

# BES Scientific User Facilities

Office Hours  
August 15, 2024



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

[Energy.gov/science](https://energy.gov/science)

# BES Supports 12 of DOE's Office of Science 28 User Facilities



5 X-ray Light Sources (ALS, APS, LCLS, NSLS-II, SSRL)  
5 Nanoscale Science Research Centers (CFN, CINT, CNM, CNMS, TMF)  
2 Neutron Sources (HFIR, SNS)

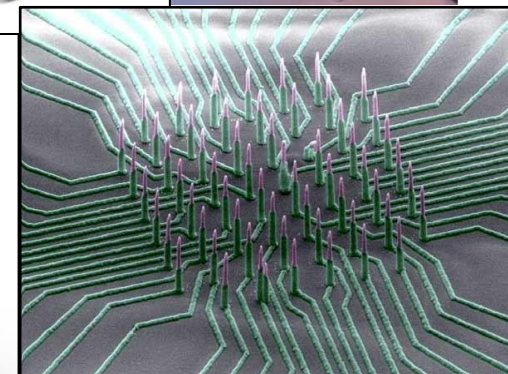
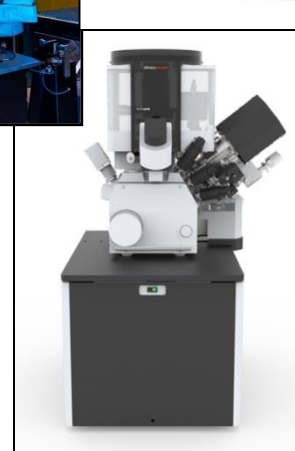
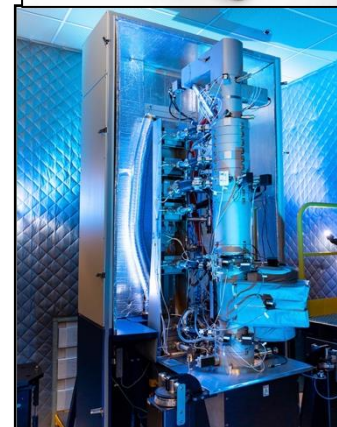
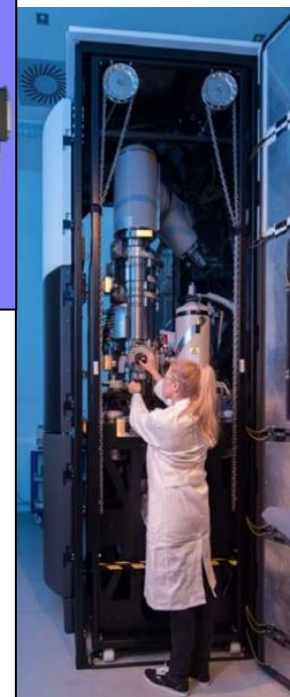
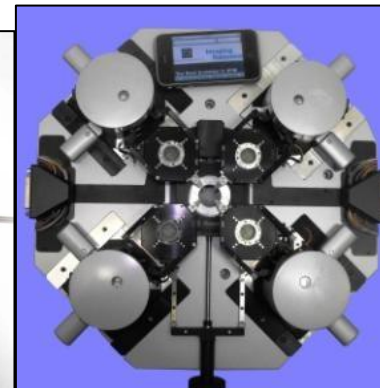
# Nanoscience: NSRC Recapitalization Project

\$80M; 17 new state-of-art tools across the 5 NSRCs; Early completion expected 2026

Priority	NSRC	Instrument	Short name
1	CNMS	He-Cooled STEM w/ Monochromator & EELS (3A scope)	MAC-STEM
2	CFN	Aberration-Corrected Environmental STEM (3A scope)	E-STEM
3	TMF	Synthesis Robots for Atomic Control Over Inorganic Materials	Robots-I
4	CNM	Dynamic DAC-STEM	DAC-STEM
5	CINT	Advanced III-V Heteroepitaxy	MBE
6	CINT	Reactive Ion Beam (RIBE)/(Si DRIE)	DRIE
7	TMF	3D Multimodal Optoelectronic STEM	Multimodal
8	CNM	Multibeam Ion Microscope	FIB
9	CNMS	Focused Ion Beam (PFIB) with Cryo-Stage and Cryo-Transfer	cryoFIB
10	CFN	Ambient Pressure Hard X-ray Photoelectron Spectroscopy	HAXPES
11	CINT	Dual Ion Beam Sputtering System	Sputter
12	CNM	Transient Photoelectron and Cathodoluminescence Spectrometer	TPCS
13	TMF	High Throughput TEM for Hard Matter	HT-TEM
14	CINT	Electron Beam Lithography Systems	EBL
15	CNM	A Microscope Capable of Single Spin Imaging	mK-STM
16	CINT	Time-Resolved Angle-Resolved Photoemission Spectroscopy	trARPES
17	CINT	Multiprobe instrument	Multiprobe

