LCLS Run 26 Users Town Hall

July 16th 2025

SLAC NATIONAL ACCELERATOR LABORATORY

Stanford University | U.S. DEPARTMENT OF ENERGY

Agenda

Time (PST)	Topic	Presenter
Plenary Session - Join via Zoom >>		
9:00 am	Current LCLS Status & Plans	**Mike Dunne** Director, LCLS
9:15 am	Universal Proposal System	**Leilani Conradson / Paul Jones** LCLS User Office
9:25 am	User Executive Committee Update	**Silvia Pandolfi** LCLS UEC Vice Chair
9:28 am	Short Proposal Program Update	**Sandra Mous** LCLS Scientist
9:31 am	Accelerator Plans for Run 26	**Tim Maxwell / Axel Brachmann** NC Linac Dept. Head / Linac & FEL Div. Dir.
9:36 am	Soft X-ray Instrument Capabilities with 120Hz beam (Introduce breakouts)	**James Cryan / Kristjan Kunnus /Georgi Dakovski** TMO/chemRIXS/qRIXS Instrument Leads
9:45 am	Hard X-ray Instrument Capabilities with 120Hz beam (Introduce Breakouts)	**Takahiro Sato / Matthieu Chollet / Leland Gee / Meng Liang / Éric Galtier** XPP/XCS/MFX/CXI/MEC Instrument Leads
9:55 am	Data systems	**Jana Thayer** Data Systems Dept. Head
Breakout Sessions/Office Hours by Instrument		
10:10 am - 11:00am	Session 1	
	•TMO Join via Zoom >>	James Cryan
	•MEC Join via Zoom >>	Eric Galtier
	•MFX Join via Zoom >>	Sebastian Dehe for Leland Gee
	•qRIXS Join via Zoom >>	Georgi Dakovski
	•XPP/XCS Join via Zoom >>	Takahiro Sato & Matthieu Chollet
	•chemRIXS Join via Zoom >>	Kristjan Kunnus
	•CXI Join via Zoom >>	Meng Liang

Current LCLS Status & Plans

Mike Dunne

LCLS Director

July 16th 2025

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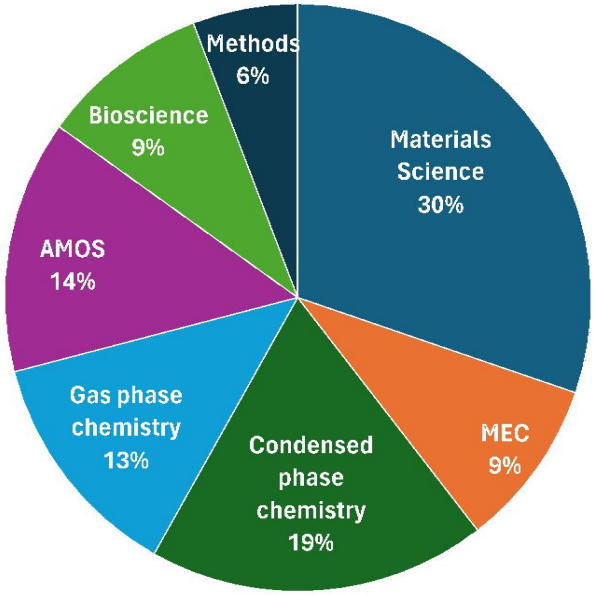
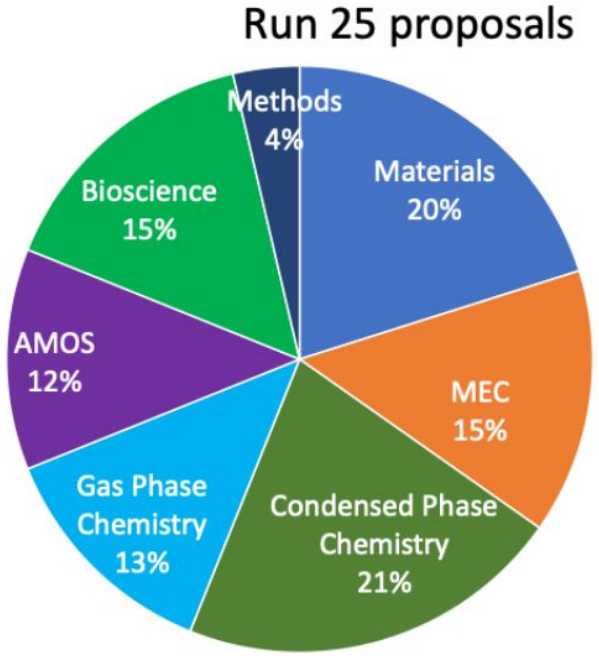
Proposal statistics from prior runs

Split by science area

Run 24

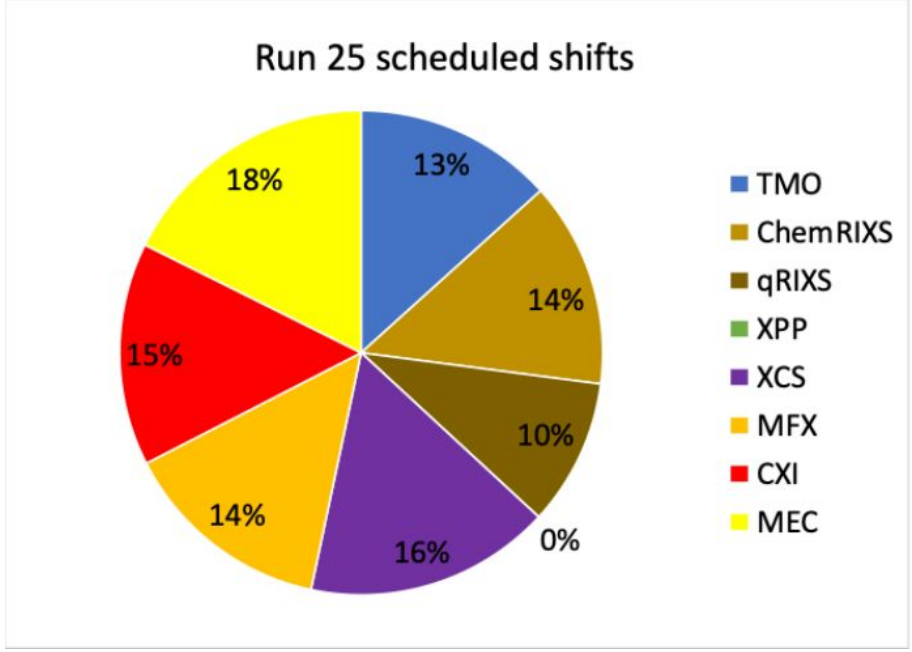


Run 25 proposals



Split by instrument

Run 25



164 proposals for Run 25 (Sept 25 – Feb 2026)

158 proposals for Run 24 (March – July 2025)

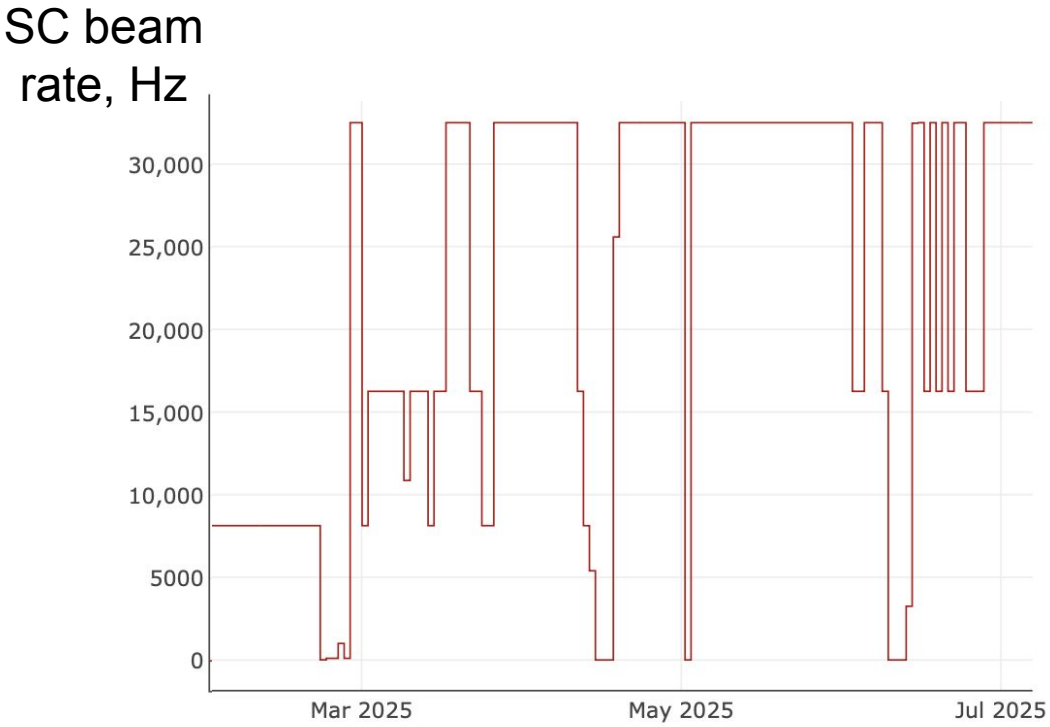
Note:
XPP is being upgraded for LCLS-II-HE.
Will be available for Run 26 (Cu beam)

LCLS user delivery statistics

"XFEL Facility Hours" delivered

FY25 will see the most beamtime ever delivered to users: ~7000 facility hours

SC beam delivery

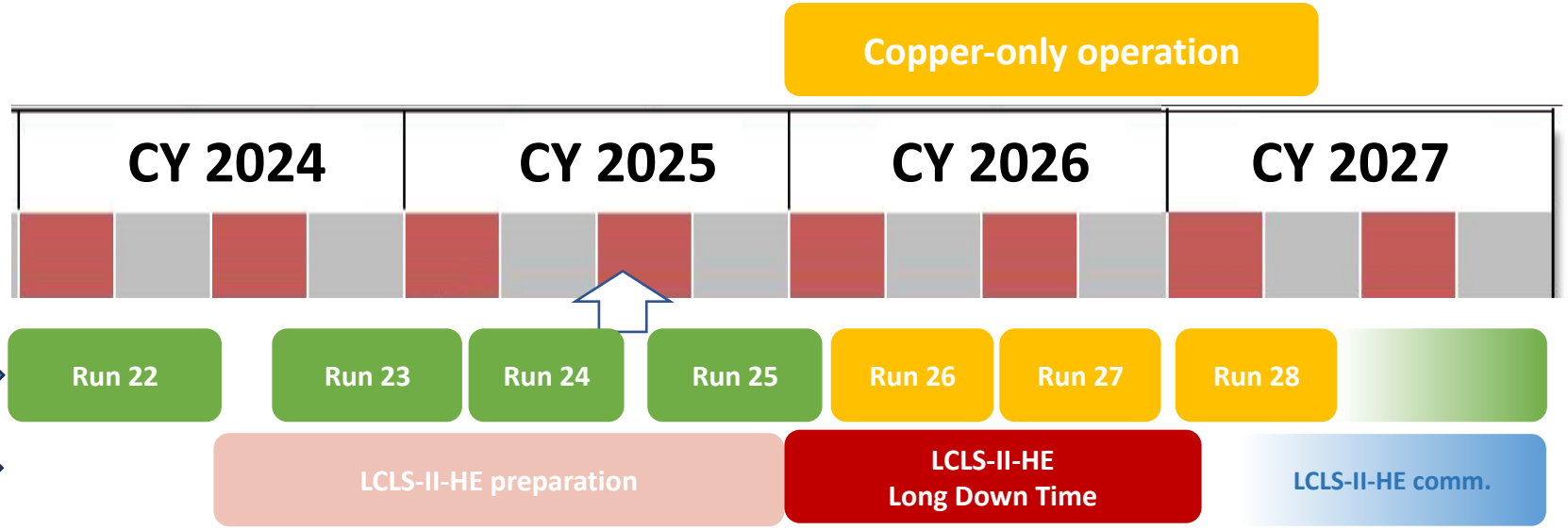


Superconducting accelerator has been running at 33 kHz since March – which will be maintained through Run 25 to December

LCLS-II-HE timeline, and impact on LCLS operations

- **LCLS-II-HE will double the energy of the SC linac to 8 GeV**
  - **Hard X-ray beamlines and instruments will be upgraded to make full use of beam (from 5 to 13 keV)**
- **An extended shutdown of the SC linac is needed (starting January 2026)**
- **Cu Linac will continue to be operated on its ~usual annual cadence throughout the SC shutdown**

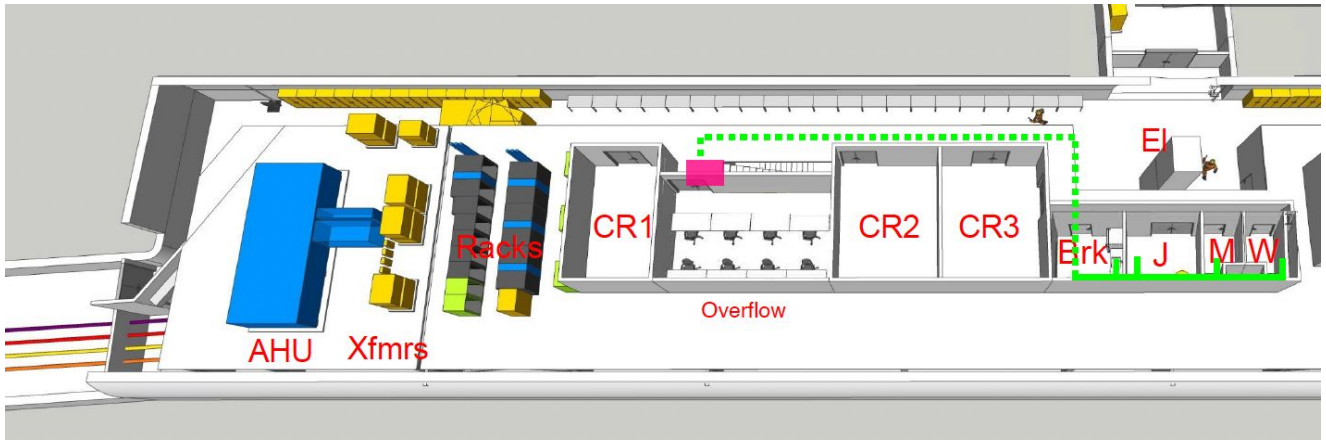
LCLS-II First Light: Sept 2023
LCLS-II First External PRP Users: June 2024
LCLS-II-HE Long Down Time: Jan 2026 – Jan 2027
Early finish for HE First Light: Oct 2027



