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Title: Estimation of the Wigner distribution of single-mode Gaussian states

Other Titles: A comparative study

Authors: Kumar, Chandan (/jspui/browse?type=author&value=Kumar%2C+Chandan)

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Abstract: In this work, we consider the estimation of single-mode Gaussian states using four different measurement schemes, namely, (1) homodyne measurement, (2) heterodyne measurement, (3) sequential measurement scheme, and (4) the Arthurs-Kelly measurement scheme, with a view to compare their relative performance. To this end, we work in the phase space formalism, specifically at the covariance matrix level, which provides an elegant and intuitive way to explicitly carry out the involved calculations. We show that the optimal performance of the Arthurs-Kelly and sequential measurement schemes is equal to the heterodyne measurement. While the heterodyne measurement outperforms the homodyne measurement in the mean estimation of squeezed state ensembles, the homodyne measurement outperforms the heterodyne measurement for variance estimation of squeezed state ensembles up to a certain range of the squeezing parameter. We then modify the Hamiltonian in the Arthurs-Kelly measurement scheme, such that the two meters can have correlations and show that the optimal performance is achieved when the meters are uncorrelated. We expect that these results will be useful in various quantum information and quantum communication protocols.

Description: Only IISER Mohali authors are available in the record.


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