



Seminar, Department of Physical Sciences, Bose Institute, Kolkata



Entanglement witness for Quantum Gravity Prof. Anupam Mazumdar, Canadian Institute for Theoretical Astrophysics (CITA), Toronto

Abstract: Although quantum gravity is widely studied in theory, it has no empirical evidence yet. This makes "Is gravity quantum?" one of the most important open questions of our time. I will discuss an ambitious idea, "spin entanglement witness for quantum gravity," to test the quantum nature of gravity in a lab with my collaborators. It exploits quantum information ideas and combines a quantum spin with cooling/trapping quantum technologies. It entangles two neutral quantum masses solely through their gravitational interaction, while mitigating other interactions, e.g., electromagnetic (EM) interactions between the masses. It proves the quantum nature of gravity, as classical gravity cannot mediate quantum correlations (entanglement). The potentially realisable protocol requires meeting a rich set of challenges: mitigating the EM interactions and background, creating spatial quantum superpositions for massive objects, and measuring spin correlations to witness the entanglement. We must also protect the quantum superpositions from heating, blackbody radiation, acceleration, seismic and gravity-gradient noise.

- **Date/time: October 05, 2026 (Monday) at 03:00 PM**
- **Venue: Room 204, Physics Seminar Room, (Second floor, UAC, BI)**