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

Seminar

Detecting single gravitons and probing their acoherence with quantum sensing

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The quantisation of gravity is widely believed to result in gravitons -- particles of discrete energy that populate gravitational waves, however, their detection has so far been considered impossible. Our recent works have shown that signatures of single graviton exchanges between matter and gravitational waves can be observed in laboratory experiments. Stimulated and spontaneous single-graviton processes can become relevant for massive quantum acoustic bar resonators, where the stimulated absorption of single gravitons can be resolved through continuous sensing of quantum jumps. In analogy to the discovery of the photo-electric effect for photons, such signatures can provide the first experimental clue of the quantisation of gravity. Simple statistical tests can also be done to observe departures from a coherent state description (Poissonian statistics) for the gravitational radiation, which would further implicate quantum theory.

References:

[1] Germain Tobar*, Sreenath K. Manikandan*, Thomas Beitel, and Igor Pikovski. "Detecting single gravitons with quantum sensing."Nature Communications 15, 7229 (2024)
[2] Sreenath K. Manikandan and Frank Wilczek, Detecting Acoherence in Radiation Fields, ArXiv 2409.20378 (2024)

Tuesday, Jan 28th 2025

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

Auditorium, TIFRH