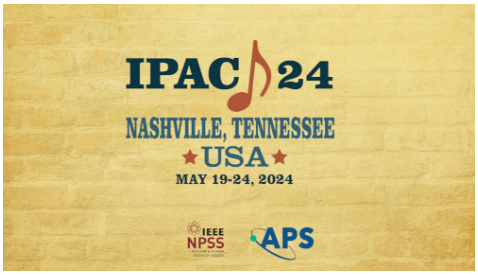

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Simulations of CXFEL with the MITHRA code

Sunday, 19 May 2024 16:00 (2 hours)

The CXFEL project at ASU will produce coherent soft x-ray radiation at a university-scale facility. Unlike conventional XFELs, the CXFEL will use an optical undulator in addition to nanobunching the electron beam instead of a static magnetic undulator. This reduces the undulator period from cm-scale to micron scale and lowers the requirements on the electron beam energy. CXFEL's overtaking geometry design reduces the effective undulator period to 7.86 μm to produce 1 keV photons. This is accomplished by crossing the laser and electron beam at a 30 degree overtaking angle, and using a tilted laser pulse front to maintain temporal overlap between the electron beam and laser pulse. The inverse Compton scattering interaction between a microbunched electron beam and an optical undulator falls out of the range of most accelerator codes. We employ MITHRA, a FEL full-wave FDTD solver software package which includes inverse Compton scattering to simulate the FEL lasing process. We have adapted the code to the CXFEL instrument design to simulate the radiation/electron beam interactions and report results of studies including scaling of key parameters.

Footnotes

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