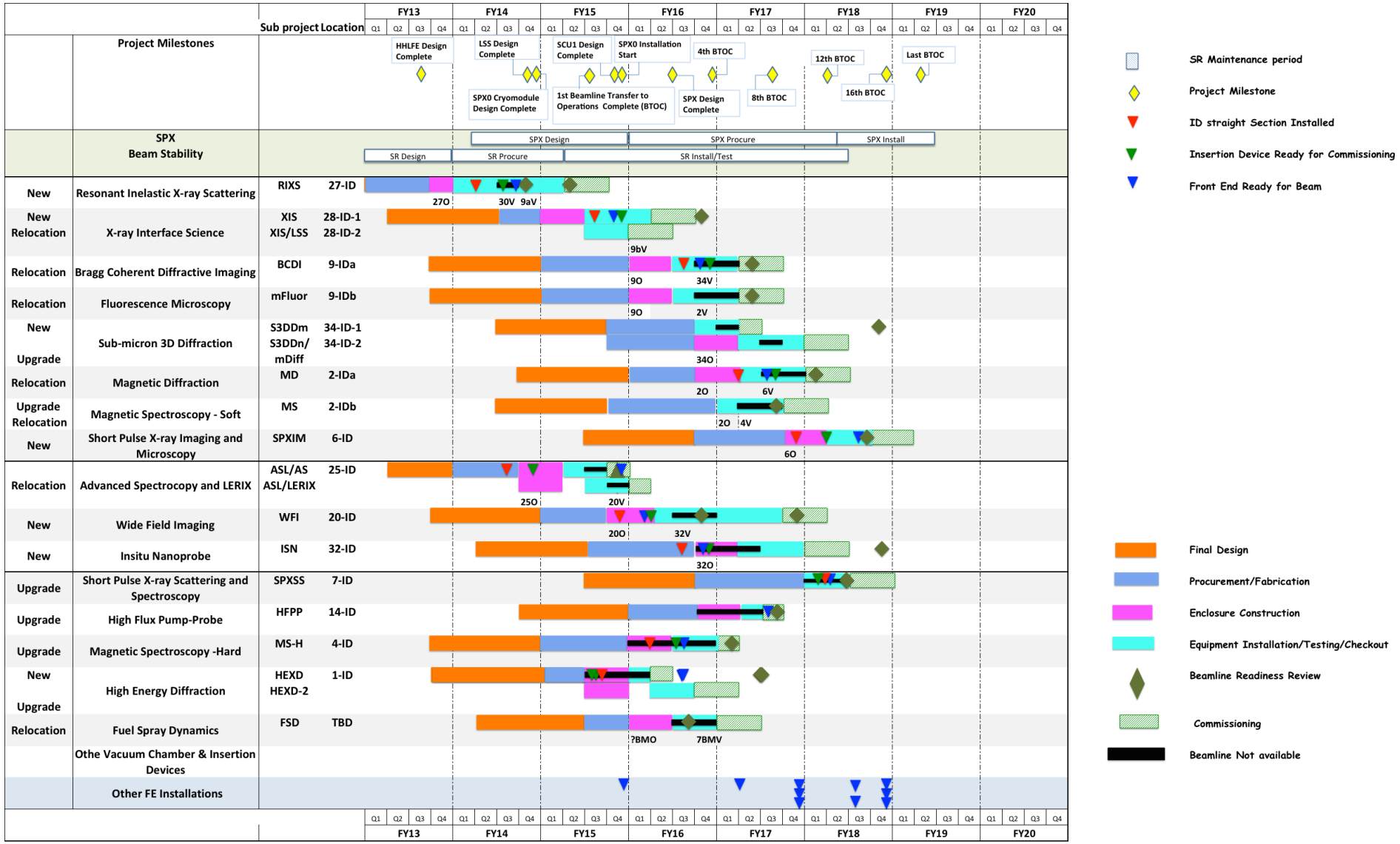
Old Beamline Designation	New Beamline Designation	Program Name	CY13			CY14			CY15			CY16			CY17			CY18			CY19			New Beamline Designation
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
	27-ID	**RIXS**																						**27-ID**
30-ID-B,C		MERIX/RIXS						MERIX/RIXS moved to 27-ID																
09-ID-B,C		RIXS						RIXS moved to 27-ID																
	28-ID-1	**XIS - tunable**																						**28-ID-1**
	28-ID-2a	**XIS - fixed E LSS**																						**28-ID-2a**
09-ID-B,C		LSS										LSS moved to 28-ID-2a												
	9-ID-1	**BCDI**																						**9-ID-1**
34-ID-C		BCDI													BCDI moved to 9-ID-1									
add cant	**9-ID-2**	**mFluor**																						**9-ID-2**
02-ID-E		mFluor													mFluor moved to 9-ID-2									
	34-ID-2a	**S3DD micro diff**																						**34-ID-2**
	34-ID-2b	**S3DD nano diff**																						**34-ID-2**
02-ID-D		mdiff													mdiff moved to 34-ID-2a									
34-ID-E	**34-ID-1**	**S3DD micros**													upgrade in place									**34-ID-1**
02-ID-B		CDI soft													program ends here or before									
add cant	**02-ID-2**	**MS-S**																						**02-ID-2**
04-ID-C		MS soft															MS-soft moved to 2-ID-2							
	02-ID-1	**MD**																						**02-ID-1**
06-ID-B,C		MD																		MD moved to 2-ID-1				
07-ID-B,C,D	**07-ID**	**SPX SS**																			upgrade in place			**07-ID**
	06-ID	**SPX IM**																						**06-ID**
06-BM		White Beam															program ends due to SPX							
	25-ID-1	**AS**																						**25-ID-1**
	25-ID-2	**LERIX**																						**25-ID-2**
20-ID-B,C		µXAFS									µXAF (AS) moved to 25-ID-1													
20-ID-B,C		LERIX									LERIX moved to 25-ID-2													
	20-ID	**WFI**																						**20-ID**
32-ID- B,C		PCI													PCI moved to 20-ID									
32-ID- B,C	**32-ID-1**	**TXM**														upgrade in place								**32-ID-1**
add cant	**32-ID-2**	**ISN**																						**32-ID-2**
01-ID B,C,D	**01-ID-1**	**HEXD**										upgrade in place												**01-ID-1**
add cant	**01-ID-2**	**HEXD-2**																						**01-ID-2**
04-ID-D	**04-ID**	**MS H**													upgrade in place									**04-ID**
	29-BM*	**FSD**																						**29-BM***
07-BM		Fuel Spray Dynamics													Fuel spray moved to 29-BM									
14-ID-B	**14-ID**	**HFPP**														upgrade in place								**14-ID**

