

Survey No. 36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy Dist., Hyderabad - 500 046

## Seminar

## Anomalous statistics of laser-cooled atoms in dissipative optical lattices

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Diffusion occurs in numerous physical systems throughout nature, drawing its generality from the universality of the central limit theorem. Approximately a century ago it was realised that an extension to this type of dynamics can be obtained in the form of "anomalous" diffusion, where distributions are allowed to have heavy power-law tails. Owing to a unique feature of its momentum-dependent dissipative friction force, laser-cooled atomic ensembles can be used as a test bed for such dynamics. The interplay between laser cooling and anomalous dynamics bears deep predictive implications for fundamental concepts in both equilibrium and nonequilibrium statistical physics. The high degree of control available in cold-atom experiments allows for the parameters of the friction to be tuned, revealing transitions in the dynamical properties of the system. Rare events in both the momentum and spatial distributions are described by nonnormalised states using tools adapted from infinite ergodic theory. This leads to new experimental and theoretical results that illuminate the various features of the system.

Tuesday, Jan 20<sup>th</sup> 2026 16:00 Hrs (Tea / Coffee 15:45 Hrs) Auditorium, TIFRH