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Quantum repeater for continuous-variable entanglement distribution

Josephine Dias

Okinawa Institute of Science and Techology

Abstract

Quantum communication enables various technological possibilities that are hard or impossible with classical communication. These include secure distribution of keys, transfer of quantum information and distributed quantum computation and sensing. However, utilizing these technologies over long distances remains challenging due to fiber loss or free-space attenuation. Quantum repeaters have been proposed as a way of extending the reach of quantum communication. First- generation approaches use entanglement swapping to connect entangled links along a long-distance channel. While repeaters for discrete variable encodings of quantum information have existed for some time, several approaches for continuous variable encoding quantum repeaters have been proposed within the last five years. In this talk, I will introduce our approach to a quantum repeater for continuous variables using homodyne detection with post-selection for entanglement swapping and noiseless linear amplification for entanglement distillation. I will also present a method of using a discrete variable repeater protocol to distribute continuous variable states and utilize it to compare the rates of continuous variable entanglement distribution between first generation continuous and discrete variable quantum repeaters. Such a comparison allows us to begin to benchmark the two quite different approaches.