LCLS Run 27 Users Town Hall

February 4 2026

Agenda

Time (PST)	Topic	Presenter
Plenary Session		
9:00 am	Current LCLS Status & Plans	**James Cryan** Science, Research and Development Interim Director, LCLS
9:10am	Science Campaign Proposals	**Bob Schoenlein** LCLS Deputy Director for Science
9:15 am	User Executive Committee Update	**Alec Follmer** LCLS UEC Vice Chair
9:18 am	Short Proposal Program Update	**Sandra Mous** LCLS Scientist
9:21 am	Accelerator Plans for Run 26	**Tim Maxwell / Axel Brachmann** NC Linac Dept. Head / Linac & FEL Div. Dir.
9:30 am	Soft X-ray Instrument Capabilities with 120Hz beam	**James Cryan / Kristjan Kunnus /Georgi Dakovski** TMO/chemRIXS/qRIXS Instrument Leads
9:40 am	Hard X-ray Instrument Capabilities with 120Hz beam	**Takahiro Sato / Sanghoon Song / Leland Gee / Meng Liang / Éric Galtier** XPP/XCS/MFX/CXI/MEC Instrument Leads
9:50 am	Questions	**Moderator: Sebastien Boutet** LCLS Director of Operations

Current LCLS Status & Plans

James Cryan, LCLS Science, Research and Development Interim Director
on behalf of Kelly Gaffney, LCLS Director

February 4, 2026

Organizational Changes

Stating October 20, 2025 Kelly Gaffney became the Director of LCLS

Thank you to Mike for his 10+ years of leadership!

Organizational Changes

Matthias Kling named as the next Director of the **Stanford PULSE Institute** (effective Feb 1)

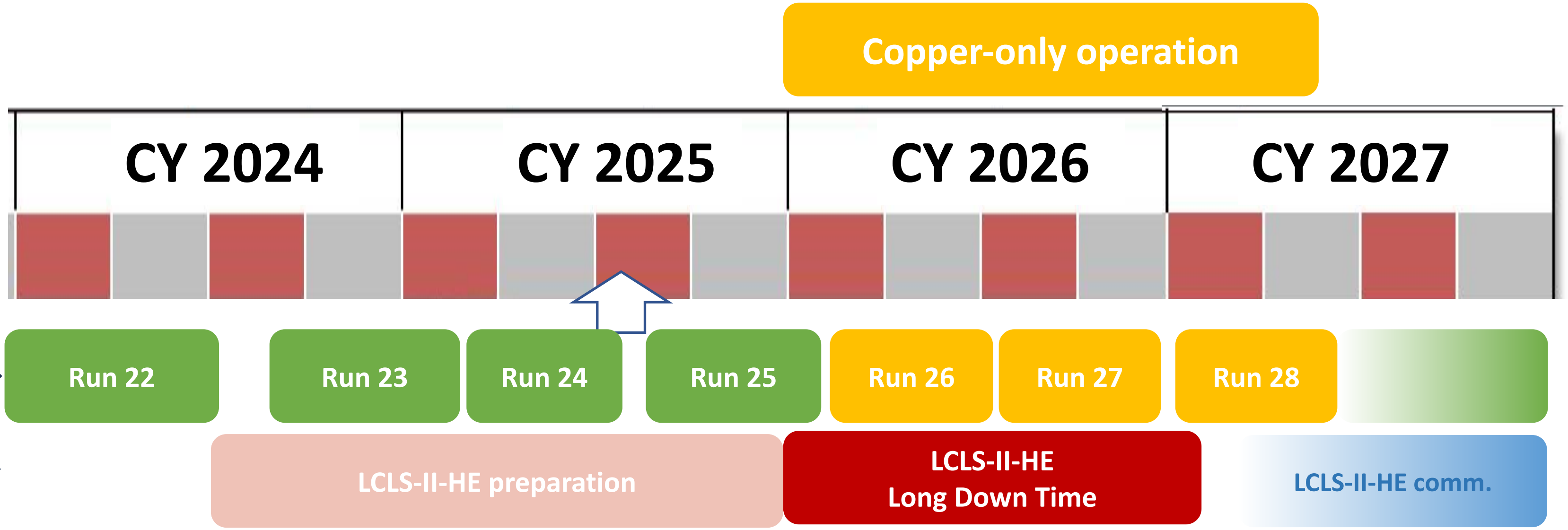
James Cryan will take over as the interim Science, Research and Development Division lead while we search for the next Division lead

Thank you Matthias for your leadership!

LCLS-II-HE Timeline

- **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
- SC linac shutdown started December of 2025
- 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

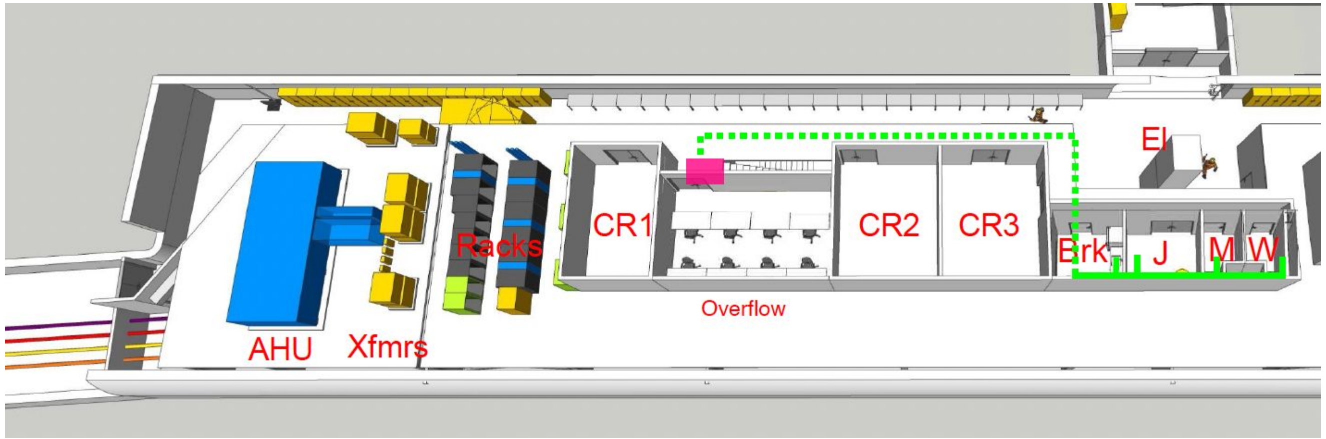


Operations

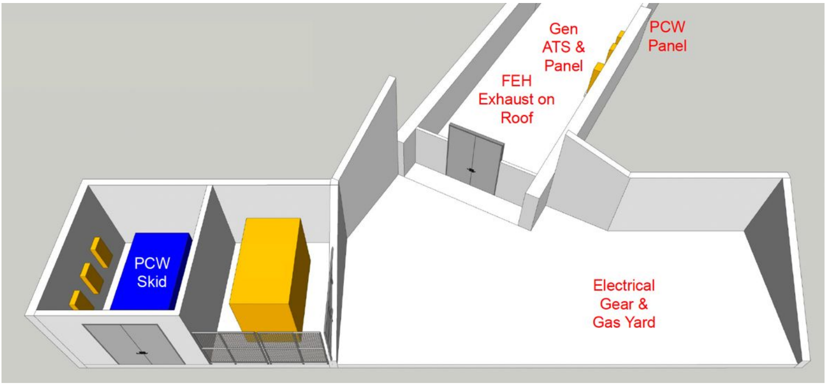
Project

The Far Experimental Hall (FEH) will be Reshaped in Readiness for LCLS-II-HE, Starting this Summer

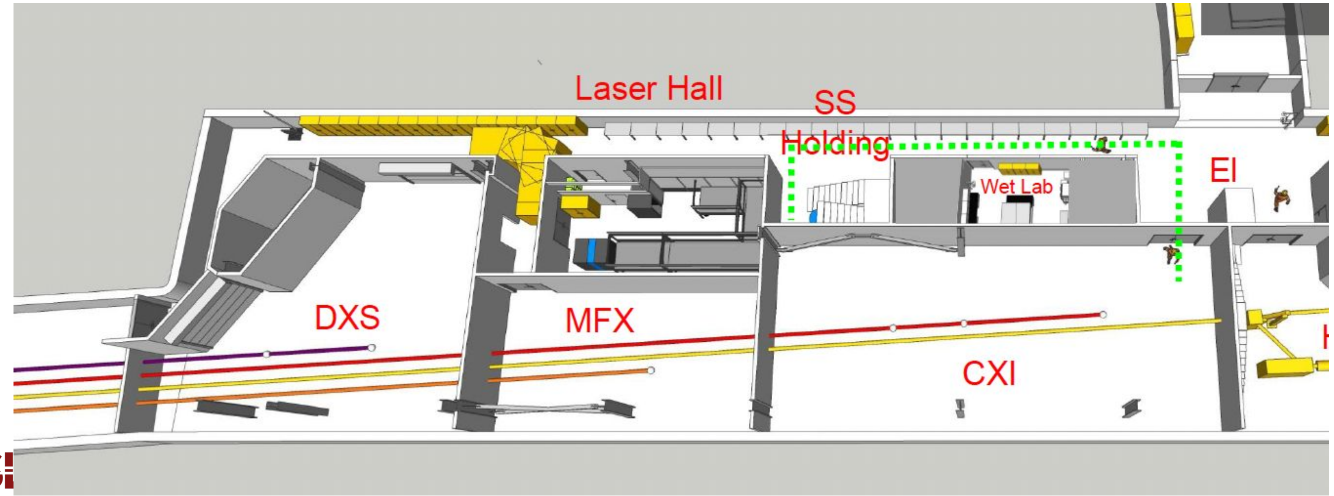
Control Rooms have been built on the mezzanine level



