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Quantum metrology in a multiport linear optical interferometer WENCHAO GE, MICHAEL FOSS-FEIG, KURT JACOBS, US Army Research Lab — Quantum metrology explores the benefits of quantum coherence and entanglement for making precision measurements. Here we study the ability of a network of beam-splitters and phase shifters (a "multiport linear optical interferometer") to perform phase metrology using separable input states. Even though such linear networks are able to generate complex entangled states, we show that when each input is an arbitrary Fock state they are not able to achieve Heisenberg scaling in the number of input modes. This result suggests that there is a sense in which linear networks, and more generally linear dynamics, cannot produce metrologically useful entanglement from separable inputs. This result also raises further questions about the nature of the entanglement that can be generated by linear dynamics, and the types of non-classical input states required to generate metrologically useful entanglement.

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