Title:	Realistic non-Gaussian-operation scheme in parity-detection-based Mach-Zehnder quantum interferometry
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Abstract:	We theoretically analyze phase sensitivity using a parity-detection-based Mach-Zehnder interferometer (MZI) with the input states generated by performing non-Gaussian operations, viz., photon subtraction, photon addition, and photon catalysis, on a two-mode squeezed vacuum (TMSV) state. Since these non-Gaussian operations are probabilistic, it is of utmost importance to take the success probability into account. To this end, we consider a realistic model of photon subtraction, addition, and catalysis and derive a single expression of the Wigner function for photon subtracted, added, and catalyzed TMSV states. The Wigner function is used to evaluate the lower bound on the phase sensitivity via quantum Cramér-Rao bound and parity-detection-based phase sensitivity in the MZI. We identify the ranges of squeezing and transmissivity parameters where the non-Gaussian states provide better phase sensitivity than the TMSV state. Taking the success probability into account, it turns out that the photon addition is the most advantageous among all three non-Gaussian operations. We hope that the generalized Wigner function derived in this paper will be useful in various quantum information protocols and state characterization.
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