



ICTS Synopsis Seminar

Title : Chaos, dynamics, and transport in isolated and open systems

Speaker : Tamoghna Ray (ICTS-TIFR, Bengaluru)

Date : Monday, 22 June 2026

Time : 11:00 AM (IST)

Abstract : Recent advances in experimental quantum platforms, including cold atoms, trapped ions, superconducting qubits, and cavity QED systems, have enabled unprecedented experimental control over interacting quantum systems, making it possible to directly probe fundamental questions about chaos, entanglement, and transport at the quantum level. This talk addresses two such themes: the emergence of chaos in dissipative quantum systems and the nature of quantum dynamics and transport in many-body settings. The first part investigates quantum chaos in open systems. Using the dissipative Dicke model, we demonstrate that quantum bath fluctuations, in addition to dissipation, can generate a strange attractor with fractal dimension and a positive Lyapunov exponent in an otherwise classically regular phase space, with deep connections to shear-induced chaos. We further use the Tavis-Cummings dimer to probe classical-quantum correspondence, uncovering links between self-trapping, integrability, and chaos via random matrix theory diagnostics. The second part addresses quantum dynamics and transport. We study entanglement dynamics in the XXZ spin- $1/2$ chain, finding Page curve like behaviour with power-law growth rates sensitive to initial conditions and presence of integrability-breaking interactions, and draw connections between entanglement and Boltzmann entropy. We also show that in such setups, magnon bound states govern the power-law decay of return probability.

Venue : Feynman Lecture Hall

Zoom link: <https://icts-res-in.zoom.us/j/96535686191?pwd=DaIOAQUZLJgocAXtsEOplWprELR8ab.1>

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