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MicroMAX: a beamline for dynamic macromolecular crystallography at the MAX IV Laboratory

The second macromolecular crystallography (MX) beamline at the MAX IV Laboratory, MicroMAX, collected its first protein dataset at the end of 2022. With the BioMAX beamline having established a robust framework for high-throughput crystallography, MicroMAX will aim to complement these abilities in the form of supporting experiments needing a higher flux density, more custom sample environments or non-standard experiment control, and to provide further tools to study dynamics.

MicroMAX will deliver experimental flexibility by being able to operate in wider bandwidth modes (up to ~ 1% ΔE/E) with maximised flux and exposure times down to 10s of μs, as well as different focusing schemes (compound refractive lenses, or Kirkpatrick–Baez mirrors). To benefit from the high flux density of the beamline, a nanosecond pump laser system from EKSPLA, covering the wavelength range of 210 – 2600 nm, for pump-probe experiments has been installed. An additional aid for studying dynamics, and providing options to mitigate radiation damage spread to neighbouring samples, will be a magnetically levitating chopper system from Celeroton, that can operate up to a pulse rate of 2.2 kHz. This setup will later be complemented with a gain-switching integrating JUNGFRAU detector from the Paul Scherrer Institute.

Capabilities also include support for rotational data collection at narrow-bandwidth, using a high-precision MD3-UP diffractometer from Arinax, an ISARA robotic sample changer from IRELEC and an EIGER2 X 9M CdTe detector from DECTRIS. In narrow-bandwidth mode, MicroMAX will be able to operate up to 25 keV photon energy and benefit from a maintained high quantum efficiency of the CdTe detector at these energies.

General user operation of the beamline will start in the third quarter of 2023 and MicroMAX looks forward to welcoming users for studying dynamics, high-throughput rotation or serial data collection at different temperatures and for other types of experiments that could benefit from its highly focused bright beam.

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