PCW, cooling and MAH in the area outside FEH

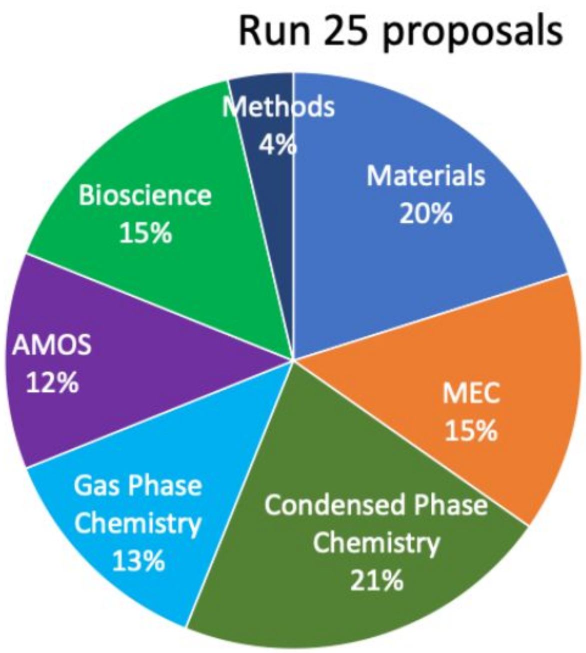


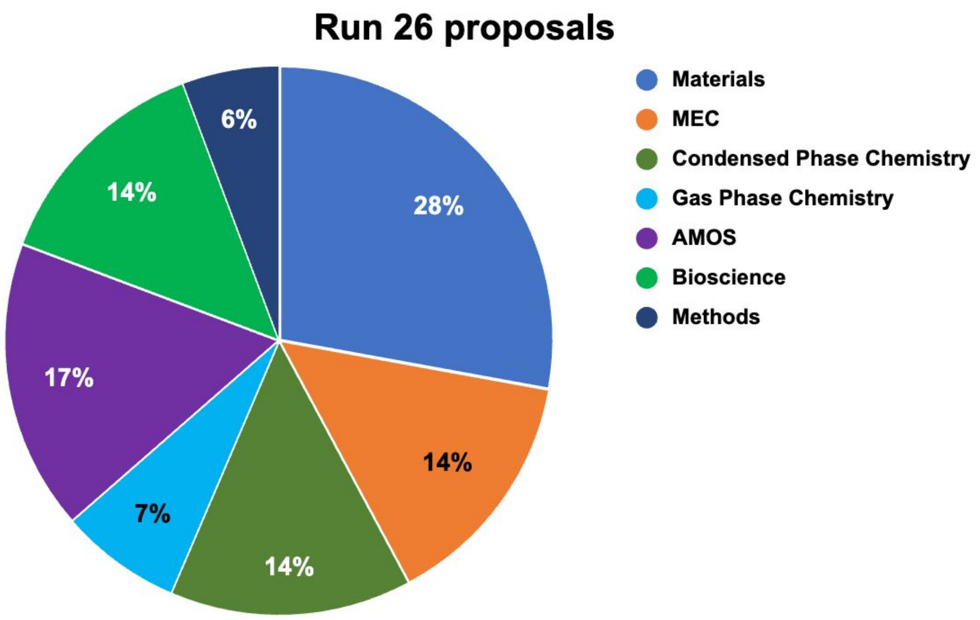
New Laser Hall (summer 2026) and potential new wetlab



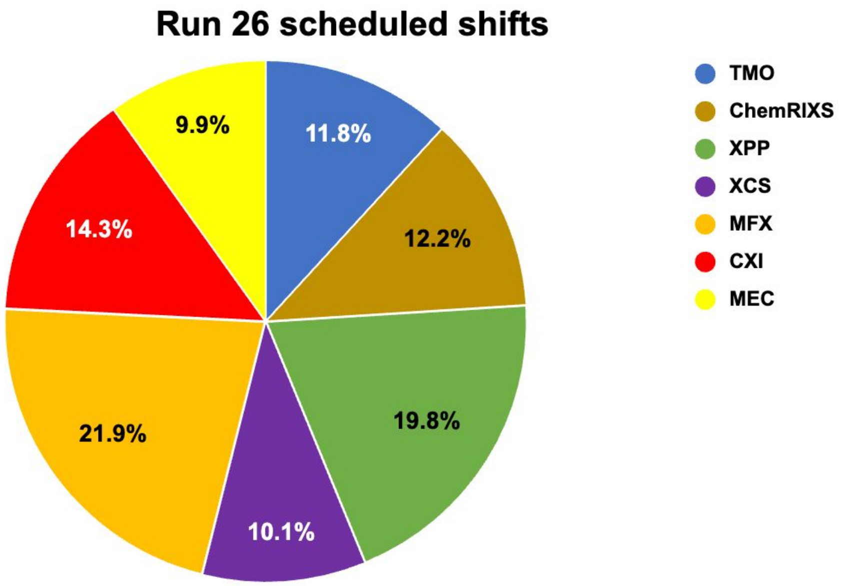
Proposal Statistics from Prior Runs

Split by science area





Split by instrument
Run 26



140 proposals for Run 26 (Mar 2026 – Jul 2026)

164 proposals for Run 25 (Sept 2025 – Feb 2026)

Science Campaign Proposals

Bob Schoenlein, LCLS Deputy Director for Science

February 4, 2026

reminder

Science Campaigns – Motivation & Criteria

expansion of PRP access channel (~10%)

Expand on existing PRP proposal criteria & review

- Dominant LCLS model is single "one-off" experiments (~3-5 shifts)
- Expanded capacity (LCLS, worldwide) enables access models leading to higher science impact

Support comprehensive research efforts requiring multiple LCLS beamtimes
(e.g. including synthesis, experiment, theory etc.)

Scientific scope and impact well above standard PRP proposal

- *Is the program likely to result in a qualitative advance on an important science area?*
- *Is the program likely to change the thinking in an important field of science?*

Compelling need for LCLS capabilities, instrumentation, expertise

- Facility partnership (support for user science, and potential influence on facility directions)

Value of proposed collaboration with LCLS facility and staff (LCLS strategic interest)

- e.g. Connection to BES or DOE-SC scientific mission
- e.g. Opening an important new area of science
- other arguments for the "value of proposed collaboration" may also be considered

Opportunity for LCLS to target a few high-reward "grand challenge" science areas

See LCLS Policies for details:
- Proposal preparation guidelines: https://lcls.slac.stanford.edu/proposals
- Proposal review process: https://lcls.slac.stanford.edu/proposals/review-process

reminder

Science Campaigns – Three Flavors

1

High-impact science
- Targeted (sharp science question)
- Grand-challenge level

- Comprehensive program, e.g.:
  - Experiment, synthesis, theory
  - Other essential studies (non-LCLS)
- Open call (LCLS defined area)
  - Community input
  - LOI req. ⇒ full proposal

2

Major experimental method development
⇒ *high-impact science*
- LCLS-led (co-led with users)
- Broad community input, involvement, coordination
- LOI req. ⇒ full proposal

3

Major new user instrument
⇒ *high-impact science*
- Close LCLS partnership
  - Ops support, logistics etc.
- Community coordination
  - Significant community interest
  - Add'l users via PRP channel
- LOI req. ⇒ full proposal

common to all:

Science Impact – criteria

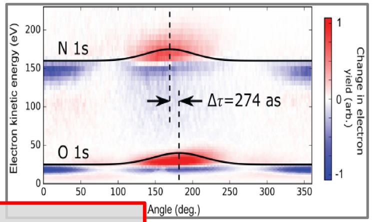
LCLS-Strategic ◊ Multiple Beamtimes ◊ Scope/Review: PRP^{+}

LCLS Science Campaigns – *targeting high-reward "grand challenge" science*

Run 18 (CY2019)

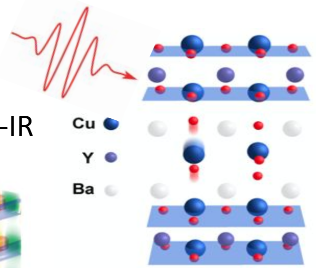
Attosecond science
Cryan, P. Walter, A. Marinelli et al.
9 investigators from 16 institutions)

- Observation and control of coherent electronic motion



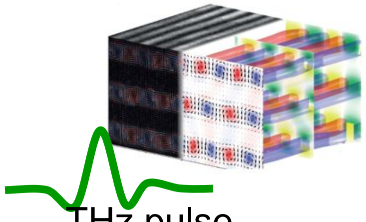
uantum materials
. Trigo et al.
1 investigators from 13 institutions)

- Coherent control of collective modes and electronic order



opological Materials
V. Gopalan et al.
(14 investigators from 5 institutions)

- Control of collective modes, transformation pathways, fluctuations

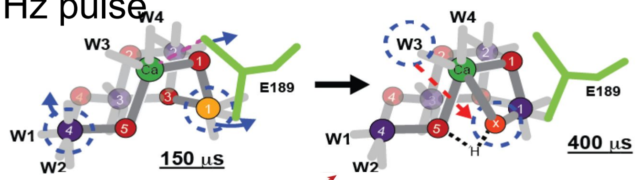


four campaigns have transitioned to regular PRP submissions for Run 26

Run 19 (CY2020)

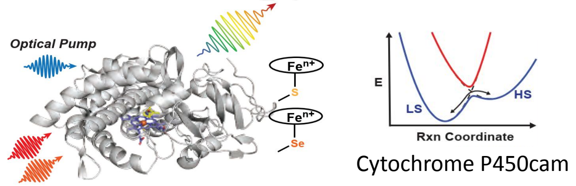
Photosynthesis PS II
. Yano et al.
0 investigators from 8 institutions)

- Understand light-driven multi-electron catalysis of the water oxidation in PS-II



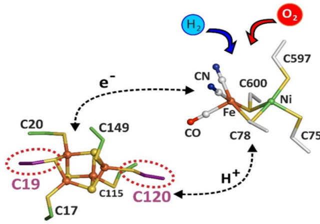
uantum Enzyme Catalysis
. Hadt et al.
7 investigators from 10 institutions)

- Understand electronic properties and quantum effects in enzyme function



Enzyme Catalysis for Energy
J. Kern et al.
(25 investigators from 15 institutions)

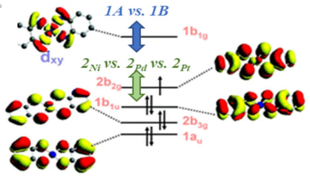
- Understand structural dynamics of metalloenzymes for the energy economy



Run 20 (CY2021)

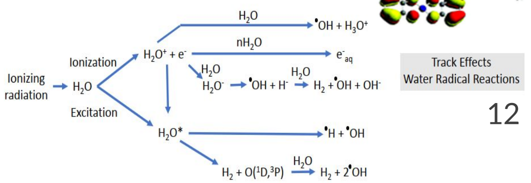
ontrol Reactivity in TM Complexes
. Gaffney et al.
3 investigators from 6 institutions)

- Design principles for covalent control of excited-state reactivity in TM complexes



adiolysis in Extreme Environments
Young, C. Pearce et al. – IDREAM EFRC
8 investigators from 6 institutions)

- Radiation-induced chemical processes for environmental remediation, nuclear waste

