

# Physikalisches Kolloquium Universität Kiel Sommersemester 2020

**Dienstag, 21. April 2020**

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(CFEL Hamburg)

## **Femtosecond science on-chip: Capturing light-induced anomalous Hall currents in graphene**

Many non-equilibrium phenomena have been discovered or predicted in quantum solids driven by femtosecond pulses of light. Examples include photo-induced superconductivity [1] and Floquet-engineered topological phases [2]. These effects are expected to lead to measurable changes in electrical transport. However, the timescales involved far exceed those accessible using conventional fast electronics. In this talk, I will present results on the transport properties of monolayer graphene illuminated by a femtosecond pulse of circularly polarized light [3]. This was achieved using an ultra-fast device architecture based on laser-triggered photoconductive switches. We observed a light-induced Hall effect in the absence of an applied magnetic field. The dependence of the effect on a gate potential used to tune the Fermi level revealed multiple features that reflect a Floquet-engineered topological band structure, similar to the band structure originally proposed by Haldane [4]. This includes a  $\sim 60$  meV wide conductance plateau centered at the Dirac point, where a gap of equal magnitude is predicted to open based on Floquet theory. We find that when the Fermi level lies within this plateau, the non-equilibrium anomalous Hall conductance saturates around  $\sim 1.8 \pm 0.4 e^2/h$ .

### References:

- [1] D. Fausti et al. Science 331, 189-191 (2011)
- [2] T. Oka & H. Aoki. Phys. Rev. B 79, 081406 (2009)
- [3] J.W. Mclver et al. Nature Physics 16, 38-41 (2020)
- [4] F.D.M. Haldane, Phys. Rev. Lett. 61, 2015-2018 (1988)

Der Vortrag beginnt um **16:15 Uhr** im **Hans-Geiger-Hörsaal (LS13-R.52)**  
des Physikzentrums.

Ab **16:00 Uhr** werden **Kaffee** und **Tee** angeboten

**Bitte Becher mitbringen!**

Prof. Dr. Bauer

Prof. O. Magnussen  
für die Dozenten der Physik