



Tuesday, January 16th, 2018 – 11:00 a.m.
CFEL Seminar room III (Bldg. 99)

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Applied Floquet engineering

Floquet engineering, i.e., control of quantum states by time periodical external fields, is becoming a more and more accessible way to realize states of matter with exotic quantum properties. One class of examples is,

(1) Control of topology/chirality by circularly polarized laser (CPL): “By applying CPL to materials such as 2D, 3D Dirac semimetals and Mott insulators, one can transform them into Floquet Chern insulator, Floquet Weyl semimetal [1], and even induce and detect scalar chirality [2]. ”

However, a more interesting and fundamental question is, “Can we invent novel quantum devices using Floquet engineering?”. One answer is the following,

(2) Heterodyne Hall effect [3]: “Electrons in oscillating magnetic fields, to our surprise, show a Landau level-like quantization under special conditions. The heterodyne response, that is, frequency shifted linear relation between the input electric field and output current, becomes quantized for the Hall component.”

It is interesting to imagine new wireless communication devices, or even an optical detection scheme utilizing this phenomenon.

This work has been done in collaboration with Leda Bucciantini, Sota Kitamura, and Sthitadhi Roy.

References

1. L. Bucciantini, S Roy, S Kitamura, T Oka, Phys. Rev. B 96, 041126 (2017)
2. S. Kitamura, T. Oka, H. Aoki, Phys. Rev. B 96, 014406 (2017)
3. T. Oka, L. Bucciantini, Phys. Rev. B 94, 155133 (2016)

Host: Angel Rubio

