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Spectro-Temporal Properties of Coherently Emitted Ultrashort Radiation Pulses at DELTA

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At the 1.5 GeV synchrotron light source DELTA operated by the TU Dortmund University, the short-pulse facility employs the seeding scheme coherent harmonic generation (CHG) to produce ultrashort pulses in the vacuum ultraviolet and terahertz regime. This is achieved via a laser-induced electron energy modulation and a subsequent microbunching in a dispersive section. The spectro-temporal properties of the CHG pulses as well as the coherently emitted terahertz radiation are influenced by the seed laser parameters and can be manipulated by varying the laser pulse shape and the strength of the dispersive section. CHG spectra for different parameter sets were recorded and compared with the results of numerical simulations to reconstruct the spectra. A convolutional neural network was employed to extract the spectral phase information of the seed laser from the recorded spectra. In addition, the shaping of the coherently emitted THz pulses by controlling the seed pulse spectral phase using a spatial light modulator was also demonstrated.

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