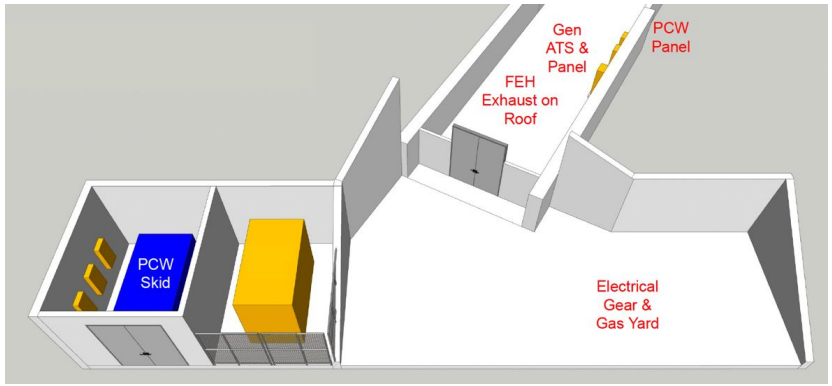
Run 26 is the first user run during the LCLS-II-HE Long Down Time

The Far Experimental Hall (FEH) will be reshaped in readiness for LCLS-II-HE, starting this summer

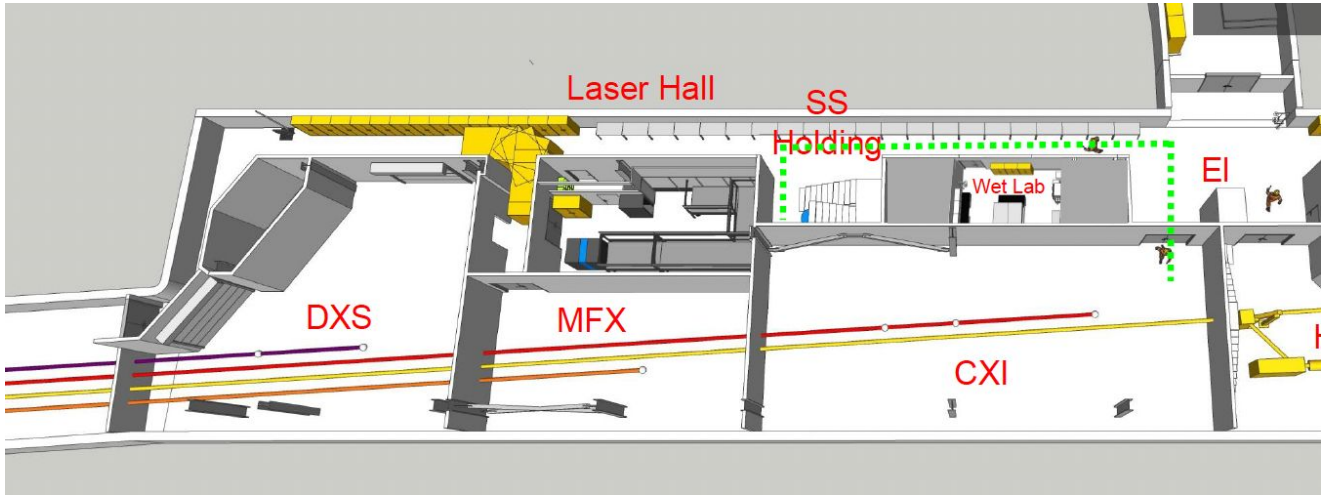
Control Rooms to be moved to the mezzanine (summer 2025)



PCW, cooling and MAH in the area outside FEH



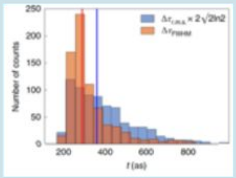
New Laser Hall (2026) and potential new wetlab



Looking ahead: Some LCLS "Scientific Campaigns" are being rotated to allow new applications for Run 27 (with LOIs due this Fall)

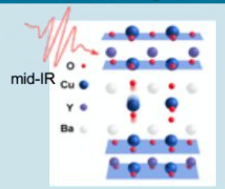
Campaigns are intended to address substantial, urgent priorities. Proposals requires cross-community integration of theory, synthesis, experiments and analysis, and are provided dedicated and sustained beamtime over multiple years

Attosecond science



- Control and observation of coherent electronic motion on natural attosecond timescales
- J. Cryan (PULSE) leading 39 PI's from 16 institutions

Collective dynamics

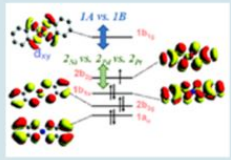


- Nonlinear coupling of collective modes in quantum materials
- Control of electronic order by coherent phonon excitation
- M. Trigo (SIMES) leading 21 PI's from 13 institutions

Topological Materials

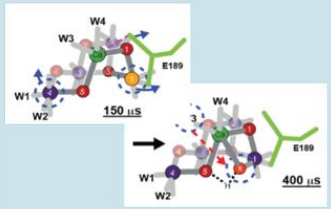
- Dynamics of complex topological structures by design
- Collective modes, transformation pathways, and fluctuations
- Gopalan et al (PSU),14 PI's from 5 institutions including SLAC

Controlled reactivity



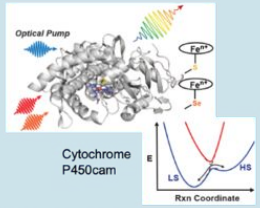
- Design Principles for Covalent Control of Electronic Excited State Reactivity in Transition Metal Complexes
- K. Gaffney et al (SLAC), 14 PI's from 5 institutions

Photosynthesis PS II



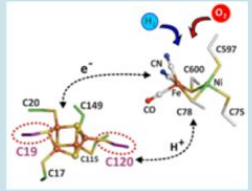
- Understand light-driven multi-electron catalysis of the water oxidation in PS-II
- Junko Yano et al. (20 investigators from 8 institutions)

Quantum Enzyme Catalysis



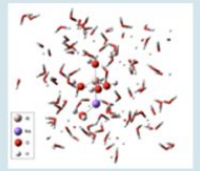
- Understand electronic properties and quantum effects in enzyme function
- Ryan Hadt et al. (17 investigators from 10 institutions)

Enzyme Catalysis for Energy



- Understand structural dynamics of metallo-enzymes for the energy economy
- Jan Kern et al. (25 investigators from 15 institutions)

Radiolysis in remediation



- Understanding radiation-induced chemistry in the condensed phase
- IDREAM environmental remediation
- L. Young (ANL) and C. Pearce (PNNL), 27 from 6 institutions

External review (Toni Taylor et al, Feb 2023), *"... progress from these Campaigns has been impressive, enabling transformative science with a long-term horizon"*

The next Campaign call will focus on
"Understanding & Controlling the Properties & Function of Complex Materials"

Universal Proposal System (UPS)

Paul Jones https://orcid.org/0000-0001-7538-4238

Leilani Conradson https://orcid.org/0000-0002-4261-7135

July 16th 2025

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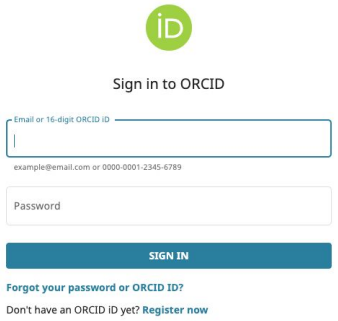
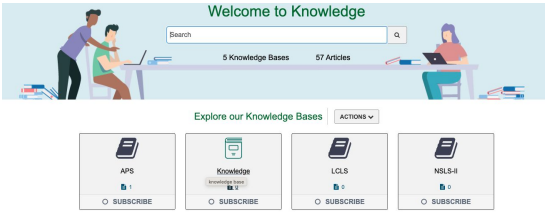
What To Expect





Logging In

Authenticate into the system via your ORCiD credentials

Do not request a new ORCiD if you already have one - please use your existing ORCiD

Profile

Your UPS profile data is private and protected

Demographic data will only be used in aggregate

You decide how much info to share

Knowledge Base

Under development - over time this will provide answers to FAQs

Fully searchable resources at your fingertips

Dashboards

Configurability to put information from your most-used facilities front and center

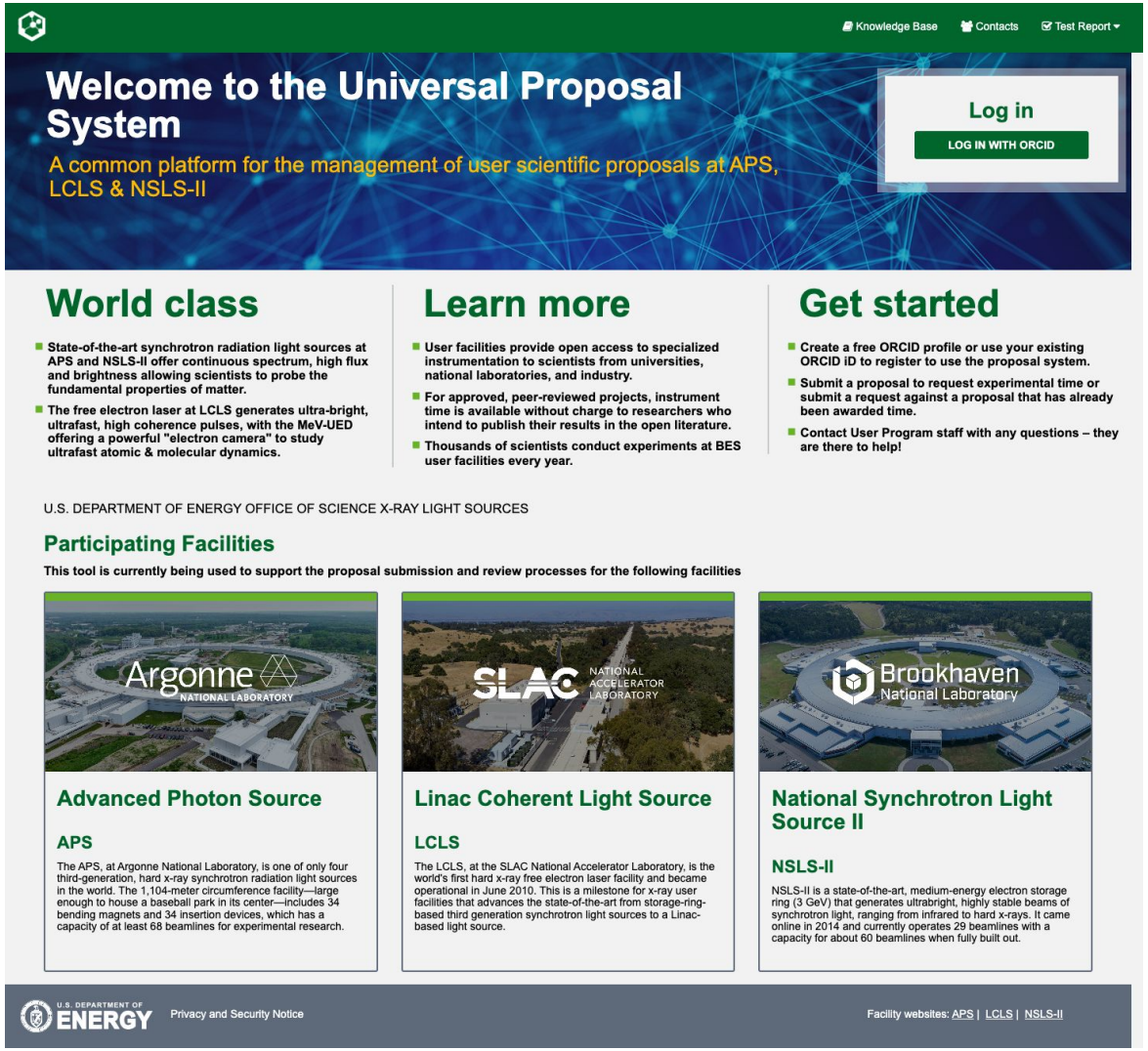
Important Notes

- **ALL members of the proposal team PIs, Co-PIs and Co-Proposers must register in UPS**
- Members of the proposal team can collaborate on draft proposals - once submitted, proposals cannot be edited
- Proposals not submitted by the submission deadline will be archived - they can be viewed, but not edited or re-used

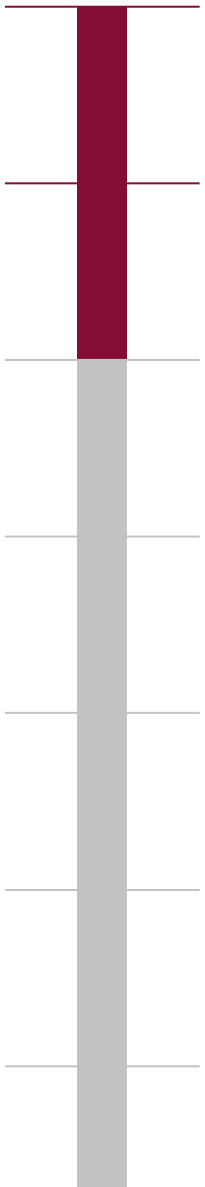
Useful Resources:

- Register / Login to UPS: https://ups.servicenowservices.com/ups
- Further information and tutorial video: https://lcls.slac.stanford.edu/user-resources/proposals/universal-proposal-system-ups
- Contact the User Office with questions: lcls-user-office@slac.stanford.edu

Do not wait until the last minute to submit!



