Contribution ID: **12** Contribution code: **WEP28** Type: **Poster Presentation**

Double crystal bent Laue monochromator: modelling and measurements up to 150 keV

Wednesday 17 September 2025 17:00 (1 hour)

A main application of Laue diffraction in thick bent crystals is on developing high energy/high power monochromators for synchrotron sources. Whereas most of the studies mainly focuses on modelling and simulation of ideal shapes, e.g., cylindrical deformation, this work adds as well a wide set of mechanical and optical measurements performed on 2 mm thickness double bent Laue crystal monochromator currently used at the Biomedical Imaging and Therapy (BMIT) beamline at the Canadian Light Source. Measurements are compared to simulations from tools such as ANSYS and XRT ray-tracing based on Tagaki -Taupin equations. We found real deformed crystal profile is far from ideal cylindrical shape, that the diffracted beam intensity raised 12X due to deformation using an incident white beam. Also, photon flux measurements were performed using a cryogenic radiometer. Measurements have been performed at the 05ID-2 (3.7 T wiggler) and the 05B1-1 (1.35 T bending magnet) BMIT beamlines with energies between 25 keV to 150 keV. Thus, considering the scarcity of experimental data, this work becomes relevant as it presents measurements of a real bent Laue monochromator and compares it to simulations.

Footnotes

Funding Agency

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Session Classification: Wednesday Poster Session

Track Classification: BEAMLINES: Optics