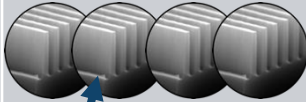
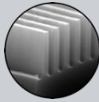
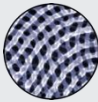
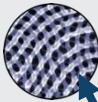
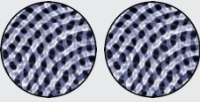
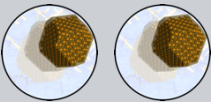
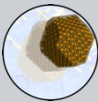
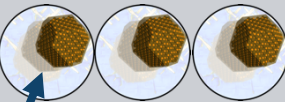
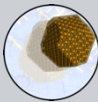
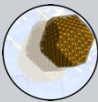
Accelerating Nanoscale Materials Discovery and Design
Decoding Nanoscale Dynamics and Heterogeneity
Expanding the Limits of Nanofabrication

**First tools are being received and installed at NSRCs!**



# Nanoscience: NSRC Recapitalization Project

\$80M; 17 new state-of-art tools across the 5 NSRCs; Early completion expected 2026

	CFN	CINT	CNM	CNMS	Foundry
Expanding the Limits of Nanofabrication					
Accelerating Nanoscale Materials Discovery & Design					
Decoding Nanoscale Dynamics and Heterogeneity					

Si Deep RIE  
at CINT



DAC-STEM  
at CNM

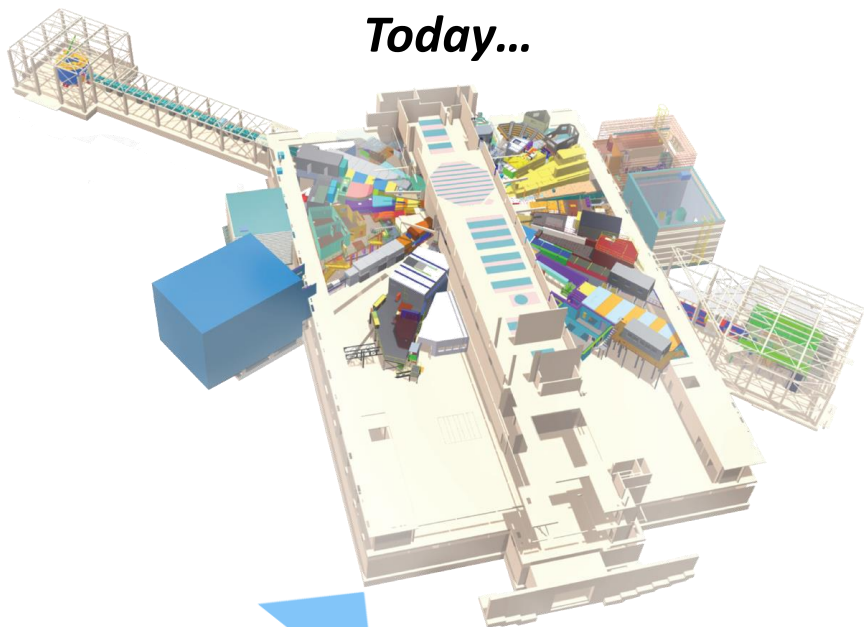


Cryo-Plasma FIB at CNMS



# Neutron science: Proton Power Upgrade and Second Target Station

*Today...*



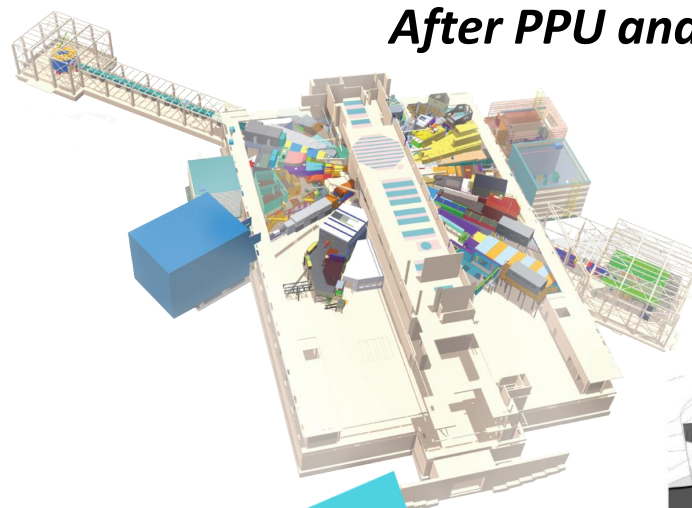
1.7 MW

Accelerator today

First Target Station (60 Hz)

- 24 instrument positions
- 19 instruments
- 1 instrument under construction (VENUS)

