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(I) Bosonic quantum interface: characterization, engineering, and application

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Bosonic quantum systems, such as photons, mechanical oscillators and spin ensembles, are promising platforms for implementing quantum technologies. Operating these quantum devices inevitably require interfaces that couple multiple bosonic degrees of freedom (modes). Unfortunately, each platform suffers from respective practical restrictions that limit the type of interface being implemented. In this talk, I will present our recent work in characterizing and engineering general two-mode bosonic interface. I will first introduce a set of unified physical parameters that uniquely specify every interface under single-mode operational constraints. Then I will illustrate an optimal, systematic strategy to engineer arbitrary interface by cascading multiple rounds of fixed, possibly platform restricted, interfaces. If time permits, I will also discuss how the interfaces are applied in quantum information processing.

Keyword-1

Hybrid quantum system

Keyword-2

Quantum information processing

Keyword-3

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