Proposal Timeline



Jul 3, 2025

Call for Proposals

https://lcls.slac.stanford.edu/proposals/run26

Jul 16, 2025

Virtual Town Hall

Aug 6, 2025

Proposal submission deadline

4pm Pacific Time

Aug-Sep

Proposal Review Process

Initial Feasibility Review: Technical challenges considered by facility staff
Peer Review: Independent reviews, Panel Meeting
- Prioritized list of proposals, Consolidated feedback

Oct 2025

Questionnaire

Subset of proposals provide additional logistical information
- Identify schedule opportunities (e.g. multiplexing, shared equipment, etc.) and restrictions
- Questionnaire does not guarantee beamtime

Nov 2025

Award Decisions

Notification via email to PI

Run Cycle begins Feb 2026

Need Help?

Contact the LCLS User Office

- Email: lcls-user-office@slac.stanford.edu
- Paul Jones: 650-926-5116
- Leilani Conradson: 650-926-8758

LCLS UEC (User Executive Committee)

Silvia Pandolfi, UEC Vice Chair

July 16th, 2025

LCLS UEC (what is the role of UEC?)

UEC is here to represent you!

UEC meets monthly with LCLS Management

UEC communicates the needs and desires of users regarding:

- LCLS operating policies and use of LCLS
- user support
- other issues of concern to users

UEC assigns LCLS awards during the User Meeting

Current Members of UEC & meeting Minutes: https://lcls.slac.stanford.edu/lclsuo

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2025 UEC Elections (3 years term):

1 Biology (BIO)

1 Materials Science - Hard Condensed Matter (HCM)

2 Chemistry, Soft Condensed Matter & Disordered Materials (CSD)

Nominations are open until **July 25th, 2025**

UEC assigns LCLS awards during the User Meeting

Current Members of UEC & meeting Minutes: https://lcls.slac.stanford.edu/lclsuo

Upcoming Users' meeting: September 21st-26th, 2025

Nominations for the LCLS Awards are open **until July 25th, 2025**:

LCLS Young Investigator Award: https://stanforduniversity.qualtrics.com/jfe/form/SV_37TAZV5hZVKUQ86
LCLS Users' Recognition Award: https://stanforduniversity.qualtrics.com/jfe/form/SV_aYkiAZMbiLg0Nro

Please feel free to contact the LCLS UEC members with any suggestions or questions!

E-mail suggestions to LCLS UEC lcls-uec@slac.stanford.edu or User Office lcls-user-office@slac.stanford.edu

Short Proposal Program Update
Dataset Collection & Screening

Sandra Mous

July 16th, 2025

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LCLS Short Proposal Program

- Offered alongside regular LCLS proposals

- Access mechanisms offered in the LCLS Run 24 Short Proposal Program:
  - **Sample Testing** (or Protein Crystal Screening - PCS): ideal for new user groups to gain first experience with XFEL beamtime and obtain preliminary results
  - **Data Set Collection**: enables user groups to complete data collection or test mature projects with a limited amount of beamtime (up to 24 hours)
  - **Rapid Access**: for time-sensitive experiments, provides short-term scheduling and rapid turnaround

DC&S program overview

- **Experimental requirements**: DC&S proposals will need to make use of a standard configuration already in place for a regular LCLS experiment to maximize the throughput of an existing set-up
  - A list of select hard X-ray configurations has been made available in the call for proposals
  - To apply for a short amount of beamtime using a non-standard configuration (or configurations not listed in the call for DC&S proposals), users will be asked to submit a regular proposal
  - DC&S proposals will not be carried over if a suitable configuration is not available
- **Proposal templates**: user groups are asked to make use of the templates provided in the proposal call
  - The template addresses key review criteria
- **Alignment of submission deadline**: DC&S proposals are due at the same time as regular proposals
- **Concurrent review**: DC&S proposals are reviewed by the PRP at the same time as regular proposals
  - This helps ensure proposals are reviewed on time for scheduling considerations
- **Ranking**: DC&S proposals will be ranked separately from regular proposals
  - Acceptance is dependent on the available shifts and set-ups and may not strictly reflect the PRP ranking

Availability

- Scientific areas
  - Biology
  - Materials Science
  - Solution Phase Chemistry and Biochemistry
  - Gas Phase Photochemistry
  - Matter in Extreme Conditions
- Frequently deployed configurations only
  - XCS: horizontal liquid jet for solution scattering and hard X-ray spectroscopy
  - MFX: horizontal liquid jet for solution scattering or crystallography
  - MFX: droplet-on-tape for crystallography
  - MFX: fixed targets in air
  - CXI: liquid jet in the micron-focus chamber (no pump laser)
  - CXI: gas phase scattering in the micron-focus chamber with 200 nm or 266 nm pump laser
  - MEC: X-ray diffraction with uniaxial compression
  - MEC: X-ray imaging with long pulse laser side irradiation

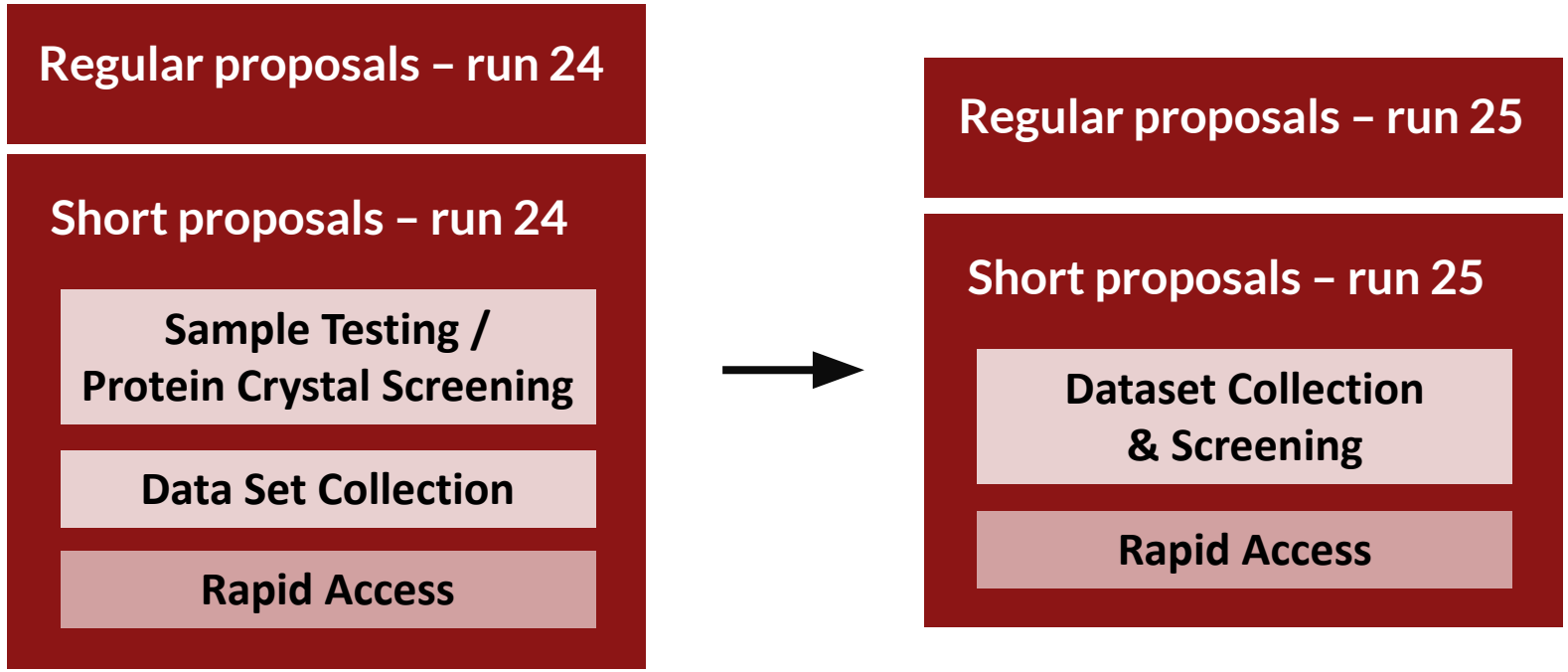
Contact information

- Questions or feedback?

  → Please reach out to Sandra Mous (smous@slac.stanford.edu) or respective instrument lead

Unifying modes of access to LCLS

- Merging some of the short proposal programs simplifies the modes of access to LCLS
  - **Dataset Collection & Screening**: short beamtime for testing or collecting a dataset using standard configuration
  - **Rapid Access**: rolling review and short-term scheduling



LCLS Run 26 Users Town Hall Accelerator Update

Tim Maxwell, Axel Brachmann, Yuantao Ding

July 16th, 2025

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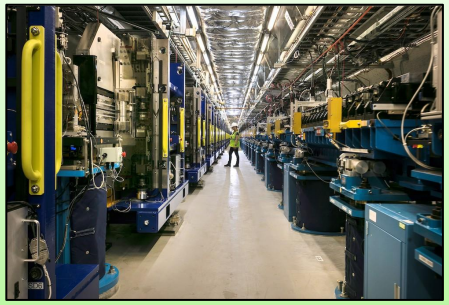
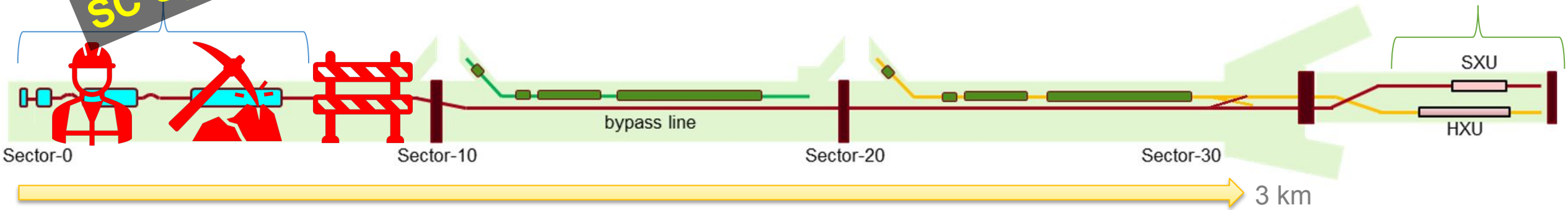
LCLS Linac FEL Complex

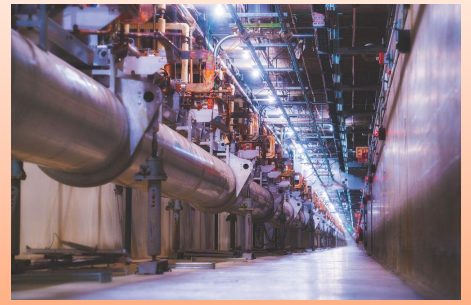
Superconducting Linac
4 GeV,
High rep rate, CW RF

SC Upgrade Construction in 2026



Soft and Hard X-ray Variable Gap Undulators (VGUs)





Normal Conducting Linac
3.5-17 GeV,
120 Hz Pulsed RF

HXR single-pulse SASE w/ NC Linac

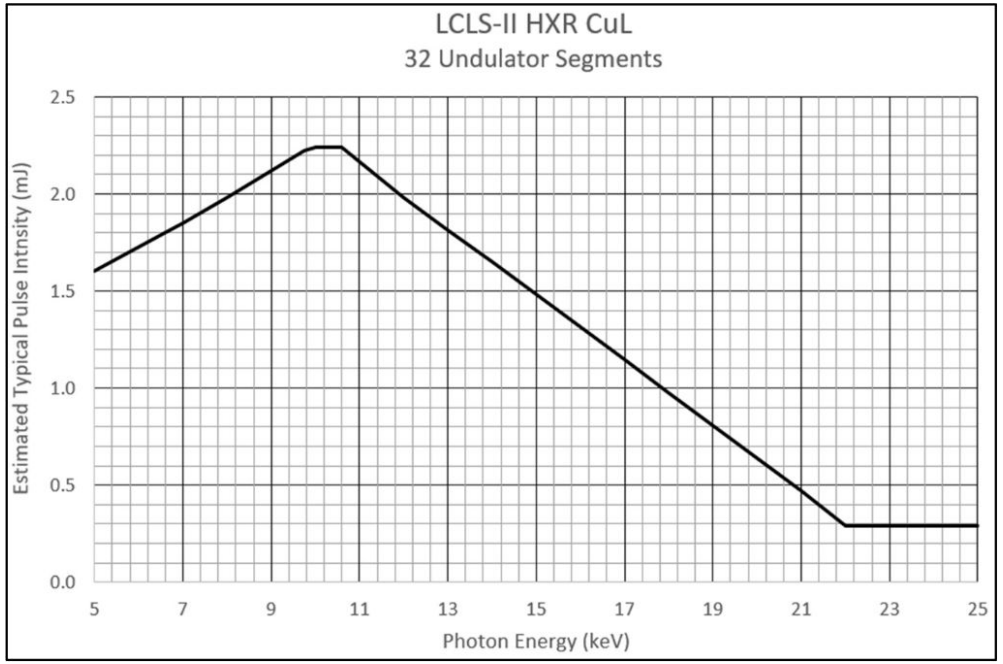
Beam Parameters	Symbol	Cu-HXU x-rays		Unit
		ω_{max}	ω_{min}	
Photon Energy	$\hbar\omega$	**25000**	**1000**	**eV**
Fundamental wavelength	λ_r	0.5	12.4	Å
Final linac e- energy	γmc^2	16.5	3.5	GeV
FEL 3-D gain length	L_G	4	1	m
Peak power	P	20	80	GW
Pulse duration range (FWHM)		10 – 50		fs
Nominal pulse duration (FWHM)	$\Delta\tau_f$	**~30**		**fs**
Max Pulse Energy*	U	**0.6**	**2**	**mJ**
Photons per pulse*	$N\gamma$	0.15	14	10^{12}
Peak brightness*	$B_{pk,\,SASE}$	7800	425	10^{30} §
Average brightness (120Hz)*	$\langle B \rangle$	280	16	10^{20} §
SASE bandwidth (FWHM)	$\Delta\omega/\omega$	30	2	eV
Photon source size (rms)	σ_s	8	20	μm
Photon far field divergence (FWHM)	$\Theta_{FWHM,x,\infty}$	1	12	μrad
Max. Beam Rate	φ_{FEL}	**120**		**Hz**
Avg. x-ray beam power	P_x	0.07	0.24	W
Linear Polarization (100%)	$\langle P \rangle$	Vertical		

