

MicroMAX – new opportunities in macromolecular crystallography

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MicroMAX at the first 4th generation storage ring [1] at MAX IV Laboratory is a new beamline providing the macromolecular crystallography field with a new powerful tool. The main applications are serial crystallography, time-resolved science, and micro-crystallography.

The X-ray beam at the sample, provided by a 156-period in-vacuum undulator, will have 10^{13} photons/second in monochromatic mode (5-25 keV energy range) and up to 10^{15} photons/second using a wider energy bandpass mode (10-13 keV energy range). The beam focusing will use compound refractive lenses with final focusing by either lenses or mirrors to give a focused beam down to 1 micrometer but flexible and easily tailored to the experimental needs.

The beamline will offer different sample delivery systems for serial crystallography, in particular fixed-target and injector-based systems but be flexible to accommodate other setups. In addition, the experiment setup will also provide a highly automated mode for oscillation data collection including a robotic sample changer. The setup will include a chopper providing short X-ray pulses (down to microseconds) and instrumentation for different time-resolved experiments. The detector stage will host two area detectors, a photon-counting and an integrating detector.

The possibility to combine all these different modes and instrumentation in a flexible way will allow to cater a wide range of experiments in structural biology including methods not yet developed.

The beamline will use the same experimental control system, MXCuBE3, and information management system, ISPyB, as the existing BioMAX beamline [2].

MicroMAX will have a laboratory for working with different sample environments and a laboratory for sample preparation. Additional infrastructures including a bio-laboratory and resources for data handling and analysis are shared with other beamlines. The beamline has a second experiment hutch that will be taken in operation at a later stage. It will allow preparation of specialized setups while experiments are done in the first hutch.

X-ray commissioning of MicroMAX is planned to start in 2022. MicroMAX is funded by the Novo Nordisk Foundation.

The MAX IV Laboratory macromolecular crystallography facilities include the BioMAX beamline in user operation since 2017 and the FragMAX fragment screening facility [3].

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