Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Optical field enhancement and strong-field effects at sharp metal tips SEBASTIAN THOMAS, MARKUS SCHENK, MICHAEL KRÜGER, PETER HOMMELHOFF, Max Planck Institute of Quantum Optics — We are currently studying strong-field effects at a nanometric metal tip by illuminating it with few-cycle femtosecond laser oscillator pulses. In this setup, the electric field at the tip's surface is significantly enhanced. Local optical field enhancement in the vicinity of metal structures occurs due to geometrical effects and dynamical effects like plasmon resonances. Both are described by Maxwell's equations, which we solve numerically to simulate the electromagnetic field for our experimental configuration. In the simulation, we observe a strongly localized field enhancement that vanishes within a few tens of nanometers from the tip's surface. Furthermore, the enhancement is not symmetric with respect to the tip's axis, which underlines the significance of dynamical effects in our setup. Experimentally, we observe above-threshold photoemission and strong field effects[1] even at low pulse energies due to field enhancement. Electron spectra might yield insight into plasmon dynamics on the nanometer-(sub-)femtosecond scale. We report on the current status of simulation and experiment.

[1]M. Schenk, M. Krüger, P. Hommelhoff, PRL 105, 257601 (2010)

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Date submitted: 02 Feb 2011 Electronic form version 1.4