MAX PLANCK INSTITUTE
FOR THE STRUCTURE AND DYNAMICS OF MATTER

ANNOUNCEMENT - TALK

Title: **On-chip Non-local Ultrafast Carrier Dynamics of Graphene Investigated Using Terahertz Electronics**

Abstract:

Exploring inherent non-local ultrafast dynamics in two-dimensional electron systems necessitates high-frequency measurements, a task gigahertz electronics can only partially meet. To bridge this gap, we've introduced terahertz (THz) electronics [1-4] capable of sub-picosecond time resolution, enriching our study of charge dynamics. Our method uses laser-induced photo-conductive switches to generate and detect ultrashort electrical pulses, allowing detailed time-domain analysis. A significant achievement is our development of a graphene photodetector with a 220 GHz bandwidth, revealing complex optical-to-electrical conversion processes [3]. Additionally, we've observed 1-picosecond wavepacket propagation of graphene plasmons, with velocity shifts dependent on carrier density, aligning with acoustic graphene plasmon theory [4]. These insights not only enhance our comprehension of ultrafast charge dynamics in two-dimensional materials but also indicate new possibilities for creating advanced high-speed optoelectronic devices.

References: [1] N. H. Tu, K. Yoshioka et al., Commun. Mater. 1, 7 (2020). [2] K. Yoshioka et al., Appl. Phys. Lett. 117, 161103 (2020). [3] K. Yoshioka et al., Nat. Photon. 16, 718 (2022). [4] K. Yoshioka et al., arXiv:2311.02821

Date/Time: **MONDAY, JUNE 24th at 15:30**
Location: **900.EG.136**

Speaker: **Katsumasa Yoshioka**
Affiliate: NTT Basic Research Laboratories, NTT Corporation, Japan