[MS29-P03] Recent developments on beamline i02 at the diamond light source

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I02 is one of the original three phase one MX beamlines at the Diamond Light Source [1], UK. We have been in operation for over five years and to date have over 400 of the 1400 structures solved at Diamond attributed to us. Within the last 18 months we underwent an upgrade of our endstation in line with the other phase one MX beamlines to improve stability and sample viewing as well as creating a solid platform to build upon. We have added additional features such as a crystal washer, an adapted sheath on our fluorescence detector, which has a He flow cell to allow for more sensitive detection of emitted fluorescence, and an annealer device as used at the MX beamlines at BESSY. We now routinely use the HC1b dehydration device as an integrated part of the beamline, and users can easily swap between cryojet and HC1b for cryo or room temperature experiments. As with the other phase one MX beamlines, we use a Rigaku sample loading robot which has been optimised to give a sample exchange time of approximately 30 seconds. We have added a second nitrogen dewar to the sample changer to double the capacity to 160 samples. In 2012 we had a detector upgrade to a Pilatus 6M-F which facilitates very sensitive and rapid data collections. We have worked with our Bimorph focussing mirrors to give a user-selectable choice of focussed, defocused and mini-focussed (at 12658 eV) beam. The mini-focussed beam option uses a combination of focussing mirrors and compound refractive lenses (CRLs) thereby limiting the use to around the Selenium edge at present. Beam profiles can be changed in a matter of minutes with no requirement for beamline staff to intervene. Our typical beam sizes are 90 x 18 µm (focussed), 45 x 85 µm (defocussed) and 15 x 45 µm (mini-focussed). Used in combination with beam defining slits and apertures, the beam size can be optimised to the mounted sample. Most recently we have improved the integration of PyMCA into the GDA software to automatically analyse the fluorescence emission spectra of a user sample, and have implemented a user selectable option to test every sample which is loaded. This can be invaluable in determining if there are any elements which may aid a phasing experiment. In addition to routine MX experiments we have developed a series of sample holders to enable non-crystallographic experiments, for example WAXS experiments on corneas and RNA footprinting experiments. We are continuously investigating ways of improving the sample environment in order to expand the tools available to researchers as well as improving the user experience.

[1] **The Phase I MX Beamlines at Diamond Light Source**. E. Duke et al. AIP Conf Proc., 1234, pp 165-168; doi: http://dx.doi.org/10.1063/1.3463165 SRI 2009, 10TH INTERNATIONAL CONFERENCE ON RADIATION INSTRUMENTATION
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