

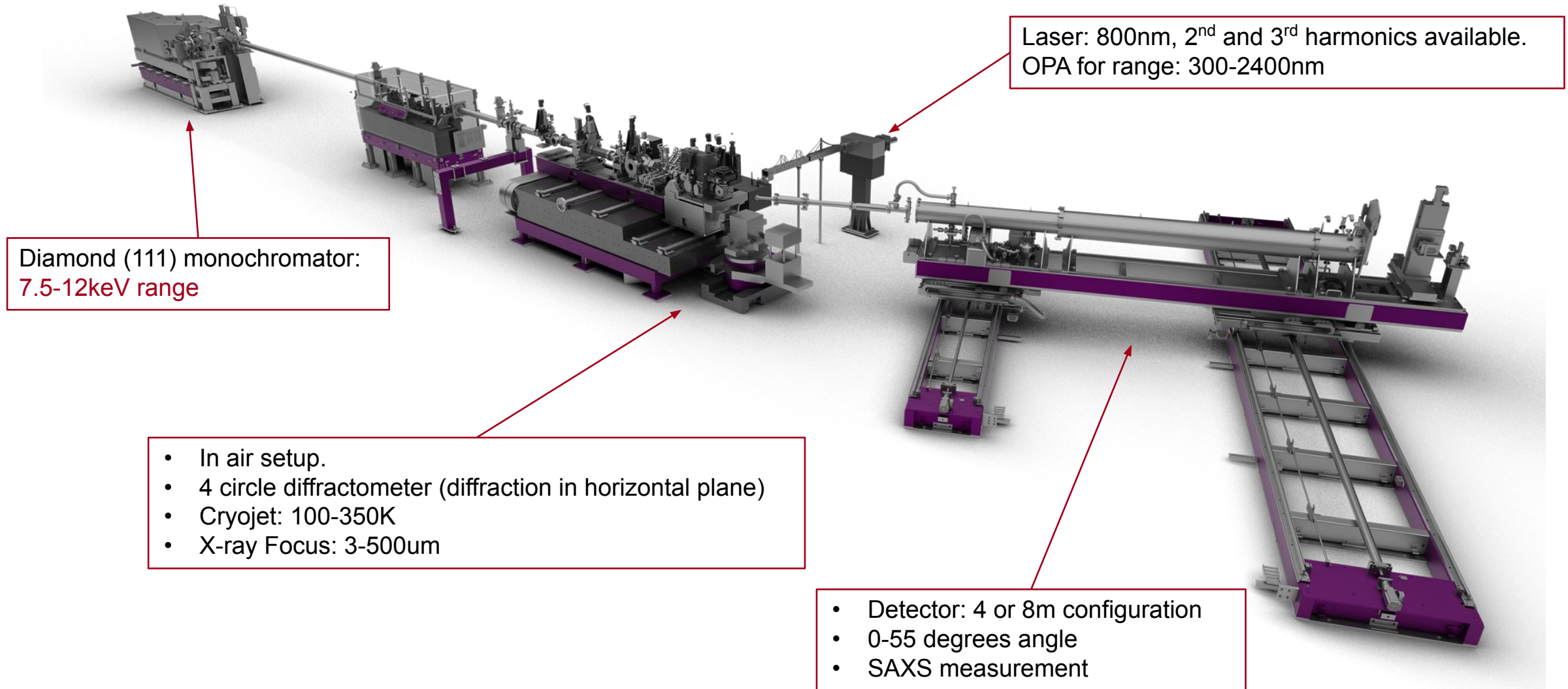
XCS Capabilities for Run 23

LCLS Town Hall

Matthieu Chollet

January 30 2024

time-resolved hard X-ray coherent scattering and small angle scattering on condensed matter systems in air.



Time-resolved wide-angle scattering, X-ray emission and absorption spectroscopy measurements for the study of photo-excited molecular dynamics in the solution phase.

