Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Attosecond-fast internal photoemission CHRISTIAN HEIDE, TOBIAS BOOLAKEE, TAKUYA HIGUCHI, MARTIN HAUCK, JUERGEN RISTEIN, LOTHAR LEY, HEIKO B. WEBER, PETER HOMMELHOFF, Department of Physics, Friedrich Alexander University ErlangenNuremberg (FAU) — Charge separation at an interface between two materials is a fundamental process in electronic components. It determines how fast signals can be transmitted in transistors and how efficiently power is generated in solar cells. Novel material combinations of stacked two-dimensional materials, so-called heterostructures, allow such interfaces to be tailored on the atomic scale. In order to investigate how fast charge transfer takes place at such an interface, we have epitaxially grown graphene, on top of the doped semiconductor silicon carbide (SiC). Such an interface is known as Schottky contact. We show that charge transfer across the graphene-SiC solid-state interface can take place within 300 attoseconds ($1\text{as} = 10^{-18}\,\text{s}$), representing the fastest charge transfer across a solid-state interface. To reveal the charge transfer time, we have developed a new method called Chameleon: We apply femtosecond laser pulses and use saturable absorption in graphene as an intrinsic clock to determine the lifetime of a photoexcited electron prior to charge transfer into SiC or inelastic scattering. [1] Heide, C., Hauck, M., Higuchi, T. et al. Attosecond-fast internal photoemission. Nat. Photonics (2020) https://doi.org/10.1038/s41566-019-0580-6

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Date submitted: 03 Feb 2020 Electronic form version 1.4