Quantum Physics

Optomechanical devices, entanglement and teleportation

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In this thesis we study continuous variable systems, focusing on optomechanical devices where a laser field interacts with a macroscopic mechanical oscillator through radiation pressure. We consider the optimization problem of quantum teleportation by means of Gaussian local operations and we study the relation between the amount of entanglement shared by Alice and Bob and the maximum fidelity they can reach for the teleportation of coherent states. We also theoretically predict the possibility of creating a robust entaglement between a mechanical mode of a Fabry-Perot mirror and the Stokes sidband of the output field. We show that by driving two different optical modes supported by the cavity, a stable steady state is reachable in which the optomechanical entanglement is significantly improved.

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