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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 ("modulators"), each followed by a magnetic chicane, an electron phase space structure with high harmonic content is produced, which gives rise to coherent emission of radiation at short wavelengths. The duration of the coherently emitted pulses in a third undulator ("radiator") is given by the laser pulse durations. Thus, EEHG pulses can be three orders of magnitude shorter but still more intense than conventional synchrotron light pulses. The worldwide first storage ring implementation of EEHG was undertaken at the 1.5-GeV synchrotron light source DELTA at TU Dortmund University by reconfiguring an electromagnetic undulator. With a total length of only 4.75 m, the setup is very compact and fits in a single straight section. The paper presents technical aspects of the EEHG implementation as well as first results.

Footnotes

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