

## **ICTS Skype Seminar**

- Title : Dynamics of few-mode Bose-Hubbard systems
- Speaker : Amit Dey, Ben-Gurion University of the Negev, Israel
- Date : Friday, July 27, 2018
- Time : 11:30 AM
- Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore
- Abstract : Few-mode Bose-Hubbard (BH) systems have immense importance in several phenomena, such as Josephson oscillations of BEC, macroscopic self-trapping, emergence of thermodynamics and appearance of chaos in small systems, etc.

In a two-dimensional BH spinor lattice with weak nearest-neighbour interaction and no particle transfer between adjacent sites, we investigate the spreading of energy from an initially excited site into the rest of the lattice. Beyond a critical on-site interaction, lower excitation spreads over the lattice, while higher excitations remain self trapped. This forms localized energy breather and soliton. In addition to the localization of excitations, it shows that the one-particle entropy can also be localized, resulting new structures of 'heat solitons'. Besides having importance from thermodynamic perspective, these structures would be important for dissipationless quantum-mechanical architectures in experimentally realizable settings.

In a BH trimer operating as stimulated Raman adiabatic passage (STIRAP), we study its efficiency in the presence of nonlinear interactions. Contrary to the prevailing dogma, we show that the breakdown of adiabaticity is not related to the destruction of energetic stability, but to the emergence of chaotic stages. Surprisingly, faster sweep, rather than slow variation of parameters, overcomes such quasi-stochastic motion and restores adiabaticity.