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**Transient electric-field-driven dynamics in condensed matter: from Terahertz to Petahertz**

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In the 1980s, femtosecond ultrafast lasers enabled optical generation of electric fields at terahertz frequencies. With the recent progress in few-optical-cycle femtosecond and attosecond pulse generation with full electric field control, the frequency regime can be extended into the petahertz. The electron motion under the influence of such a high-frequency electric field ultimately determines the material limit for high-speed device performance. We have started to explore materials in a regime where the quiver energy (or ponderomotive energy Up ) of the electrons in such an oscillating electrical field becomes comparable to the photon energy of the driving laser. The system transitions from a more classical (field driven) regime to a more quantum-mechanical (photon driven) regime and we explored these regimes in diamond [Science 353, 916, 2016] and GaAs [Nature Physics, in press]. We also explored how long it takes for an excited electron in a metal to feel its effective mass [Optica 4, 1492, 2017]. The long-term goal is to explore such electric-field-driven dynamics in strongly correlated materials - such as high-$T_c$ superconductors for example - where we have even less physical understanding today.