651st ASRC Seminar

Date: Monday, October 24, 15:00 ~

Location: Room 302, ASRC bldg.

Speaker: Professor Tomo Uemura
(Columbia University)

Title: Quantum phase transitions of Mott insulators and itinerant-electron magnets:
$RENiO_3$, V_2O_3, $Ba(Co,Ni)S_2$, MnSi, (Mn,Fe)Si

Abstract: For studies of phase transitions, Muon Spin Relaxation (mSR) has a unique capability to separately determine the ordered moment size and the volume fraction of ordered regions, unlike neutron scattering, magnetization or transport studies which probes volume-integrated signals and thus blind to phase separation and other spatial heterogeneities. Taking advantage of this feature, we performed mSR measurements in Mott transition systems $RENiO_3$ and V_2O_3, and demonstrated first order quantum transition associated with phase separation in the process of evolution from antiferromagnetic insulator phase to paramagnetic metal phase [1], in quantum tunings with substitution and pressure. Similar first order quantum evolution was found in the itinerant-electron helimagnet MnSi tuned with hydrostatic pressure [2]. In contrast, restoration of second order quantum criticality was observed in pressure tuning of (Mn,Fe)Si. We will discuss roles of disorder in quantum evolution of these systems, and report present status of on-going studies on Mott transitions in $Ba(Co,Ni)S_2$ and $(La,Sr)VO_3$.

[1] B.A. Frandsen et al., Nature Communications 7 (2016) 12519.

[2] Y.J. Uemura et al., Nature Physics 3 (2007) 29-35.

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