

凝縮系インフォーマルセミナー

## Condensed Matter Seminar

Location: Room 413, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: 15:30 – 16:30, Monday, 26 October 2015

# “Spin liquid versus long range magnetic order in the frustrated body-centered tetragonal lattice”

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### Abstract:

First we will briefly overview famous examples of unconventional correlated electron materials with body-centered tetragonal lattice (BCT-lattice) structure. Even if these experimental systems are metallic, the introduction of a Heisenberg model will be motivated invoking general properties of Kondo lattice models.

Then, an  $SU(n)$  generalization of the quantum Heisenberg model will be studied in the geometrically frustrated BCT-lattice with antiferromagnetic interlayer coupling  $J_1$  and intralayer first and second neighbor coupling  $J_2$  and  $J_3$ . Using a fermionic representation of the  $SU(n)$  spin operators, we will study the phase diagram characterizing the ground state of the system. For small  $n$ , we find that the most stable solutions correspond to four different families of possible long range magnetic orders that are governed by  $J_1$ ,  $J_2$ , and  $J_3$ . For large  $n$ , spin-liquid (SL) solutions are stabilized. The SL solution governed by  $J_1$  breaks the lattice translation symmetry. This Modulated SL is associated to a commensurate ordering wave vector  $(1,1,1)$ . For intermediate values of  $n$ , we show how competition between  $J_1$ ,  $J_2$ , and  $J_3$  can tune the ground state from a magnetically ordered to a SL state. We then discuss the relevance of this scenario for correlated systems with BCT crystal structure.

References: Phys. Rev. Lett. **106**, 106601 (2011), Phys. Rev. B **87**, 014422 (2013), Phys. Rev. B **90**, 045125 (2014), and S. Burdin, C. Farrias, C. Pépin, A. Ferraz, C. Lacroix, in preparation.