

ICTS Seminar

Title : Role of quantum fluctuations in the t-J model: Implications for cuprates

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Time : 11:00 AM

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : The physics of strongly correlated electron systems is among the central problems of condensed matter physics. One of the outstanding problems in this category is that of the high- T_c superconductivity in insulating parent materials like some layered copper oxides (cuprates). Early experimental and theoretical studies had revealed that for much of the doping range of interest, in the zero temperature limit, the cuprates are d-wave superconductors. However, it has now been realized that underdoped cuprates can support node-less superconductivity. At the same time, early experiments on cuprates had also found that these materials don't break time reversal symmetry. Here again, recent improved experiments reveal clear signatures of microscopic time reversal symmetry breaking, manifesting in a non-zero Polar Kerr Effect (PKE) signal. In this talk we shall aim to discuss the role of quantum fluctuations in the canonical t-J model, and how it may provide the scope for understanding some of these newly discovered features of the cuprates. In particular, we shall present the results of a fluctuation-consistent theory of the t-J model at zero temperature, wherein, we find a d-SC to d + is-SC transition at a doping of ~ 0.12 holes per unit cell, as one moves from the overdoped to the underdoped region. The similarities and differences of these results from those obtained using cluster extensions of DMFT for the t-J model will also be highlighted.