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Quantum Cramer-Rao Bound for M&M' States with Lossy Interferometers YI WENG, MOOCHAN B. KIM, HWANG LEE, JONATHAN P. DOWLING, Louisiana State University Physics & Astronomy, HEARNE INSTITUTE FOR THEORETICAL PHYSICS TEAM — Understanding limits on interferometers performance is fundamental to quantum metrology. The standard quantum limit was considered as the fundamental limitation on measurements made with light beams for long. Using non-classical states of light, this precision can be improved to the Heisenberg limit. Unfortunately, highly correlated quantum states of light are very fragile with respect to noise. In 2008, Huver introduced a path-entangled number state known as M&M' state, $\left|M :: M'\right\rangle_{a,b} = \left(\left|M, M'\right\rangle_{a,b} + \left|M', M\right\rangle_{a,b}\right)/\sqrt{2}$, which is more robust to loss than N00N states possessing all photons in either mode. In this talk, we give a detailed discussion of quantum states for optical two-mode interferometers with definite photon number in the presence of photon losses. We calculate an expression for the quantum Fisher information as well as the Quantum Cramer-Rao Bound for optical two-mode Interferometers of M&M' states with loss.

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