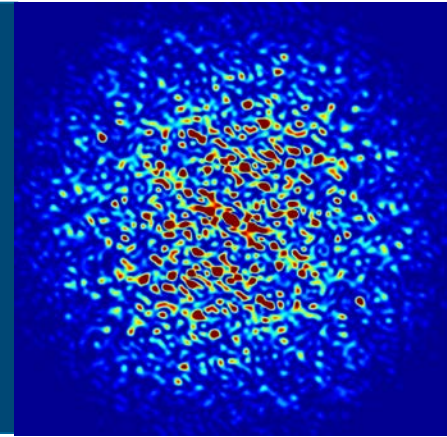


# APS UPGRADE PROJECT UPDATE



**Robert Hettel**

Director, APS Upgrade Project  
Argonne National Laboratory

APS All-Hands Meeting  
January 24, 2018

# APS-U PROJECT SCOPE

All existing beamlines incorporated in plans to come back online at conclusion of APS-U

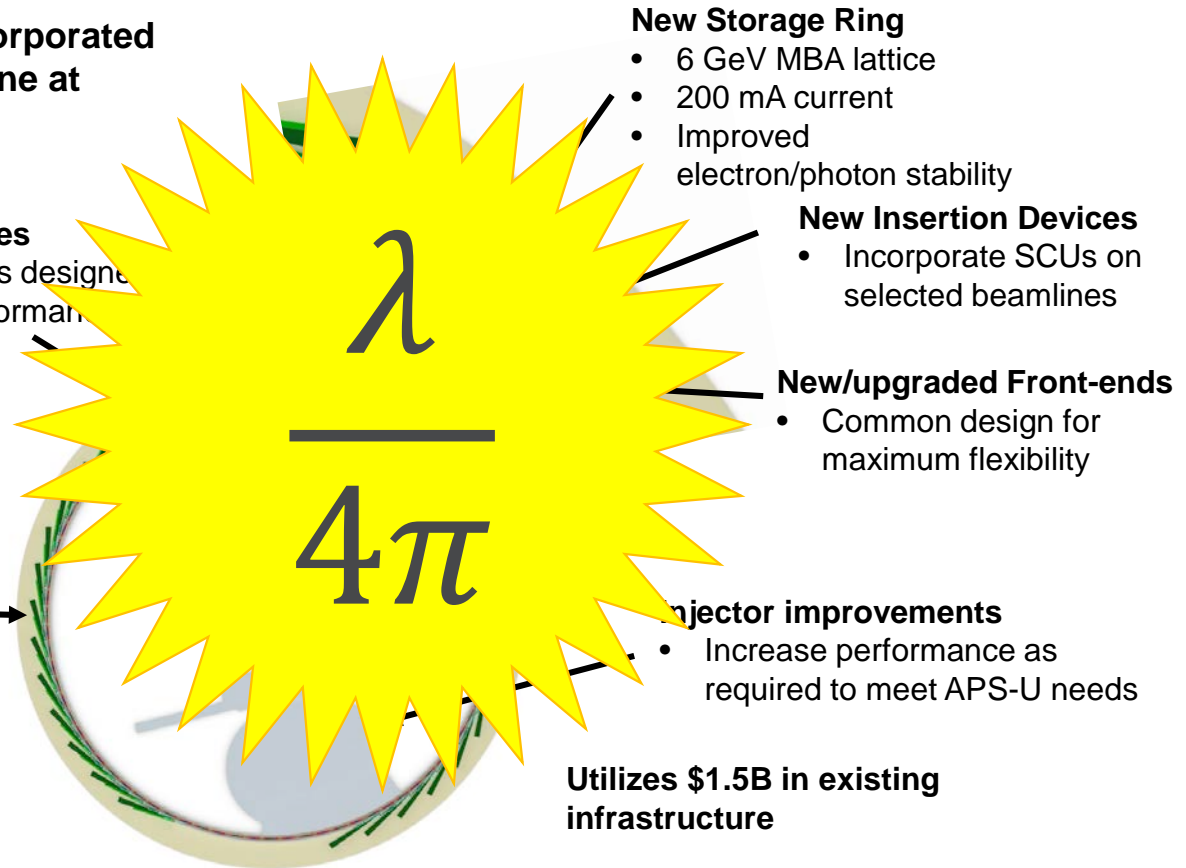
## Feature beamlines

Suite of beamlines designed for best-in-class performance

## Beamline Enhancements

: improvements to make beamlines "Upgrade Ready"

