Coherently Excited Superresolution for Scalable Quantum Sensors

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Quantum sensing has been extensively studied over the last decade to beat classical sensors limited by the shot-noise limit. Due to the exponential drop of N00N states for the order N, however, practical applications of quantum sensing have been severely limited. Not only the impractical order N but also the photon loss-based quantum disadvantage is another problem to overcome. Here, a macroscopic quantum sensing method is introduced for superresolution whose feature is not limited by either photon loss or generation inefficiency but coherently manipulated quantum advantage with practically infinite order N. Moreover, the superresolution satisfying the Heisenberg limit is compatible with conventional interferometer-based sensors. Experimental proofs are accompanied.

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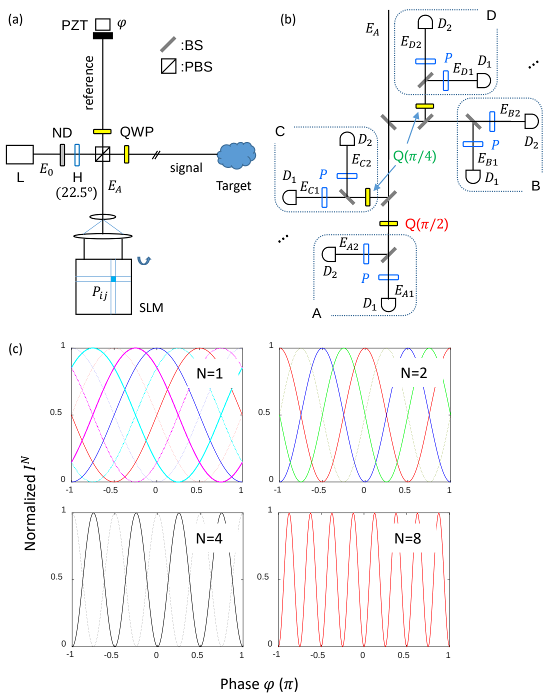

Figure 1: Coherently excited superresolution. (a) A remote sensing scheme. (b) Scalable quantum sensors. (c) Numerical simulations for (b)