

# 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 17 October 2019 at 14:00**

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

**Lecture hall F2**



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## Inversion and Magnetic Quantum Oscillations in Kondo Insulators

The occurrence of magnetic quantum oscillations in a material (samarium hexaboride, a Kondo insulator) caused a stir in condensed matter community because it is not expected to occur in insulators [1, 2]. The periodic oscillations in magnetization with respect to inverse magnetic field is known as the quantum oscillations, or de Haas-van Alphen (dHvA) effect, which is considered as a hallmark of metallic systems and a direct probe to the Fermi surface [3, 4]. The dHvA oscillations in samarium hexaboride forced us to reexamine and reconsider the underlying working principle.

In this talk, I would focus on our theoretical study of quantum oscillations in Kondo insulators, using a canonical representation of electrons invented by Kumar [5], and construct an effective theory that appropriately describes the Kondo insulating state and gives the dHvA quantum oscillations. We get these oscillations due to “inversion” of charge quasiparticles dispersion whose effective chemical-potential surface they measure [6, 7].

[1] G. Li et al, Science 346, 1208 (2014).

[2] B. S. Tan et al, Science 349, 287 (2015).

[3] W. de Haas, J. de Boer, and G. van den Berg, Physica 1, 1115 (1934).

[4] L. Onsager, Phil. Mag. 43, 1006 (1952).

[5] B. Kumar, Phys. Rev. B 77, 205115 (2008).

[6] P. Ram and B. Kumar, Phys. Rev. B 96, 075115 (2017).

[7] P. Ram and B. Kumar, Phys. Rev. B 99, 235130 (2019).

