Electronic and magnetic properties of $CePt_2In_7$

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The appearance of unconventional superconductivity in the vicinity of a quantum critical point (QCP), a second order phase transition at zero temperature, is a common trend in Ce-based heavy fermion compounds. A more recent and still somewhat controversial issue is the effect of the Fermi surface (FS) dimensionality on this superconductivity. Indeed, reduced dimensionality of the FS leads to nesting-type magnetic instabilities and thus enhances the superconductivity. The exact knowledge of the FS topology of heavy fermion systems is, therefore, essential. In addition, this information allows distinguishing if the f-electrons are itinerant or localized, i.e. whether they contribute to the FS or not.

At ambient pressure and zero magnetic field, the heavy-fermion compound $CePt_2In_7$ exhibits an antiferromagnetic (AFM) phase below 5.5 K. The AFM order is suppressed at a pressure-induced (QCP) at P_c = 3.2 GPa [1], around which a superconducting dome emerges. A magnetic-field-induced QCP is also expected at H_c ~ 55 T [2]. The $4f$-electrons of Ce are known to be fully localized at ambient pressure and moderate magnetic fields [3]. However, the question of whether the f-electrons are itinerant or localized above the QCPs is still open due to the lack of quantum oscillation studies either at high pressure or high magnetic field.

The AFM structure of this compound, as determined from a single-crystal neutron diffraction [4], suggests that its magnetic Brillouin zone is eight times smaller than the crystallographic one. That is why high enough magnetic fields are required to observe large FSs of $CePt_2In_7$ via magnetic breakdown.

Our recent results of quantum oscillations measured by torque technique in pulsed magnetic fields suggest that the FSs do not change up to 70 T, which is well above the field induced QCP. However, a drastic change of the effective masses occurs close to H_c. I will also present first quantum oscillation measurements under pressure, which will allow us to probe the FSs across P_c.

[1] V. A. Sidorov et al., Phys. Rev. B **88**, 020503(R) (2013)
[2] Y. Krupko et al., Phys. Rev. B **93**, 085121 (2016)
[3] K. Götze et al., Phys. Rev. B **96**, 075138 (2017)
[4] M. Raba et al., Phys. Rev. B **95**, 161102(R) (2017)