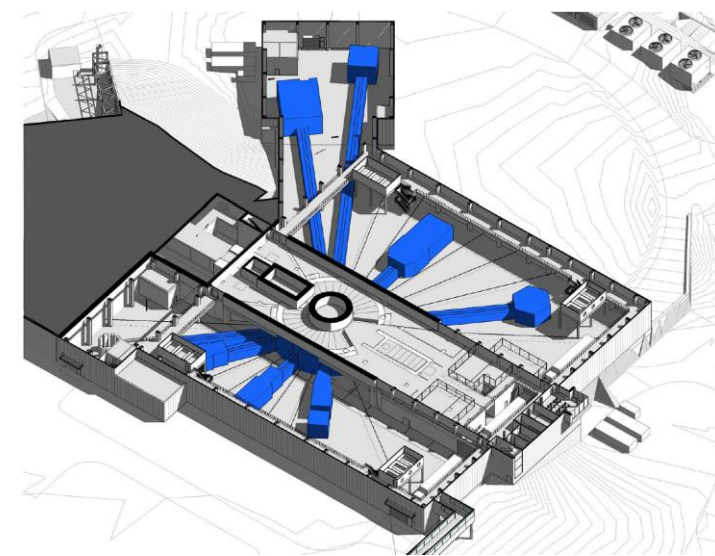
*After PPU and STS*



2 MW

0.7 MW

Accelerator after PPU

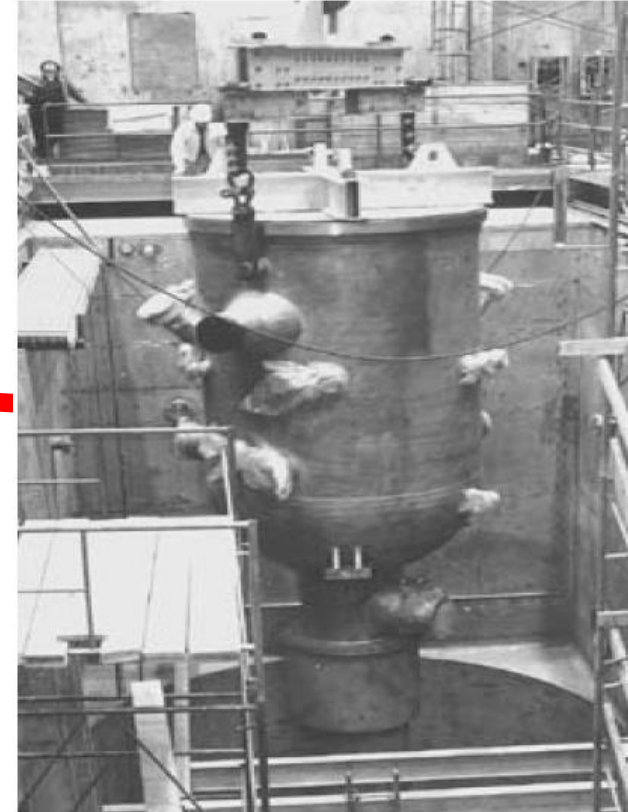
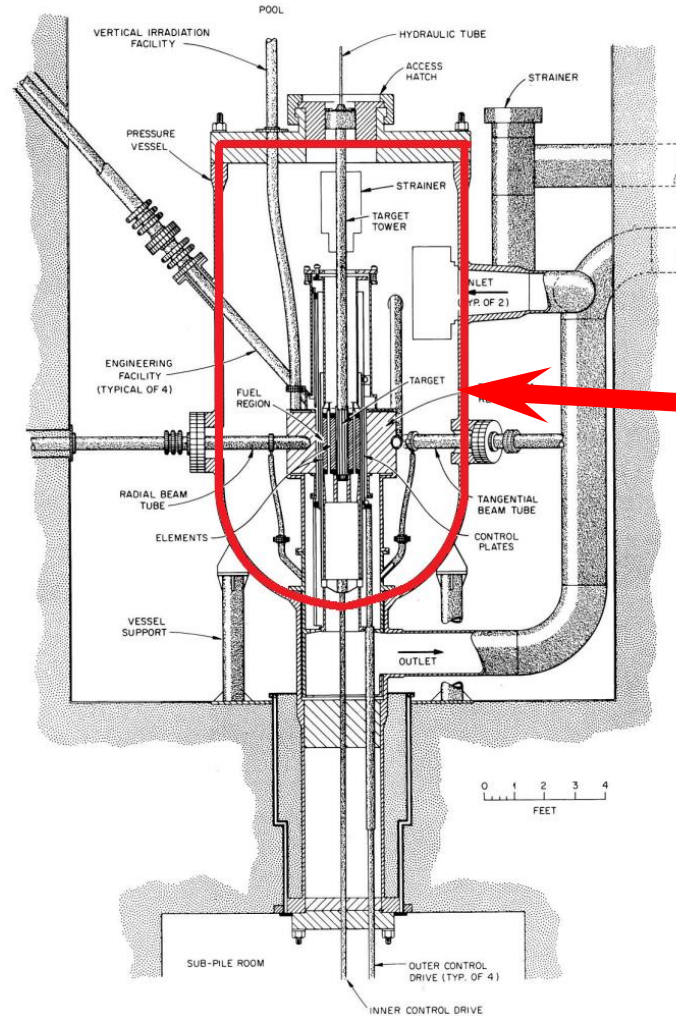
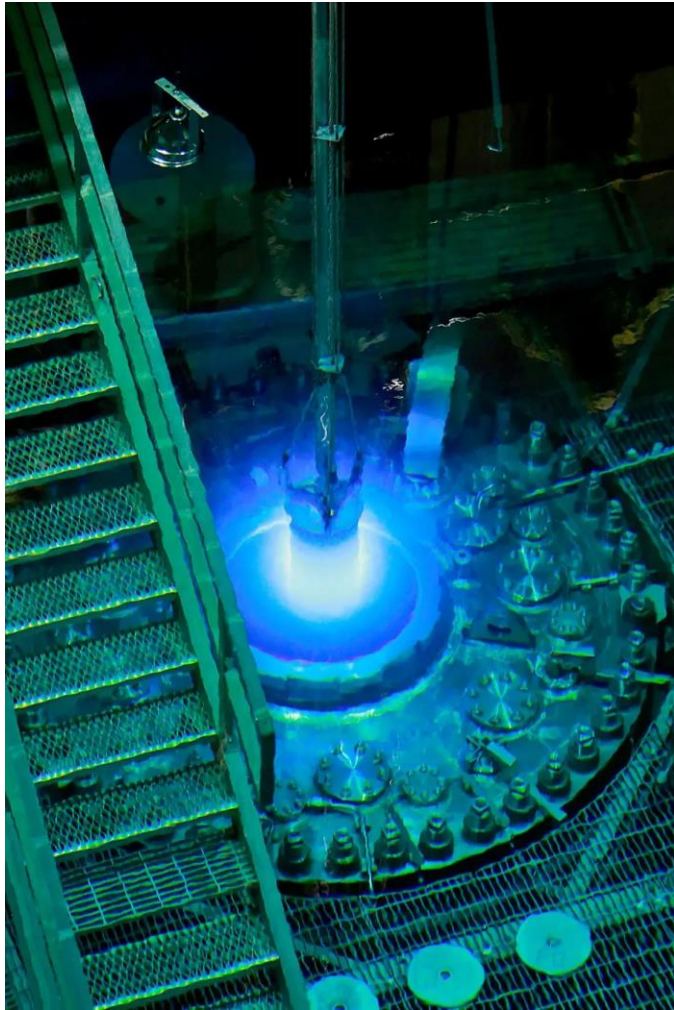


