

Multimode Quantum Optics

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-1) What is a mode?

The double linearity of Quantum Optics (Maxwell equations+ Schrodinger equation)

Modes and mode basis. Quantization in different mode bases.

- 2) Intrinsic properties of multimode states

Mode-dependent and mode-independent quantum properties. Intrinsic single mode state, intrinsic mode number. minimum mode basis, or "super-mode basis". Case of multimode Gaussian states

-3) Characterization of multimode quantum states

Mode projection by homodyne detection. Extraction of the supermode basis in different situations : spatial, temporal, spectral

-4) Measurements and parameter estimation with multimode states

Illumination and detection mode. Quantum Cramer-Rao bound for Gaussian multimode states and how to reach it

The different parts will be illustrated by experimental examples