

Ultrafast time-resolved electron microscopy

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Ultrafast Time-Resolved Electron Microscopy

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We are developing femtosecond electron beam techniques, based on 3 GHz microwave cavities accurately synchronized to a mode-locked laser, for pump-probe electron diffraction and microscopy experiments. At TU/e a femtosecond SEM setup is currently operational. Recently a new FEI Tecnai has been installed in our lab, which will be modified to allow ultrafast pulsed operation. We will use the new techniques to excite plasmons at the nanoscale with the femtosecond pulsed electron beam, and study both the emitted light, using nonlinear optical gating techniques, and the energy loss suffered by the electrons. The latter may be accomplished by a new time-resolved, TM110- cavity-based EELS technique we recently proposed. In addition we plan to study the feasibility of a femtosecond coherent electron beam splitter based on the diffraction of electrons on a standing wave of light, the so-called Kapitza-Dirac effect.