Sample environment:

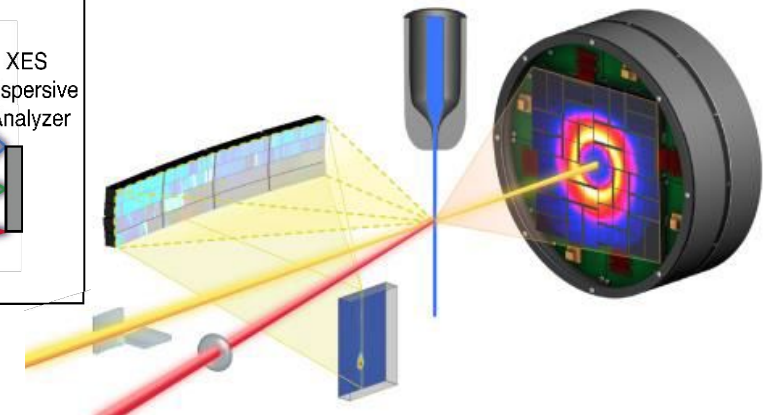
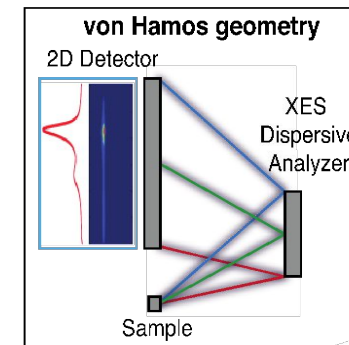
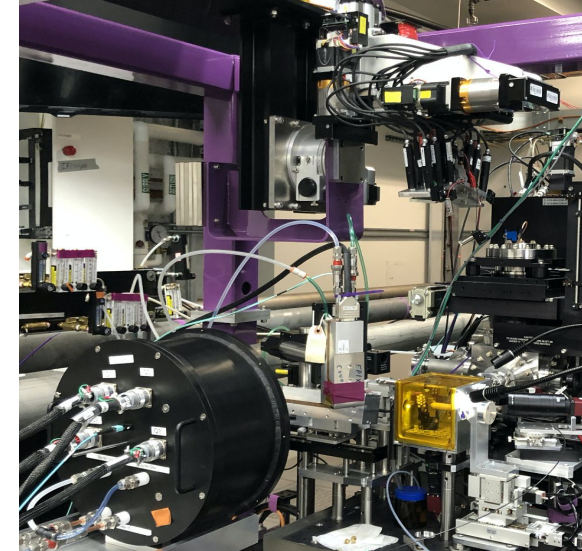
- Helium purged sample chamber
- Sample monitoring and cleanup slits
- Horizontal liquid jet driven by HPLC pumps will be used to deliver the sample into the interaction point. Round and flat sheet jets of various sizes are available.

X-ray:

- Higher X-ray energy up to 25keV is available.
- Pink beam with the XCS periscope mirror system
- scannable monochromatic energy with the CCM Si(111): 6.5 to 25keV

