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Time-resolved photoemission by attosecond streaking[1]

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With the advent of sub-femtosecond ultrashort light pulses novel pathways have opened up for investigating time-resolved electronic processes on the attosecond scale. One of the most fundamental techniques is attosecond streaking which enables time domain studies of photoionization for atoms, molecules, and solids and provides unprecedented information on the release time of photoelectrons. The challenge in interpreting the obtained time delays lies in disentangling the intrinsic time shifts one is interested in and the additional measurement-induced apparent delays caused by the probing infrared (IR) field in the streaking setup. In this talk, these issues will be addressed with the help of a few examples. On the one-electron level we identify effects of the dressing IR field on the extracted streaking delays in the entrance (initial state) and in the exit (continuum) channel for atomic photoemission. On the multi-electron level we study the effect of electron correlations on the time delays and explore their influence in the presence of the probing streaking field. As a prototypical two-electron system we study helium which exhibits rich many-electron effects. We quantify all the contributions to the streaking time shifts with attosecond precision and provide benchmarks for future experiments.

[1]Work in collaboration with R. Pazourek, J. Feist, K. Doblhoff-Dier, K. Tokesi, C. Lemell, and J. Burgdoerfer.