Towards superresolution surface metrology: Quantum estimation of angular and axial separations

Martedì 29 Maggio alle 15:30 presso l'aula E del Dipartimento di Fisica e Chimica, via Archirafi 36

Prof. Gerardo Adesso,
University of Nottingham https://arxiv.org/abs/1805.04116

Abstract. We investigate localization of two incoherent point sources with arbitrary angular and axial separations in the paraxial approximation. By using quantum metrology techniques, we show that a simultaneous estimation of the two separations and of the two corresponding coordinates of the centroid is achievable by a single quantum measurement, with a precision saturating the ultimate limit stemming from the quantum Cramer-Rao bound. Such a precision is not degraded in the sub-wavelength regime, thus overcoming the traditional limitations of classical direct imaging derived from Rayleigh's criterion. Our results are qualitatively independent of the point spread function of the imaging system, and quantitatively illustrated in detail for the Gaussian instance. This analysis may have relevant applications in three-dimensional surface measurements.