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The MANACA beamline at Sirius, structural biology at 4th generation

MANACA (MAcromolecular micro and NAno Serial CrystAll will be the first macromolecular crystallography beamline at Sirius, optimised for high flux, micro-beam size and small beam divergence (0.4 mrad). The focus is optimized to 10 x 7 um (HxV) at sample position, but the beam size can be adjusted from 100 x 80 um to 10 x 7 um allowing match the beam to the crystal size. Additionally, the beam can also be cut to achieve smaller sizes (e.g. 5x5 um). The photon flux at sample will be ˜3x10¹² ph/s/100mA at 12.5 keV and energy range from 5 to 20 keV. The experimental station has a mini-kappa [1] goniometer that allow the optimal alignment of crystals with long cell axes. Setups for serial crystallography data collection and analyses as well as automation procedures are being prepared.
The great beam characteristics provided by Sirius [2] and the high stability and precision of the optics and experimental station will allow the diffraction of challenging samples such as viruses (and other big unit cell crystals), membrane proteins and complexes, which commonly yield small crystals. The energy range and beamline setup will allow native SAD phasing, reducing the necessity of additional experiments to solve new structures. The experiment control will be done using a user-friendly graphical interface (MXCuBE) [3], and automatic data processing (from data reduction to initial modelling) will be available.
Several strategies are being implemented in order to reduce the radiation damage, from beamline/data collection controls to data collection modes (e.g. multi-crystal/serial data collection). Our end station setup have an on-line intensity/position monitor and a photodiode beamstop that will allow monitoring the incident beam flux and size and the sample absorption in real time. The beam information will be use to generate data collection strategies and to estimate the dose absorbed by the crystal. We have also several attenuators that provide a fine control of beam transmission over the most of energy range. Last but not the least, multi-crystal and serial data collection setups and strategies are being developed to reduce even more the dose and allow room-temperature data collection.

References
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