Second Target Station (15 Hz)

- 18-22 instrument positions
- 8 initial instruments

# Neutron science : HFIR pressure vessel replacement

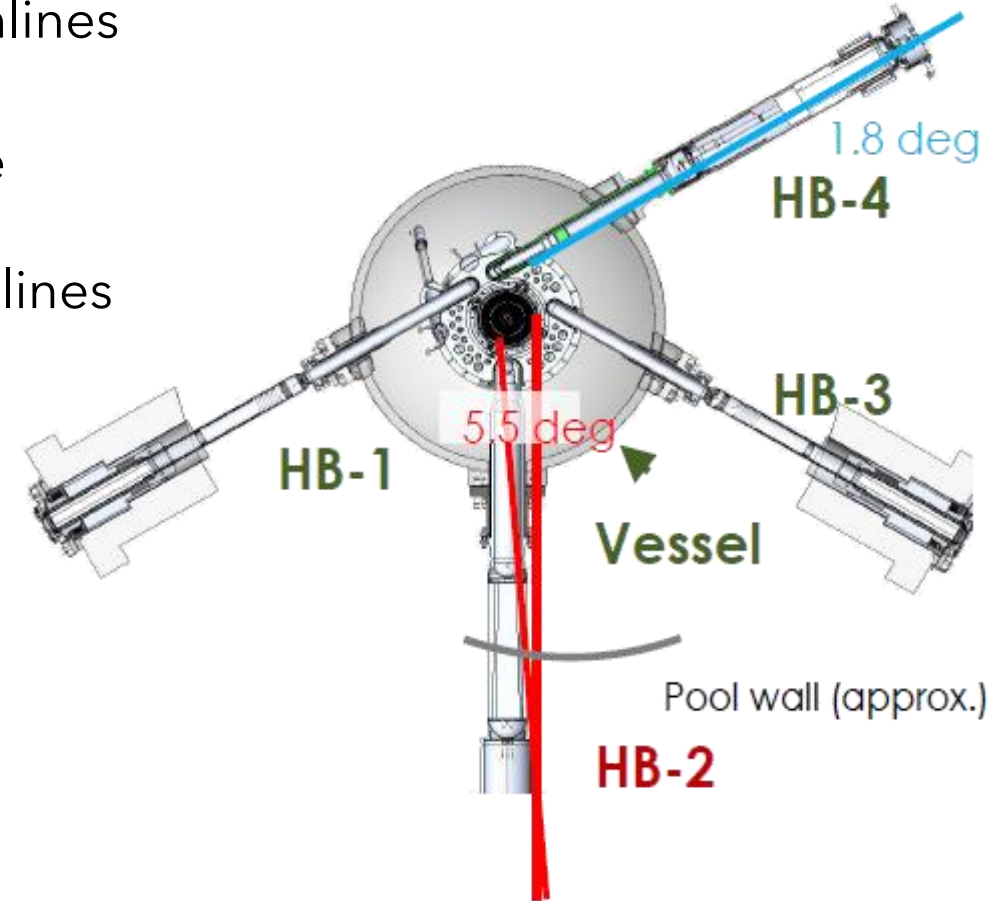
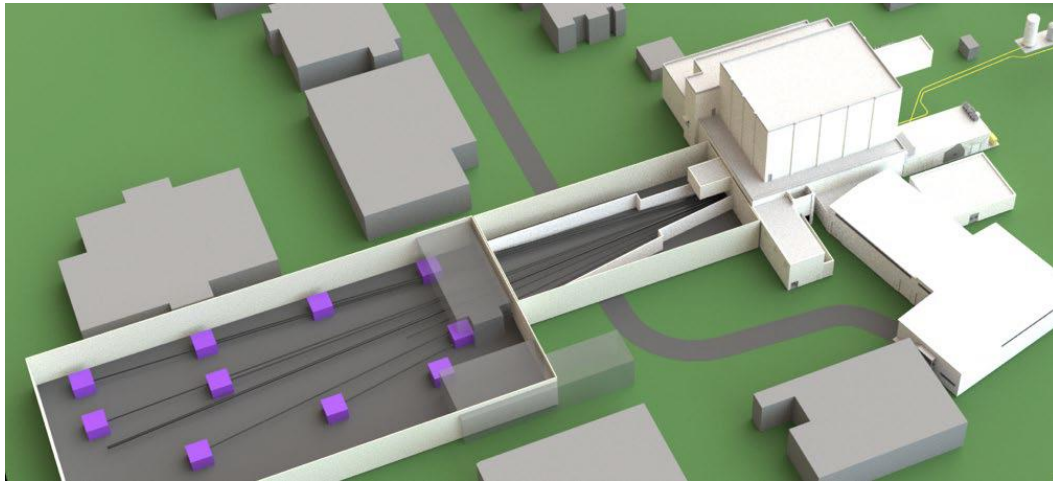
Original HFIR pressure vessel in 1965



