physics University of Maryland

NAM center for nanophysics and advanced materials

Condensed Matter Colloquium

Thursday, February 27, 2014

2 pm, Room 1201

Aditi Mitra

New York University

Quench Dynamics in interacting field-theories

Due to experiments in cold-atomic gases, the study of quantum quenches has become an active topic of research. While many rigorous results exist for exactly solvable "free" theories, not much is known about the effect of non-linearities, especially at long times and for systems in the thermodynamic limit, where numerical studies are challenging. In this talk, in order to highlight the main questions, I will first present results for a quench in an exactly solvable theory, namely the Luttinger model. I will then present results for the effect of various non-linearities such as a commensurate periodic potential and a local back-scattering potential. I will show that the dynamics following a quench can be quite complex by being characterized by three regimes. One is a short time perturbatively accessible regime which depends on microscopic parameters, the second is an intermediate time prethermalized regime where inelastic effects are weak and correlation functions can show universal scaling behavior which is quantified by a nonequilibrium generalization of the Callan-Symanzik equations. The third is a long time regime where inelastic effects become important. For the case of the commensurate periodic potential, I will show that these inelastic effects cause the system to eventually thermalize, where the thermalization time depends in a non-monotonic way on the quench amplitude.

Refreshments served at 1:30 in Room 1305F