School of Nano Science (IPM)

School of PHYSICS

Condensed Matter & Statistical Physics Group (IPM)

Weekly Webinar

Quantum spin liquids in frustrated antiferromagnets

Speaker: **Dr. Saeed Jahromi**

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Quantum spin-liquids (QSL) are exotic phases of matter with highly entangled ground-states and fractionalized excitations which fall beyond the Ginzburg-Landau paradigm. Due to lack of local magnetic ordering at zero temperature, QSL are very hard to come by experimentally. However during the past years, there has been tremendous progress at the theoretical level towards a better understanding of these phases, ranging from the QSL ground-states of topological spin systems, which are platforms for fault-tolerant quantum computation, to highly frustrated quantum spin systems such as Heisenberg antiferromagnets on lattices with triangular geometries and resonating valence-bond states. In this talk, I will briefly review some basic properties of QSL states and further discuss our recent advancements with tensor methods which enables us to both detect or construct QSL sates on different lattice geometries. As concreate examples, I will talk about the phase diagram of the spin-1/2 Heisenberg antiferromagnet on a breathing-kagome lattice which host a gapless spin-liquid as well as, a resonating-valence-bond (RVB) state on the ruby lattice which is gapped and topologically ordered.

Keywords: quantum spin liquid, resonating-valence-bond, tensor network, topological order

Further readings:

1) Saeed S. Jahromi, Roman Orus, Didier Poilblanc, Frederic Mila. SciPost Phys. 9, 092 (2020).
2) Saeed S. Jahromi, Roman Orus. Phys. Rev. B. 101, 115114 (2020)
3) Saeed S. Jahromi, Roman Orus. Phys. Rev. B. 99, 195105 (2019)

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