Contribution ID: **34** Type: **not specified**

Quantum phase transition between spin liquid and spin nematics in spin-1 Kitaev honeycomb model

Wednesday, 27 March 2024 16:10 (20 minutes)

Besides the exactly solvable spin-1/2 Kitaev model, higher spin-S ones, not exactly solvable, are promising playgrounds for researches on the quantum spin liquid as well. As one of main interests in higher spin-S cases, the interplay between the Kitaev spin liquid (KSL) and spin nematics has attracted attentions, which may lead to novel quantum properties of matters. However, this is far from understood since it is hard to investigate their hidden magnetism. In our work, we probe this interplay by utilizing the infinite Projected Entangled Pair State (iPEPS) to introduce quantum entanglements between spins. We here consider a spin-1 model on the honeycomb lattice with competing bilinear-biquadratic and Kitaev interactions. As a result, we map out the phase diagram with emphasis on parameter regions in the vicinity of two pure Kitaev limits, in which we discover the direct KSL–spin-nematics transitions. In particular, around the ferro-Kitaev limit, the KSL is stabilized under the influence of the almost pure spin-quadrupolar interaction. Also, the spin-nematic phase is extended to the parameter region near the antiferro-Kitaev limit. It is perhaps the first time that the direct phase transition between a quantum spin liquid phase and a spin nematic phase is discovered in higher spin-S systems. We expect that this phase transition may emerge when one control the extent of spin-phonon couplings in materials with strong spin-orbit couplings.

Primary author: MASHIKO, Tohru (Univ. of Tokyo)

Co-author: Prof. OKUBO, Tsuyoshi (Univ. of Tokyo)

Presenter: MASHIKO, Tohru (Univ. of Tokyo)

Session Classification: Symposia talks

Track Classification: Contributed talk