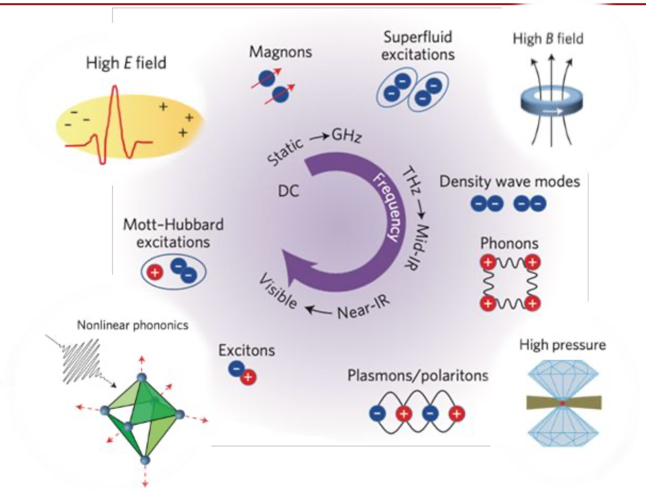


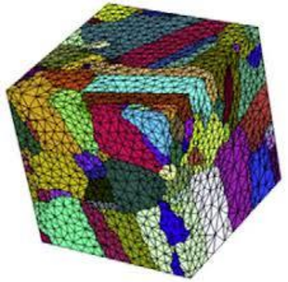
Science Campaign Call – Run 27

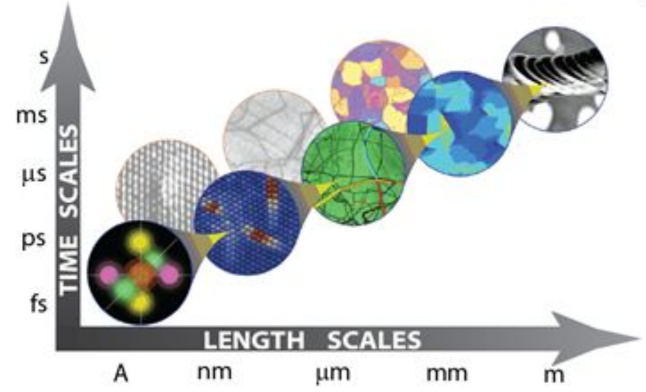
Understanding & Controlling the Properties & Function of Complex Materials

Motivation & Example Science Opportunities (not exclusive):

- Nonequilibrium processes, transformations, structural dynamics & emergent phases in complex matter
- Collective modes, topological structures, & emergent properties in quantum materials relevant for future computation and communication technologies
- Stochastic dynamics, heterogeneity, fluctuations & disorder – determining the properties & evolution of materials under conditions relevant for materials function
- Fundamental materials nucleation & synthesis processes
- Materials degradation & failure mechanisms relevant for advanced materials fabrication, functionality and reliability
- Strong interest (in all areas) for compelling plans to exploit







LCLS Welcomes Community Suggestions on Science Topics for Future Campaign Calls

Oct. 2025 Campaign Call for Run 27:
https://lcls.slac.stanford.edu/news/run27-campaign-loi

LCLS UEC (User Executive Committee)

Alec Follmer, UEC Vice Chair

February 4, 2026

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
- use of LCLS
- user support
- other issues of concern to users

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

Upcoming user meeting

2026 LCLS/SSRL/ALS Users' Meeting: 20-25 September

Hands on tutorial on Sunday 20th and many interesting scientific workshops from Monday 21rd – Friday 25th

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)

Dataset Collection and Screening

Sandra Mous, LCLS Scientist

February 4, 2026

LCLS Short Proposal Program

- Offered alongside regular LCLS proposals
- Access mechanisms offered in the LCLS Run 24 Short Proposal Program:
  - **Sample Testing** (also called 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)
    - Both use short proposal form
    - Due February 26
  - **Rapid Access**: for time-sensitive experiments, provides short-term scheduling and rapid turnaround
    - Welcome at any time during the run cycle
    - Contact instrument lead

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) and/or instrument lead

SLAC

Accelerator Update

Tim Maxwell & Axel Brachmann

February 4 2026

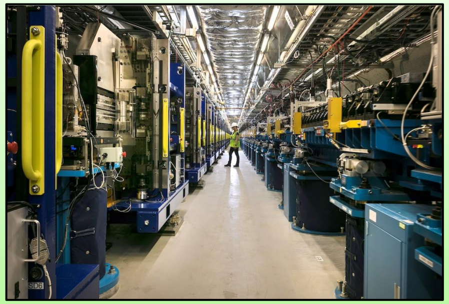
SLAC NATIONAL ACCELERATOR LABORATORY

Stanford University | U.S. DEPARTMENT OF ENERGY

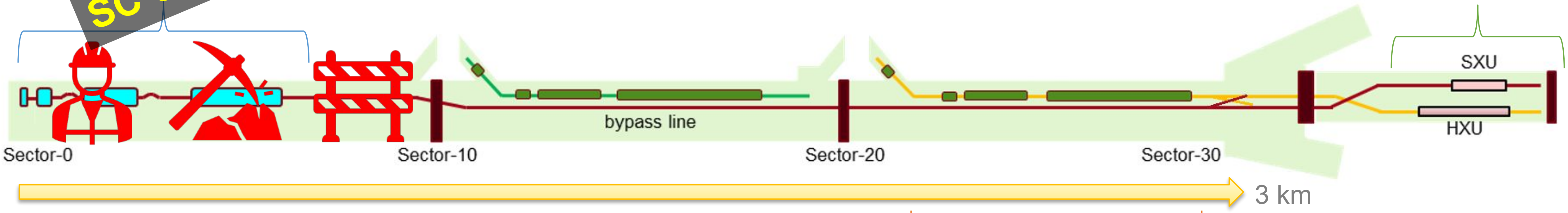
LCLS Linac FEL Complex

SC Upgrade Construction in 2026

Superconducting Linac
4 GeV,
High rep rate, CW RF



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



Linac gallery and new cryoplant viewed from Sector 0

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

HXR single-pulse SASE w/ NC Linac

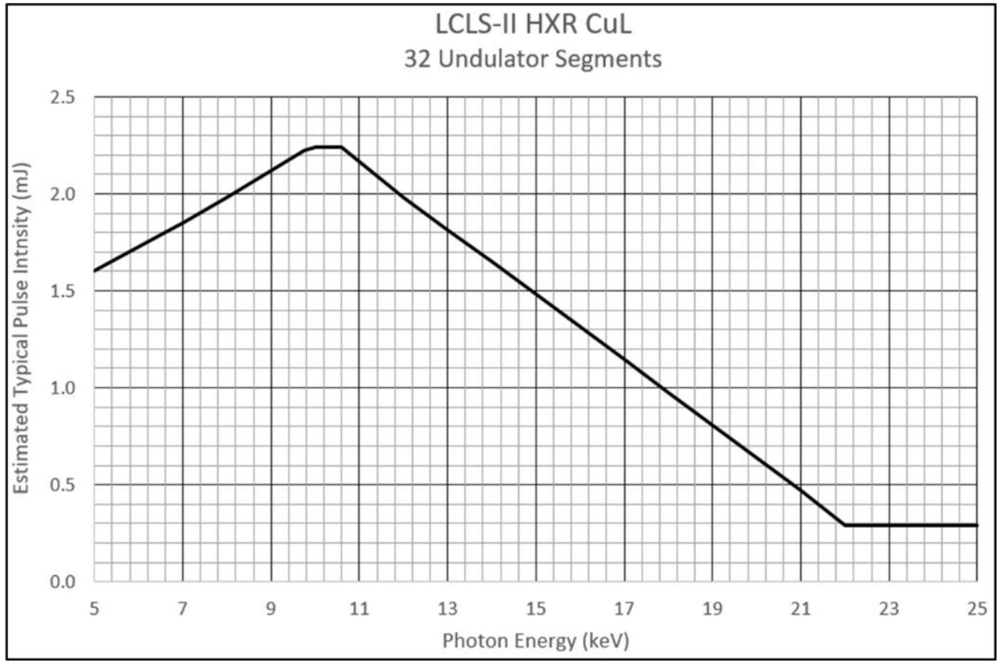
Beam Parameters	Symbol	Cu-HXU x-rays		Unit
		ω_{max}	ω_{min}	
Photon Energy	$\hbar\omega$	**23000**	**1000**	**eV**
Fundamental wavelength	λ_r	0.54	12.4	Å
Final linac e- energy	γmc^2	15	3.4	GeV
FEL 3-D gain length	L_G	5.3	1.1	m
Peak power	P	15	50	GW
Pulse duration range (FWHM)		10 – 50		fs
Nominal pulse duration (FWHM)	$\Delta\tau_f$	40		**fs**
Max Pulse Energy*	U	0.6	2.0	**mJ**
Photons per pulse*	$N\gamma$	0.16	12.5	10^{12}
Peak brightness*	$B_{pk,\,SASE}$	2450	220	10^{30} §
Average brightness (120Hz)*	$\langle B \rangle$	117	11	10^{20} §
SASE bandwidth (FWHM)	$\Delta\omega/\omega$	48	3.4	eV
Photon source size (rms)	σ_s	10	21	µm
Photon far field divergence (FWHM)	$\Theta_{FWHM,x,\infty}$	1	11	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 23 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

