

Seminar on Condensed Matter Theory

Group of Theoretical Physics at the Department of Condensed Matter Physics
of Charles University has a pleasure to invite you to attend the seminar

on 2 May 2019 at 13:00

at Faculty of Mathematics and Physics of Charles University, Ke Karlovu 5, 121 16 Praha 2

Seminar room F052



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Controllable Nonlinear GHz-THz Optics with Semiconductor Superlattices

Transient and steady state nonlinearities in semiconductor materials are well understood in the visible and near infrared ranges. In contrast, little is known about the nonlinear response in gigahertz (GHz) and terahertz (THz) spectral ranges, and materials with strong nonlinear terahertz response are difficult to find. Semiconductor superlattices (SSLs) [1] are the ideal system to study nonlinear transport and optics and to the best of our knowledge, our recent work is so far the only theoretical approach (confirmed by experiments) able to describe controllable GHz-THz nonlinearities in SSLs covering both “even” and “odd” nonlinear responses [2-4]. In conventional nonlinear optics, based on optical susceptibilities, the desired response increases with pump field. In contrast, in our case we show that this is not the case and a complex combination of effects leads to controllable nonlinear output, which can be larger than originally expected in some cases and zero in others. The theory is based in a combination of Nonequilibrium Green’s Functions and the Boltzmann Equation in the relaxation rate approximation and very good agreement is shown between theory and experiments.

[1] M.F. Pereira, *Materials* 11(1), 2 (2018).

[2] M.F. Pereira et al, *Phys. Rev. B* 96, 045306 (2017).

[3] M.F. Pereira et al, *J. Nanophoton* 11 (4), 046022 (2017).

[4] A. Apostolakis and M.F. Pereira, *AIP Advances* 9, 015022 (2019).

