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Sensitivity of Echo-Enabled Harmonic Generation to Seed Power Variations

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The external seeding technique Echo-Enabled Harmonic Generation (EEHG) consists of two undulators which are used to imprint energy modulations to an electron bunch via interaction with a seed laser. Each of these so-called modulators is followed by a chicane introducing longitudinal dispersion. Proper adjustment of the amplitudes of the energy modulations and dispersive strengths allows to achieve bunching at high harmonics of the seed laser wavelength. In the near future, this seeding scheme will be utilized in one of the beamlines of the free-electron laser (FEL) user facility FLASH at DESY to provide stable seeded radiation down to the soft X-ray regime at high repetition rate. Dedicated numerical simulations are carried out within the foreseen parameter space to investigate how variations of the energy modulations due to power fluctuations of the two seed lasers affect the bunching properties and the stability of the generated FEL radiation.

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Primary authors: PANNEK, Fabian (University of Hamburg); ACKERMANN, Sven (Deutsches Elektronen-Synchrotron); FERRARI, Eugenio (Deutsches Elektronen-Synchrotron); SCHAPER, Lucas (Deutsches Elektronen-Synchrotron); HILLERT, Wolfgang (University of Hamburg)

Presenter: PANNEK, Fabian (University of Hamburg)

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