

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"The mechanism for superconductivity in slightly doped strontium titanate"

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Abstract: Doped strontium titanate becomes superconducting at a density as low as $n = 5 \times 10^{17} \text{ cm}^{-3}$, where the Fermi energy is orders of magnitude smaller than the longitudinal-optical-phonon frequencies. In this limit the only optical mode with a frequency which is smaller than the Fermi energy is the plasmon. In contrast to metals, the interaction strength is weak due to screening by the crystal, which allows the construction of a controllable theory of plasmon superconductivity. We show that plasma mediated pairing alone can account for the observed transition temperatures if the screening by the crystal is reduced in the slightly doped samples compared with the insulating ones. This mechanism can also explain the pairing in the two-dimensional superconducting states observed at surfaces and interfaces. We also discuss a unique experimental signature of the plasmon mechanism, which appears in the tunneling density of states above the gap.

12:00pm
Tuesday, May 10, 2016
Duboc Room (4-331)