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Optimal phase estimation using photon number counting in the presence of dephasing noise KAUSHIK SESHADREESAN, BHASKAR ROYBARDHAN, HWANG LEE, JONATHAN DOWLING, Louisiana State University, QUANTUM SCIENCE AND TECHNOLOGIES GROUP TEAM — We study interferometric phase estimation in the presence of dephasing noise. We show that photon number counting and photon number parity measurement achieve the quantum Cramer-Rao bound of the optimal cosine state. Furthermore, we show that, when operated using a Bayesian update protocol, photon counting saturates the bound independently of the actual value of the unknown phase, thereby allowing for globally optimal phase estimation. We also show that both photon counting and parity measurement achieve the quantum Cramer-Rao bound of all path-symmetric probe states (a class which includes the optimal cosine state) in the presence of dephasing noise.

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