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Single-shot determination of the Munich Compact Light Source's two-dimensional X-ray source profile based on a backprojection approach

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The Munich Compact Light Source (MuCLS) is a compact synchrotron source based on inverse Compton X-ray scattering. This effect produces brilliant quasi-monochromatic hard X-ray radiation with rather low electron energy (tens of MeV) by colliding these electrons head-on with a laser beam. Such sources are sufficiently compact to fit into a laboratory or industrial environment enabling a more widespread use of synchrotron techniques. Many of these techniques are affected detrimentally by a larger (projected) source size, e.g. X-ray phase contrast imaging. The more precisely the exact shape of the source is determined, the better can its effects be corrected for in the recorded data.

We experimentally evaluate a novel approach to obtain an accurate 2D X-ray source profile**. A hole in a strongly absorbing structure is used to record the edge-spread function azimuthally resolved in a single shot. The 2D source spot is retrieved from this data by taking the derivative of the edge-spread function and applying the filtered-backprojection algorithm of computed tomography. We discuss results obtained for the source shape and relate them to general performance parameters of the MuCLS.

Footnotes

- Eggl et al. Journal of Synchrotron Radiation 23, 1137 (2016) ** Guenther et al. Journal of Synchrotron Radiation 27, 1395 (2020) *** Di Domenico et al, Medical Physics 43, 294 (2016)

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