Invitation for a LIN Seminar – Public thesis Defense

Date: Wednesday, August 25, 2021 16:00

Location: Paul Scherrer Institut, Area West, Bldg. WHGA/001 (Auditorium). We have the possibility of a live talk in the Auditorium with live participation. The number of participants is limited to 50. Wearing a mask is obligatory. If you are interested to attend the seminar in the Auditorium please register here Doodle | Public PhD Thesis Defense - Damaris Tartarotti Maimone via ZOOM: https://unibas.zoom.us/j/64699723270

Speaker: Damaris Tartarotti Maimone, LIN;

Title: Intertwined ordered states in Nd_xCe_{1-x}CoIn_5

The physics of a many-body system of strongly interacting particles defies simple extrapolation of the behavior of individual particles constructed ab-initio. Rather, interactions lead to complex phenomena and stabilize ground states with deeply intertwined degrees of freedom. As a result, novel collective phenomena emerge that are interesting from both fundamental and technological perspectives, as shown in this work.

In this talk, I will discuss the complex interplay between superconductivity and magnetism in Nd_{x}Ce_{1-x}CoIn_5. Two main techniques were used, neutron diffraction and ultrasound. With neutron diffraction, it is shown that concentrations as low as 2% of Nd ions are sufficient to induce a spin density wave at zero field. The application of magnetic fields transverse to the moment direction suppresses the magnetic order at low fields, but at higher fields, a spin density wave emerges with the same magnetic structure. These ground states, which have identical symmetry, show opposite interplay between superconductivity and magnetism. While superconductivity is necessary for magnetism at high fields, in the low-field phase, a competing interplay is found. A detailed investigation of the low field spin density wave revealed a domain selection in the normal state.

This study lead to the discovery of a new spintronic phenomenon that allows switching of antiferromagnetic domains without a Zeeman component. Moreover, longitudinal ultrasound measurements obtained with a new digital setup developed within this work show that the high-field state is deeply intertwined with the d-wave nature condensate. Our highly sensitive angular dependence of the critical field allows us to conclusively explain the disappearance of this state when the field orientation lies within ≈180° of the basal plane and suggests a connection of the highfield phases with H⊥c and H I c.

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