Multiparameter Heisenberg Scaling in Arbitrary Optical Networks with Limited Squeezed Resources

V Tamma[1]

[1] *University of Portsmouth, 47 Gains Road, Portsmouth, UK. Contact Phone: ++447519292937*
Contact Email: vincenzo.tamma@port.ac.uk

Simultaneous estimation of multiple parameters is a central task in quantum metrology, distributed sensing, and the calibration of large photonic interferometers. I will show novel quantum interference techniques with squeezed light for the measurements with Heisenberg-scaling sensitivity of multiple parameters in linear optical networks [1–4]. I will also demonstrate the Heisenberg-scaling characterization of an arbitrary two-channel network via two-port homodyne de- tection and two-mode squeezed sources [5,6]. I will finally show the geometric bounds on multiparameter Heisenberg scaling for arbitrary M-mode networks with limited squeezed resources [7].

Applications can range from environmental sensing to high-precision biomedical imaging, characterization of nanomaterials, navigation, gravity tests and quantum networks of high-precision clocks.

References

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