

## Ultrafast time-resolved electron microscopy

**Citation for published version (APA):**

Verhoeven, W., Rens, van, J. F. M., Kieft, E. R., Mutsaers, P. H. A., Brussaard, G. J. H., & Luiten, O. J. (2015). Ultrafast time-resolved electron microscopy. In *27th Annual Meeting on Plasma Physics and Radiation Technology CPS/NNV 2015, 10-11 March 2014, Lunteren, Netherlands*

**Document status and date:**

Published: 01/01/2015

**Document Version:**

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

**Please check the document version of this publication:**

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

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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, TM<sub>110</sub>-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.