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Optimization of States in a Lossy Interferometer BLANE MCCRACKEN, TAE-WOO LEE, SEAN D. HUVER, LEV KAPLAN, HWANG LEE, CHANGJUN MIN, DMITRY B. USKOV, CHRISTOPH F. WILDFEUER, GEORGIOS VERONIS, JONATHAN P. DOWLING, Louisiana State University — We have utilized a genetic algorithm to determine the minimum possible phase sensitivity in a lossy interferometer, and the corresponding quantum states that yield this optimization. The setup involves an arbitrary source with a finite number of photons which is sent through the two lossy arms of the interferometer. The detection process passes the two arms through a beam splitter and measures the output with number resolving detectors. The detection probability is used in calculating the Fisher information and minimum phase sensitivity of the interferometer. The optimization parameters consisted of relative phase shift between the arms of the interferometer in addition to input state amplitude and phase coefficients. We found that maintaining no loss in the control arm of the interferometer increases phase sensitivity for all values of loss in the target arm. Although no single state is optimally phase sensitive over the entire regime of loss, the optimum sensitivity as a function of loss for any number of photons has a nearly identical exponential dependence in the high loss regime.

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