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Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

Ansprechpartner: Eberhard Goering
E-Mail: e.goering@fkf.mpg.de
Telefon: 0711 689-1756

Hybrid

Login data will be announced by e-mail and on the colloquium webpage.

Dienstag, 20. Mai 2025	16.15 Uhr	Lecture Hall 2D5

Max-Planck-Institut für Festkörperforschung, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

Optically induced quantum spin-disordered state in the Kitaev material α-$RuCl_3$

Paul von Loosdrecht
Universität zu Köln

Abstract

One way to characterize quantum spin-liquids is through the fractionalization of spin excitations. A prime example of this is found in the exactly solvable Kitaev model of spin-1/2 moments with anisotropic exchange interactions on a tri-coordinated lattice. To find examples of this kind of physics in nature turns out to be challenging. The currently best-known examples of materials in which Kitaev-like physics plays a central role are the layered spin-orbit entangled J=1/2 systems Na_2IrO_3, α-Li_2IrO_3, and α-$RuCl_3$. However, these materials all possess additional interactions, which, among other, lead to a magnetically ordered state at low temperature preventing the formation of a pure Kitaev spin-liquid (KSL) state. Apart from the ongoing quest for materials showing a true KSL ground state, one can also destabilize the magnetic order in the existing materials, which potentially can induce the sought-after KSL state. In this contribution I will discuss two methods to destabilize magnetic order in α-$RuCl_3$. The first one is through the application of an in-plane magnetic field. Though it has been shown by various authors that this indeed leads to suppression of the ordered state in α-$RuCl_3$, the nature of the field-induced state is still not fully clear. The second approach is a pump-probe method which creates holon and doublon excitations. These excitations are found to couple efficiently to magnetic excitations which in turn disorder the magnetically ordered state. For sufficiently high excitation densities the magnetic order is fully suppressed, leading to a quantum disordered magnetic state.