BL Names

XX-ID-1 canted line of XX-ID
XX-ID-a shared program on line of XX-ID
* tentative location

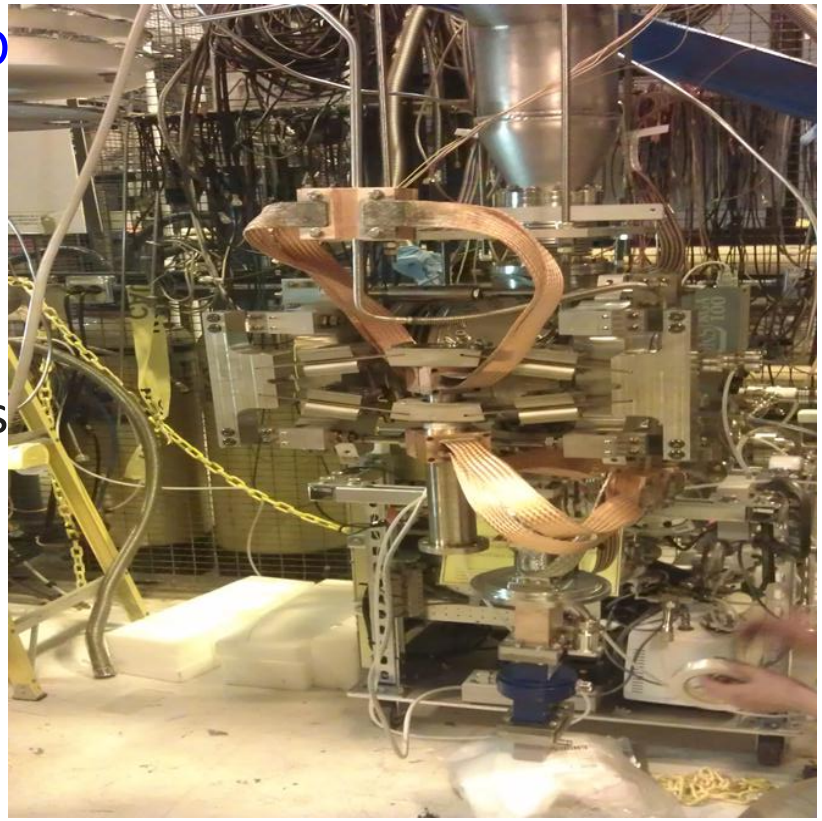
open
existing beamline operational
construction
program not available
upgrade beamline operational

