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An all-optical streak camera to measure the jitter between two beams in the single-digit femtosecond regime

Tuesday, 8 November 2022 17:00 (2h 30m)

We present a novel all-optical streak camera (AOSC) based on the Kerr-effect which measures the relative temporal position of a laser pulse and a second short pulse of arbitrary constituents (e.g. electrons, protons, light, or x-rays) in a single shot. Many modern accelerator concepts rely on the coupling of an electron beam with a laser beam, which must overlap with ultra-high temporal precision down to the low fs-regime. Our new device comes in at this point, measuring the temporal position of the electron pulse relative to the laser pulse for single shots, which will also show jitter or temporal drifts. We show results of a proof-of-principle experiment in which the AOSC was tested and characterized by an ultrashort laser pulse (7 fs FWHM). The apparatus resolution was shown to be < 2 fs, whereas the total temporal resolution is of the order of gating beam pulse duration.

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