➤ October 2020 CD-0 mission need approval for reactor pressure vessel replacement

# Neutron science: HFIR pressure vessel replacement

- ◆ Modification of beam tube positions and angles:
  - Improvement in beam quality and flux at existing beamlines
  - Repurpose existing beamlines
  - Minimize line of sight of HFIR active zone to reduce the background
  - Possibility to build a new guide hall to host more beamlines
  - Improve moderators

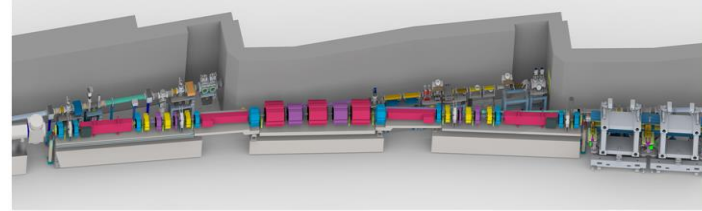
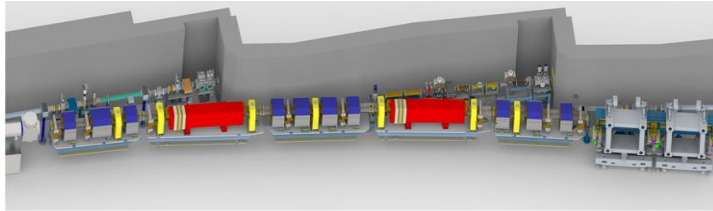


# X-ray science: Synchrotron Upgrades

Old

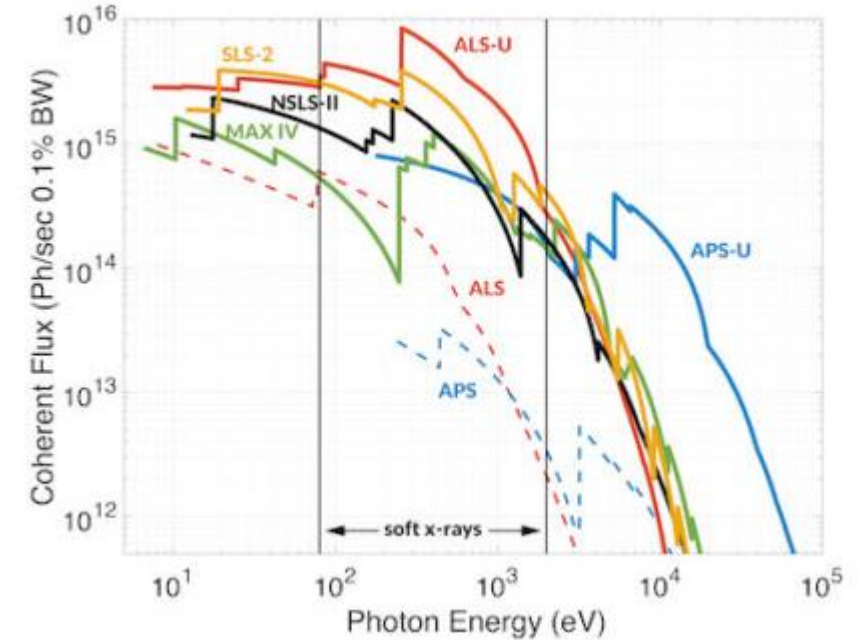
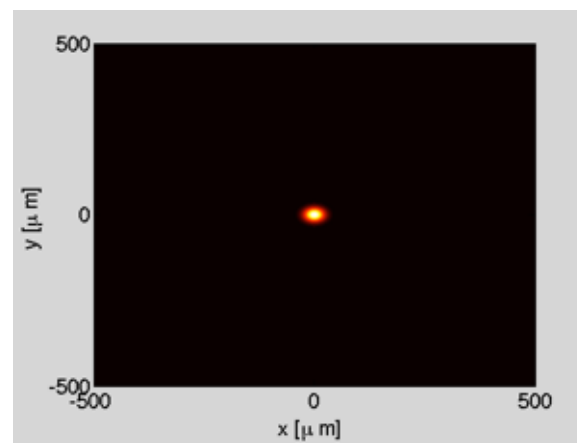
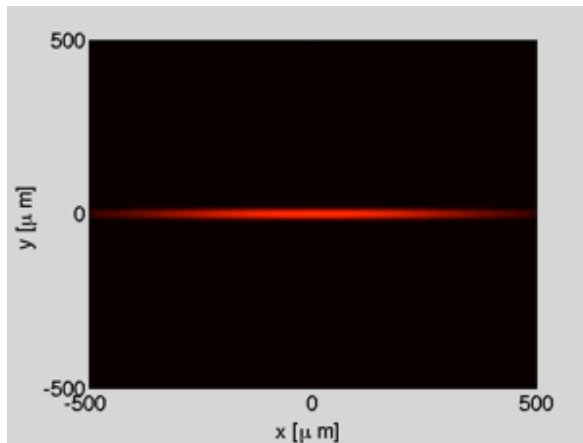
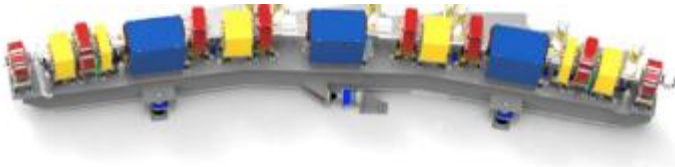
New

