

Topological Quantum Optics for robust photon mediated interactions

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Abstract

Quantum emitters interacting with photonic band-gap materials lead to the appearance of localized and non-decaying polariton excitations that have been labeled as qubit-photon bound states [1]. These states can mediate decoherence-free tunable emitter-emitter interactions. Recently, it has been shown that when these band-gaps have a topological origin, these interactions inherit certain robustness to disorder. In this talk, I will give an overview of robust photon-mediated interactions in different photonic environments, like the photonic SSH model [2] and the extended SSH models displaying long-range hoppings [3]. I will also discuss the tunability of these interactions through non-local light-matter couplings that can be obtained with giant atoms.

References

- [1] S. John et al.; Physical Review Letters (1990), vol. 64 no 29, p.2418
- [2] M. Bello et al.; Science advances (2019), vol. 5, no 7, p. eaaw0297.
- [3] C. Vega et al.; arXiv preprint, arXiv: 2105.12470 (2021).