APS Upgrade Beamlines Schedule: Project View - DRAFT



SPX Horizontal Cavity Tuner Test (HCT) @ ATLAS*

- First integration test of SPX assembly cold (LHe temp)—major milestone for SPX R&D
- Horizontal Cavity/Tuner Assembly completed at JLab in December 2012; installed @ ATLAS last week
- High Power RF, Low Level RF, and Controls installed/operational by APS-U
- Initial tests performed
- Currently analyzing results
- Tests will continue in February



*Argonne Tandem Linear Accelerator System

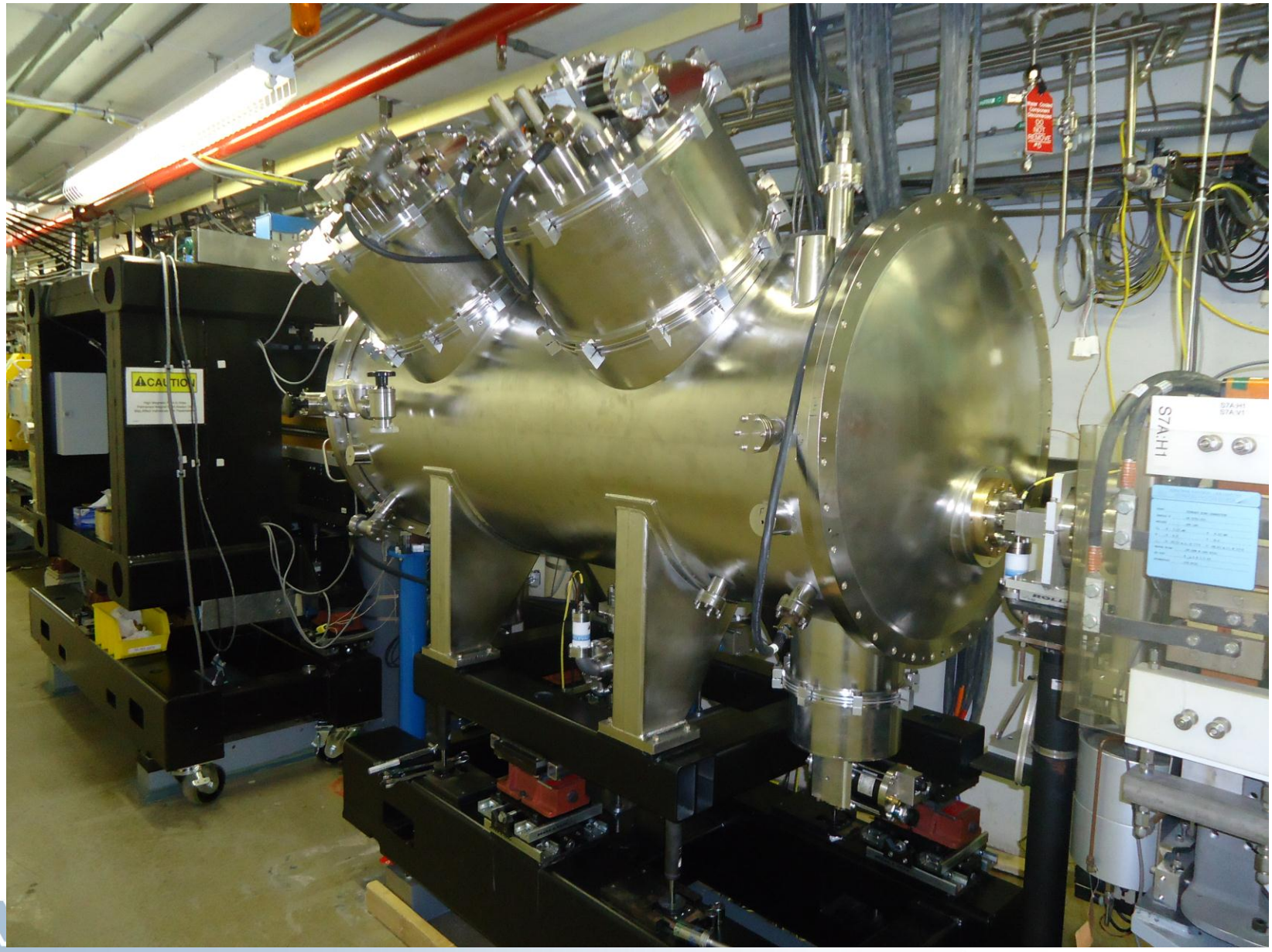
SPX Team Performing Tests at ATLAS

Not shown:
Jeremiah Holzbauer

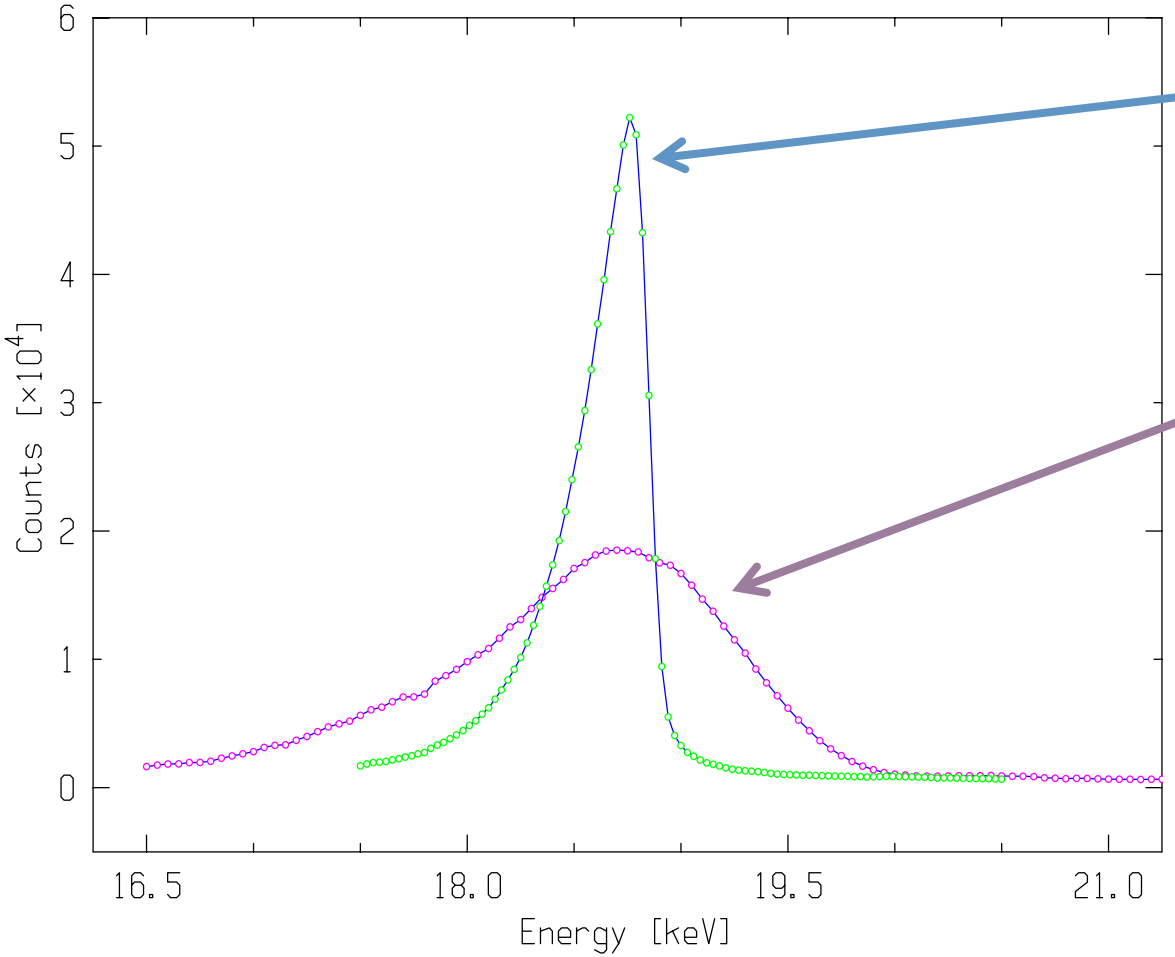
Joel Fuerst — APS-U Cryogenics
John Mammosser — JLAB Senior Staff Engineer (sitting)
Ali Nassiri — APS-U Technical Lead