APS  
(2024)



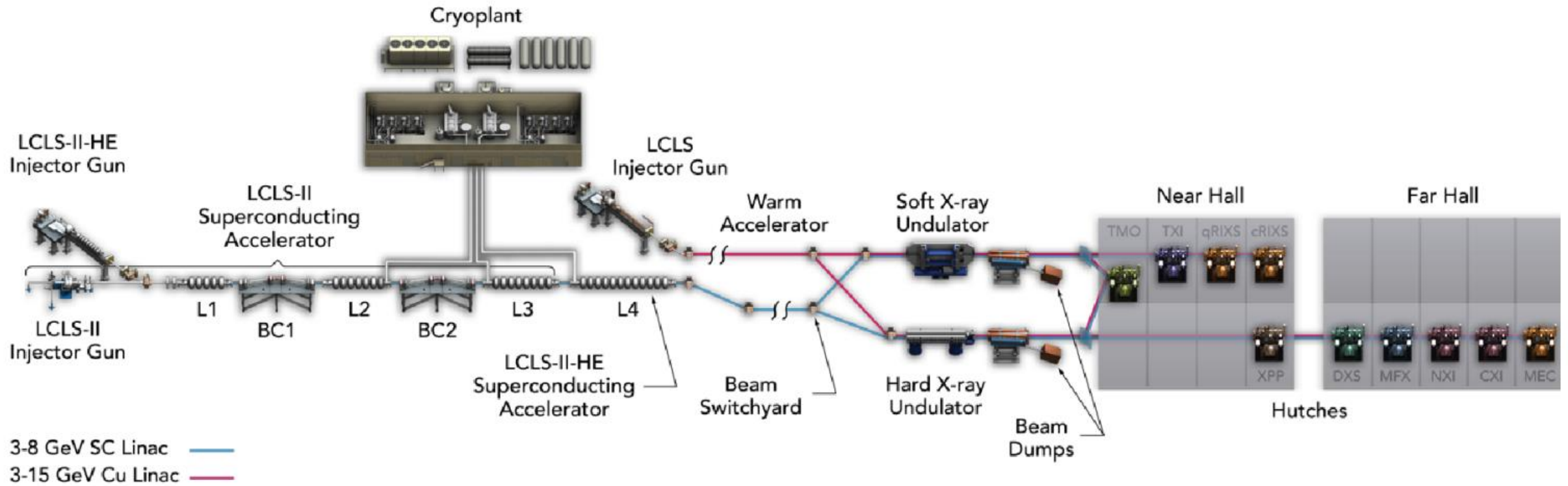
Including new beamlines and beamline enhancements

ALS  
(2027)





