



# Institutskolloquium

Am **01. Juni 2005, 16:00 Uhr** spricht:

**Prof. Dr. Marc J.J. Vrakking**

FOM Institute for Atomic and Molecular Physics (AMOLF)

über

**“Strongly driven electrons: the development and application of attosecond lasers”**

**Ort: Max-Born-Saal, MBI, Max-Born-Str. 2a**

Interessenten sind herzlich eingeladen.

Prof. Dr.I. V. Hertel

## Strongly driven electrons: the development and application of attosecond lasers

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In my talk I will discuss how strongly driven electrons are at the basis of the generation of attosecond laser pulses and a model system where applications of attosecond laser pulses can be explored.

I will first discuss experiments on the behaviour of electrons that are controlled by electric fields that vary over a wide range of timescales (from DC electric fields to laser fields at optical frequencies). In DC fields, I will illustrate the importance of electron trajectories in photoionization<sup>i,ii,iii</sup>, while experiments in the radio-frequency domain will illustrate the importance of the optical cycle of the light source<sup>iv</sup>. Combining the two I will show how high harmonic generation leads to the formation of attosecond laser pulses<sup>v</sup> and I will present results of a very recent experiment where the motion of a strongly driven continuum electron is initiated and controlled on attosecond timescales. Time permitting, I will also show results of recent experiments where an XUV attosecond pulse train was used to monitor time-dependent alignment properties of molecules.

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- <sup>i</sup> C. Nicole, I. Sluimer, F. Rosca, M. Warntjes, F. Texier, F. Robicheaux, C. Bordas and M.J.J. Vrakking, **Slow Photoelectron Imaging**, Phys. Rev. Lett. 85, 4024 (2000)
- <sup>ii</sup> C. Nicole, H.L. Offerhaus, M.J.J. Vrakking, F. Lepine and Ch. Bordas, **Photoionization Microscopy**, Phys. Rev. Lett. 88, 133001 (2002).
- <sup>iii</sup> F. Lepine, S. Zamith, A. de Snaijer, Ch. Bordas and M.J.J. Vrakking, **Observation of Large Quadrupolar Effects in a Slow Photoelectron Imaging experiment**, Phys. Rev. Lett. 93, 233003 (2004).
- <sup>iv</sup> A. Guertler, F. Robicheaux, M. J. J. Vrakking, W. J. van der Zande, and L. D. Noordam, **Carrier Phase Dependence in the Ionization of Rydberg Atoms by Short Radio-Frequency Pulses: A Model System for High Order Harmonic Generation**, Phys. Rev. Lett. 92, 063901 (2004).
- <sup>v</sup> S. A. Aseyev, Y. Ni, L.J. Frasinski, H.G. Muller and M.J.J. Vrakking, **Attosecond Angle-Resolved Photoelectron Spectroscopy**, Phys. Rev. Lett. 91, 223902 (2003).