Introducing MicroMAX: Advanced Beamline for Serial Crystallography and Time-Resolved Studies

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Since its inception in 2016, the BioMAX beamline [1] has been the only beamline for macromolecular crystallography at the MAX IV Laboratory, a fourth-generation synchrotron located in Lund, Sweden. Since then, BioMAX has been instrumental in supporting various research endeavors, extending its capabilities to encompass serial crystallography investigations conducted at ambient temperature [2]. These studies have predominantly involved continuous data acquisition using fixed-targets [3] and injectors, alongside pump-probe techniques for capturing time-resolved data [4].

To complement BioMAX and extend the capabilities in serial and room temperature crystallography at the MAX IV Laboratory, the new MicroMAX beamline has been built with funding from the Novo Nordisk Foundation. The experimental features encompass fast scanning stages tailored for fixed-target serial crystallography, beam sizes down to the single-micron scale, an X-ray chopper to facilitate high flux beam. Additionally, the setup includes adjustable photon energy bandwidth and nano-second laser together with flexible diode-based pump-probe setup. A schematic depiction illustrating the essential components of the experimental configuration is presented in Fig. 1.

MicroMAX took first light in 2022 and since then had its first rotational data collection in December 2023, with further serial synchrotron X-ray crystallography (SSX) experiments in the Spring of 2024. Which included cryo-trapping time-resolved experiments, high-viscosity extruder (HVE) time-resolved experiments and fixed-target collection with various supports.

A notable aspect of the enhanced capabilities of MicroMAX is its focus on facilitating serial crystallography and enabling room-temperature data collection and high adaptability to non-standard experiments of different users. An overview of these advancements, initial beamtimes, and forthcoming avenues for serial and standard crystallography at MicroMAX will be provided.

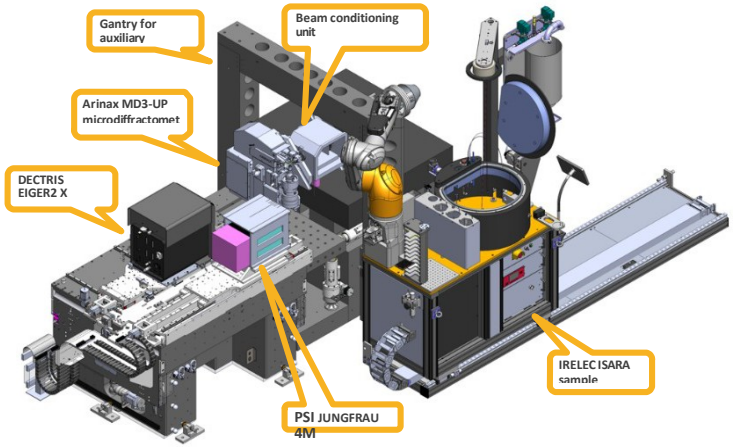

Figure 1. CAD representation of a selection of key components of the MicroMAX endstation 1.

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