复旦大学物理系物质科学报告

Physics Department Colloquium

A quest to bosonic U(1) quantum spin liquids quantum electrodynamics of magnetic monopoles

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In conventional magnets, electron spins localized at magnetic ions in the crystal release an entropy on cooling by forming a long-range magnetic order. When interactions among spins are frustrated, for instance, on the triangular, kagome, or pyrochlore lattice, however, spins may remain disordered even at zero temperature without breaking any symmetry. This is called a symmetric quantum spin liquid (QSL). The entropy in QSLs is released through a fractionalization of spins into emergent quasiparticles, dubbed spinons, coupled to emergent gauge fields.

Here I introduce a series of theoretical and experimental works for finding pyrochlore QSLs, which host bosonic spinons carrying magnetic monopole charges and gapless analogous photon modes in spin excitations at zero magnetic field. I will also present recent numerical simulations showing a new gapped spin liquid, which appears on cooling from a classical kagome spin ice on the pyrochlore under the 111 magnetic field [1]. I will briefly introduce our theoretical proposal for high-temperature quantum spin ice on the spinel iridate [2].

Reference

[1] T.A. Bojesen, S. Onoda, soon posted on arXiv.

[2] S. Onoda, F. Ishii, to appear in arXiv on Dec. 5.

Time： 2:00pm, Tuesday, December 6, 2016

Location： Physics Building, Room 221B

(Cookies and coffee are served from 1:30 pm)