Time-Resolved Measurement of Interparticle Coulombic Decay Processes

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Interparticle Coulombic Decay (ICD) processes are electronic decay processes of weakly interacting systems, which are initiated by inner-valence excitation ionized ionization. These weakly interacting systems include solvents, biomolecules and quantum dots in semiconductors, that interact via electron correlation. We report about a new theory for the time-resolved description of the spectator resonant ICD processes initiated by and measured with short laser pulses. We propose to excite the system with an XUV laser pulse, measure the absorption spectrum of the system and to quench the decay process with a strong IR laser pulse at different time delays. The quenching results in the initiation of an ICD process, whose ICD electron signal can then be measured without interference effects. Additionally, the lifetime regime of the ICD processes allow for the observation of oscillations of the time- and energy-differential ionization probability close to the peak energy of the RICD electron signal. We propose to utilize this oscillation for the measurement of lifetimes of electronic decay processes.

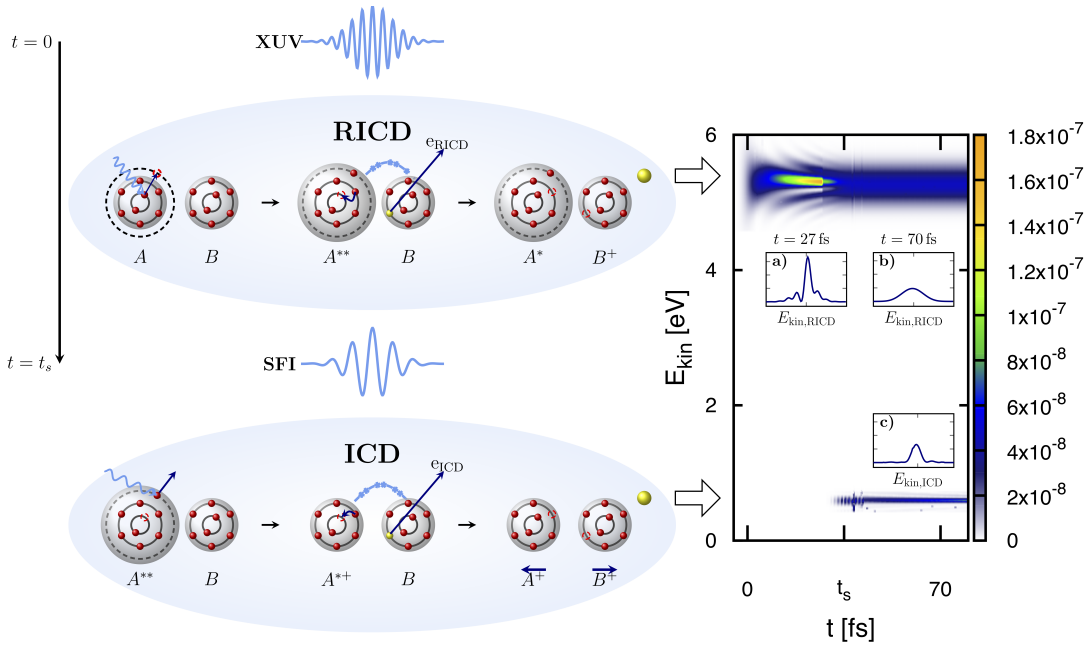

Figure 1: Illustration of the proposed measurement and the underlying processes.

References

1. E. Fasshauer and L. B. Madsen, submitted.