$$\lambda = 1\text{\AA} \Rightarrow \epsilon_{\text{diff}} = 8 \text{ pm-rad}$$



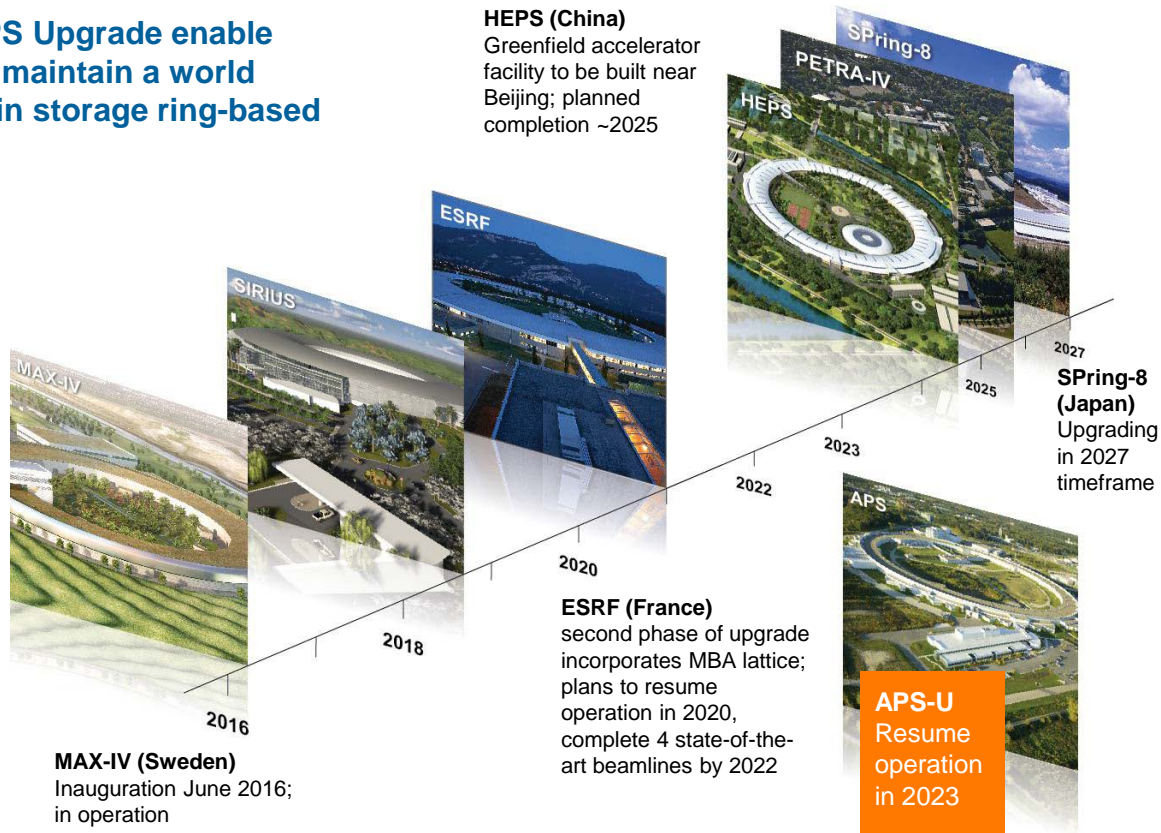
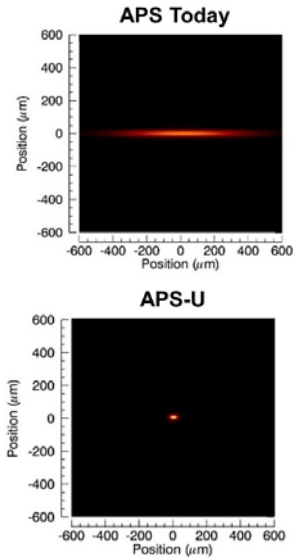
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# DIFFRACTION-LIMITED STORAGE RINGS – DLSRS (OR 4<sup>TH</sup> GENERATION STORAGE RINGS – 4GSRs)

Our plans for the APS Upgrade enable the United States to maintain a world leadership position in storage ring-based x-ray sources



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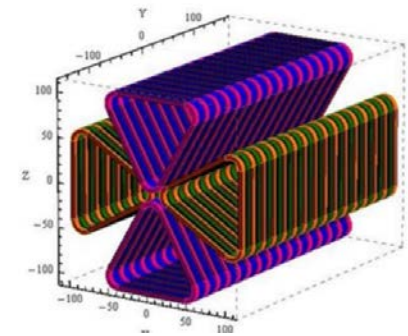
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# SOME APS-U DESIGN UPDATES

