北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Optical Nonlinearity of Graphene at Single Particle Approximation

JinLuo Cheng

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Time: 4:00Pm, Sep. 26, 2018 (Wednesday)

时间：2018年09月26日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

We theoretically consider nonlinear optical responses of graphene at the single particle approximation. The nonlinear conductivities are obtained by solving the semiconductor Bloch equation, with describing scattering effects phenomenologically in a relaxation time approximation. The obtained conductivities can be applied to various nonlinear phenomena, including harmonic generations, Kerr effects and two photon absorption, two-color coherent control, parametric frequency conversion, and dc-current/field induced second order optical nonlinearities. Starting from the analytic expressions, we further summarize a class of divergences appearing in the third order conductivities, which are induced by intraband motion. It provides a possible method for obtaining huge nonlinearities.

To calculate the nonlinear signal radiation from the layered structures, which is used in many experimental setups, we apply a Green function technique to extend the usual transfer matrix method to include the nonlinear radiations. A key equation is obtained to connect the electromagnetic fields around the graphene sheet and the incident fields.

About the speaker

JinLuo Cheng received the B.S. degree in Applied Physics, and the Ph.D. degree in Condensed Matter Physics from University of Science and Technology of China (USTC), China in 2002 and 2007, respectively. He was a Postdoctoral Fellow in USTC from 2007-2009, in University of Toronto from 2010 to 2013, and in Vrije Universiteit Brussel from 2014 to 2016.

Dr. Cheng has joined The Guo China-US Photonics Laboratory of Changchun Institute of Optics Fine mechanics and Physics, CAS as an associate reseacher since 2016. His research interests focus on theoretical investigation on physical properties of semiconductors, metals, and 2D materials, including spin dephasing and transport, optical injection and coherent control, optical nonlinearities, band structure calculation from the first principle method; as well as the optics in 1D photonic crystal and 2D materials. He is Editorial Board Member of *Journal of Physics: Photonics.*