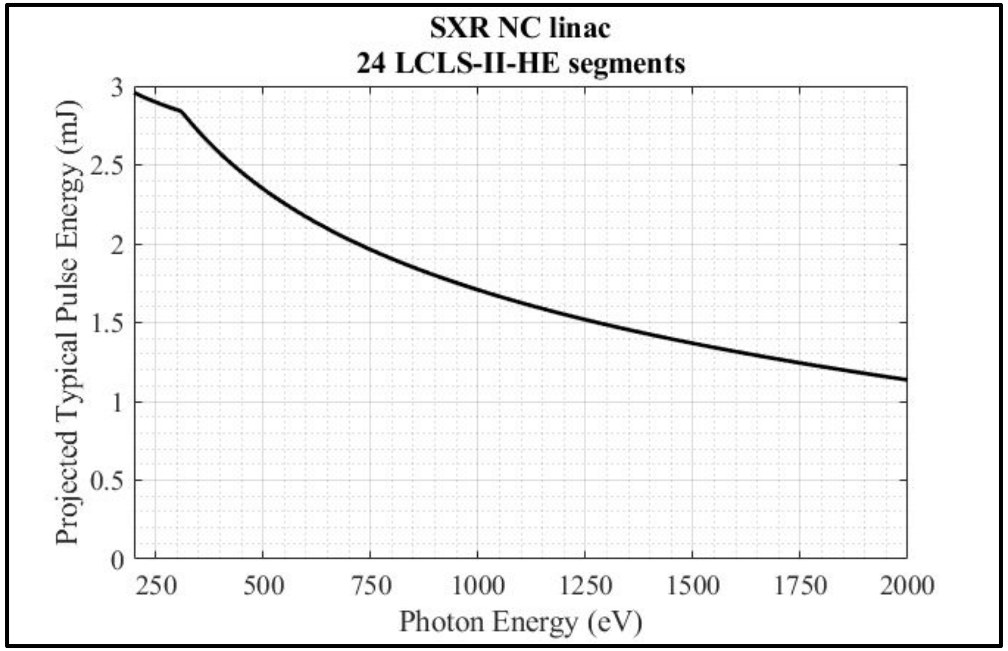
Beam Parameters	Symbol	Cu-SXU x-rays		Unit
		ω_{max}	ω_{min}	
Photon Energy	$\hbar\omega$	**2000**	**200**	**eV**
Fundamental wavelength	λ_r	6.2	62.0	Å
Final linac e- energy	γmc^2	9	7.2	GeV
FEL 3-D gain length	L_G	2.6	1.2	m
Peak power	P	17	47	GW
Pulse duration range (FWHM)		10 – 250		fs
Nominal pulse duration (FWHM)	$\Delta\tau_f$	**50**		**fs**
Max Pulse Energy*	U	**1**	**2.8**	**mJ**
Photons per pulse*	$N\gamma$	3.1	87	10^{12}
Peak brightness*	$B_{pk,\ SASE}$	170	26	10^{30} §
Average brightness (120Hz)*	$\langle B \rangle$	12	2	10^{20} §
SASE bandwidth (FWHM)	$\Delta\omega/\omega$	6	1	eV
Photon source size (rms)	σ_s	18	29	µm
Photon far field divergence (FWHM)	$\Theta_{FWHM,x,\infty}$	6	40	µrad
Max. Beam Rate	φ_{FEL}	**120**		**Hz**
Avg. x-ray beam power	P_x	0.12	0.34	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 >mJ for nominal ~50 fs pulse duration**

*** Conservative prediction as we transition to LCLS-II-HE SXR undulator operation*



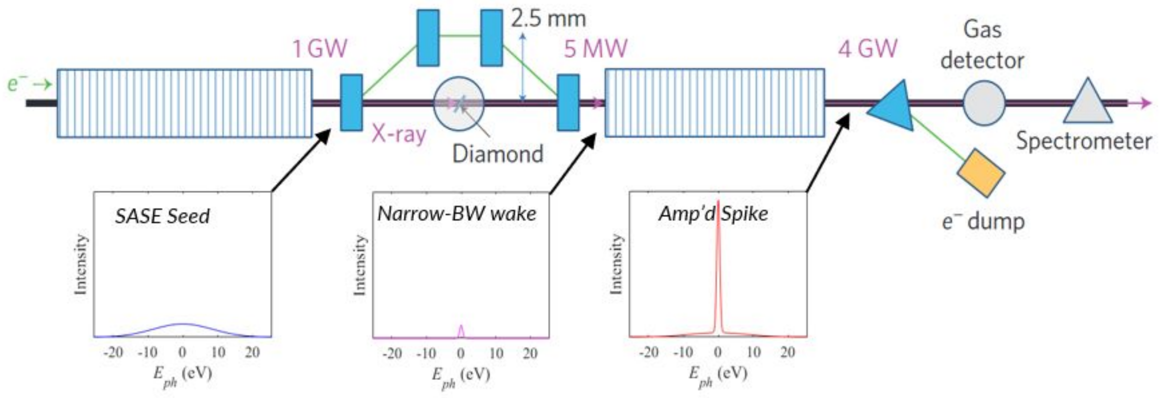
https://lcls.slac.stanford.edu/machine/parameters

Hard X-ray Self-Seeding (HXRSS)

Spectral brightness enhancement for narrow bandwidth experiments

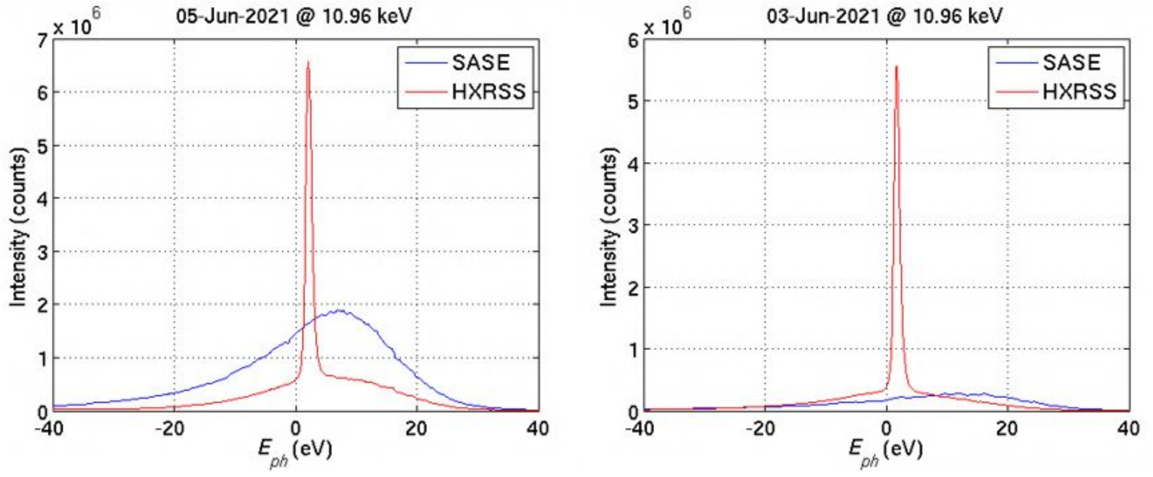
- Now for *vertically* polarized HXU
- 3-6x spectral brightness at sample vs. SASE

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



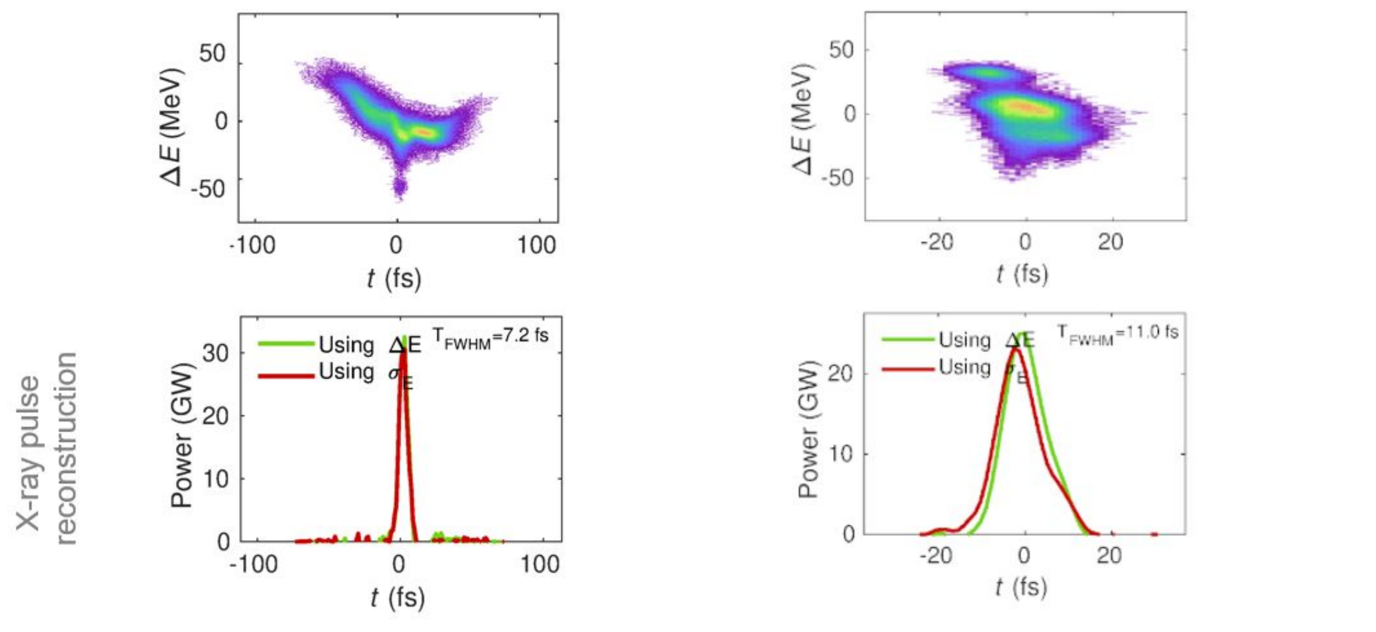
Initial SASE passes diamond wake monochromator, narrow BW amplified in 2nd half of undulator

Full SASE vs. HXRSS average spectra at 11 keV

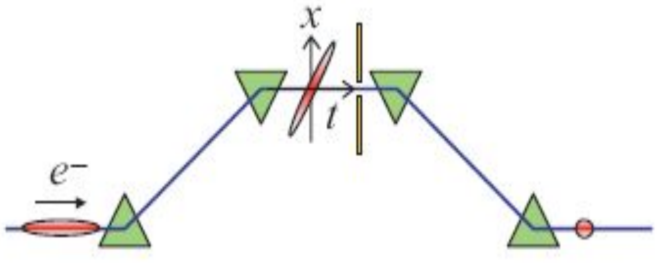


Shorter Pulses (SXR & HXR)