*Assuming nominal duration and undulator strength

§Brightness units are photons/sec/mm²/mrad²/0.1%-BW

High photon energy (up to 25 keV) and pulse energy (0.3-2mJ)

Varies w/ duration, energy, beamline transmission, etc.



https://lcls.slac.stanford.edu/machine/parameters

SXR single-pulse SASE w/ NC Linac

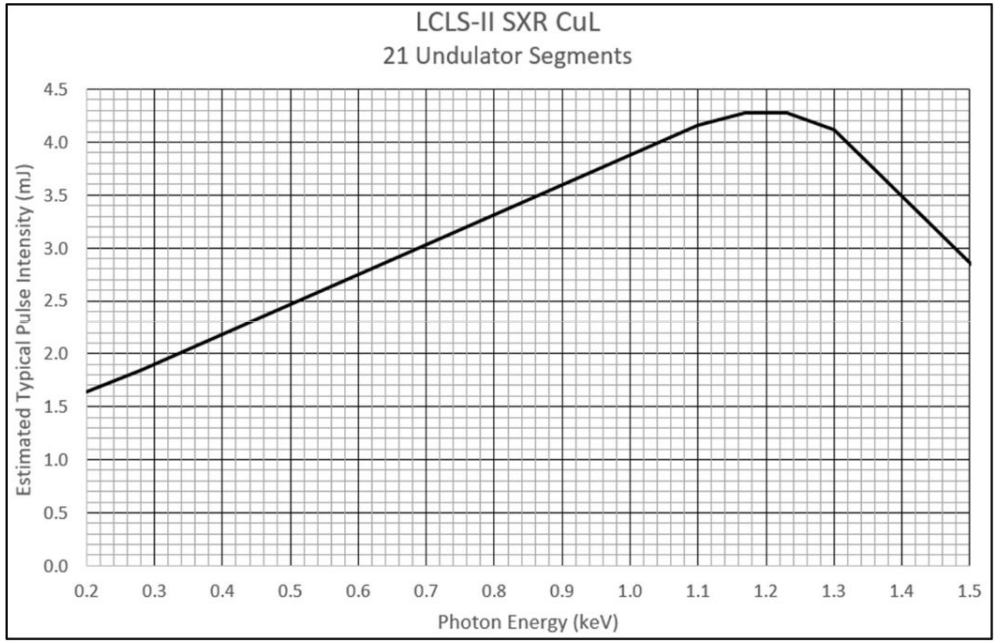
Beam Parameters	Symbol	Cu-SXU x-rays		Unit
		ω_{max}	ω_{min}	
Photon Energy	$H\omega$	5000	200	eV
Fundamental wavelength	λ_r	2.5	62	Å
Final linac e- energy	γmc^2	10	3.5	GeV
FEL 3-D gain length	L_G	2.5	1	m
Peak power	P	50	30	GW
Pulse duration range (FWHM)		10 – 250		fs
Nominal pulse duration (FWHM)	$\Delta\tau_f$	50		fs
Max Pulse Energy*	U	2.5	1.5	mJ
Photons per pulse*	$N\gamma$	3.1	47	10^{12}
Peak brightness*	$B_{pk,\,SASE}$	2250	19	10^{30} §
Average brightness (120Hz)*	$\langle B \rangle$	138	1.5	10^{20} §
SASE bandwidth (FWHM)	$\Delta\omega/\omega$	10	2	eV
Photon source size (rms)	σ_s	16	46	μm
Photon far field divergence (FWHM)	$\Theta_{FWHM,x,\infty}$	3	25	μrad
Max. Beam Rate	φ_{FEL}	120		Hz
Avg. x-ray beam power	P_x	0.3	0.18	W
Linear Polarization (100%)	$\langle P \rangle$	Horizontal		

*Assuming nominal duration and undulator strength

§Brightness units are photons/sec/mm²/mrad²/0.1%-BW

Wide tunability with >2 mJ* for nominal 40-50 fs pulse duration

**Performance may vary due to LCLS-II-HE undulator upgrade*



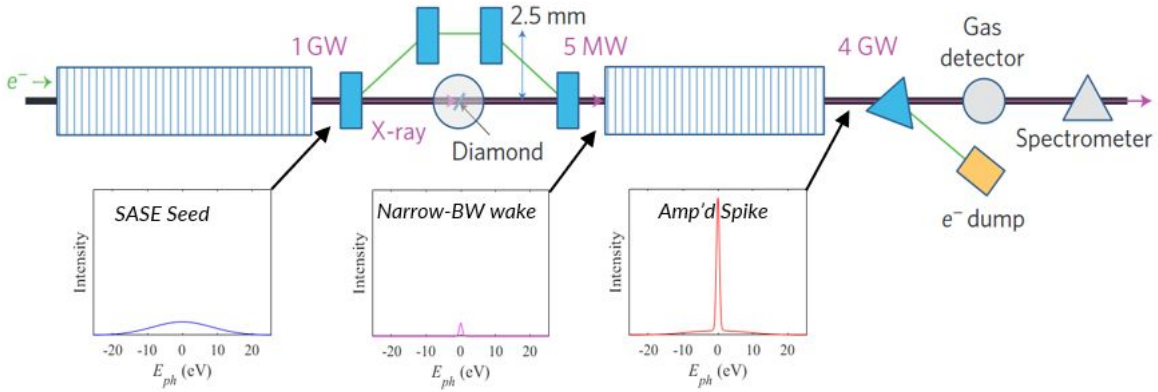
https://lcls.slac.stanford.edu/machine/parameters

Hard X-ray Self-Seeding (HXRSS)

Spectral brightness enhancement for narrow bandwidth experiments

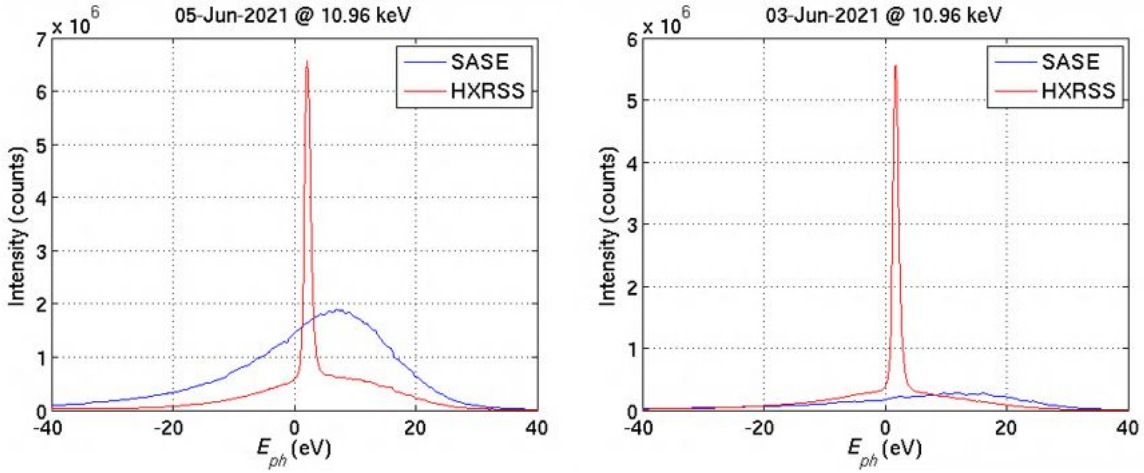
- Now for *vertically* polarized HXU
- 3-6x spectral brightness at sample vs. SASE

Photon energy	4.5 – 11 keV
Bandwidth (FWHM)	**0.35 – 1.5 eV**
Max pulse energy	0.2 – 0.5 mJ
Duration	30 fs



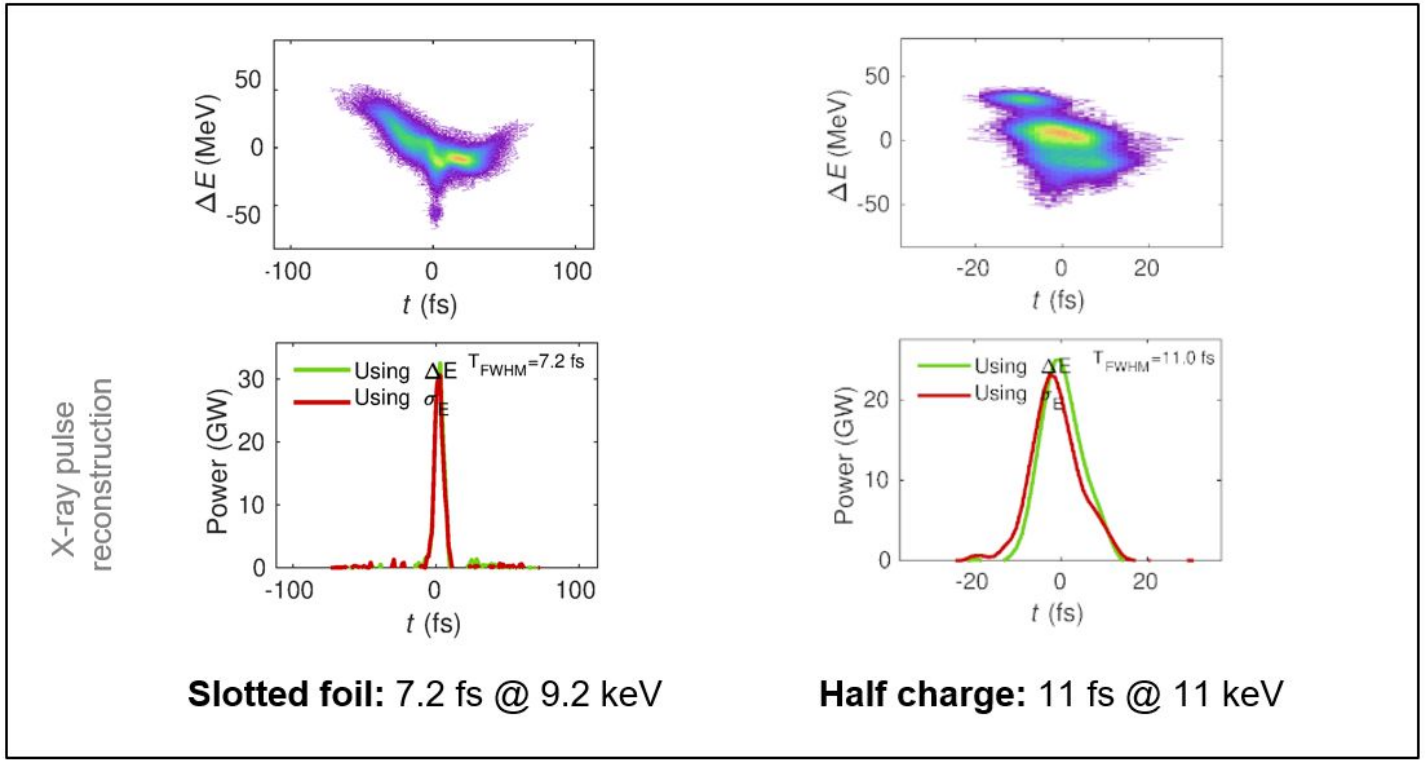
Initial SASE passes diamond wake monochromator, narrow BW amplified in 2nd half of undulator

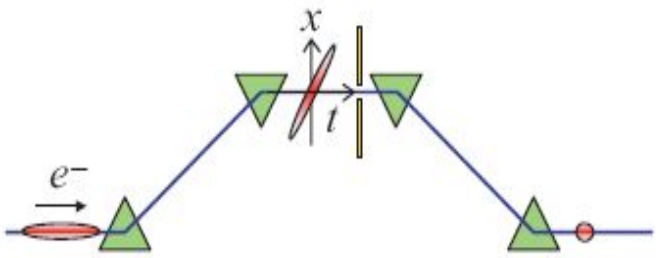
Full SASE vs. HXRSS average spectra at 11 keV



Shorter Pulses (SXR & HXR)

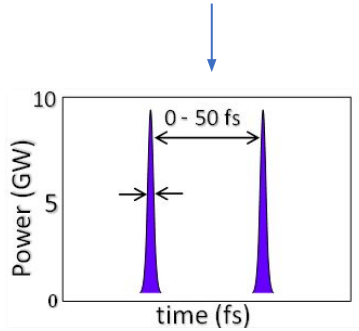
- **~7-20 fs pulses readily achievable** with corresponding reduction in pulse energy





Slotted foil inserted in beam to spoil lasing in time

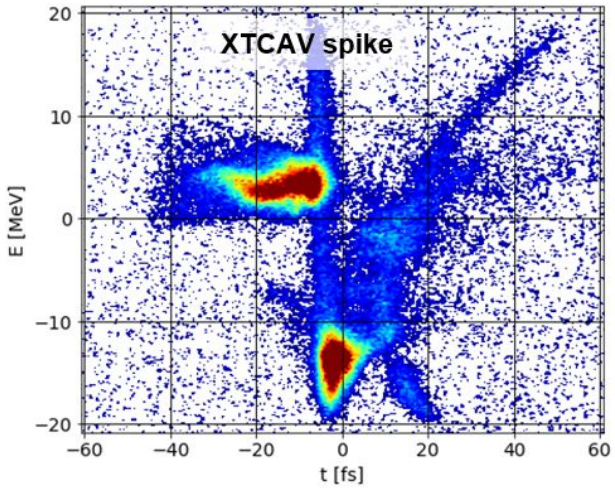
Make short single or double pulses

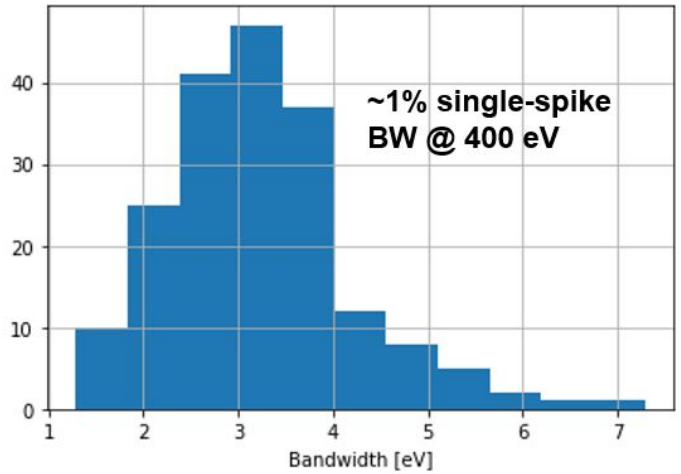


Discuss special requirements with your LCLS POC

Sub-femtosecond Pulses (SXR & HXR)

