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Towards pulses with Orbital Angular Momentum at the European XFEL

Thursday 29 August 2024 11:00 (20 minutes)

High-power attosecond X-ray pulses carrying orbital angular momentum (OAM) are promising tools for various scientific applications, including imaging and spectroscopy. Self-seeded free-electron lasers (FELs) with OAM (SSOAM) offer an attractive approach for producing these pulses. In this work, we discuss several aspects concerning the generation of XFEL pulses carrying OAM with a SSOAM setup, with in mind in particular the European XFEL. We examine the formation of helical microbunching and its interaction with the radiator, whether helical or planar, in determining the topological charge of the resultant radiation pulse. Then, assuming that the SSOAM seed signal is short (different methods, e.g. ESASE can be used for the goal of creating such a short seed), we consider the separate evolution of different FEL modes along the setup, according to semi-analytical theory. We discuss how the real and imaginary parts of the eigenvalues for different eigenmodes may be used to tune the relative final position and magnitude of different OAM modes at the exit of the setup.

I plan to submit also conference proceedings

Yes

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