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

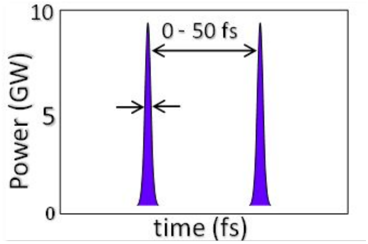


Slotted foil: 7.2 fs @ 9.2 keV **Half charge:** 11 fs @ 11 keV



Slotted foil inserted in beam to spoil lasing in time

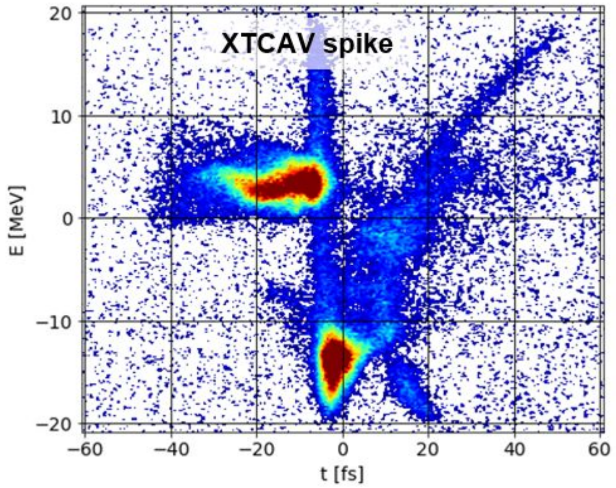
Make short single or double pulses

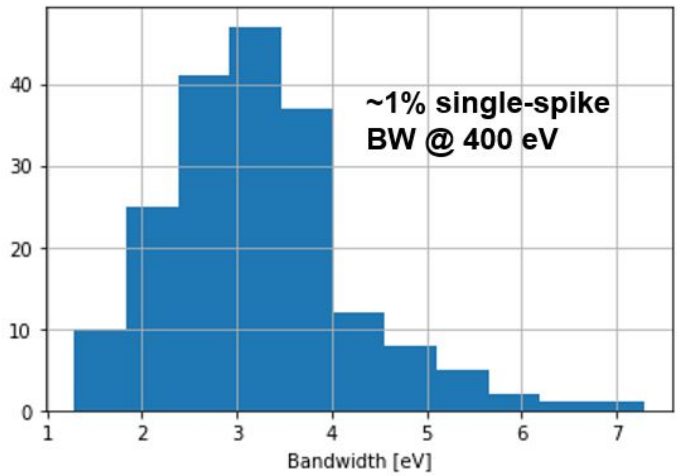


Discuss special requirements with your LCLS Instrument Lead

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 Instrument Lead

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

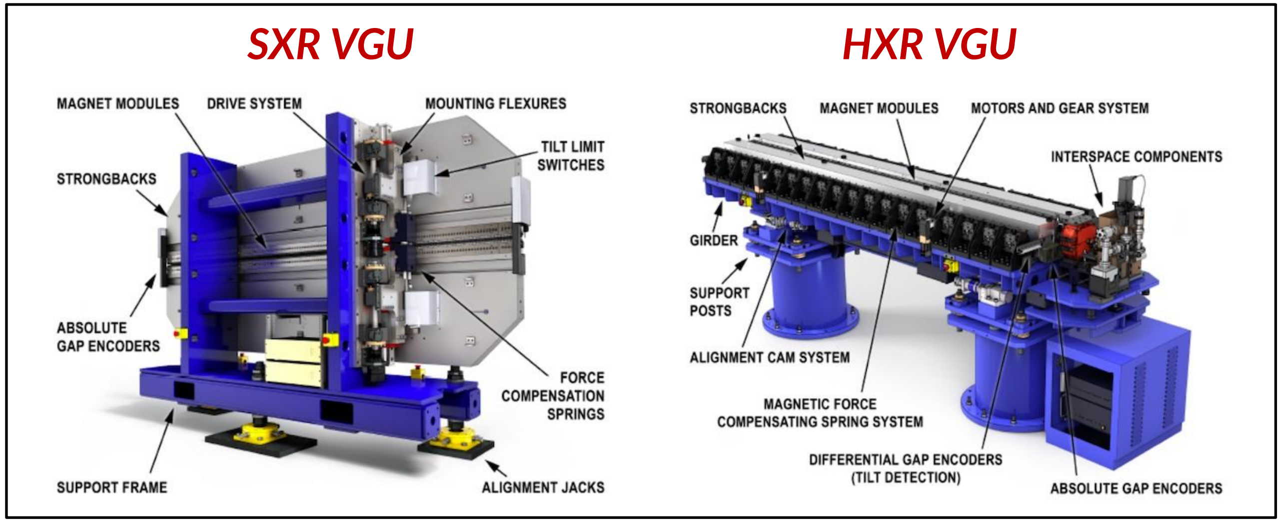
Restrictions, parameters, and setup times vary depending on photon energy, duration, etc.
See https://lcls.slac.stanford.edu/machine/parameters for more details, and as always:

Discuss special requirements with your LCLS Instrument Lead

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



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 Instrument Lead is the conduit for communication with the Accelerator teams for proposal writing

Thank you and good luck!

TMO Instrument

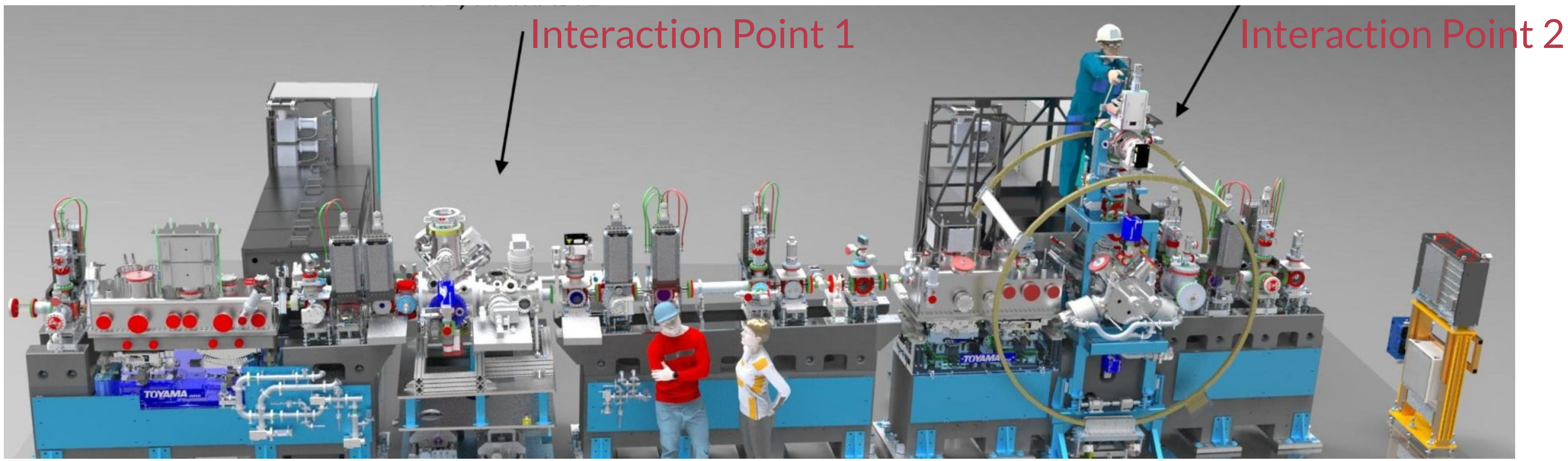
James Cryan and the TMO Team

February 4 2026

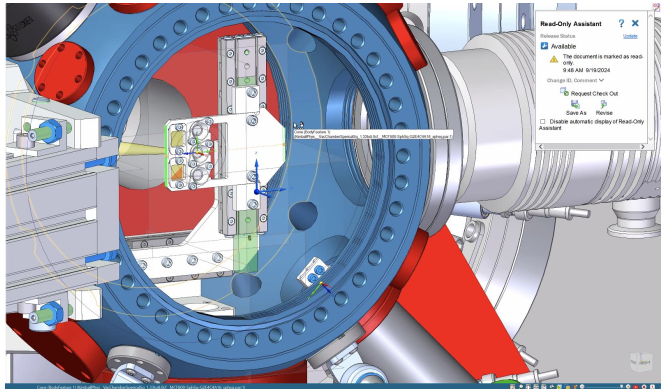
SLAC NATIONAL ACCELERATOR LABORATORY

Stanford University | U.S. DEPARTMENT OF ENERGY

TMO in Run 27



- We will offer several possible standard configurations at IP1:
  - IP2 is not accepting User proposals in Run 27
  - MBES
  - cVMI
  - MRCO + material science endstation addition
- Atto/atto capabilities
- Other, non-standard configurations are possible, see the website and speak with TMO team



Standard Config Parameters for TMO in Run 27

Laser Parameters				
Repetition rate (Hz)	Synchronized up to 71 kHz			
Wavelength	1030 nm	515 nm	343 nm	257 nm
Pulse Duration	< 30 fs	< 30 fs	< 40 fs	< 40 fs
Energy per pulse (on target)	> 500 μJ	> 39μJ	> 5 μJ	> 5 μJ
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.			

Under Development (Not standard config):

- IR OPA (1450-3400 nm)
- 200 nm

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	> 1 μJ / pulse with tunable delay via split undulator method. This provides a minimum delay of ~10 fs for arbitrary wavelength. For harmonic operation ($\omega/2\omega$, $\omega/3\omega$) the minimum delay ~300 as.		

SLAC

chemRIXS Instrument

Kristjan Kunnus and the chemRIXS Team

February 4 2026

ChemRIXS Run 27 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.

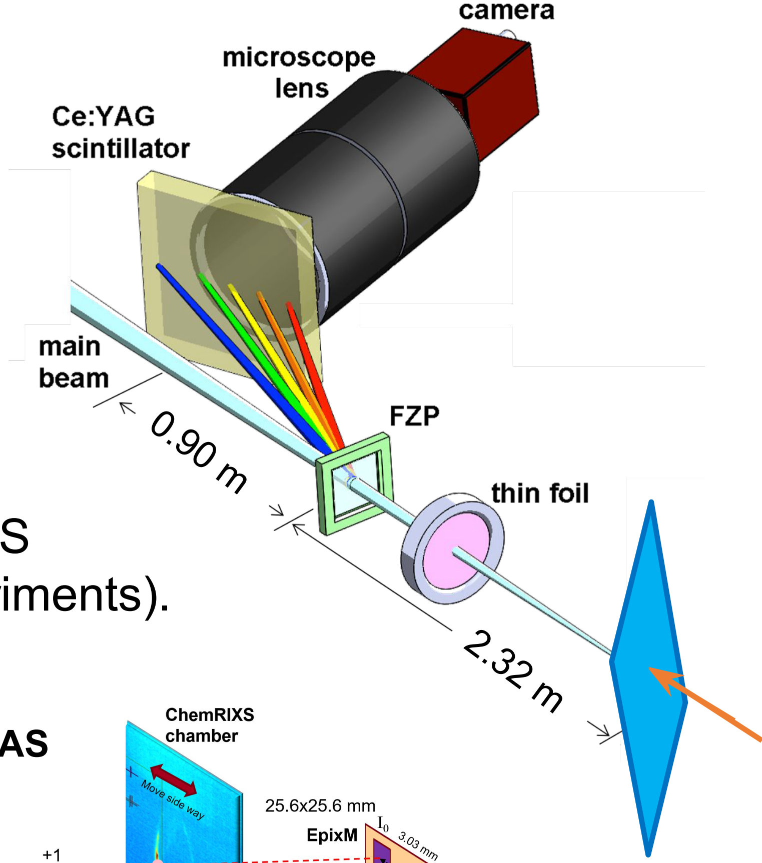
FZP standard configuration

- 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

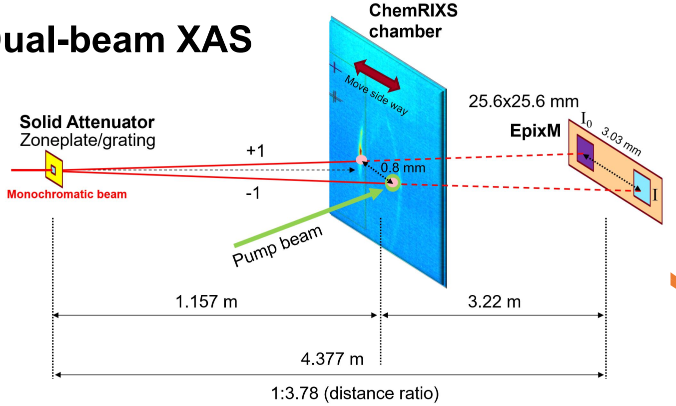
New capability

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

FZP spectrometer



Dual-beam XAS



ChemRIXS Run 27 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

NEW LASER!

