Study of shake-up states in helium by XUV-IR pump-probe experiments\textsuperscript{1} S. NAGELE, J. FEIST, R. PAZOUREK, E. PERSSON, J. BURGDÖRFER, Institute for Theoretical Physics, Vienna University of Technology, Austria, EU, B.I. SCHNEIDER, Physics Division, NSF, USA, L.A. COLLINS, Theoretical Division, LANL, USA
— The rapid progress in the creation of attosecond pulses paves the way towards time-resolved control and observation of ultrafast electronic dynamics. In a recent XUV-IR pump-probe experiment Uiberacker et al.\textsuperscript{[1]} studied the ionization dynamics of shake-up states in Neon ions. The overall stepwise structure of the resulting double ionization yield as a function of the delay time between the two pulses results from incoherent tunneling of the excited shake-up states. However, recent theoretical studies\textsuperscript{[2,3]} suggest that coherent effects play an important role as well. In addition, the influence of the IR field on the shake-up process might have significant effects. Since a full \textit{ab initio} treatment of Ne atoms in external fields is not feasible, we will study the process for helium where the full multi-electron dynamics can still be solved numerically. In particular, we will investigate the role of coherent effects, electronic interactions, and the presence of the IR field in the shake-up process.

\textsuperscript{[1]} M. Uiberacker et al., \textit{Nature} \textbf{446}, 627 (2007)\textsuperscript{[2]} A.K. Kazansky et al., \textit{EPL} \textbf{82}, 13001 (2008)\textsuperscript{[3]} S. Nagele et al., \textit{to be published}\textsuperscript{1}

\textsuperscript{1}Work supported by the FWF-Austria, Grant SFB016.