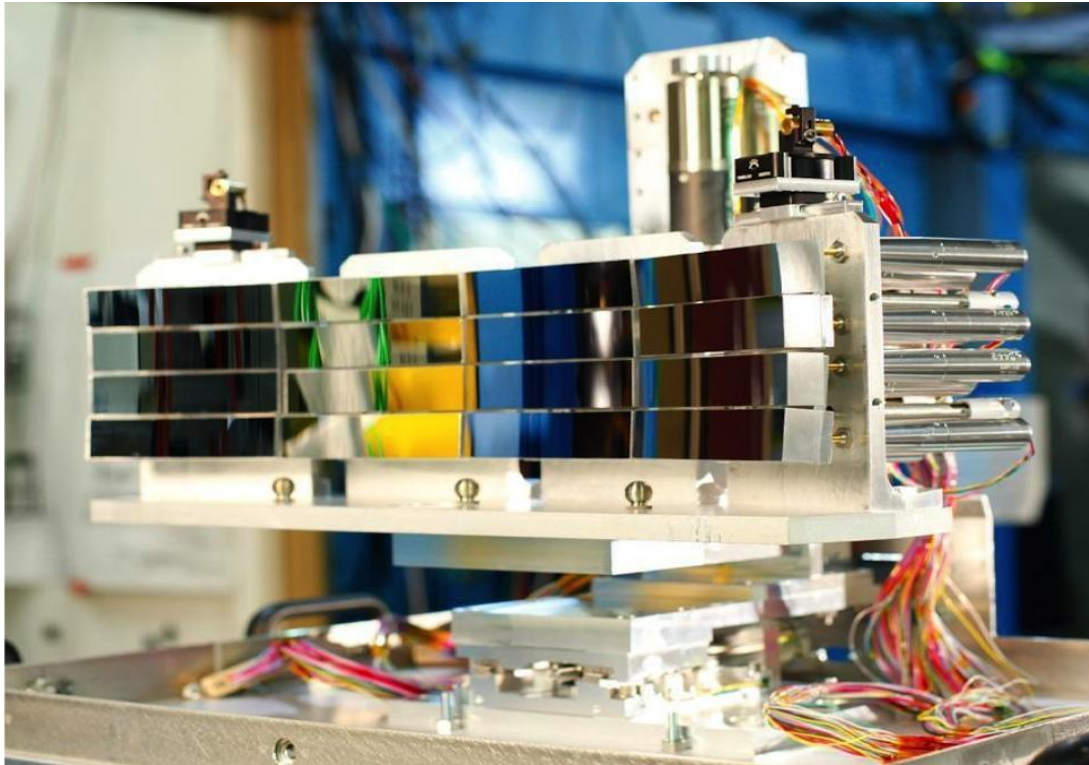
Optical Laser:

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

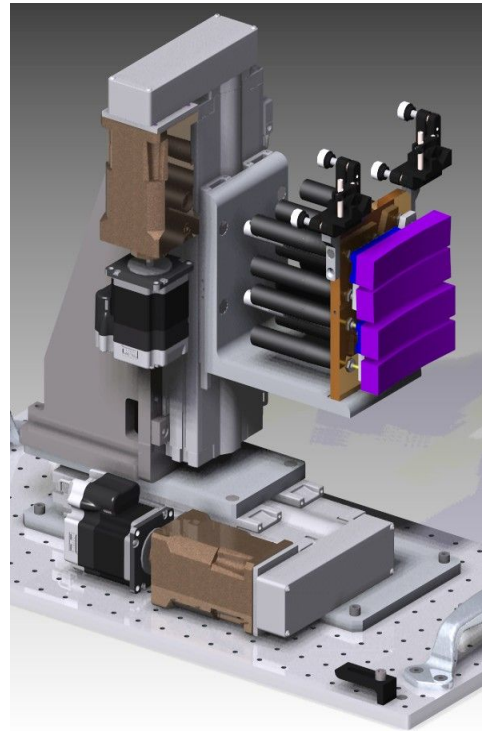


Hard X-ray Spectroscopy at LCLS: XES

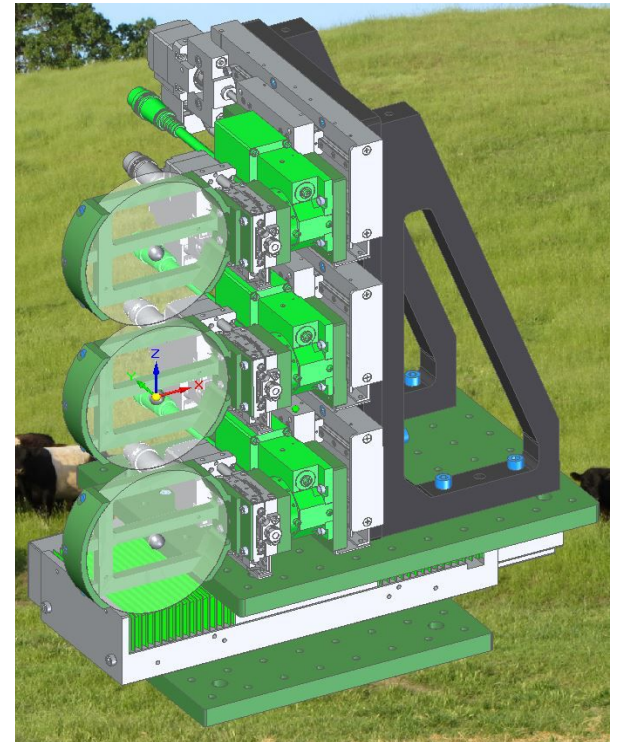
Existing LCLS multi-crystal X-ray Emission Spectrometers