- 42-pm, 6-GeV reverse-bend lattice adopted as baseline ( $\lambda_{\text{diff}} = 5.3 \text{ \AA}$ ,  $\sim 2.3 \text{ keV}$ )
- 200 mA in 48 bunches or more planned
- Progress in improvements of injector chain for 48-bunch swap-out
- Accelerator R&D program nearly complete
- CD-3b long-lead procurements (LLPs) identified and prioritized; magnet, front end, beamline, and vacuum chamber LLPs in process
- Diamond CRL development in progress
- SCU R&D: long cryostats (4.5m) holding 2 SCUs; full-length thin-wall vacuum chamber; test of fully assembled cryostat
- Feature beamlines selected; prioritization underway
- Solid state amplifiers for RF cavities under investigation
- DOE/OPA review in December a success
- APS-U is “a bargain” – R. Perry, Jan 2018



Design model of long SCU installed in the APS-U.



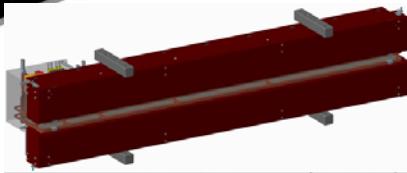
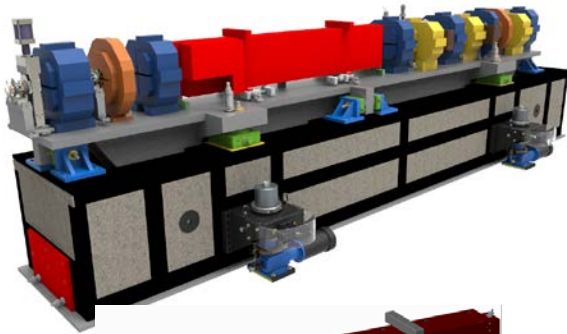
**SCAPE** (not a project deliverable)

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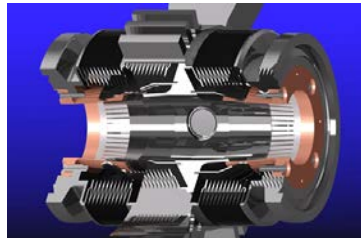
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# APS-U TECHNOLOGY



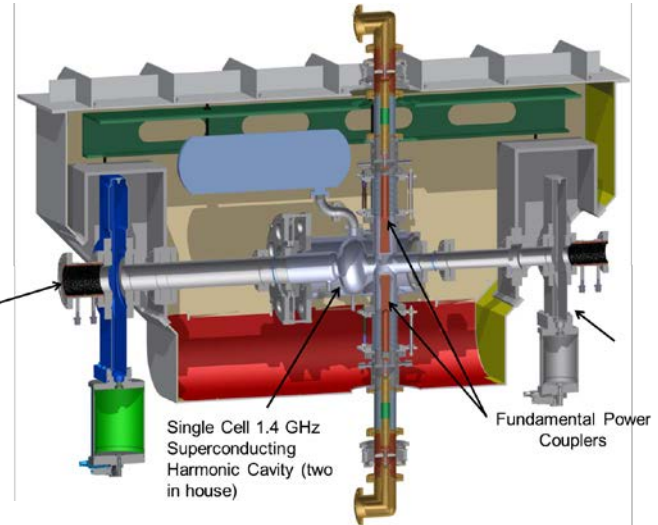
L-Bend Magnets (M1, M2)



Higher-order mode damper (four units exist)

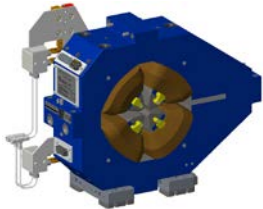


In-House Design  
Fast Bipolar Power Supply\*

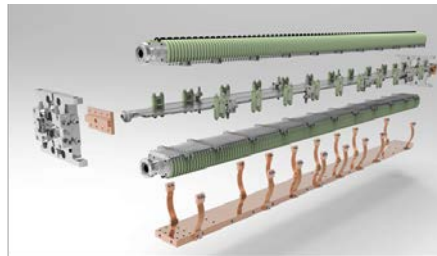


Single Cell 1.4 GHz Superconducting Harmonic Cavity (two in house)

