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FOCUS: FAST MONTE CARLO APPROACH TO COHERENCE OF UNDULATOR SOURCES

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Abstract

We present Fast Monte-CarlO approach to Coherence of Undulator Sources (FOCUS), a new GPU-based code to compute the transverse coherence of X-ray radiation from undulator sources. The code relies on scaled dimensionless quantities and analytic expressions of the electric field emitted by electrons in an undulator. A consistent use of Fourier optics and statistical optics naturally leads to the core structure of the code, which exploits GPUs for massively parallel computations. We validate our approach by direct comparison with Synchrotron Radiation Workshop (SRW), evidencing a reduction in computation times by up to five orders of magnitude on a consumer laptop. Finally, we show examples of applications to beam size diagnostics.

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