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Control of electronic wavepacket dynamics in atomic and molecular systems

*Abstract:*

In this talk, some recent activities regarding control of electronic dynamics by mid-intense few-color laser pulses are presented.

The first part concentrates on purely theoretical results where the localization dynamics of an electron in a diatomic molecule is steered using trains of half-cycle pulses. Solving the coupled nuclear-electronic Schrödinger equation of bound and dissociative model systems, the control landscape and the mechanism is explored.

The second part of the talk focuses on very recent mixed theoretical and experimental research on control of electronic ionization dynamics in rare gas atoms. Experiments (performed by Markus Kitzler et al.) have measured the coincidence momentum distribution of those atoms subjected to the combined high intensity field of two equally strong color fields, varying the relative phase between the two laser fields. Theory shows that scanning the phase delay between the two colors serves as a probe of the Coulomb potential of the ionized atom. Depending on the relative phase, mainly the long range part can be extracted, or the excited state structure is mapped into the asymmetries of the momentum distribution of the electrons.