第１回トポロジカル物質科学セミナー
Topological Materials Science Seminar (1)

First order quantum evolution in disappearance of magnetic order: Mott systems, unconventional superconductors and itinerant ferromagnets (plus) Searching for topological vortex core in Sr_2RuO_4

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Place: Room 525, Department of Physics, Graduate School of Science, Kyoto University
Date: Thursday, 23 July 2015
Time: 10:00 a.m.

Abstract: $RENiO_3$ (RE=Rare Earth) and V_2O_3 are prototypical systems which exhibit Mott metal-insulator transition and associated antiferromagnetic (AF) order. The AF insulator state can be driven to paramagnetic metal state in quantum tuning by RE element substitutions in $RENiO_3$ and application of hydrostatic pressure in V_2O_3. We have performed muon spin relaxation measurements in these systems and found that the magnetically ordered state disappears in quantum tuning associated with decreasing volume fraction in phase separation without change of the local ordered moment size. Similar behavior was also found in $Ba(Fe,Ni)_2As_2$, overdoped Na(Fe,Cu)As, and itinerant electron systems MnSi and $(Sr,Ca)RuO_3$. To our surprise, (Mn,Fe)Si exhibits tendency towards second order quantum criticality tuned by pressure. We discuss implications of these results on unconventional superconductors, and relevance to the theory of itinerant-electron magnets by Belitz and Kirkpatrick. Finally, we will introduce our ongoing efforts to detect topological effect in vortex cores of Sr_2RuO_4. Work performed in collaboration with Alonso, Dai, Jin, Boeni, Pfleiderer, Kageyama, Yoshimura, Maeno, Yonezawa, Luke and others.

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