

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"The Mott transition and the pseudogap phase in organic and cuprate superconductors: a quantum cluster theory perspective"

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Abstract: Despite many years of intense research many electronic properties of cuprate and layered organic superconductors, k -(BEDT-TTF) $_2$ X, remain a theoretical challenge. One important example is the pseudogap phase which has been identified in angular resolved photoemission spectroscopy (ARPES) experiments through a characteristic suppression of spectral density around the antinodal direction at the Fermi surface. Understanding the origin of the pseudogap phase may be relevant for unveiling the mechanism of cuprate and organic superconductivity.

In this talk, I will describe recent analysis of the electronic properties of the single-band Hubbard model on a square and anisotropic triangular lattice relevant to cuprate and organic materials, respectively. Using the dynamical cluster approximation (DCA) we find that, as the Coulomb repulsion is increased, electrons around the antinodal point open a pseudogap in the spectral density whereas electrons in the nodal region display a quasiparticle-like peak in agreement with ARPES. We discuss the origin of the characteristic destruction of quasiparticles on some parts of the Fermi surface found in quantum cluster theories of the Mott transition. Geometrical and doping effects on the Mott transition and the pseudogap will be addressed in the context of cuprate and organic materials.

[1] J. M. and O. Gunnarsson, Phys. Rev. B 89, 245130 (2014); arXiv1310.4597.

[2] O. Gunnarsson, T. Schaefer, J. P. F. LeBlanc, E. Gull, J. M., G. Sangiovanni, G. Rohringer, and A. Toschi, PRL 114, 236402 (2015).

12:00pm
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