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Echo-enabled harmonic generation at the DELTA storage ring

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Echo-enabled harmonic generation (EEHG) has been proposed as a seeding method for free-electron lasers but can also be employed to generate ultrashort radiation pulses at electron storage rings. With a twofold laser-electron interaction in two undulators, each followed by a magnetic chicane, an electron density pattern with a high harmonic content is produced, which gives rise to coherent emission of radiation at short wavelengths. The duration of the coherently emitted pulse is given by the laser pulse lengths. Thus, the EEHG pulse can be three orders of magnitude shorter and still more intense than conventional synchrotron radiation. At the 1.5-GeV synchrotron light source DELTA at TU Dortmund University, the worldwide first implementation of EEHG at a storage ring was achieved by reconfiguring an electromagnetic undulator. The paper reviews the experimental setup and describes the present status of the project.

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