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Extracting the shake-up amplitudes from XUV-IR pump-probe experiments[1] STEFAN NAGELE, JOHANNES FEIST, EMIL PERSSON, JOACHIM BURGDÖRFER, Institute for Theoretical Physics, Vienna University of Technology, Austria, EU — The rapid progress in the creation of attosecond pulses opens the door to time-resolved control and observation of electronic motion in atoms. In a recent experiment, Uiberacker *et al.* [1] exposed a gas of neon atoms to a phase-stabilized few-cycle IR laser pulse and a synchronized XUV subfemtosecond pulse. The XUV pulse directly ionizes one electron and excites a second electron through shake-up, which is then tunnel ionized by the IR field. By varying the time delay between the two pulses and measuring the double ionization yield, they were able to directly observe electron tunneling in the time domain. We will present numerical studies which suggest that with such a pump-probe setup it is possible to directly determine the shake-up amplitudes (both modulus and phase) of the electronic wave packet created by the XUV laser burst. Such information is not accessible in energy-domain measurements and thus represents a prime example for novel information gained from time-resolved attosecond spectroscopy.
[1] M. Uiberacker et al., *Nature* **446**, 627 (2007).

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