

Simultaneous Excitation of Equivalent Electrons to Non-equilibrium with Attosecond Pulses

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Multi photon absorption is a well understood phenomenon which, in most cases, refers to the absorption of many photons by one or two electrons over the duration of the laser pulse (typically 10-100 fs). Multiphoton absorption with attosecond pulses implies that the photons are absorbed within a time, too short for the relaxation of electron dynamics. Moreover, in a cluster equivalent electrons (one from each atom) absorb almost simultaneously one photon which constitutes a new light-matter coupling mechanism. It results for clusters in an excited electron dynamics, so far never activated optically.

Time permitting another -- quite surprising -- ultrafast multi-electron process will be introduced. It can be triggered by a few seed atoms implanted in a rare gas cluster when illuminated by a standard 800nm strong laser pulse with 50 fs duration. Primary ionization of the seed atoms (with ionization potential lower than those of the cluster) again creates a strong electric field gradient which removes very quickly (on a time scale of 1 fs) many electrons bound to atoms of the cluster.

We will explain the effect which occurs for both, linear and elliptic polarization of the laser.