RED
SALAMANDER

SCU0 Installed in December 2012



First Photons From SCU0: January 21, 2013*



Undulator A
3rd Harmonic
3.3cm 70 periods

SCU0
1st Harmonic
1.6cm 20 periods

Flux from SCU ~30% of Undulator A at 18.7 keV

Should provide greater flux at 60keV and 100 keV

*Measurements done during machine studies

SCU Team

Y. Ivanyushenkov (ASD)
Technical Lead and Commissioning Co-Lead

Core Team

Management: E. Gluskin*(ASD-MD)

Simulation: R. Dejus (ASD-MD)

S. Kim (ASD-MD)

R. Kustom (ASD-RF)

Y. Shiroyanagi (ASD-MD)

Design: D. Pasholk (AED-DD)

D. Skiadopoulos (AES-DD)

E. Trakhtenberg (AES-MED)

Cryogenics: J. Fuerst (ASD-MD)

Q. Hasse (ASD-MD)

Measurements: M. Abliz (ASD-MD)

C. Doose (ASD-MD)

M. Kasa (ASD-MD)

I. Vasserman (ASD-MD)

Controls: B. Deriy (ASD-PS)

M. Smith (AES-CTL)

Tech. support: *S. Bettenhausen (ASD-MD)*

K. Boerste (ASD-MD)

J. Gagliano (ASD-MOM)

M. Merritt (ASD-MD)

J. Terhaar (ASD-MD)

Budker Institute Collaboration
(*Cryomodule and Measurement System Design)*

N. Mezentsev

V. Syrovatin

V. Tsukanov

V. Lev

FNAL Collaboration
(Resin Impregnation)

A. Makarov

UW-Madison Collaboration
(Cooling System)

J. Pfotenhauer

D. Potratz

D. Schick

K. Harkay
Commissioning Co-Lead

Commissioning Team

L. Boon (ASD-AOP)

M. Borland (ASD-ADD)

G. Decker* (ASD-DIA)

J. Dooling (ASD-AOP)

L. Emery* (ASD-AOP)

R. Flood (ASD-AOP)

M. Jaski (ASD_MD)

F. Lenkszus (AES-CTL)

V. Sajaev (ASD-AOP)

K. Schroeder (ASD-AOP)

N. Sereno (ASD-AOP)

H. Shang (ASD-AOP)

R. Soliday (ASD-AOP)

X. Sun (ASD-DIA)

A. Xiao (ASD-AOP)

A. Zholents (ASD-DD)

SCU Team - Continued

Technical Support	
R. Bechtold (AES-MOM)	D. Capatina (AES-MED)
J. Collins (AES-MED)	P. Den Hartog* (AES-MED)
R. Farnsworth* (AES-CTL)	G. Goeppner* (AES-MOM)
J. Hoyt (AES-MOM)	W. Jansma (AES-SA)
J. Penicka* (AES-SA)	J. Wang* (ASD-PS)
S. Wesling (AES -SA)	

Excerpts from Jim Murphy e-mail sent on January 23, 2013:

"Light Source Directors: Brian Stephenson & George Srajer shared some exciting news from the APS/APS-U team with BES yesterday. The APS/APS-U team obtained the first spectra from the prototype superconducting undulator that they recently installed in the APS ring…. I encourage each of you to think how this exciting new technology could play a role in your facilities. Congratulations to the APS/APS-U team on this achievement."

Summary

- APS Upgrade had a successful CD-2 review
- Trip to DOE planned for February 4 to discuss CD-2 review and provide technical updates (SCU0 and SPX)
- Significant technical progress has been made:
  - Superconducting undulator prototype (SCU0)
  - Short pulse x-ray prototype cavity (SPX0)
- APS Upgrade keeps moving forward