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

Seminar

Topological charge excitations and Green's function zeros in paramagnetic Mott insulator

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Band topology in single-electron systems relies on Bloch eigenstates to identify and classify topological properties. However, in correlated systems, the key topological features are reflected in the Green's functions. While the poles of two-point Green's functions, representing quasiparticles, have been the primary focus, strongly correlated electrons also harbour Green's function zeros. By treating electrons as a combination of holon and doublon excitations in the strong correlation regime, we use the composite operator formalism to explore topology in correlated systems. We investigate the emergence of topological features in the charge quasiparticles of Mott insulators in the Chern-Hubbard model. The Green function zeros manifest as the tightly bound pairs of such elementary excitations of the Mott insulators. Our analysis examines the winding number associated with the occupied Hubbard bands (poles) and the band of Green's function zeros. We show that both the poles and zeros show gapless states and zeros, respectively, in line with bulk-boundary correspondence. The gapless edge states emerge in a junction geometry connecting a topological Mott band insulator and a topological Mott zeros phase. These include an edge electronic state that carries a charge and a charge-neutral gapless zero mode.

Monday, Feb 24th 2025

14:30 Hrs (Tea / Coffee 14:15 Hrs)

Auditorium, TIFRH