

CMP Seminar
Michigan State University

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Non-equilibrium dynamics of a frustrated Mott insulator

What happens to electrons when both the spin orbit coupling and inter-particle Coulomb repulsion are very strong? While SOC alone can change the topology of the single particle insulating state, even short range on-site repulsion by itself can give rise to a Mott insulator - one of the most mysterious and thought provoking phases in solid state physics. In this seminar I will talk about the behaviour of quasiparticles in a frustrated Mott insulator in the presence of strong spin-orbit coupling. Using ultrafast optical spectroscopy to study Na₂IrO₃ we found that the low energy properties of non-equilibrium charged quasiparticles are almost entirely determined by their interaction with the magnetic background. We observe that the behaviour of photo-doped electrons and holes is drastically different in the magnetically ordered and disordered phases. While in the ordered phase the spin correlations just renormalize the effective mass of the quasiparticles, in the latter they give rise to an effective attraction between charged excitations which grows with distance causing them to become trapped within a bound state in a far going analogy with quark confinement inside hadrons.

Monday, January 30, 2016

4:10 p.m.

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Prof. Chong-Yu Ruan - Host