

Open PhD position for studying

Topological Transitions in Condensed Matter

Within a collaboration between LNCMI Grenoble (CNRS) and PHELIQS (CEA) laboratories this PhD project aims at a systematic investigation of the signatures of field induced Fermi surface instabilities (Lifshitz transitions). More precisely, it is planned to measure (thermoelectric) transport properties (Seebeck effect) and thermodynamic properties (magnetization) at low temperatures and under high magnetic field (up to 35T). Comparing these two experimental probes together with theoretical predictions should allow for a clear distinction of the major consequence of Lifshitz transitions: a change in the density of states or extra scattering processes. As a first class of samples, highly correlated electron systems will be investigated (in-house grown high quality single crystals of UCoGe, YbNiSn, etc.) since their generally flat bands at the Fermi level are very sensitive to external magnetic fields.

As a second hot spot it is planned to study recent topological materials like Weyl and Dirac semi-metals (for example Cd_3As_2 or Na_3Bi) which exhibit simpler band structures than the former materials, and are expected to exhibit exotic topological transitions.

This research project has been awarded a special budget by Grenoble University, including a PhD grant of about 1400€ net per month during 3 years; it will be located in Grenoble, jointly hosted by PHELIQS laboratory and the National High Magnetic Field laboratory.

Start date: not later than fall 2017

The PhD student will be jointly supervised by :

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Recent related publications

-A. Gourgout, A. Pourret, G. Knebel, D. Aoki, G. Seyfarth, et al. , "Collapse of Ferromagnetism and Fermi Surface Instability near Reentrant Superconductivity of URhGe", Phys. Rev. Lett. **117**, 046401 (2016)

-G. Bastien, A. Gourgout, D. Aoki, A. Pourret, I. Sheikin, G. Seyfarth, J. Flouquet, G. Knebel, *Lifshitz Transitions in the Ferromagnetic Superconductor UCoGe*, Phys. Rev. Lett. **117**, 206401 (2016)

-D. Aoki, G. Seyfarth, A. Pourret, et al., "*Field-Induced Lifshitz Transition without Metamagnetism in CeIrIn₅*", Phys. Rev. Lett. **116**, 037202 (2016)

-A. Palacio-Morales, A. Pourret, G. Seyfarth, M.T. Suzuki, D. Braithwaite, G. Knebel, et al., "*Fermi surface instabilities in CeRh₂Si₂ at high magnetic field and pressure*", Phys. Rev. B (editor's suggestion) **91**, 245129 (2015)

Key words

Fermi surface instabilities – Lifshitz transitions - heavy fermion systems – Dirac and Weyl semi-metals – topological materials – high magnetic fields – low temperatures – quantum oscillations – thermoelectric power – magnetization