



QuanTalks

IISc Quantum Technologies Initiative (IQTI) Seminar Series



Title

Quantum Amplified Metrology

Speaker

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Meeting Link

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Date & Time

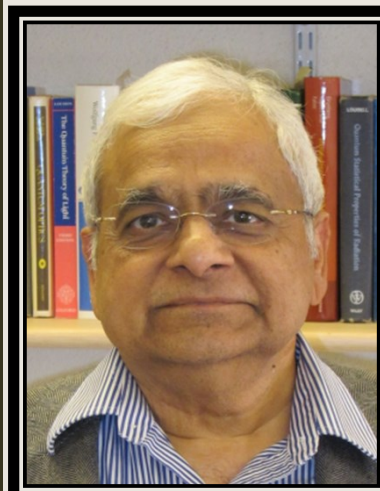
Wednesday,
13th July 2022, 2 30 PM (IST)

Venue

Physics Dept. Auditorium,
Indian Institute of Science,
Bangalore

Abstract: 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 experiments on quantized motion of trapped ions [1,2] and on quantum advantage in absorption and scattering [3,4] using intensity squeezed beams of light. Further I would demonstrate how parametric devices, which produce squeezed states, can be used to enhance cavity mediated interactions.

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).



Author Biography: Girish S Agarwal, University Distinguished Professor at Texas A&M University; specializes in quantum optics and is the author of "Quantum Optics" published by the Cambridge University Press. His work is widely followed with an h index of 97 with more than 36000 citations. He has been recognized by a large number of awards, including the Max-Born Prize from the Optical Society of America in 1988, The C.H.Townes medal of the Optical Society of America (2022), the physics prize of the World Academy of Sciences (1994), the Humboldt Research Award (1997) of Germany. He was elected Fellow of the Royal Society UK in 2008 and is a fellow many other academies and societies.

https://en.wikipedia.org/wiki/Girish_Saran_Agarwal