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Quantum metrology with non-Gaussian spin states

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The well-known spin squeezing coefficient efficiently quantifies the sensitivity and entanglement of Gaussian states [1,2]. However, this coefficient is insufficient to characterize the much wider class of non-Gaussian quantum states that can generate even larger sensitivity gains. In this talk, we present a non-Gaussian extension of spin squeezing based on reduced variances of nonlinear observables that can be optimized under relevant constraints [3]. We determine the scaling of the sensitivity enhancement that is made accessible from increasingly complex quantum states generated by one-axis-twisting in the presence of relevant noise processes [4,5]. Our analytical results provide recipes for optimal non-Gaussian spin squeezing in atomic experiments.

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