Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Students' Annual Seminar

Low-Frequency Vibrations and Local Elastic Moduli in Amorphous Solids

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Amorphous solids, in contrast to crystals which are well-described by the Debye model, display anomalous mechanical and thermal properties arising from an excess of low-frequency modes over the Debye prediction. Recent simulation studies have revealed that these low-frequency vibrations are non-universal: depending on the system size, annealing protocols, as well as boundary conditions.

In this talk, I will discuss how stress fluctuations in the ensemble influence the observed density of states in amorphous solids. Theoretical frameworks attempting to explain these low-frequency vibrations often model amorphous solids as an elastic medium with short-ranged correlated heterogeneous local elastic moduli. However, simulation results frequently contradict predictions made by such theories, suggesting the potential existence of long-range correlations in local moduli. We explore these correlations by employing a measurement protocol based on macroscopic strain-based measurements and find strong evidence for long-range correlations in local moduli. In particular, local shear moduli correlations are characterised by pinch-point singularities in Fourier space in the small wavenumber limit.

Wednesday, Mar 27th 2024

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Seminar Hall, TIFR-H