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A study of beam stability improvements delivered by a monochromator upgrade to the Australian Synchrotron MX2 beamline

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MX2 is an in-vacuum undulator based crystallography beamline at the 3 GeV Australian Synchrotron. The beamline delivers hard x-rays in the energy range from 5.5 - 21 KeV to a focal spot at the sample position of ~15 microns FWHM. At 13 KeV the flux at the sample is typically 2.0 x 10^12 ph/sec. This beamline is ideal for weakly-diffracting, hard-to-crystallise proteins, viruses, protein assemblies and nucleic acids as well as smaller molecules such as inorganic catalysts and organic drug molecules. However, as a decrease in beam size generally has positive effect on smaller crystals or disordered larger crystals the beam vibration can have an effect in beam position with consequent decrease in data quality. These considerations are particularly true for small crystals such as from GPCRs or grown by the lipidic cubic phase methodologies where wedges of data from multiple crystals is required to build a complete set of data. A description of the latest upgrade on the monochromator including a pre- and post upgrade beam vibration analysis is presented. The results show a more robust beamline to both external vibrations as well as reduce intrinsic vibration.

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