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Laser Activated Streak Camera for Measurement of Electron Pulses with Femtosecond Resolution[1] OMID ZANDI, ALICE DESIMONE, KYLE WILKIN, JIE YANG, MARTIN CENTURION, Univ of Nebraska - Lincoln
— The duration of femtosecond electron pulses used in time-resolved diffraction and microscopy experiments is challenging to measure in-situ. To overcome this problem, we have fabricated a streak camera that uses the time-varying electric field of a discharging parallel plate capacitor. The capacitor is discharged using a laser-activated GaAs photoswitch, resulting in a damped oscillation of the electric field. The delay time between the laser pulse and electron pulse is set so that the front and back halves of the bunch encounter opposite electric fields of the capacitor and are deflected in opposite directions. Thus, the electron bunch appears streaked on the detector with a length proportional to its duration. The temporal resolution of the streak camera is proportional to the maximum value of the electric field and the frequency of the discharge oscillation. The capacitor is charged by high voltage short pulses to achieve a high electric field and prevent breakdown. We have achieved an oscillation frequency in the GHz range by reducing the circuit size and hence its inductance. The camera was used to measure 100 keV electron pulses with up to a million electrons that are compressed transversely by magnetic lenses and longitudinally by an RF cavity.

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