PAUL SCHERRER INSTITUT

Invitation

LMU-Seminar

Title: **Exotic electronic states in Fe chalcogenides and pnictides revealed by µSR**

Speaker: **Dr. Vadim Grinenko**
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Time: **Monday, March 26th 2018, 09:00**

Place: **WBGB/019**

Abstract:

Understanding the interplay between nematic, magnetic and superconducting orders is one of the key problems of Fe based superconductors. A lot of theoretical and experimental efforts have been applied to shed light on the nature of the broad nematic region of the FeSe system and understand the reasons for a lacking static magnetism. The lack of magnetism is a challenge for the theoretical description of FeSe. In the first part of my talk I will present results of our study of FeSe single crystals using high-field (up to 9.5 Tesla) muon spin rotation (µSR) measurements [1]. Our results indicate that FeSe is in vicinity of an itinerant antiferromagnetic quantum critical point. However, the quantum critical behavior breaks down at low temperatures. I will discuss possible scenarios for this breakdown. In the second part of the presentation I will talk about the superconducting state with a broken time reversal symmetry (BTRS) realized in another family of the Fe based superconductors [2]. Over the last years a lot of theoretical and experimental efforts have been made to find this frustrated superconducting phase in multi-band superconductors. In particular, it was theoretically proposed that in the $Ba_{1-x}K_xFe_2As_2$ system either an *s+is* or an *s+id* BTRS state may exist at high doping levels in a narrow region of the phase diagram. I will report the observation of an enhanced zero field muon spin depolarization rate below the superconducting transition temperature for a high-quality crystalline samples in the doping range 0.8>x>0.7. Our data are consistent with the multi-band *s+is* superconducting state caused by competing pairing interactions close to the Lifshitz transition.

[1] V. Grinenko, R. Sarkar, P. Materne, S Kamusella, A. Yamashita, Y. Takano, Y. Sun, T. Tamegai, D. V. Efremov, S.-L. Drechsler, J.-C. Orain, T. Goko, R. Scheuermann, H. Luetkens, H.-H.Klauss, arXiv:1801.02556 (2018).

[2] V. Grinenko P. Materne, R. Sarkar, H. Luetkens, K. Kihou, C. H. Lee, S. Akhmadaliev, D. V. Efremov, S.-L. Drechsler, and H.-H. Klauss, Phys. Rev. B 95, 214511 (2017).