	Wavelength	Pulse Duration	Pulse Energy	Spot Size
Fundamental	1030 nm	< 30 fs	up to 700 uJ	100 - 200 um FWHM
Harmonics	515 nm	< 30 fs	up to 200 uJ	100 - 200 um FWHM
	343	< 30 fs	up to 50 uJ	100 - 200 um FWHM
	257	< 30 fs	up to 5 uJ	100 - 200 um FWHM

Please contact us for any questions.
K. Kunnus
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qRIXS Instrument

Georgi Dakovski and the qRIXS Team

February 4 2026

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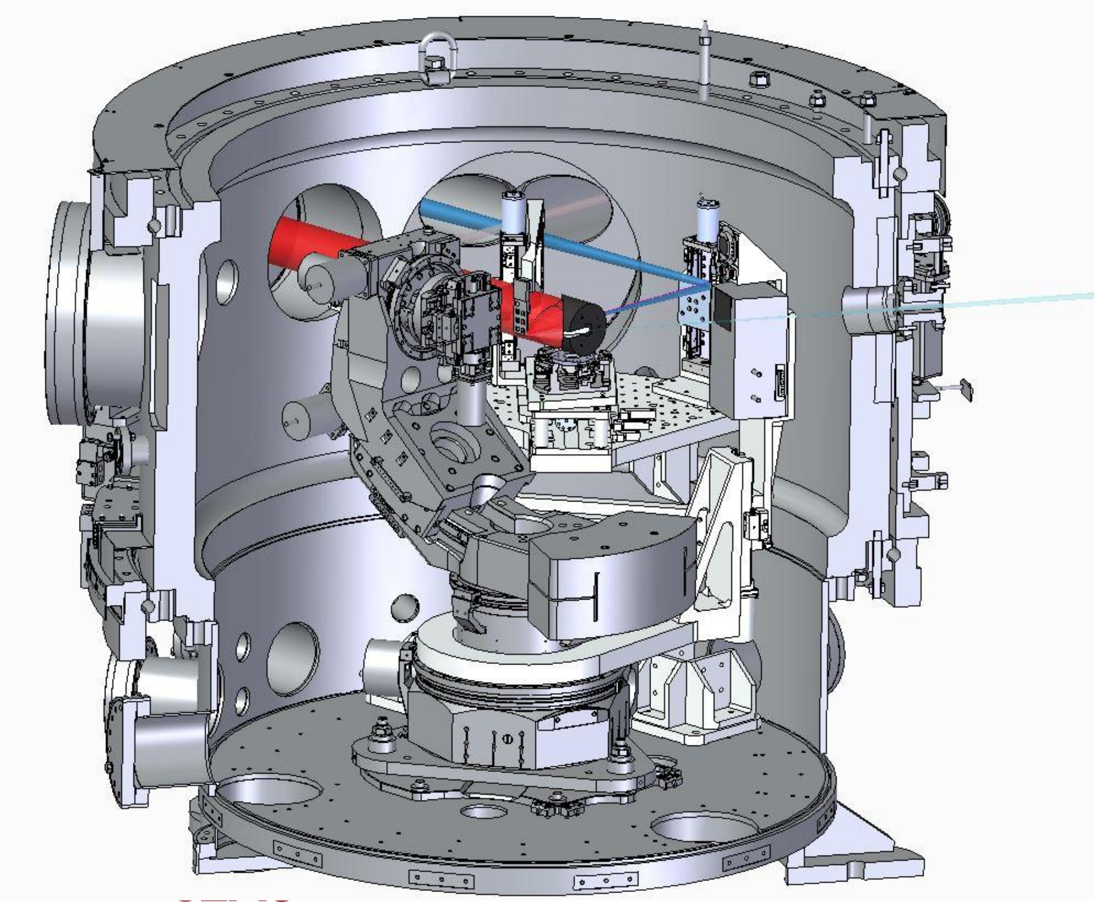
qRIXS Instrument: Run 27 capabilities

Due to the low repetition rate of LCLS-I (120Hz), time-resolved RIXS experiments will not be offered unless an exceptionally strong scientific justification is provided.

Techniques: XRD, REXS, XRR, XAS



- In-vacuum diffractometer, 6 degrees of freedom
- Bulk samples and thin films on substrates
- Load-lock chamber
- Sample cooling, ~ 25 K
- Diagnostic paddle for calibration targets, spatio-temporal overlap, etc.
- Laser in- and out- coupling
- Avalanche photodiode detectors for x-ray absorption and diffraction
- Arrival time monitor
- Overall temporal resolution: ~60 fs

qRIXS Instrument: Key Parameters

X-ray Parameters			Laser Parameters	
Repetition rate (Hz)	120		Repetition rate (Hz)	120
Energy Range (eV)	250 - 1500		Wavelength (nm)	1030 and up to 4th harmonic, 1.3-16um, THz
Spot Size (um), H x V	10 x 10, min 1000 max		Spot size (µm)	>100, wavelength dependent
Energy per pulse (uJ)	>10		Energy per pulse (µJ)	Wavelength dependent
Pulse Duration (fs)	<50		Pulse Duration (fs)	<50 @ 1030 nm, 300 @ MiR
Beamline Resolving Power	~2,000		Polarization control	Horizontal and vertical, circular
Combined Spectrometer resolving power	~2,000		Arrival time monitor precision (fs)	<20
Polarization	Linear horiz.			

For more details:
https://lcls.slac.stanford.edu/instruments/qRIXS

Contact:

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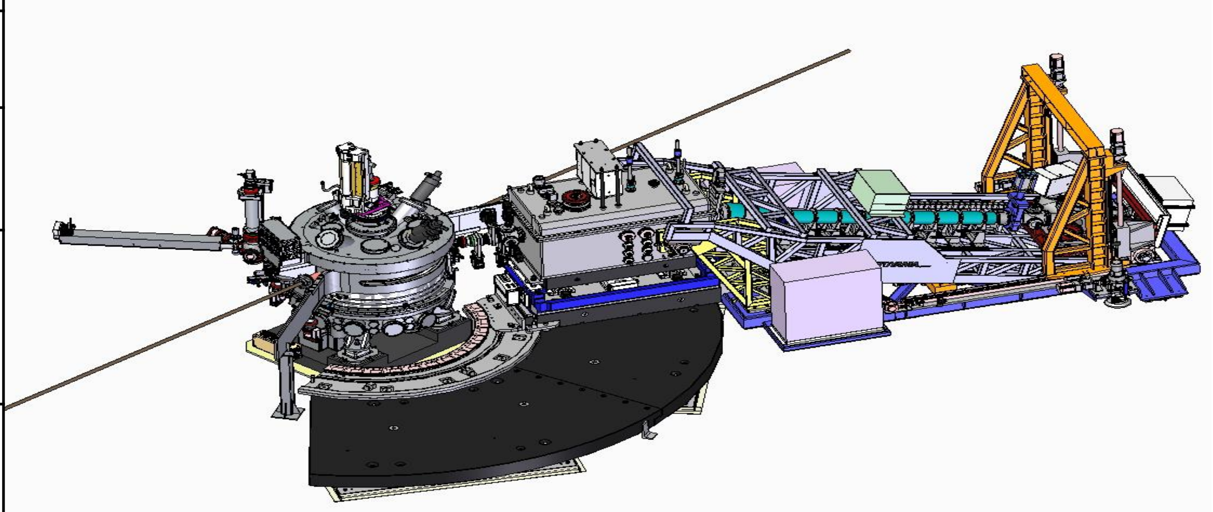
dakovski@slac.stanford.edu

Giacomo Coslovich (Laser Point of Contact)
gcoslovich@slac.stanford.edu



XPP Instrument

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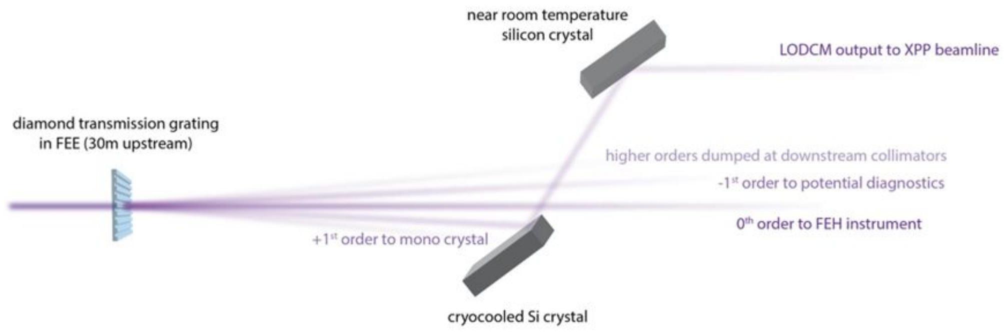
Matthias Hoffmann: hoffmann@slac.stanford.edu (Laser)

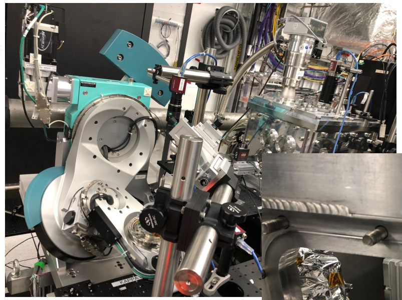
Meredith Henstridge: mhenst@slac.stanford.edu (Laser)

