

754th ASRC Seminar

Date: 令和元年5月13日(月)

13:30~

Location: 第1センター会議室

Speaker: Prof. Raivo Stern

(京都大学 客員教授)

Title: NMR studies of some quantum magnets

量子磁性体における核磁気共鳴— $\text{BaCuSi}_2\text{O}_6$, $\text{SrCu}_2(\text{BO}_3)_2$, TiPO_4 ,
 $\text{NaTiSi}_2\text{O}_6$

Abstract:

$\text{BaCuSi}_2\text{O}_6$ has served physicists as a valuable model material for studying Bose-Einstein condensation (BEC) of magnons in high magnetic fields. We have characterized the BEC phase by copper and silicon NMR at 50 mK and around 23-27 T. Using the precise low- T structural data and extensive density-functional calculations, we elucidate magnetic couplings in this compound. The resulting magnetic model comprises two types of nonequivalent spin dimers, in excellent agreement with the $^{63,65}\text{Cu}$ NMR data. We further argue that leading inter-dimer couplings connect the upper site of one dimer to the bottom site of the contiguous dimer. This finding is verified by inelastic neutron scattering data and implies the lack of magnetic frustration in $\text{BaCuSi}_2\text{O}_6$, thus challenging existing theories of the magnon BEC in this compound.* Novel $\text{Sr}_{0.1}\text{Ba}_{0.9}\text{CuSi}_2\text{O}_6$ with suppressed structural phase transition and apparently just a single set of dimers at low- T is promising new exciting extension of this study.**

If time permits, I will also introduce our original cryoMAS powder NMR technique in Tallinn and demonstrate some examples on $\text{SrCu}_2(\text{BO}_3)_2$, TiPO_4 , $\text{NaTiSi}_2\text{O}_6$, and other interesting compounds.

* V. V. Mazurenko, M. V. Valentyuk, R. Stern, A. A. Tsirlin, *PRL* **112**, 107202 (2014).

** P. Puphal, D. Sheptyakov, N. van Well, L. Postulka, I. Heinmaa, F. Ritter, W. Assmus, B. Wolf, M. Lang, H. O. Jeschke, R. Valenti, R. Stern, C. Rüegg, C. Krellner, *PRB* **93**, 174121 (2016).

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