Speaker: Giuliano Chiriacò

Affiliation: ICTP

Title: Understanding the non equilibrium phase transition in strongly correlated ruthenates: heating and Peltier effects

Abstract: Current-driven insulator-metal transitions are in many cases driven by Joule heating proportional to the square of the applied current. Recent experiments in Ca2RuO4 reveal that the non equilibrium transition can be induced by a small current and that the metal-insulator phase boundary depends on the direction of the applied current, suggesting an important non-heating effect. We investigate the effects of an electric current in a system containing interfaces between metallic and insulating phases using a general model. We derive a heat balance equation from the Onsager transport theory and in addition to the usual Joule heating effect, we find a heating term proportional to the product of the current across the interface and the discontinuity in the Seebeck coefficient, so that heat can either be generated or removed at an interface, depending on the direction of the current relative to the change in material properties. For parameters appropriate to Ca2RuO4, this heating can be comparable to or larger than Joule heating. A simplified model of the relevant experimental geometry is shown to provide results consistent with the experiments

---