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

Seminar

Quantum Amplified Metrology

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It is now well appreciated that quantum physics can be used to build better sensors. Such sensors can be based on unitary systems [1,2] like various types of interferometers or open systems based on scattering and lossy transmission channels [3,4]. The framework of the quantum Fisher information enables one to obtain best estimates of the parameters and then one can design experiments that can reach Cramer-Rao bounds. I would highlight not only the importance of the quantum states used as probes, but also the importance of the quantum-ness of the measurement schemes. I would bring out the especial importance of the squeezed states of matter and light for sensing studies. I would illustrate the results with two experiments on quantised motion of trapped ions [1,2] and on quantum advantage in absorption and scattering [3,4] using intensity squeezed beams of light.

References:

[1] S. C. Burd et al., Quantum amplification of mechanical oscillator motion, Science 364, 1163 (2019).
[2] G. S. Agarwal, and L. Davidovich, Quantifying quantum-amplified metrology via Fisher information, Phys. Rev. Res. 4, L 012014 (2022).
[3] J. Wang, L. Davidovich, and G. S. Agarwal, Quantum sensing of open systems: Estimation of damping constants and temperature, Phys. Rev. Res. 2, 033389 (2020).
[4] F. Li, T. Li, M. O. Scully, and G. S. Agarwal, Quantum advantage with seeded squeezed light for absorption measurement, Phys. Rev. Applied 15, 044030 (2021).

Monday, July 4th 2022

04:00 PM

Venue: Auditorium