Subcycle Control of Electron Dynamics

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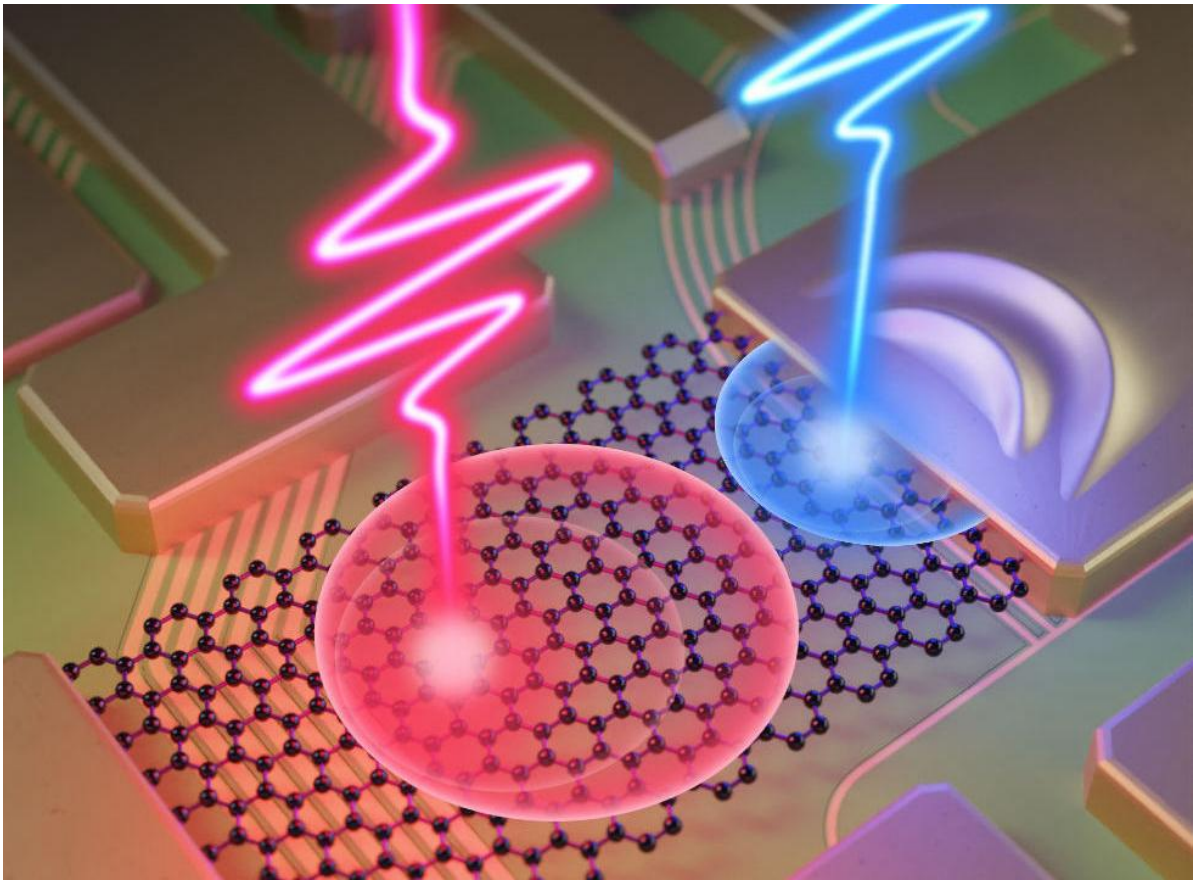

Ultrashort light pulses play a critical role in our quest to observe and exploit ever-faster physical phenomena. In particular, few-cycle lasers with frequencies in the visible range enable the visualization and control of chemical and physical processes occurring on femto to attosecond timescales. In this talk, I will discuss how the interaction of these intense and ultrafast light fields with matter can be used to guide electrons in matter and generate bursts of currents on ultrafast femtosecond timescales [1-5], an emerging direction of research called lightwave electronics [6]. Specifically, I will discuss how in the context of nanojunctions it is possible to disentangle the ultrafast laser-induced currents into contributions by real and virtual carriers and use this augmented to control landscape to design petahertz electronic logical circuits elements that operate about a million times faster than present-day capabilities.[1] I will further discuss how to capture light-matter interactions beyond the dipole approximation without performing multipolar expansions [7], and the prospects of using nanostructured light for the quantum control of electrons in matter.

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