- XLEAP capability for < 1 fs pulses





10-20 uJ (avg) sub-fs pulses for SXR & HXR

5-10 uJ *two-color* attosecond pulses also possible for SXR

Discuss special requirements with your LCLS POC

Advanced Multi-Pulse/Color Modes

Multiple accelerator-based means for x-ray pump, x-ray probe on variety of time scales

Technique	Pulse Separation	Pulse Duration	Energy Separation	Max Energy/Pulse
Split Undulator SASE	0 to 30 fs *or* -30 to 0 fs	15 fs	20% (HXR) 100% (SXR)	20 uJ (HXR) 50 uJ (SXR)
Double Slotted Foil	7-20 fs	~ 10 fs	+/-1.5%	~100 uJ
Twin Bunches	25 - 90 fs	~ 20 fs	0.2-2%	200 uJ (HXR) 500 uJ (SXR)
Two-(multiple) bunch				
Two bucket	350 ps increments, up to 120 ns	30 fs	~ 1%	0.5-1 mJ (HXR) >1 mJ (SXR)
Multi bucket (4 or 8 bunches)	Two trains of 4 pulses. 700 ps between each pulse in the same train.	20 fs	~ 1%	TBD

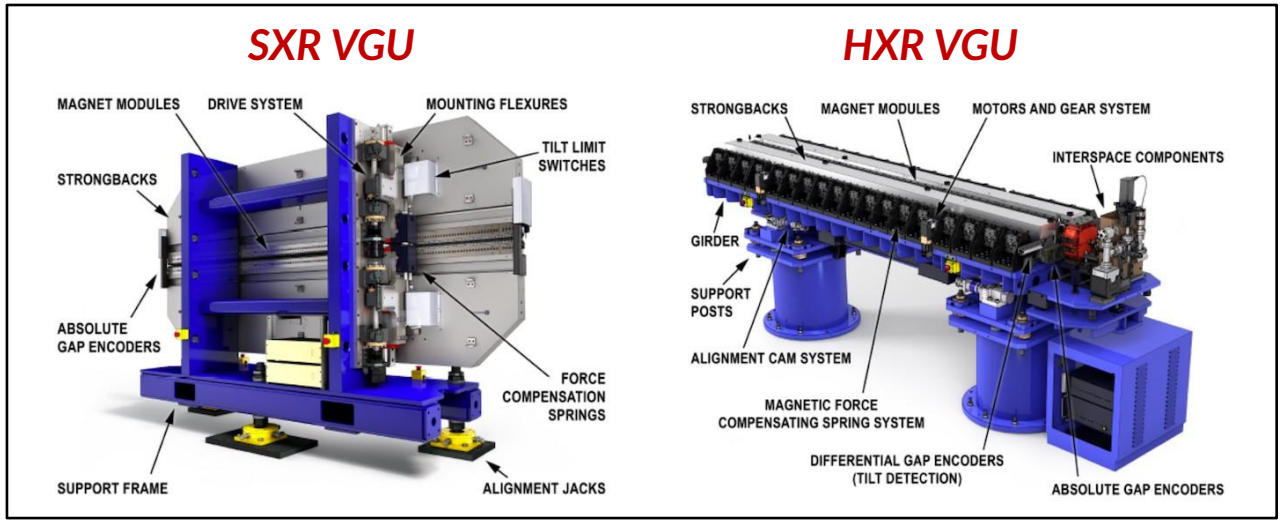
Restrictions, parameters, and setup times vary depending on photon energy, duration, etc.
See https://lcls.slac.stanford.edu/machine/parameters for more details, and as always:

Discuss special requirements with your LCLS POC

Photon Energy Scanning

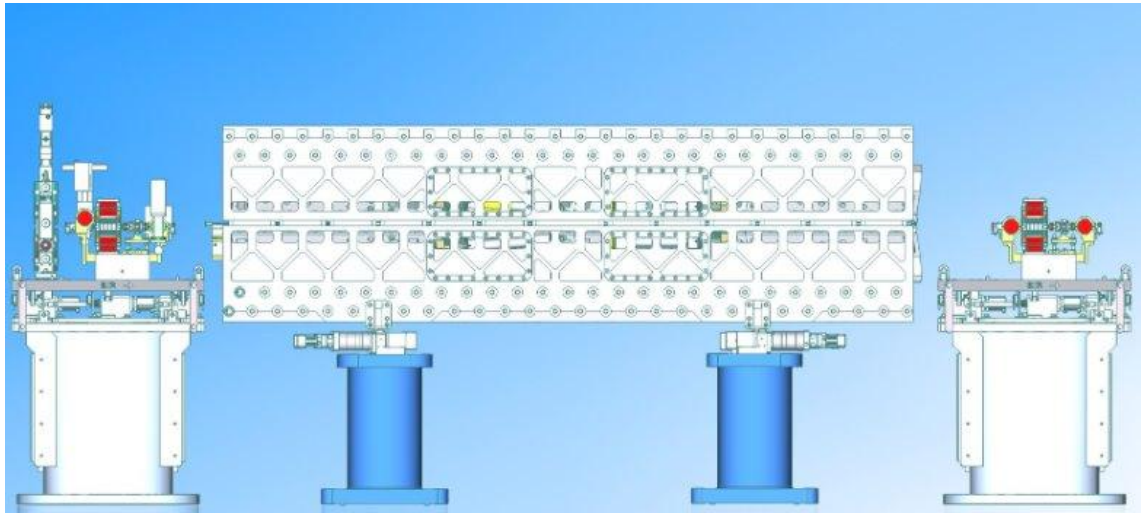
Linac+Und	Mode	Energy delta	Speed/step	Note
NC + HXR	Und. Gap (coarse)	+20%	seconds	Range is performance limited
	Vernier (fine)	±1-2%	milliseconds	
NC + SXR	Und. Gap (coarse)	+50 to 100%	seconds	
	Vernier (fine)	±1-2%	milliseconds	

User control of photon energy scans ready and available via new variable gap undulators



Polarized Beams (SXR)

- Installation of the new DELTA-II undulator is planned for February 2026



- Expected parameters:

Parameter	Value
Energy range	250 – 1100 eV
Pulse energy	150 µJ
Circular polarization	99%

To be commissioned in 2026 (“at risk” capability)

Communication with the Accelerator Team

- Weekly ‘User Meeting’ with the ACR team:

  Wednesday before your experiment starts, share experiment background and summarize key x-ray parameters: photon energy, pulse energy, pulse length, other special conditions/requests important for FEL source requirements. (~10 min presentation each)

- LCLS POC is the conduit for communication with the Accelerator teams

Thank you and good luck!

TMO in Run 26

LCLS Run 26 Users Town Hall

July 16th 2025

James Cryan and the TMO Team

SLAC NATIONAL ACCELERATOR LABORATORY

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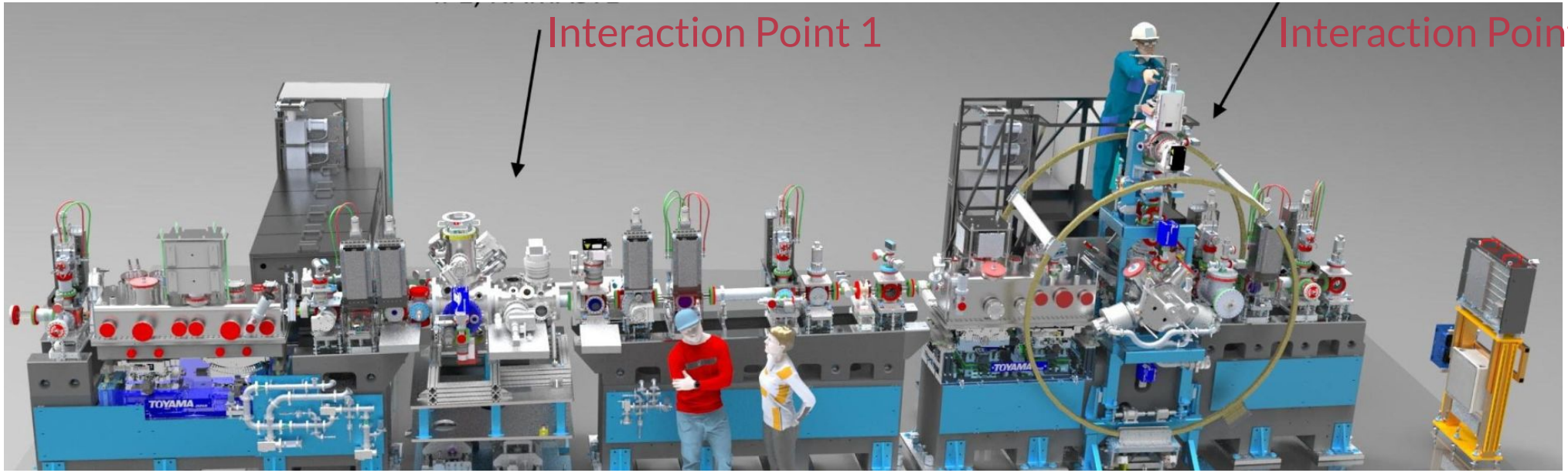
TMO in Run 26



- We will offer a standard configuration for both IP1 (MRCO/MBES/cVMI)
  - IP2 is not accepting User proposals in Run 26
- X-ray repetition rates up to 120 Hz
- Atto/atto capabilities

TMO in Run 26

Laser Parameters				
Repetition rate (Hz)	Synchronized up to 33 kHz			
Wavelength	800 nm	400 nm	266 nm	1200-2300 nm
Pulse Duration	< 25 fs	< 30 fs	~ 30 fs	< 100 fs
Energy per pulse (on target)	< 600 μJ	< 100 μJ	~ 10 μJ	< 130 μJ (signal) > 10 μJ (idler)
Spot Size, FWHM (800 nm)	50 to 100 um			
Polarization	Variable: linear, circular			
Angle	~0.5 deg angle with x-ray beam			
Arrival Time Monitor	< 20 fs accuracy in x-ray/laser arrival time tagging.			

X-ray Parameters			
	IP1		~~IP2~~
Repetition rate (Hz)	120 Hz		
Energy Range (eV)	200 - 2000		~~200-1300~~
Spot Size, FWHM (range)	1.0-200 (um) diameter		~~0.5 - 10 (um) diameter~~
Pulse Duration	20 fs (nominal)	Tunable to 5 fs	< 1 fs (XLEAP-II)
Energy per pulse	~ 50 μJ	Scales linear with pulse energy	~10 μJ
Bandwidth (FWHM)	0.5%	0.5%	>1%
Repetition Rate	> 30 kHz	> 30 kHz	>1 kHz
Polarization	Linear, Horizontal		
Two Pulse Modes	< 10 μJ / pulse with tunable delay via split undulator method. This provides a minimum delay of ~10 fs for arbitrary wavelength. For harmonic operation (ω/2ω, ω/3ω) the minimum delay ~300 as.		

ChemRIXS in Run 26

LCLS Run 26 Users Town Hall

July 16th 2025

Kristjan Kunnus and the ChemRIXS Team

SLAC NATIONAL ACCELERATOR LABORATORY

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ChemRIXS Run 26 call

120 Hz!

Liquid standard configuration

Liquid samples, sheet or round jets.

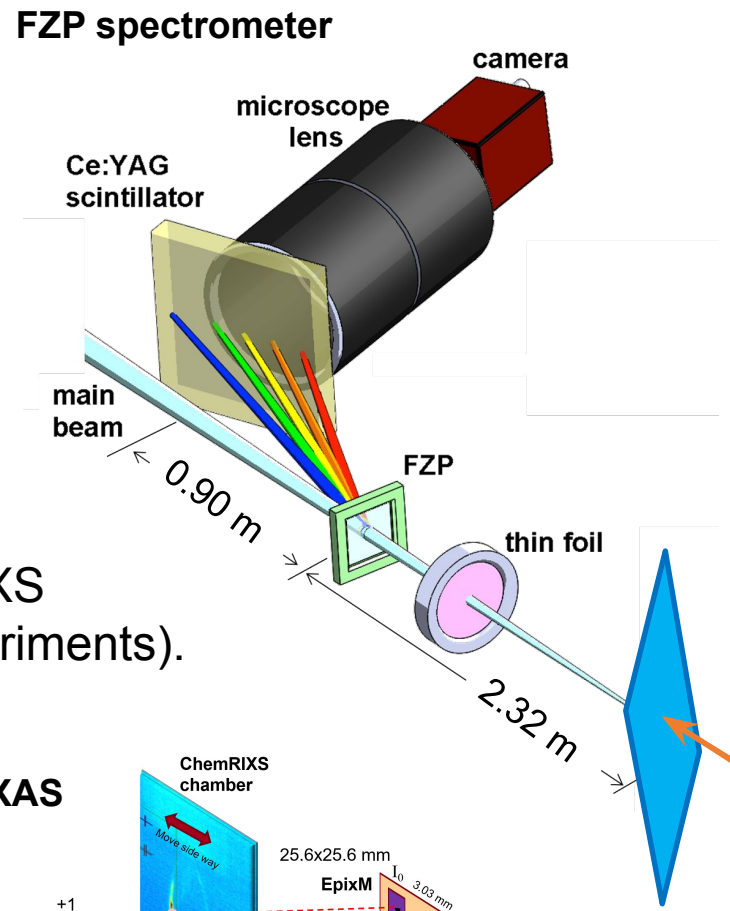
- Time-resolved XAS with monochromatic beam (scanning)
  - Transmission experiments (sheet jets)
  - Total Fluorescence Yield (TFY) mode
- High throughput RIXS spectrometer is available.

