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Superresolution at the quantum limit with coherent light and a homodyne-based parity detection scheme KAUSHIK SESHADREESAN, Louisiana State University, PETR ANISIMOV, Stony Brook University, HWANG LEE, JONATHAN DOWLING, Louisiana State University — We study a simple interferometric scheme that uses coherent light and a quantum inspired detection strategy based on the measurement of the parity of photon number in one of the output modes. The scheme provides sub- Rayleigh resolution while still operating at the shot noise limit in terms of the detected photon power. Although the parity observable can be implemented using photon number resolving detectors, accurate and efficient photon number resolution at large photon numbers becomes difficult. Alternatively, we show that the super-resolving parity signal can be inferred from a simple homodyne based measurement of the quadratures of the output coherent light, also at the shot noise limit. Due to its inherent simplicity and effectiveness, the scheme can potentially be used to improve existing technologies in satellite imaging and remote sensing such as in quantum laser radar (LADAR), where atmospheric absorption forbids the use of nonclassical states of light for any quantum enhancement and renders coherent light interferometry as the optimal choice.

Kaushik Seshadreesan
Louisiana State University

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