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DFCSR: A Fast Calculation of 2D/3D Coherent Synchrotron Radiation in Relativistic Beams

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Coherent Synchrotron Radiation (CSR) is regarded as one of the most important reasons that limit beam brightness in modern accelerators. Current numerical packages containing CSR wake fields generally use 1D models, which can become invalid in extreme compression regimes. On the other hand, the existing 2D or 3D codes are often slow. Here we report DFCSR, a novel particle tracking codes which can simulate 2D/3D CSR and space charge wakes in relativistic electron beams 2 or 3 orders of magnitude faster than conventional models like CSRtrack. We showed benchmark simulations and compared the results with existing models. The tracking code is written in Python and C programming languages with human-friendly input styles and is open-sourced on GitHub. It can serve as a powerful simulation tool for the design of next-generation accelerators.

Footnotes

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