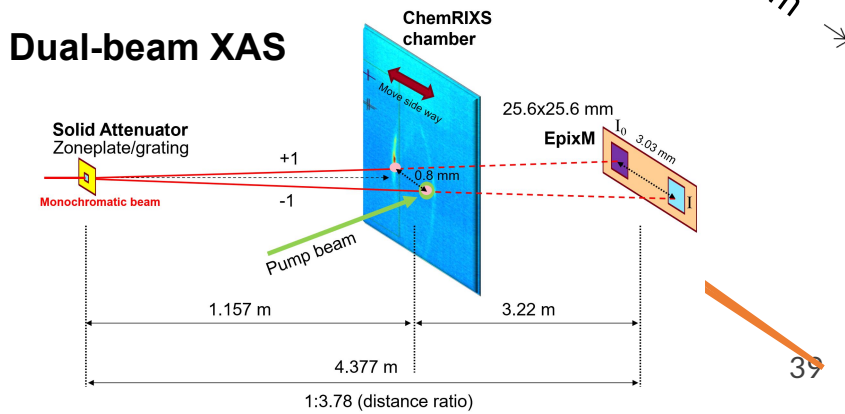
FZP standard configuration

- In-line Fresnel-Zone-Plate (FZP) spectrometer downstream of the ChemRIXS
- Zero-order operation of the mono (compatible with attosecond XLEAP experiments).
- Liquid sheet jets – transmission experiments.
- X-ray-pump/X-ray-probe, non-linear X-ray experiments

New capability

- Dual-beam transmission XAS
- 10x expected S/N improvement





ChemRIXS Run 26 key parameters

X-ray

X-ray Parameters	
Repetition rate (Hz)	Up to 33 kHz (Run 25) or 120 Hz (Run 26)
Energy Range (eV)	350 - 1600 eV
Pulse Duration (fs)	20 fs (nominal, SASE)
Energy per pulse at the IP (monochromatic)	>100 nJ (350 - 1000 eV) >10 nJ (1000 - 1300 eV) >1 nJ (1300 - 1600 eV)
Beamline Resolving Power	>2000
Spot Size, FWHM (range)	10 - 1000 (um) diameter
Polarization	Linear, Horizontal

Laser

Laser Parameters					
Repetition rate (Hz)	Synchronized up to 33 kHz (Run 25) or 120 Hz (Run 26)				
Wavelength (fs)	800	400	266	480 - 600	600 - 900
Pulse Duration (fs)	20	30	35	<50	<50
Energy per pulse (µJ) (on target)	500	50	5 - 15	>10*	>5*
Fluence on target, max. (mJ/cm2)	1500	150	15 - 50	50	15

Please contact us for any questions
K. Kunnus
kristjan@slac.stanford.edu

qRIXS in Run 26

LCLS Run 26 Users Town Hall

July 16 2025

Georgi Dakovski and the qRIXS Team

SLAC NATIONAL ACCELERATOR LABORATORY

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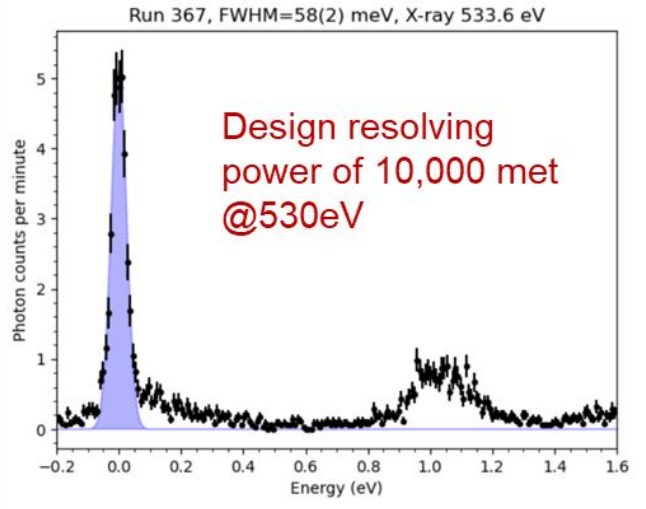
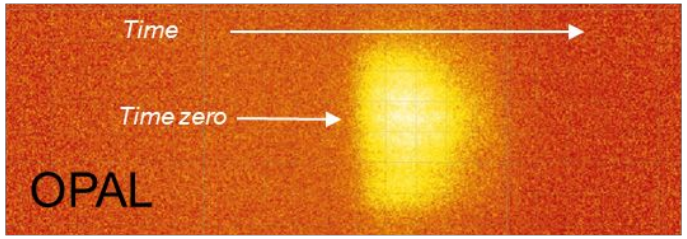
qRIXS is commissioned @ 33kHz and is open to users

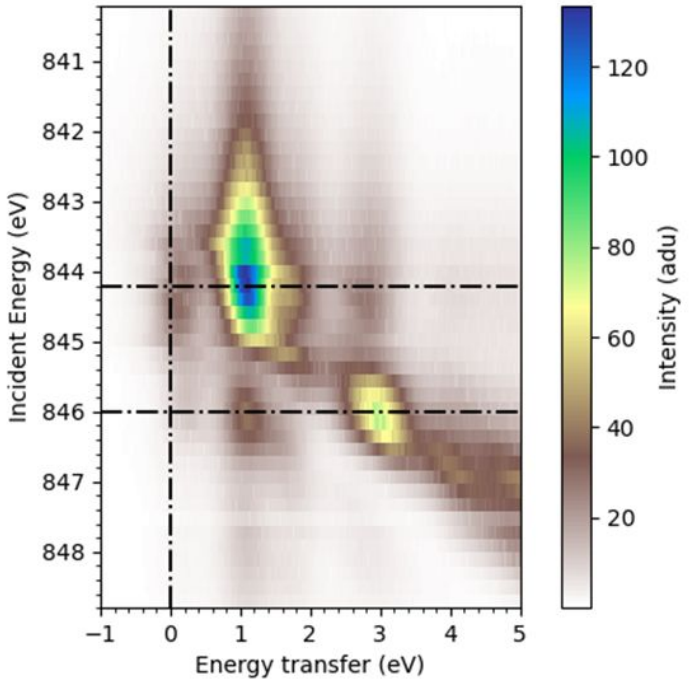


First Arrival Time Monitor results using SC & 1030nm beams



qRIXS began c

Fast RIXS map of NiO at the Ni L_3 edge



In general, due to the low repetition rate of LCLS-I, time-resolved RIXS experiments will not be offered unless an exceptionally strong scientific justification is provided.

SLAC

XPP in Run 26

LCLS Run 26 Users Town Hall

July 16 2025

Takahiro Sato and the XPP Team

SLAC NATIONAL ACCELERATOR LABORATORY

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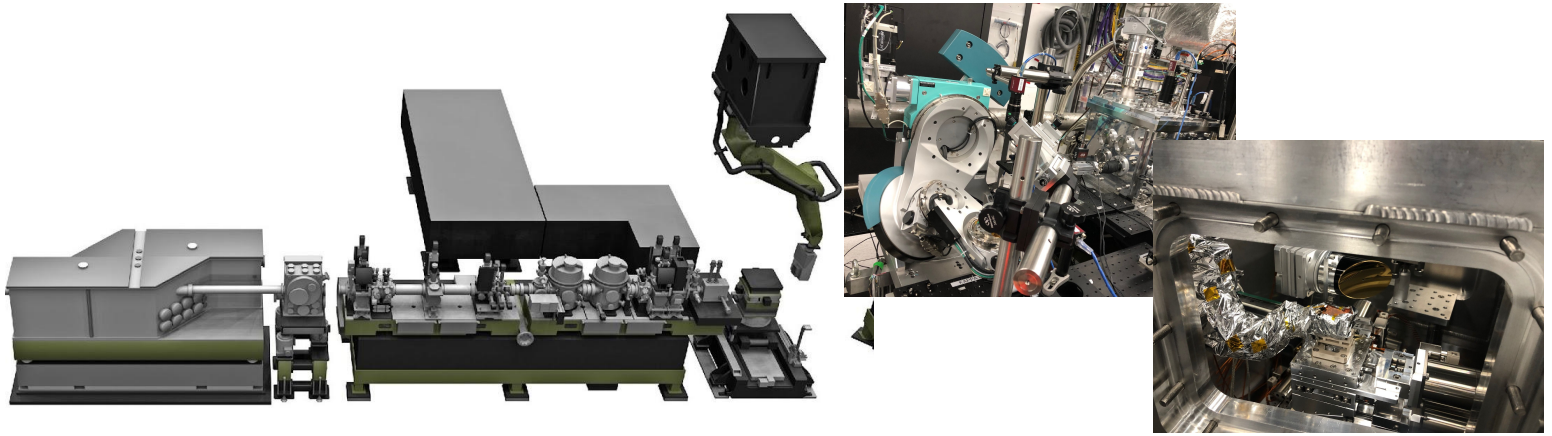
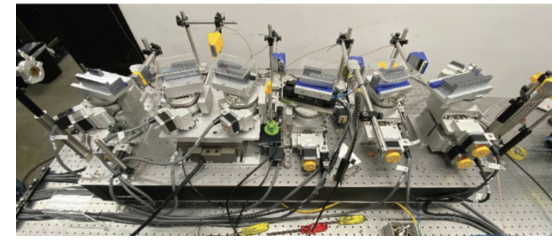
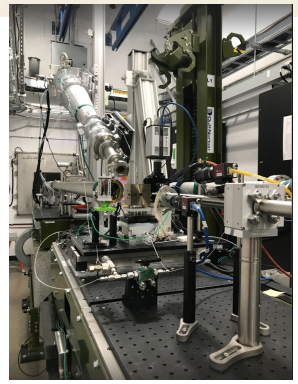
XPP status and configurations : **XPP is back!!**

Note: Laser + X-ray commissioning will be done in parallel with user operation.

Some risks about special laser parameter(THz, mid-IR)







XPP alcove (SB4/5/6)

- **trWAX** for material science at 20keV+, vacuum environment supporting fixed target rapid replacement.
- **trXRD in-air 4-circle diffractometer or kappa diffractometer,** (400K-100K with nitrogen cryojet)
- **Hard x-ray polarization control** established to switch on a near pulse-to-pulse bases between circular and linear inside the new laser in coupling chamber.
- **High resolution mono** (<100meV)
- **Mini-split&delay** (delay range ~20ps) based on amplitude splitting(transmission grating)
- **Special setup and experiments using "the secondary interaction points", high res. mono, tight focus. etc** on XPP alcove tables
- **Low-T chamber**

Detectors (on XPP robot arm or motion assembly)

ePix10k 2M, ePix100, and Jungfrau1M, Zyla, Alvium detectors are available for diffraction, spectroscopy and scattering measurement

X-ray parameters: **New multiplex scheme=> Transmission grating (10%, 25%) + Si DCM**

Photon energy	4 keV – 26 keV (8-13 keV Std. config with Si(1 1 1) mono)
Mono Bandwidth	1.1 eV (Silicon (1 1 1) mono) – 20 meV(~sub meV):**appendix 1** Self seed is also available, factor of 3~4 more **average** spectral brightness
Pink beam Bandwidth	20 eV~
Pulse energy at 9.8 keV	Pink: 1 mJ at the sample location **Transmission grating (10%(standard 20% of the old multiplex pulse energy) , 25%(upon request), 100% (full beam, strong justification))** **Highly recommend users to request self-seed for 10% multiplex mode**
Pulse duration	Standard:30 ~50 fs, Special mode: attosecond, sub10 fs, ~100 fs
Rep rate	Single shot ~120 Hz
Polarization	**Vertical(from undulator),** horizontal, and circular (with phase retarder)
Focus	2um ~ un-focus (350 um)+ diagnostic 1D focus is available

XCS in Run 26

LCLS Run 26 Users Town Hall

July 16 2025

Matthieu Chollet and the XCS Team

SLAC NATIONAL ACCELERATOR LABORATORY

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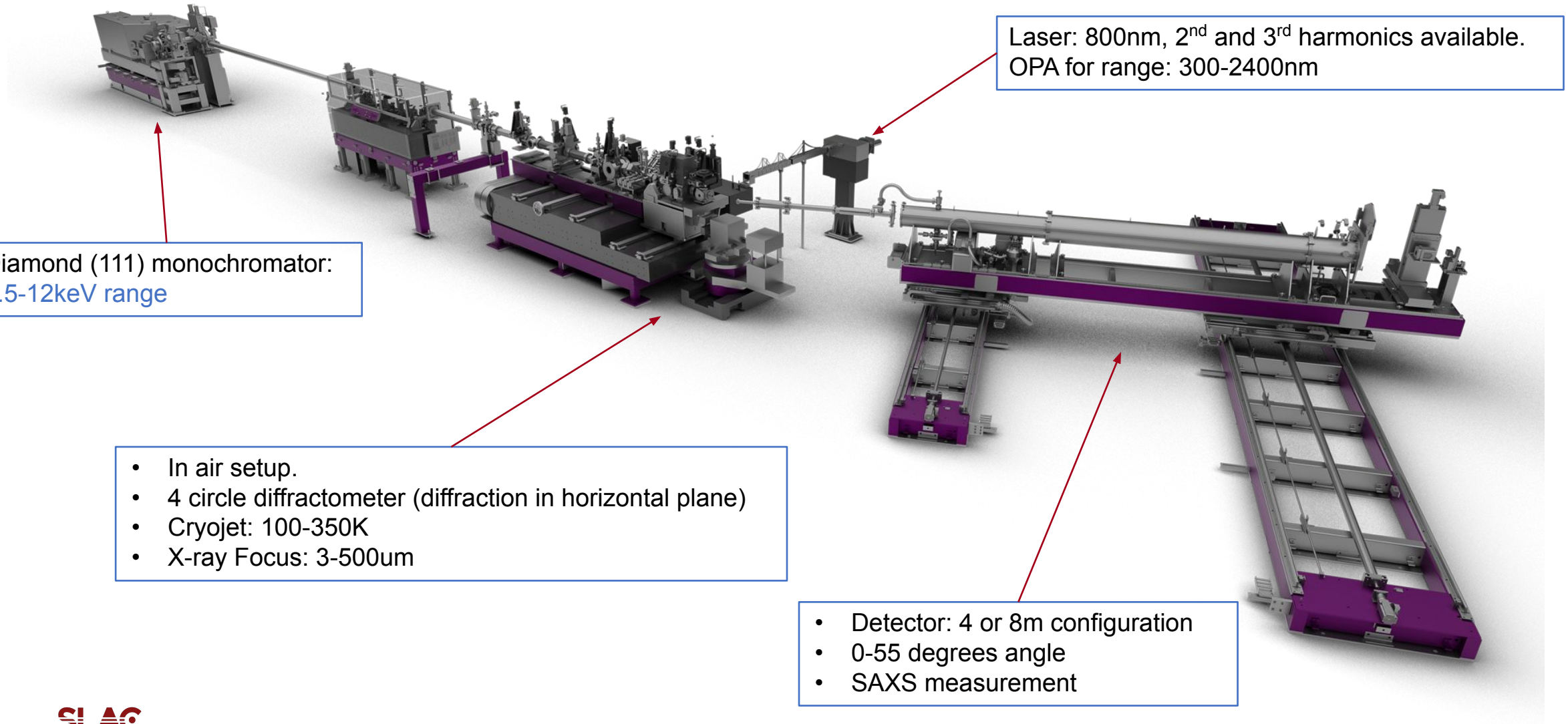
Standard config #1: **time-resolved hard X-ray coherent scattering and small angle scattering on condensed matter systems in air.**



