5th call for proposals (opens May 15, closes end-June, 2019)

- We (still) offer a reduced scope during run-4
  - 5-18 keV x-ray photon energy
  - Single pulses on demand, or 10 Hz,
    or up pulse trains with 1.1 MHz rep. rate and max. 200 pulses
  - SASE spectrum (about 0.2% bandwidth)
  - 4-bounce monochromator (1 eV bandwidth) at 10 Hz
  - High res-mono@7.49 keV (about 40 meV bandwidth) at 10 Hz
  - full focusing capability CRL 1,2,3,4
    any focus from parallel beam (few µrad divergence) down to sub-µm foci

- optional (requires R&D support from HED)
  - bent diamond crystal spectrum analyzer downstream of the interaction
  - Pulsed laser heating for DAC research (see separate slide)
Platforms – Interaction Chamber 1

- 2 ePIX100 detectors for spectroscopy, imaging or XRD, 50um pixel pitch, ~700x700 pixels, 10 Hz
- 2-3 ePIX10k (gain switching, 10^4 dynamic range) for XRD or spectroscopy, 100um pixel pitch, ~350*350 pixels, 10 Hz
- 3 JUNGFRAU detectors (gain switching 10^4) at 10 Hz (no burst mode) for XRD or spectroscopy (pixel pitch 75um, detector size ~ 3.5*7 cm)

For details on detectors, please contact Sebastian Göde or Valerio Cerantola from the HED team.

- Possibility to mount area detectors or spectrometers on curved rails in vacuum on vertical breadboard
- Von-Hamos HAPG spectrometers (RoC 50mm and 80mm, crystals available 40um HAPG, 100um HAPG, 200um HOPG)
- High-resolution monochromator and diced analyzers (Si 533) for ~50meV spectroscopy at 7.490 eV
- Stepper-motor target stage on hexapod and precision rotation stage
- CRL4 for sub-µm foci
Platforms – Interaction Chamber 2, pp-laser

**IC2**
- Diamond Anvil Cell (DAC) setup for precision XRD
- 2 VAREX flatpanel detectors in IC2 (10 Hz)

contact HED instrument scientists or HiBEF UC for details of this platform
Pump-probe (PP) laser for Run 5
(available potentially with limited capability)

Submitting a proposal using this laser has the risk that if the laser will not be ready the proposal has to be cancelled to be rescheduled to the next Run. “Limited capability” refers to timing jitter, pulse energy and stability, and repetition rate. This laser will be in its early phase.

Anticipated parameters

**PP laser at 800 nm wavelength**
- 15 fs duration, fourier-limited bandwidth (going for narrower bandwidth with longer pulse duration is an option)
- 100 kHz, max ~2 mJ (10Hz or shot-on-demand is possible. Higher repetition than 100 kHz with lower pulse energy is an option)
- Second harmonic (400 nm) is potentially available

**PP laser at 1030 nm wavelength**
- ~ 1 ps duration
- 100 kHz, max ~35 mJ (10Hz or shot-on-demand is possible. Higher repetition than 100 kHz with lower pulse energy is an option)
- Second/third harmonic (515/343 nm) are potentially available

For more details contact Motoaki Nakatsutsumi and/or Jan-Patrick Schwinkendorf from the HED team: motoaki.nakatsutsumi@xfel.eu, jan-patrick.schwinkendorf@xfel.eu
Pulsed Laser heating for DAC research

- double side laser heating in DACs
- 2x 100 W NIR lasers in pulse mode or cw mode.
  Pulse duration 10-500 ns, and >1 us possible
- Temperature determination: time resolved spectral radiometry using streak camera system

For further information, please contact Zuzana Konopkova from the HED team.

<zuzana.konopkova@xfel.eu>
What do we still have to exclude for users?

- Large optical laser drivers from HiBEF (HI, HE)
  the 200TW laser commissioning will be during 2019 and it is expected that the laser is included for first experiments in the next call (run6, opens ~November 2019)

- Precision timing between optical lasers and x-rays (PAM)
  commissioning is planned autumn 2019

- Split-Delay-Line (installation planned for winter shutdown 2019/2020, commissioning planned for spring 2020)

- AGIPD (delivery expected for end 2019/beginning 2020)
Facility parameters (LINAC; undulators)

<table>
<thead>
<tr>
<th></th>
<th>5th CfP (1/2020 – 6/2020)</th>
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<tbody>
<tr>
<td><strong>SASE FEL</strong></td>
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<tr>
<td>Photon energy [keV]</td>
<td>SASE 1/SASE 2</td>
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<tr>
<td></td>
<td>5 – 18</td>
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<td></td>
<td>SASE 3</td>
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<tr>
<td></td>
<td>0.27 – 3.0</td>
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<tr>
<td>Intra-train frequency [MHz]</td>
<td>1.1</td>
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<tr>
<td>Max. number of pulses</td>
<td>200*</td>
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* 200 pulses can be obtained at 1.1 MHz operation and additionally may depend on specific conditions of operation. At reduced intra-train frequencies the pulse number reduces accordingly.

HED, SASE2:

- Photon energies **between 5 and 18 keV**
- Higher photon energies have typically less pulse energy
- Typically of order 1 mJ pulse energy can be expected
- Pulse duration is not measured, only estimated from electron bunch length
Some constraints

- The linac of EuXFEL has three electron energy setpoints, the central and most common one is 14 GeV.

- At 14 GeV, the available photon energy range at SASE2 and HED is 6-12 keV, it can be extended to 14 keV but the intensity will drop significantly.

- Working below 6 keV (5-6 keV) and above 12 keV (12-18 keV) needs a different electron energy (16.5 GeV or 11.5 GeV), which typically only are schedule for 1-2 weeks in each run.

- It is also not possible to change between 5-6 keV and 12-18 keV during one user experiment because the electron energy is fixed for the entire facility.

- We strongly recommend to not change the photon energy during your experiment, or at least not more than 1 keV. Larger changes need extensive tuning time of the LINAC and undulators and may lead to a low technical feasibility ranking. Also the x-ray focusing needs to be changed and aligned after each change.
Possible experiments

Scientific drivers:

- Isochoric heating (using the focused intense XFEL pulse to create a plasma)
- Diamond anvil cells
- Pump-probe laser

Contact the HED instrument scientists for detailed information.

We further encourage submission of:

- “user assisted / advanced commissioning” proposals
- “demonstration of new techniques that will later enable groundbreaking science”
- community proposals (entire community pushing one fundamental technique)

Proposals must be submitted through UPEX (https://in.xfel.eu/upex)