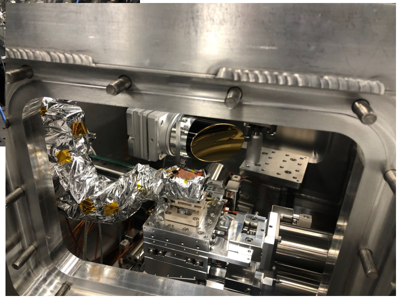
Takahiro Sato and the XPP Team

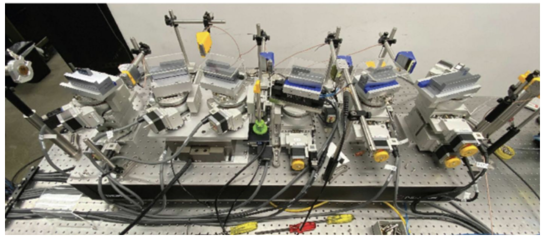
February 4 2026

XPP Capabilities

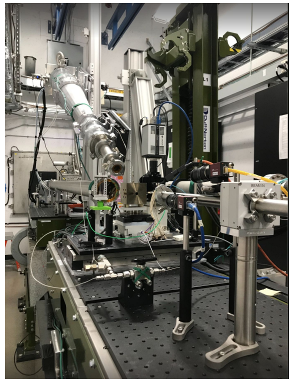








XPP alcove (SB4/5/6)



- New multiplex scheme using grating(next page)
- Time-resolve WAX
  Material science at 20keV + vacuum environment supporting fixed target rapid replacement
- Time-resolve XRD(in-air)
  4-circle diffractometer or kappa diffractometer, 400K-100K with nitrogen cryojet
- Hard x-ray polarization control
  Near pulse-to-pulse switching bases between circular and linear
- High resolution mono (<100meV)
- Low-Temperature chamber

- Special experimental setup at "the secondary interaction points"
  High res. mono, tight focus. etc (XPP alcove tables)
- Mini-split&delay (contact Haoyuan Li)
  x-ray time delay range ~20ps, amplitude splitting(transmission grating)
- Atto-split&delay (contact Yanwen Sun)
- Detectors (on XPP robot arm or motion assembly)
  ePix10k 2M, ePix100, and Jungfrau1M, Zyla, Alvium

X-ray and optical laser parameters:
New X-ray multiplex scheme=> Transmission grating (10%, 20%) + Si DCM

X-ray parameters:

Photon energy	4 keV – 26 keV (8-13 keV Std. config with Si(1 1 1) mono)
Pink beam Bandwidth	20 eV~
Pulse energy at 9.8 keV	Pink: 1 mJ at the sample location **Transmission grating** **1. 10%(standard 20% of the old multiplex)** **2. 20%(upon request)** **3. 100% (full beam, strong justification))** **Highly recommend users to request self-seed for 10% multiplex mode**
Mono Bandwidth	1.1 eV (Silicon (1 1 1) mono) – 20 meV(~sub meV) High quality channel-cut crystals Si (nnn) is avaliable Self seed available(x3~4 **average** brightness)
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 (from phase plate)
Focus	Sub-um ~ un-focus (350 um)+ diagnostic 1D focus is available

Optical laser parameters:

We will recover the previous capability as much as possible in Run27
Please contact Matthias before submitting the proposal.

	800nm	SHG/THG/FHG	OPA	THZ + 800nm EOS
geometry	Colinear(1deg) Non-collinear(5-10deg)			Only Collinear
Pulse energy	20mJ			~15uJ
Focal spot size	~150um		150um ~300um	~1mm
Standard config	50fs	SHG and THG	480nm – 2.4um	LiNbO3
Comments	Please contact for Sub 10fs		Contact us for UV and Mid IR region	

XCS Instrument

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Sanghoon Song and the XCS Team

February 4 2026

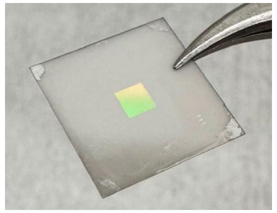
XCS Capabilities

- Split & Delay system for XPCS
  - Wavefront splitting or **Amplitude splitting(Diamond grating)**
  - Energy range 6.5 to 13keV with a Si 220
  - Delay range from -50ps to 550ps at 8keV.
- Double bunch operation mode for longer delays (~ns)
- Sample environment
  - High field pulsed magnet setup (upto 30T in scattering geometry)
  - Low temperature chamber (~20k, enable laser coupling)
  - Polycapillary spectrometer for ultradilute samples with XAS
- **Drop on demand sample delivery system**
- **THz optical laser with colinear geometry**

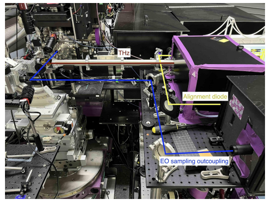
Detectors:

- Epix10k: 135k and 2M pixels with100um pixel size
- Epix100: 50um pixel size
- Jungfrau 0.5M and 1M: 75um pixel size

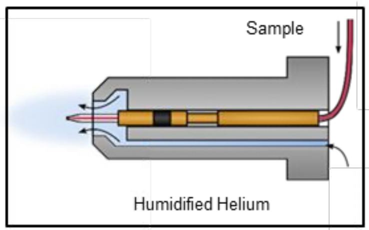
Recent changes:



Diamond grating

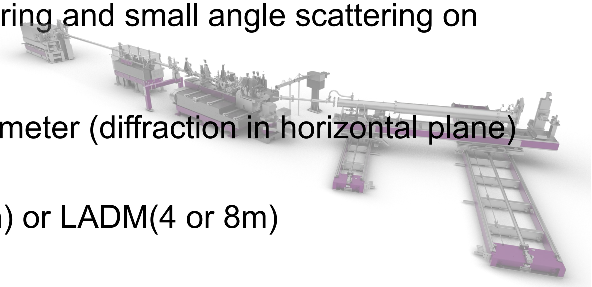


THz laser setup



Drop on demand injector

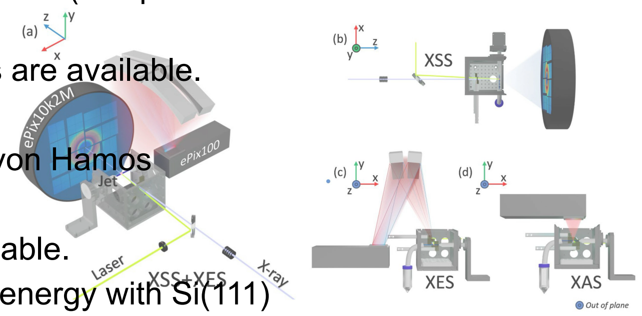
Standard config #1:
Time-resolved hard X-ray coherent scattering and small angle scattering on condensed matter systems in air.



- Ambient conditions with 4 circle diffractometer (diffraction in horizontal plane)
- Cryojet: 100-350K
- Detector on 2th arm(distance 0.2m ~ 1m) or LADM(4 or 8m)
- X-ray Focus: 3-500um
- Monochromatic beam with diamond (111) :7.5-12keV range

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

- Horizontal liquid jet in helium purged chamber(sample volumes down to ~1 mL)
- Round and flat sheet jets of various sizes are available.
- Emission Spectrometers:
- 16 crystal or 4 crystal energy dispersive von Hamos
- 3 crystal scanning Rowland
- Higher X-ray energy up to 25 keV is available.
- Pink beam or scannable monochromatic energy with Si(111)



Optical laser capability for standard configuration

- ~1deg colinear geometry
- 800nm, 2^{nd} and 3^{rd} harmonics available.
- OPA for range: 300-2400nm

SLAC

MFX Instrument

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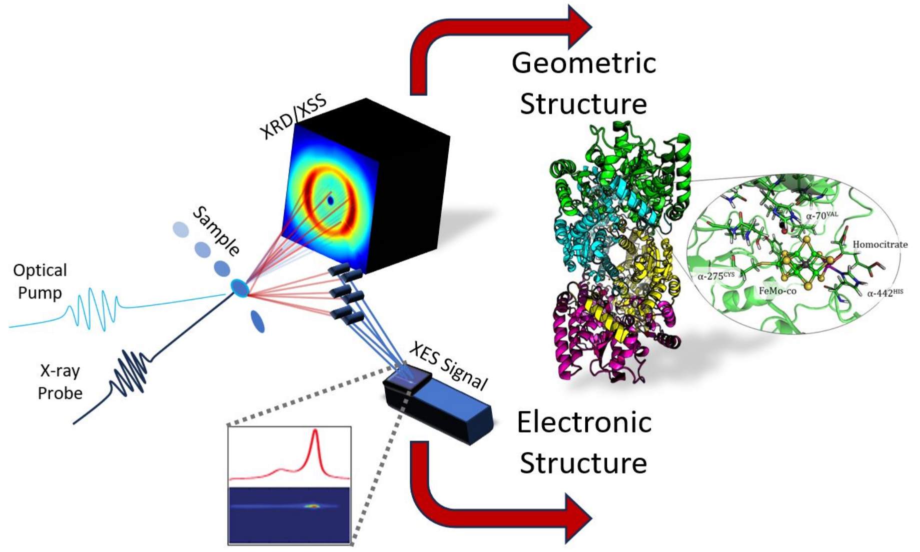
Leland Gee and the MFX Team

February 4 2026

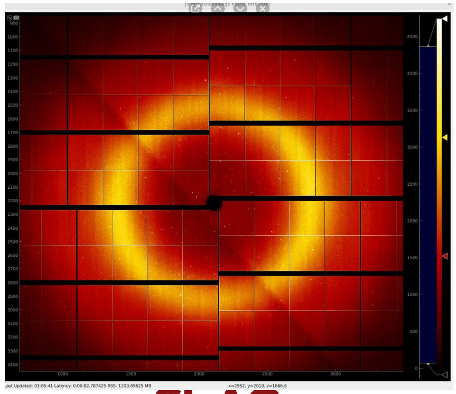
MFX Capabilities



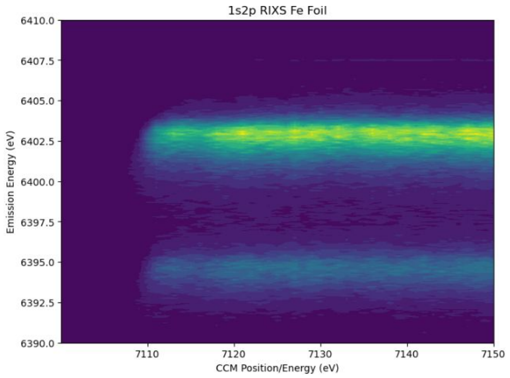
MFX will conduct experiments in Run 27!

