PAUL SCHERRER INSTITUT

Invitation

LMU-Seminar

Title: **Complementary response of static spin-stripe order and superconductivity to non-magnetic impurities and pressure in cuprates**

Speaker: **Dr. Zurab Guguchia**
Department of Physics, Columbia University, USA

Time: **Thursday, July 13th 2017, 14:00**

Place: **WBGB/019**

Abstract:

Cuprate high-temperature superconductors (HTSs) have complex phase diagrams with multiple competing ordered phases. Understanding to which degree charge, spin, and superconducting orders compete or coexist is paramount for elucidating the microscopic pairing mechanism in the cuprate HTSs. In this talk, i will report some novel results of muon-spin rotation (μSR), neutron Scattering and magnetization experiments on non-magnetic Zn impurity and hydrostatic pressure effects on the static spin-stripe order and superconductivity in the La214 cuprates [1,2]. Namely, in $La_{2-x}Ba_xCu_{1-y}Zn_yO_4$ ($0.11 \leq x \leq 0.17$) and $La_{1.48}Nd_{0.4}Sr_{0.12}Cu_{1-y}Zn_yO_4$. Remarkably, it was found that in these systems the spin-stripe ordering temperature T_{so} decreases linearly with Zn doping y and disappears at y≈4%, demonstrating the extreme sensitivity of static spin-stripe order to impurities within a CuO_2 plane. Moreover, T_{so} is suppressed in the same manner as the superconducting transition temperature T_c by Zn impurities. We also observed the same pressure evolution of both T_c and T_{so} in $La_{2-x}Ba_xCuO_4$, while there is an antagonistic pressure evolution of magnetic volume fraction and superfluid density [1,2,3]. These results indicate that static magnetic order and SC pairing correlations develop in a cooperative fashion in La214 cuprates. In other words the existence of the stripe order requires intertwining with the SC pairing correlations, such as occurs in the proposed pair-density wave (PDW) state [4].

[1] Z. Guguchia et. al., Phys. Rev. B 94, 214511 (2016).

[2] Z. Guguchia et. al., arXiv:1704.05195v1 (2017).

[3] Z. Guguchia et. al., Phys. Rev. Lett. 113, 057002 (2014).

[4] E. Fradkin, S.A. Kivelson, and J.M. Tranquada Rev. Mod. Phys. 87, 457 (2015).