16 crystal energy dispersive von Hamos



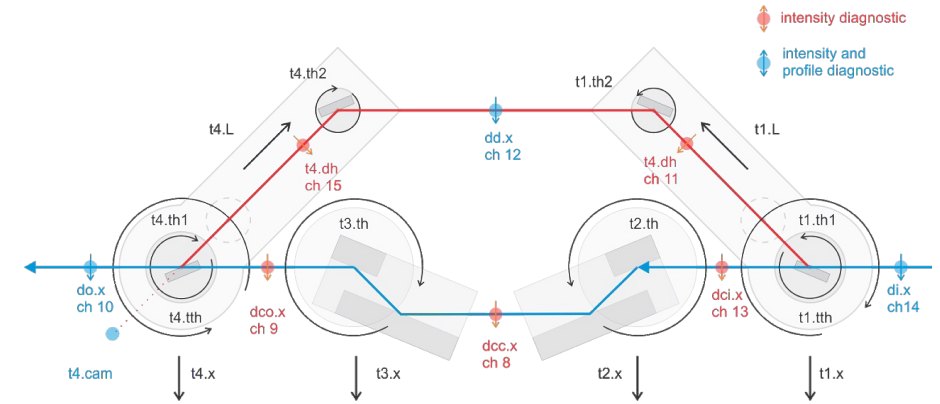
4 crystal E. dispersive von Hamos



3 crystal scanning Rowland

Other capabilities:

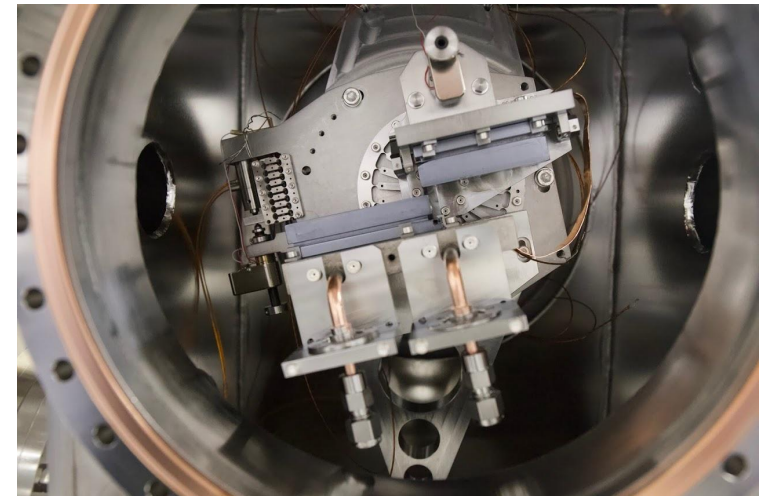
- Split & Delay for XPCS: Wavefront splitting design. Energy range 6.5 to 13keV with a delay range from -50ps to 550ps at 8keV.
- Double bunch operation mode for longer delays (~ns)
- **Low temperature chamber (~20K): Commissioning in run 22.**
- X-ray Pulse picker for single shot or non 120Hz operations.