Laser: 800nm, 2nd and 3rd harmonics available.
OPA for range: 300-2400nm

Diamond (111) monochromator:
7.5-12keV range

- In air setup.
- 4 circle diffractometer (diffraction in horizontal plane)
- Cryojet: 100-350K
- X-ray Focus: 3-500um

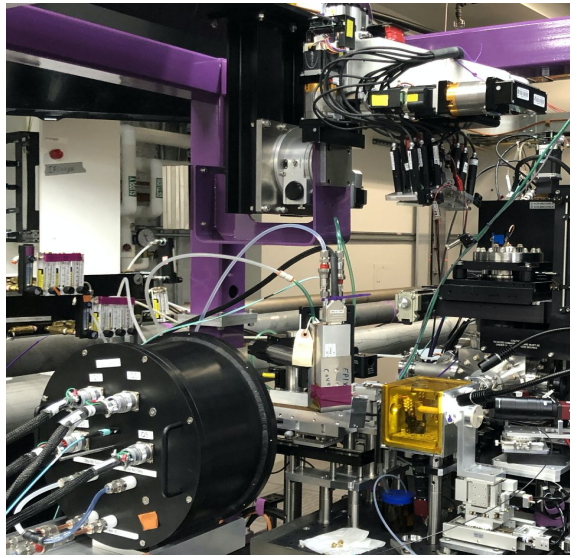
- Detector: 4 or 8m configuration
- 0-55 degrees angle
- SAXS measurement

SLAC

Standard config #2: **Time-resolved wide-angle scattering, X-ray emission and absorption spectroscopy for the study of photo-excited molecular dynamics** in **solution phase**

LJE Sample environment:

- Helium purged sample chamber
- Sample monitoring and cleanup slits
- Horizontal liquid jet driven by HPLC pumps will be used to deliver the sample into the interaction point. Round and flat sheet jets of various sizes are available.

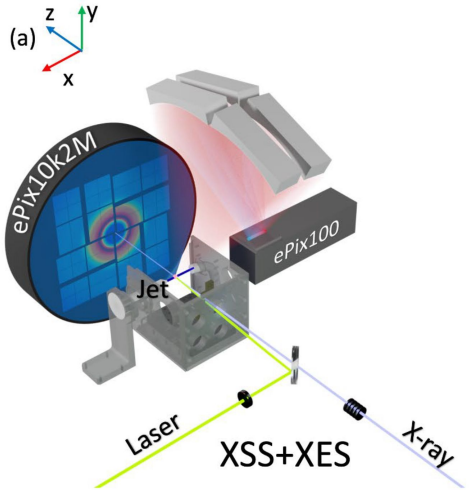


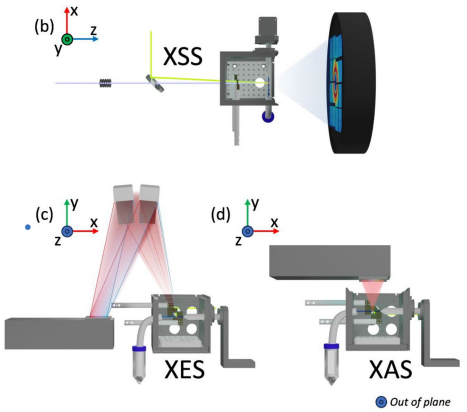
X-ray:

- Higher X-ray energy up to 25 keV is available.
- Pink beam with the XCS periscope mirror system
- Scannable monochromatic energy with the CCM Si(111): 6.5 to 25 keV or new DCCM 2.5 to 18keV (dual Si(111) channel cut)

Optical Laser:

- 800/400/266 nm 50 fs Ti:Sapphire fundamental/2nd/3rd harmonic wavelengths
- OPA available to cover the wavelength range of 300-2400 nm.





MFX in Run 26

LCLS Run 26 Users Town Hall

July 16 2025

Leland Gee and the MFX Team

SLAC NATIONAL ACCELERATOR LABORATORY

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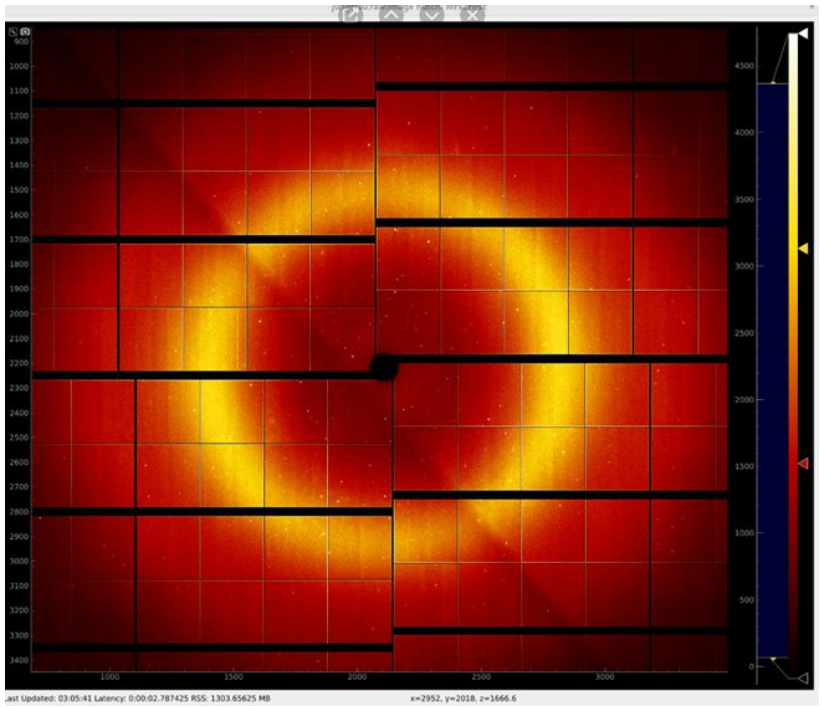
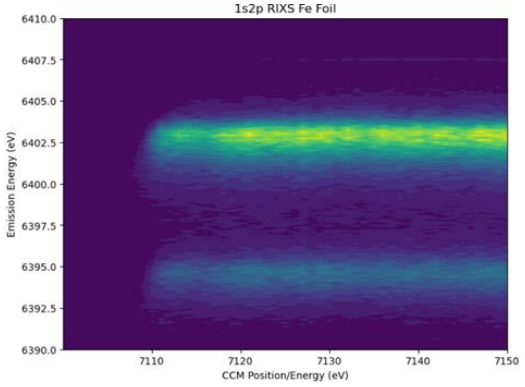
MFX (The Final Run)

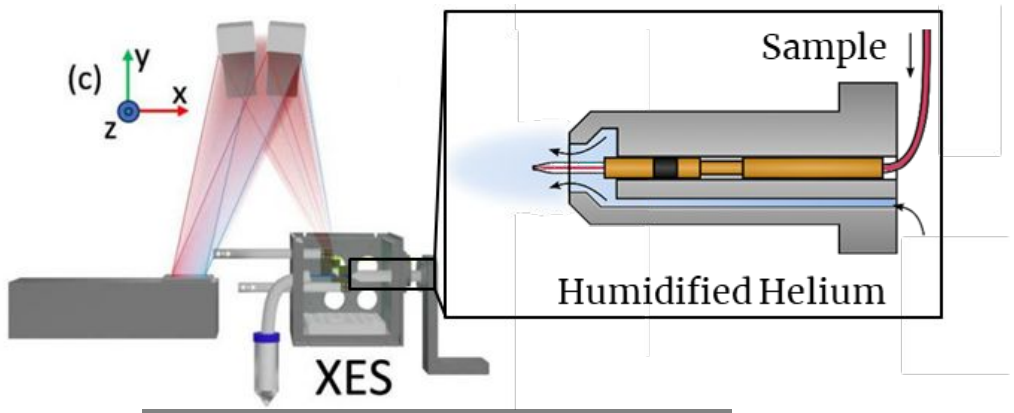


Jungfrau 16M

- **Key Capabilities**: Femtosecond Crystallography and time-resolved forward scattering (WAXS/SAXS). Multimodal with XES.
- Femtosecond Pump Laser: Collinear in-coupling geometry with wavelength coverage from UV to near IR.
- Jungfrau 16M: Fast large area detector commissioned in Run 25.
- eXchangeable Liquid Jet Endstation: Helium environment horizontal and vertical jet sample delivery compatible with emission spectroscopy and forward scattering.
- Dedicated multicrystal XES spectrometer: Compatible with collinear optical pump.
- Droplet on Demand: Semi-automated droplet delivery system with low sample consumption. **Now optionally coupled to XLJ He enclosure.**
- Coyote: Fast Fixed Target System.
- Monochromatic Beam Option: RIXS, XAS, Anomalous Scattering



1s2p RIXS at MFX via DCCM



eXchangeable Liquid Jet (XLJ) Coupled to DOD

Instrument Lead: Leland Gee

CXI in Run 26

LCLS Run 26 Users Town Hall

July 16 2025

Meng Liang and the CXI Team

SLAC NATIONAL ACCELERATOR LABORATORY

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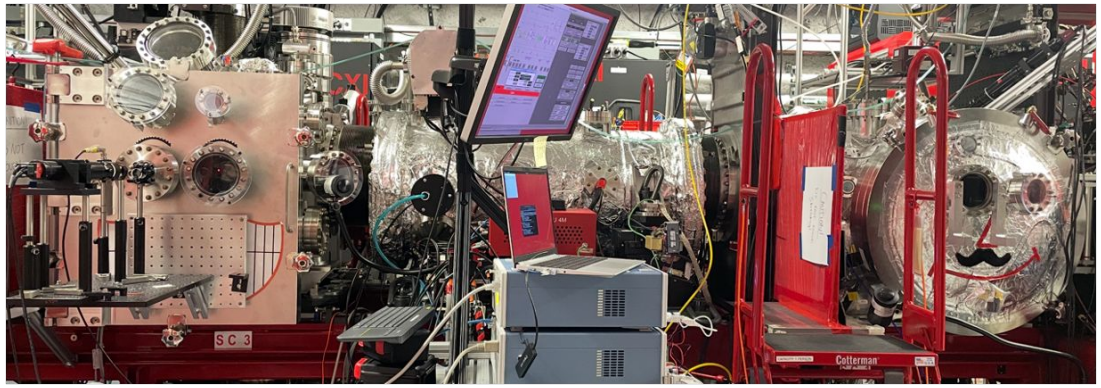
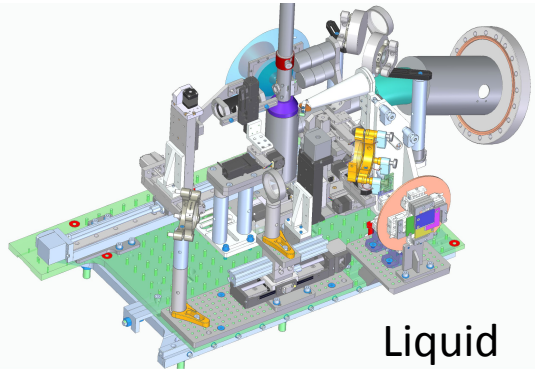
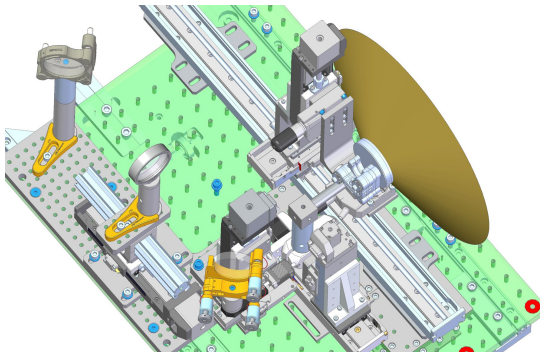
CXI





Liquid jet



Gas cell

Serial Femtosecond Crystallography: variety of sample injection options from jets (GDVN, high-viscosity, MESH, mixing) to fixed target. High photon energy (18 keV) available for 0.8 Å resolution.

Gas Phase Photochemistry: In vacuum gas cell, short-pulse UV pump (<50fs), multisample gas exchange manifold.

Nanofocus for high field physics and nonlinear x-ray science: 100nm KB system allows reaching power density of 10^{20} W/cm$^{2.}$ Improved nanofocus monitoring with wavefront sensor.

Liquid jet and Gas Phase Photochemistry are part of the DC&S program

MEC in Run 26

LCLS Run 26 Users Town Hall

July 16 2025

Eric Galtier and the MEC Team

SLAC NATIONAL ACCELERATOR LABORATORY

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MEC

Discuss with the staff to evaluate the use of these capabilities for your experiment!