Recent changes:

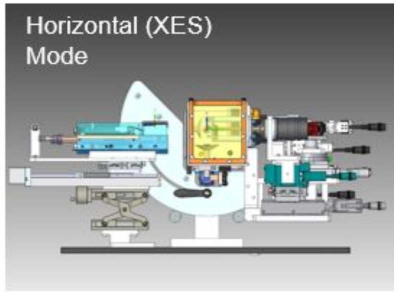
Jungfrau 16M

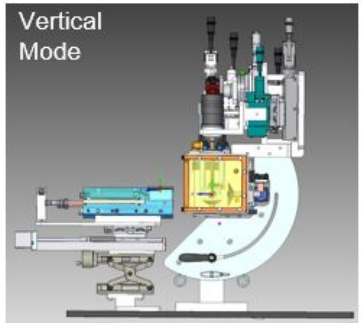


Monochromatic Beam
(Double - CCM)



eXchangeble Liquid
Jet Chamber (XLJ)





MFX Strengths

- Ambient conditions
- Flexibility
- Multimodal Experiments

MFX Science

- Biological serial femtosecond crystallography (SFX)
- Materials Science
- Mail-in Small Molecule SFX (smSFX)
- Condensed Phase Chemistry

SFX@MFX Highlights

- Transient sample conditions:
  - Optical-pump (femtosecond to milliseconds)
  - UV to NIR
  - Temperature-jump
  - Gas dosing
  - Chemical mixing
- Multimodal Probes:
  - XES+XRD
  - Minimizing sample consumption:
  - Droplet-on-tape (DOT)
  - Droplet-on-demand (DOD)
  - GDVNs
  - Fixed Targets
  - **Mid-IR/THz**

CXI Instrument

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Mike Minitti: minitti@slac.stanford.edu (Gas Phase Photochemistry)

Sandra Mous: smous@slac.stanford.edu (Serial Femotosecond Crystallography)

James Baxter: jb2717@slac.stanford.edu (Non-linear X-ray science)

Kirk Larsen: larsenk@slac.stanford.edu (Laser)

Meng Liang and the CXI Team

February 4 2026

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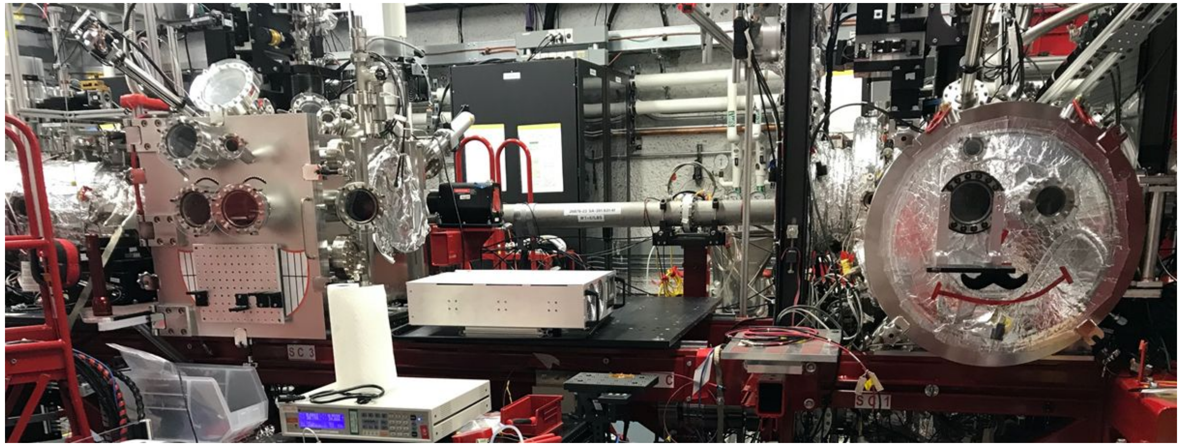
CXI - In Vacuum, Forward Scattering, High Power Density

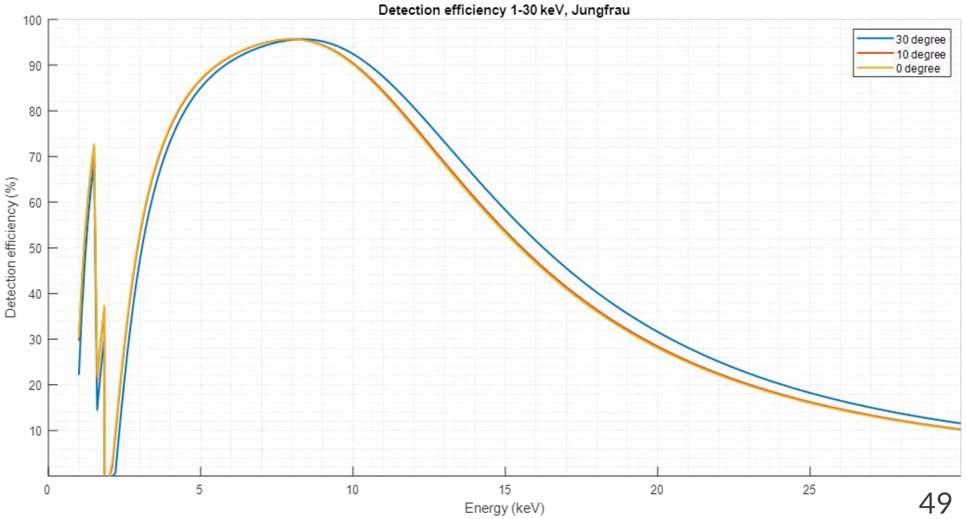
- Photon energy
  - 7keV-10.5keV (1 µm or 100nm focal spot) – KB mirrors (reflective optics)
  - 10.5keV-20keV (2-3µm – 50µm focal spot) – CRL (in line optics)
  - 0.75A resolution with 18keV (previously used)
- In-vacuum background gives excellent signal to noise beyond the solvent ring
- Solid (fixed target), liquid and gas phase samples

Detector – 4M Jungfrau detector

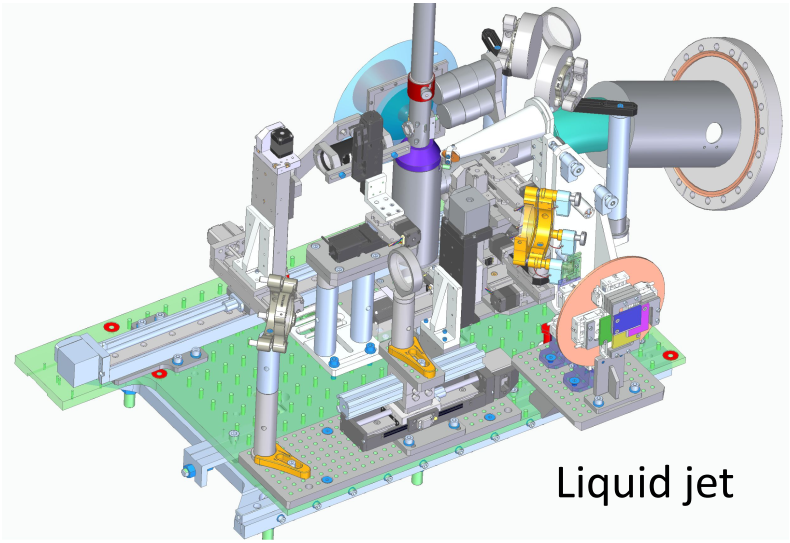
- Adaptive gain
- Quantum Efficiency of the Jungfrau drops to ~30% in the 20keV range
- Variable same to detector distance of ~80mm – 500mm

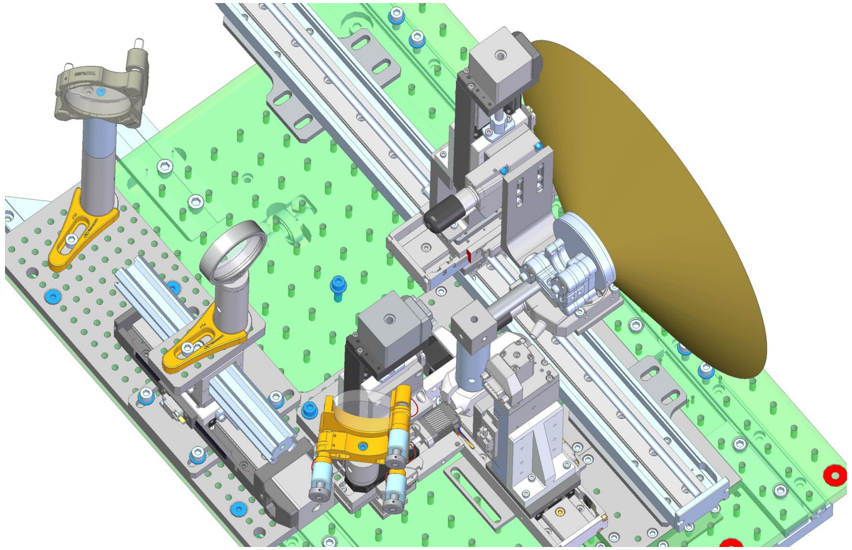
- in-line X-ray spectrometer available as needed
- Downstream laser power monitor – camera and diode
- Downstream small angle detector if required





CXI – Standard Configurations and Main Science Areas





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 Instrument

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Éric Galtier and the MEC Team

February 4 2026

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

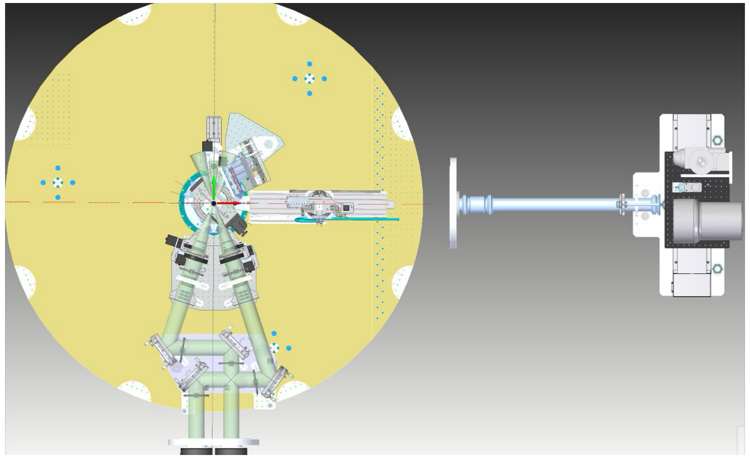
- Delivery of up to 1J in 45 fs at 800 nm, or 0.54J at 400 nm
- high intensity platform: peak intensity > 10^{19} W/cm^2
- at 800 nm, 45° angle of incidence allowed between high intensity mode and FEL
- low intensity platform: peak intensity << 10^{16} W/cm^2

Multiple submission avenues

- Regular PRP proposal
  - up to 50% towards Inertial Fusion Energy (e.g. wetted foams)
  - about 50% standard configuration
- Data Set Collection
  - 1-2 shifts
  - no requirement for previous X-rays beamtimes
  - reviewed by PRP
- VISAR only (no X-rays)
  - can be submitted at any time during the year
  - reviewed by the MEC team
  - improved submission process via UPS

Standard 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



Questions