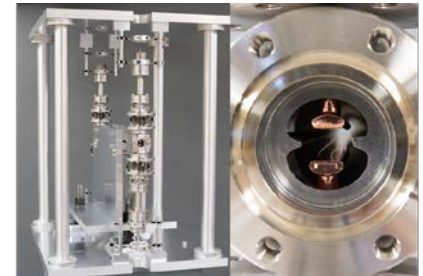
Fundamental Power Couplers



Q-Bend Magnets M3, M4



Exploded view of planar SCU design model with vacuum chamber



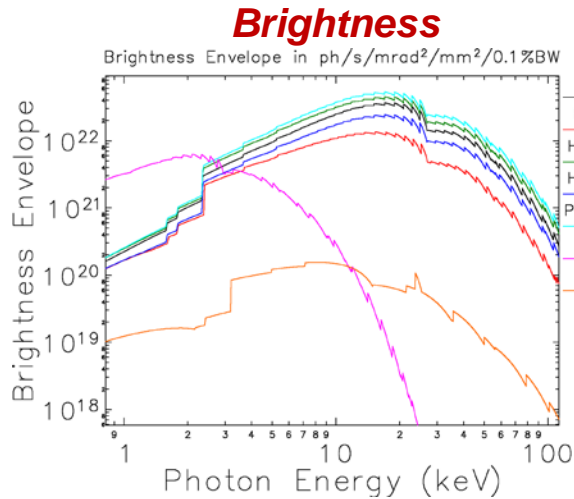
Prototype Stripline Kicker used for successful BTX Beam Tests

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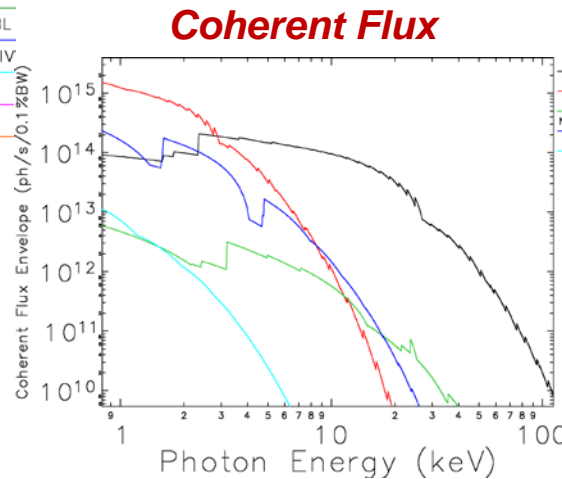
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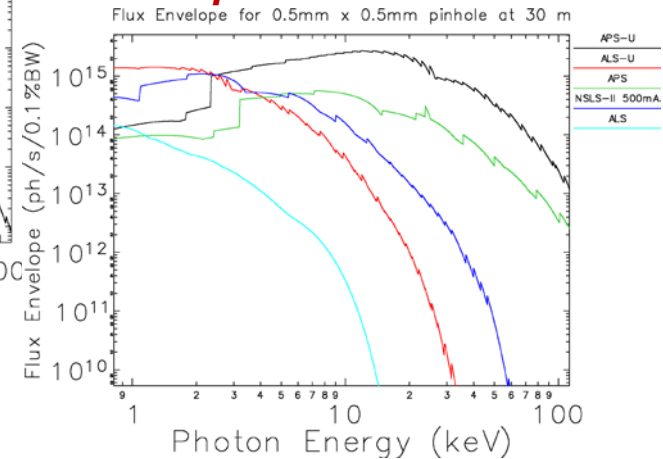
# APS-U ENSURES THAT THE UNITED STATES MAINTAINS WORLD LEADERSHIP IN LIGHT SOURCES



Curves for APS, ESRF-EBS, PETRA-IV and HEPS based on present designs, assuming identical undulators