# X-ray science: LCLS-II and LCLS-II-HE

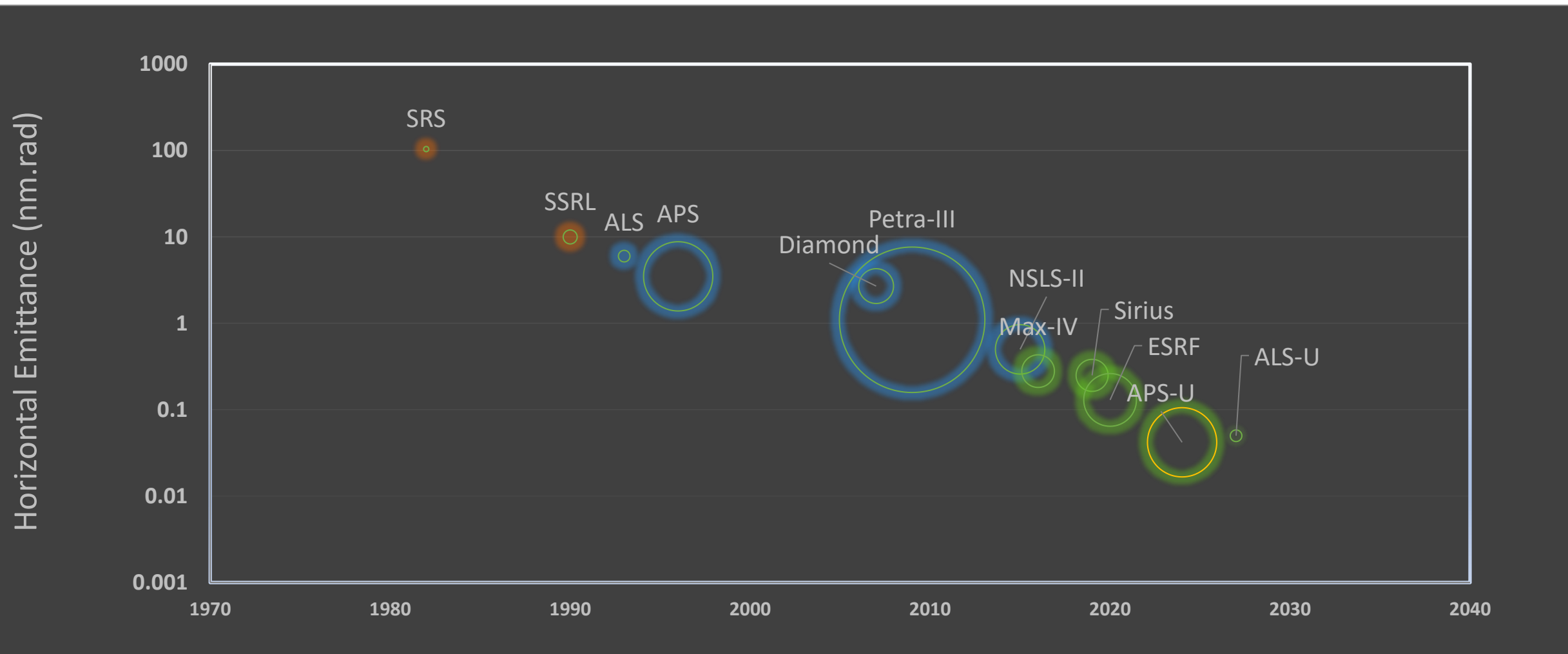


Original LCLS (2009): 200 eV to 25 keV, fs pulses @ 120 Hz

LCLS-II (2023): 250 eV to 5 keV, fs pulses @ up to 1 MHz

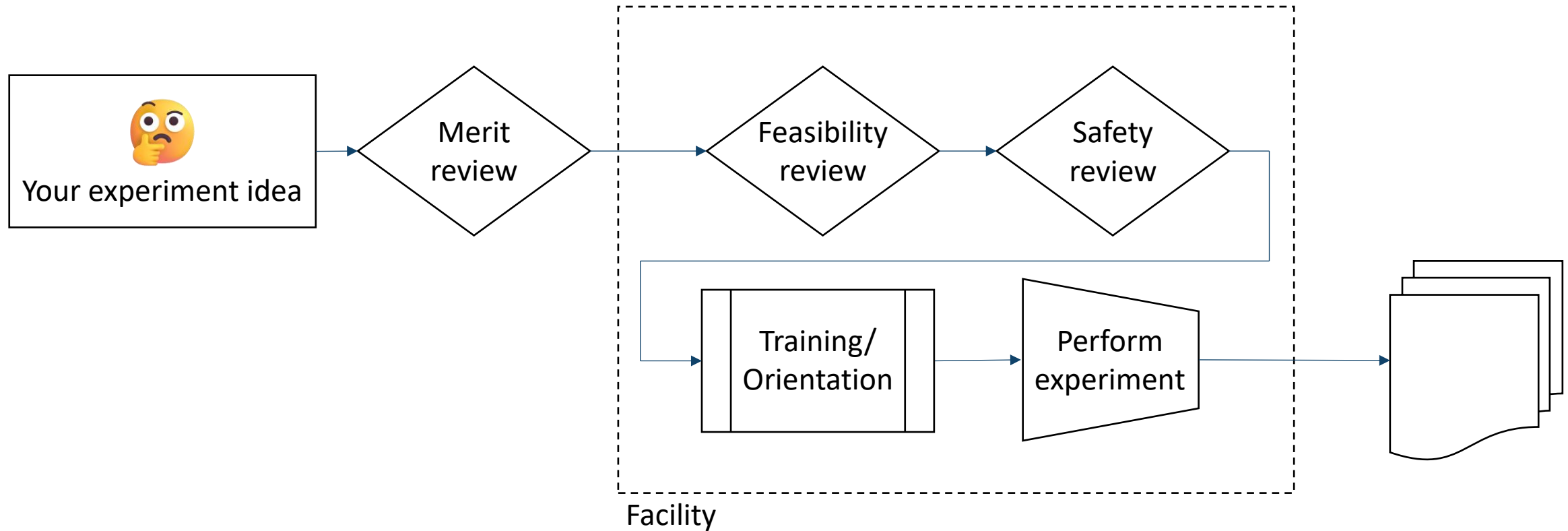
LCLS-II-HE (2026): 250 eV to 13 keV (20 w/Low Emittance Injector), fs pulses @ up to 1 MHz

