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Quantum metrology with squeezed states

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Abstract

Quantum resources, as entanglement and squeezing, are powerful tools exploitable to reach high-sensitive measurements of parameters describing physical systems [1]. Within the range of optical systems, the parameter is typically encoded in a passive interferometer probed by photons, and its value is estimated by measuring the probes at the output. Several quantum metrology problems have been largely studied and a few approaches have been proposed to reach Heisenberg scaling sensitivity in the estimation of the unknown parameter[2]. Ultimately, a common drawback in these prescriptions based on interferometers with more than two channels, is that the input states, or the measurement at the output, or both, strongly depend on the value of the parameter, making them impossible to reproduce in laboratory without an adaptive approach or a-priori knowledge of the parameter to infer. We study a procedure to estimate with high precision the parameter of interest encoded in an arbitrary linear optical interferometer, by using only squeezed states as probes. Our procedure can reduce or eliminate the need for an adaptive approach.

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