**Flux into 0.5 mm x 0.5 mm pinhole @ 30 m**

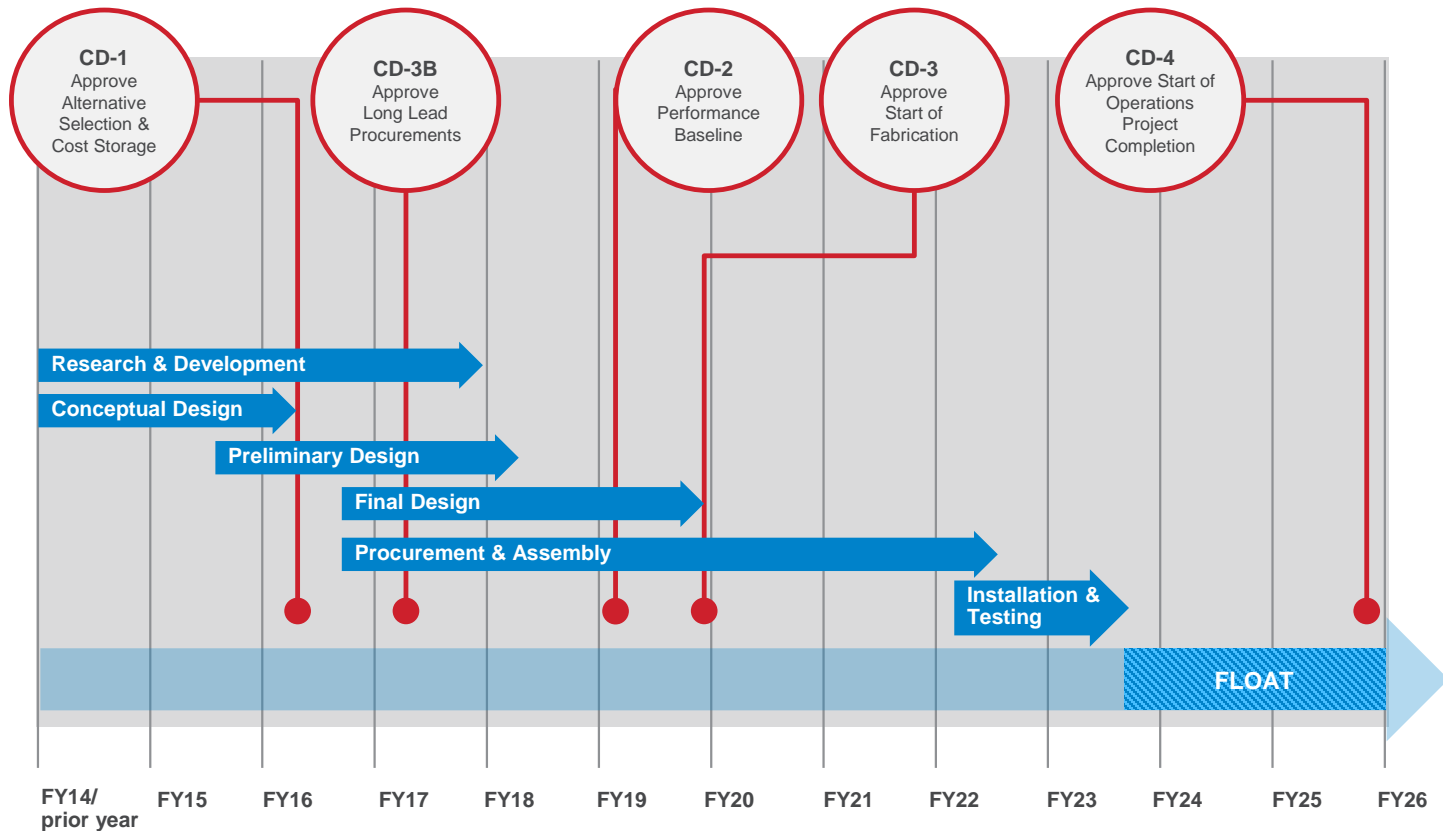


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# APS UPGRADE PROJECT SCHEDULE



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# FY18 ANNUAL PLAN MILESTONES

IN REVISION

Milestone Number	Milestone Description	Planned Date	Actual / <i>Anticipated Date</i>
AP-FY18-M1	First operation of new booster sextupole power supply	21-Dec-17	13-Dec-17
AP-FY18-M2	Award of 28-ID-A shielded enclosure contract	15-Mar-18	20-Dec-17
AP-FY18-M3	Receive prototype five-segment gradient dipole	15-May-18	15-Apr-18
AP-FY18-M4	Receive high-voltage pulser from alternate vendor	29-Jun-18	1-Feb-18
AP-FY18-M5	Lattice Final Design Review	14-Apr-18	14-Apr-18
AP-FY18-M6	High Heat Load Front End (HHLFE) components for R&D beamline ready for installation	27-Aug-18	27-Aug-18
AP-FY18-M7	Complete tests of vacuum system sector mockup	28-Sep-18	28-Sep-18
AP-FY18-M8	Finish Fabrication and characterization of a set of 6 zone plates with 16 nm outer most zone width	17-Sep-18	17-Sep-18

M3 – Vendor currently showing ship date of 3 March

M4 – Arrived at ANL. Initial Testing Setup near complete.

All not yet finished milestone is being reviewed per phone call of 17 Jan. Some modifications are underway...Updates next month.

BES APS-U January 2018 Call



# APS-U PROJECT MANAGEMENT TEAM IS IN PLACE AND READY TO DELIVER THE PROJECT



**Jim Kerby**  
Project Manager



**Robert Hettel**  
APS Upgrade Project Director



**Tom Fornek**  
Deputy Project Manager



**Elmie Peoples-Evans**  
Project Operations



**Glenn Decker**  
Accelerator Systems



**Mohan Ramanathan**  
Front-ends and IDs



**Dean Haeffner**  
Experimental Systems

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