# Towards the Diffraction Limit



# User facility access

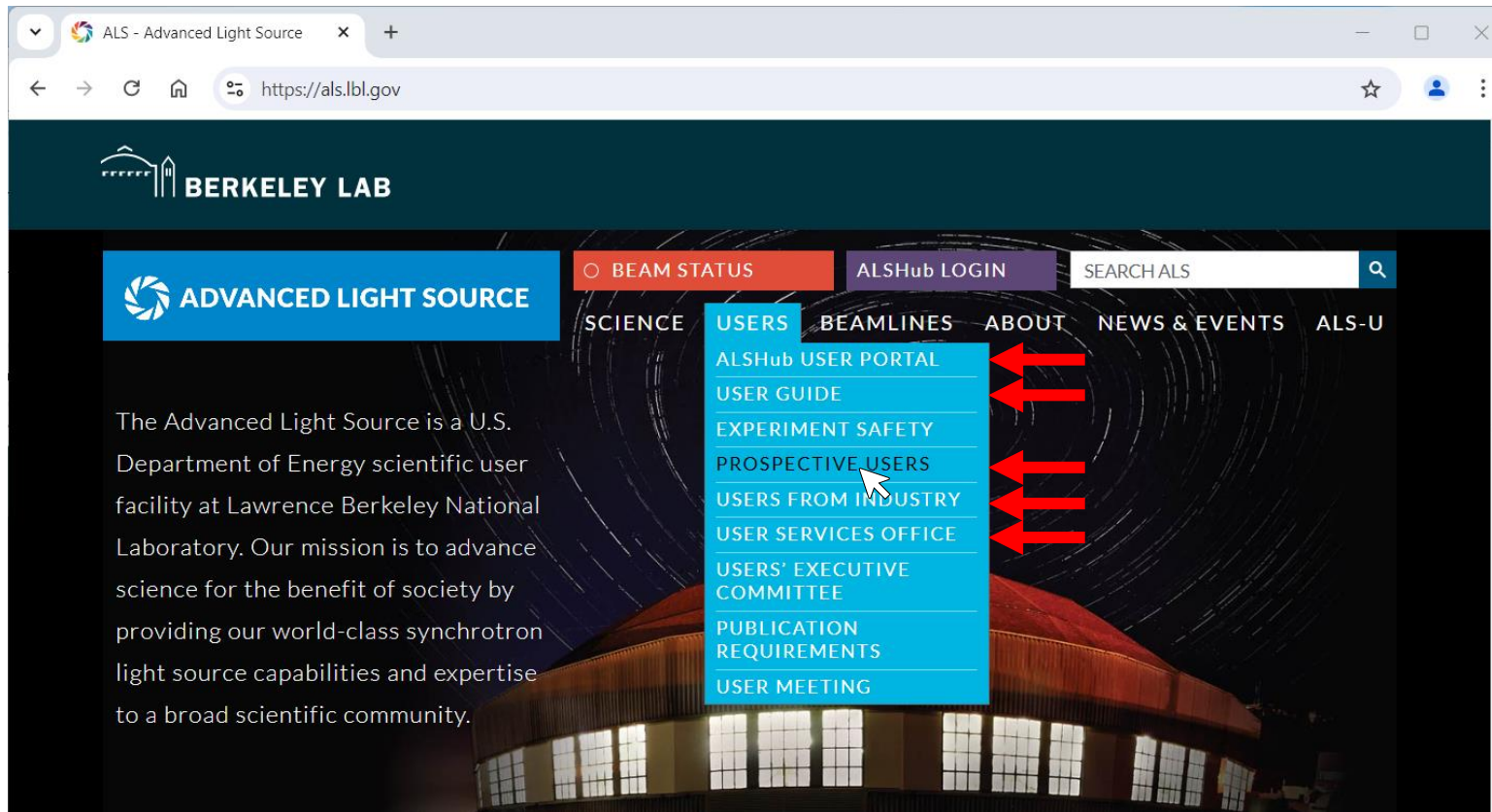
- ◆ Facility access and time is awarded on scientific merit without charge for operations to the user (except for proprietary access)
- ◆ The basic process:



# User facility access

- ◆ Proposal processes vary by facility:
  - “One-stop shop”: <https://science.osti.gov/bes/suf/User-Facilities>

Facility websites are the front doorbell:




- BES facilities offer capabilities **AND** expertise
- **Staff can and will help you develop your experiment and your proposal!**


# Upcoming Office Hours (SC-wide)

◆ <https://science.osti.gov/officehours>

## Upcoming Office Hours and Topics

Tuesday, September 3, 2024, at 2pm ET – Promoting Inclusive and Equitable Research (PIER) Plans. Register [here](#) .

Tuesday, October 1, 2024, at 2pm ET – FY 2025 Continuation of Solicitation for the Office of Science Financial Assistance Program, more commonly known as the Open Call or Annual Solicitation. Register [here](#) .

Tuesday, November 5, 2024, at 2pm ET – Topic TBD. Register [here](#) .

Tuesday, December 3, 2024, at 2pm ET – Topic TBD. Register [here](#) .

Tuesday, January 7, 2025, at 2pm ET – Topic TBD. Register [here](#) .

Tuesday, February 4, 2025, at 2pm ET – Topic TBD. Register [here](#) .

# Q & A



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