Advanced data collection at FMX – the Frontier Microfocusing Macromolecular Crystallography Beamline at the National Synchrotron Light Source II

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The micro-focusing Frontier MX beamline, FMX, in sector 17-ID-2 at the National Synchrotron Light Source II, NSLS-II, covers a photon energy range from 5 - 30 keV, and delivers a flux of 3.5e12 ph/s at 1 Å into a 1x1.5 µm² to 10x10 µm² (VxH) variable focus. Its achievable flux density, and therefore dose rate, surpasses most current MX beamlines by up to two orders of magnitude (Schneider et al. 2021).

FMX has been supporting users throughout the Covid19 pandemic by operating completely through remote access. The microbeam enables fast rastering localization and characterization of large irregular crystals, and of microcrystals down to a few microns to support data collection from the most challenging crystals. Further special measurement modes offered are serial and multi crystal crystallography, fully automated data collection of crystals of sizes 40 µm and up, and room temperature and multi temperature crystallography. For long wavelength native phasing, we recently implemented a He flight path to minimize scattering and air absorption artefacts.

The beamline's high throughput has proved crucial for fragment binding studies on the SARS COV2 Nsp3 macrodomain (Schuller et al. 2021), and the new opportunities provided by multi temperature crystallography were demonstrated in a temperature dependent study of the SARS-CoV-2 main protease (Ebrahim et al. 2021).

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Research proposals for beamtime can be submitted through the NSLS-II website: https://www.bnl.gov/nsls2/userguide/,