S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES
Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Department of Astrophysics and High Energy Physics

24th March,2023 **3.00 PM** **ONLINE/ FERMION**

SPEAKER

Dr. Debarshi Das,
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TITLE OF THE TALK

Mass-independent test of genuine quantumness of massive objects

ABSTRACT

Search for empirically implementable schemes that can evidence the nonclassicality of large masses is a quest currently attracting considerable research. Motivated by this, we investigate the quantum violation of the pivotal classical notion of macrorealism (MR) for arbitrary masses in a harmonic potential. To this end, we use two standard tools for probing the violation of MR, namely the two-time Leggett-Garg inequality (LGI) and the no-signalling in time (NSIT) condition, but crucially, modify them to the case of two different measurement arrangements at successive times. This yields a striking result: a mass-independent violation of MR is possible, thereby providing a mass-independent demonstration of an irreducible quantumness of macroscopic objects. In fact, our adaptation of LGI and NSIT enables probing quantum violations for literally any mass, momentum, energy and frequency. Our proposed test of MR can in principle be realised with a large range of harmonic oscillator systems from atomic ions to mirrors in LIGO, while the uncertainties in the measurements for large masses can be offset by decreasing the angular frequency, suggesting that for such systems MR test can be performed based on existing experimental technology.

HOST FACULTY

Prof. Archan S Majumdar
Dept. of ASTROPHYSICS AND HIGH ENERGY PHYSICS

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