Split and delay

Detectors:

- Epix10k and epix10k-2m: 135k pixels and 2M pixels with 100um pixel size
- Epix100: 50um pixel size
- Jungfrau 0.5M and 1M: 75um pixel size



CCM

Short proposal program

Short proposal program

- **Data set collection** 1-2 shifts sufficient to produce data for publication (contingent on having a previous LCLS proposal)

Studies carried out with limited instrument flexibility

Well suited for the **liquid standard config** at **XCS** - short proposals/rapid turnaround

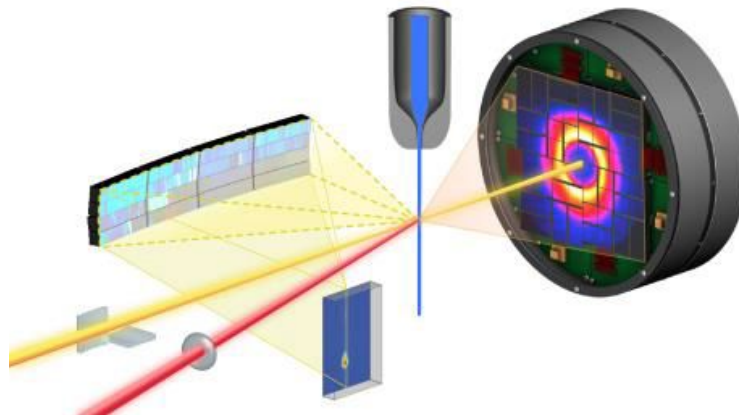
For samples with well known experiment conditions

XAS / XANES 3d TM

XES Mn, Fe, Co, Ni, Co, V K-edge spectroscopy

Combined with **WAXS/XSS** 0.3-5 Å⁻¹ q-range

[proposal guidelines](#)



SLAC NATIONAL ACCELERATOR LABORATORY **LCLS Short Proposal Form**
Biology

SLAC NATIONAL ACCELERATOR LABORATORY **LCLS Short Proposal Form**
Material Sciences

SLAC NATIONAL ACCELERATOR LABORATORY **LCLS Short Proposal Form**
Solution Phase Chemistry / Biochemistry

SLAC NATIONAL ACCELERATOR LABORATORY **LCLS Short Proposal Form**
Solution Phase Chemistry / Biochemistry

Proposal information

Proposal type Sample testing program Data set collector Rapid access

Proposal date

Descriptive experiment title. The title will be made public if you are awarded beamtime.

Is the experiment related to
 No Yes, submitted

Spokesperson
Name

Experimental team

1. Name
Description of relevant experience

2.

3.

4.

5.

6.

7.

8.

9.

10.

The experimental team

Scientific case

Briefly explain the background and significance of your proposed experiment. Avoid broad discussion. Maximum of 2500 characters.

Experimental details

Sample description. List name and metal concentration for all proposed samples.

Preferred sample delivery method(s)

Round (Rayleigh) jet (minimum sample volume 50 nl) / preferred diameter (50 - 200 µm):

Flat sheet jet (minimum sample volume 200 nl) / preferred thickness (10 - 50 µm):

I'm not sure / other:

Specific aims and questions to be addressed

Preferred experimental method(s)

Scattering / Q priority: low Q (<0.15 - 4 Å⁻¹) balanced Q (0.3 - 4.5 Å⁻¹) high Q (1 - 6 Å⁻¹)

X-ray Emission Spectroscopy / emission line: Mn (K_{L2,3}, K_{L2,3}, K_{L2,3}) Fe (K_{L2,3}, K_{L2,3}, K_{L2,3}) Co (K_{L2,3}, K_{L2,3}) Ni (K_{L2,3}, K_{L2,3}) Ti (K_{L2,3}, K_{L2,3}) V (K_{L2,3}) Other

X-ray Absorption Spectroscopy / XANES spectrum 3d TM element:

X-ray parameters

X-ray energy (keV): Preferred X-ray focal spot size (2 - 100 µm):

X-ray bandwidth: Monochromatic Pink

Why is LCLS required for this experiment?

Optical beam parameters. Offered with collinear geometry, 0.1 - 30 µJ, 50 fs FWHM, 100x100 µm² FWHM.
Wavelength: 266 nm 400 nm 800 nm Visible OPA, wavelength (nm): None

Polarization control: No Yes

Comments

Date: Spokesperson:

Date: Spokesperson:

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Contact us for any questions:

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[**https://lcls.slac.stanford.edu/instruments/xcs/standard-configurations**](https://lcls.slac.stanford.edu/instruments/xcs/standard-configurations)