Long Pulse Laser

- Delivery of up to 100J in 10 ns on target
- Peak power of 10 GW for any temporal configuration
- Pulse shaping (e.g. flat top, ramp)
- CPP: 150, 300 and 600 μm

Short Pulse Laser

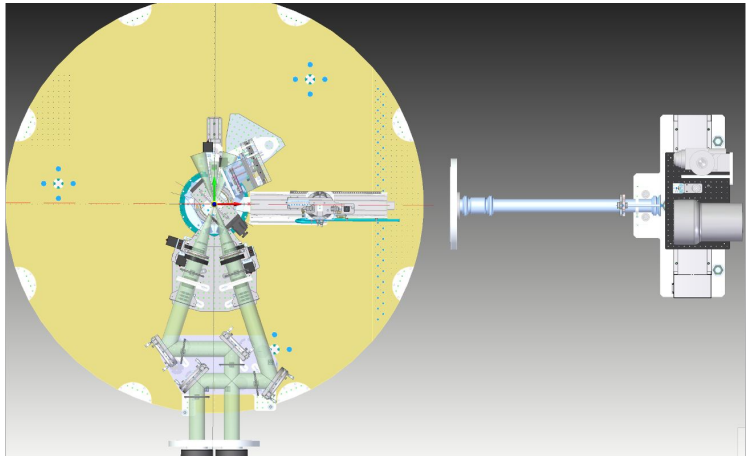
- Delivery of up to 1J in 45 fs at 800 nm, or 0.6J at 400 nm
- high intensity platform: peak intensity > 10^{19} W/cm^2
- at 800 nm, 45° angle of incidence allowed between high intensity mode and FEL
- low intensity platform: peak intensity << 10^{16} W/cm^2

Multiple submission avenues

- Regular PRP proposal
  - up to 50% towards Inertial Fusion Energy through improved submission process
  - ~50% standard configuration
- Data Set Collection
  - 1-2 shifts
  - no requirement for previous X-rays beamtimes
  - reviewed by PRP
- Rapid Access
  - VISAR only shots
  - can be submitted at any time during the year
  - reviewed by the MEC team

Std configurations

1. X-Ray Diffraction configuration with long pulse laser in collinear geometry (vs the FEL)
2. X-Ray Imaging geometry with Long Pulse Laser perpendicular to the FEL, X-Ray Diffraction with 1x ePix10k

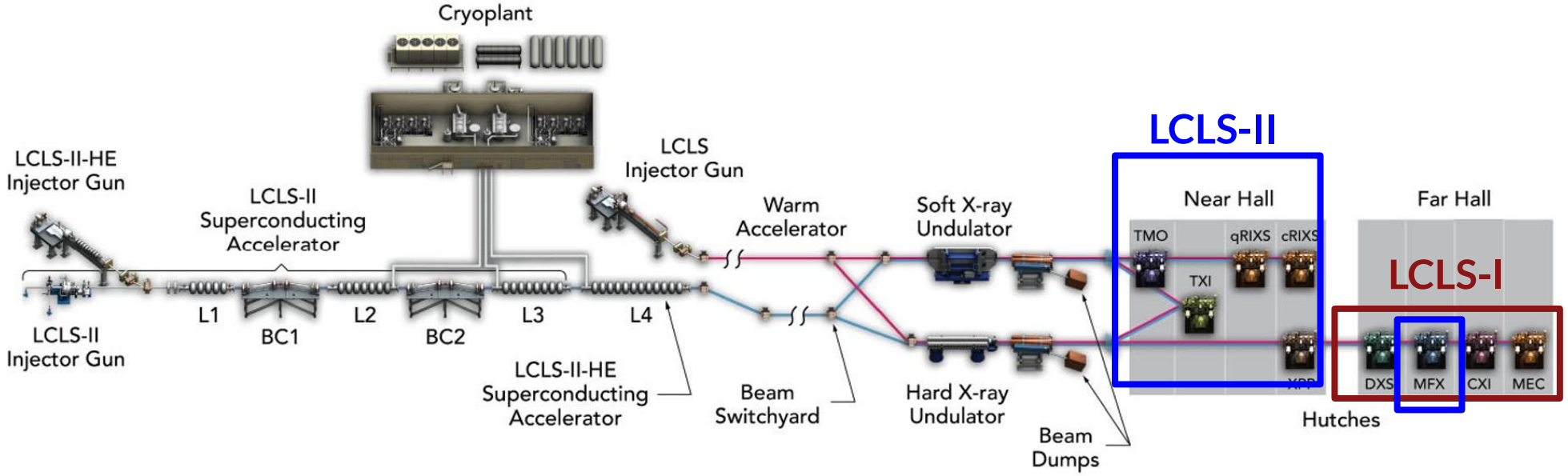


Data Systems

February 6th 2025

Reminder: LCLS-I and LCLS-II Use Different Data Systems

LCLS-I and LCLS-II have different DAQ, psana analysis framework, and AMI



LCLS-I is used for hard x-ray instruments **XCS, CXI, and MEC** - limited to 120 Hz and ~10 GB/s

LCLS-I psana analysis framework (psana) documentation: https://confluence.slac.stanford.edu/display/PSDM/LCLS+Data+Analysis

LCLS-II is used for the new instruments in **TMO, RIX, XPP, MFX** - up to 1 MHz and ~TB/s

LCLS-II psana analysis framework (psana2), documentation:

https://confluence.slac.stanford.edu/display/LCLSIIData/LCLS-II+Data+Acquisition+and+Analysis.

AMI2 available in TMO, RIX, XPP, and MFX: https://confluence.slac.stanford.edu/display/LCLSIIData/ami

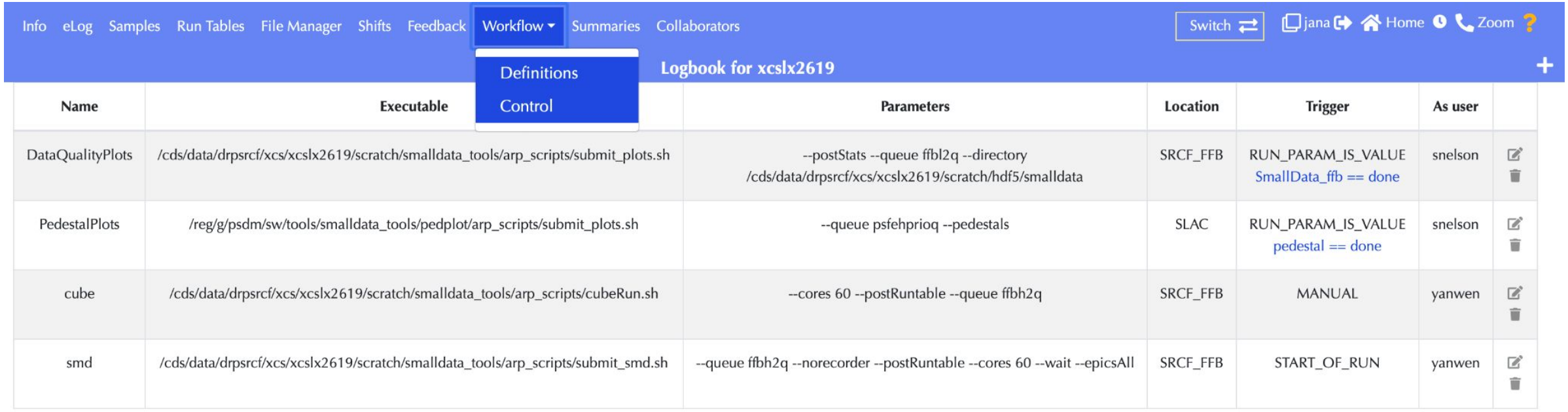
What's new?

- MFX has transitioned to LCLS-II DAQ/analysis and AMI2
- TMO and RIX data reduction: High Speed Digitizers are emitting both reduced (Feature Extracted, or FEX, data) and non-reduced (non-FEX) data.
  - Data Reduction in TMO/RIX digitizers is zero suppression; it is recommended that users analyze both FEX and non-FEX data in parallel to verify that they agree to within statistical errors
  - Please contact pcds-ana-l@slac.stanford.edu or your POC with questions.
- Data center (S3DF) outages announcements: https://confluence.slac.stanford.edu/display/PCDS/Outages

Try out Automated Run Processing (ARP)

Automated Run Processing (ARP) capabilities are available via eLog →Workflow → Definitions

- The Automatic Run Processor (ARP) is a web service that allows for automatic workflows and for the easier submission of batch jobs via a web interface: see eLog →Workflow → Definitions
- A script that submits the batch job is all that is needed for this system to work.
- ARP will automatically launch the configured workflow and return status and results to eLog.
- Examples and documentation: https://confluence.slac.stanford.edu/pages/viewpage.action?pageId=219269619
- Working on some standardized workflows for complex analysis tasks.
- For more information on using this resource, reach out to Silke Nelson (snelson@slac.stanford.edu)



Name	Executable	Parameters	Location	Trigger	As user
DataQualityPlots	/cds/data/drpsrcf/xcs/xcslx2619/scratch/smalldata_tools/arp_scripts/submit_plots.sh	--postStats --queue ffbl2q --directory /cds/data/drpsrcf/xcs/xcslx2619/scratch/hdf5/smalldata	SRCF_FFB	RUN_PARAM_IS_VALUE SmallData_ffb == done	snelson
PedestalPlots	/reg/g/psdm/sw/tools/smalldata_tools/pedplot/arp_scripts/submit_plots.sh	--queue psfehprioq --pedestals	SLAC	RUN_PARAM_IS_VALUE pedestal == done	snelson
cube	/cds/data/drpsrcf/xcs/xcslx2619/scratch/smalldata_tools/arp_scripts/cubeRun.sh	--cores 60 --postRuntable --queue ffbh2q	SRCF_FFB	MANUAL	yanwen
smd	/cds/data/drpsrcf/xcs/xcslx2619/scratch/smalldata_tools/arp_scripts/submit_smd.sh	--queue ffbh2q --norecorder --postRuntable --cores 60 --wait --epicsAll	SRCF_FFB	START_OF_RUN	yanwen

https://github.com/lcls-mlcv/BayFAI

Louis Conreux
Research Assistant

Available soon: Geometry Optimization

BayFAI: **lute**-based workflow that provides geometry within **minutes** to the user

User Doc

Operator

~5min

User

Analysis

BayFAI Workflow Overview

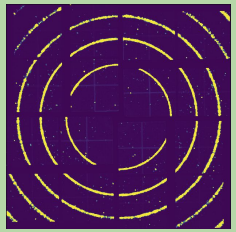
Collect Calibrant Run

~2min

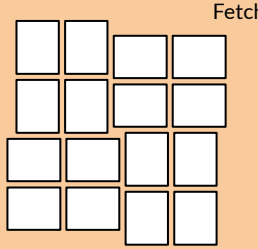
exp
run
detector

lute

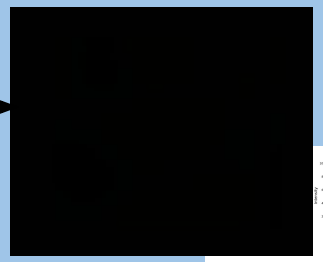
~30s smalldata
Produce Calibrant Image

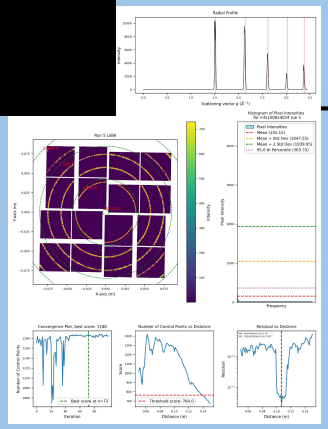


psana
Fetch Metrology



BayFAI
Optimize Geometry
~2min





Calibrated Geometry
Translations
Distance
Shift-x
Shift-y
Rotations
Rx
Ry
Ry

MFX
CXI
MEC
XCS
XPP
UED

SLAC

Questions? Email fpoitevi@slac.stanford.edu

S3DF Quick Reference

S3DF Quick Reference: https://s3df.slac.stanford.edu/public/doc/#/

SSH	s3dflogin.slac.stanford.edu
NoMachine	s3dfnx.slac.stanford.edu
OnDemand	https://s3df.slac.stanford.edu/ondemand
Globus Endpoint	slac#s3df
Help (slack channel)	slac.slack.com#comp-sdf
Help (email)	s3df-help@slac.stanford.edu
Banking & Accounting	https://s3df.slac.stanford.edu/coact
S3DF Dashboard & Monitoring	https://s3df.slac.stanford.edu/monitoring

Questions?

Agenda

Time (PST)	Topic	Presenter
Plenary Session - Join via Zoom >>		
9:00 am	Current LCLS Status & Plans	**Mike Dunne** Director, LCLS
9:15 am	Universal Proposal System	**Leilani Conradson / Paul Jones** LCLS User Office
9:25 am	User Executive Committee Update	**Silvia Pandolfi** LCLS UEC Vice Chair
9:28 am	Short Proposal Program Update	**Sandra Mous** LCLS Scientist
9:31 am	Accelerator Plans for Run 25	**Tim Maxwell / Axel Brachmann** NC Linac Dept. Head / Linac & FEL Div. Dir.
9:36 am	Soft X-ray Instrument Capabilities with 120Hz beam (Introduce breakouts)	**James Cryan / Kristjan Kunnus /Georgi Dakovski** TMO/chemRIXS/qRIXS Instrument Leads
9:45 am	Hard X-ray Instrument Capabilities with 120Hz beam (Introduce Breakouts)	**Takahiro Sato / Matthieu Chollet / Leland Gee / Meng Liang / Éric Galtier** XPP/XCS/MFX/CXI/MEC Instrument Leads
9:55 am	Data systems	**Jana Thayer** Data Systems Dept. Head
Breakout Sessions/Office Hours by Instrument		
10:10 am - 11:00am	Session 1	
	•TMO Join via Zoom >>	James Cryan
	•MEC Join via Zoom >>	Eric Galtier
	•MFX Join via Zoom >>	Sebastian Dehe for Leland Gee
	•qRIXS Join via Zoom >>	Georgi Dakovski
	•XPP/XCS Join via Zoom >>	Takahiro Sato & Matthieu Chollet
	•chemRIXS Join via Zoom >>	Kristjan Kunnus
	•CXI Join via Zoom >>	Meng Liang