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Enhancing spin squeezing using weak measurement MINGFENG WANG, WEIZHI QU, PENGXIONG LI, HAN BAO, YANHONG XIAO, Fudan University — Spin squeezed states (SSS) are recognized as the key resource for precision measurements and quantum information processing. So far, the generation of such states is mainly based on quantum nondemolition (QND) measurement, which creates the degree of squeezing $1/(1+\kappa^2)$, where κ is the coupling strength between light and atoms. In realistic systems, the coupling strength is often limited to a small value. Here we propose a novel scheme to enhance the coupling strength (and thus the spin squeezing) by using the weak measurement technique. We show that spin-spin entanglement can be greatly enhanced by properly post-selecting the final state of the photon that interacts with atoms via off-resonant Faraday interaction. Our calculation shows that strongly squeezed spin states can be created with presently available techniques.

Yanhong Xiao
Fudan University

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