



Contribution ID: 8

Type: **Talk**

Harnessing quantum emitter rings for efficient energy transport and trapping

Thursday, 9 May 2024 11:00 (30 minutes)

Efficient transport and harvesting of excitation energy under low light conditions is an important process in nature and quantum technologies alike. Here we formulate a quantum optics perspective to excitation energy transport in configurations of two-level quantum emitters with a particular emphasis on efficiency and robustness against disorder. We study a periodic geometry of emitter rings with subwavelength spacing, where collective electronic states emerge due to near-field dipole-dipole interactions. The system gives rise to collective subradiant states that are particularly suited to excitation transport and are protected from energy disorder and radiative decoherence. Comparing ring geometries with other configurations shows that the former are more efficient in absorbing, transporting, and trapping incident light. Because our findings are agnostic as to the specific choice of quantum emitters, they indicate general design principles for quantum technologies with superior photon transport properties and may elucidate potential mechanisms resulting in the highly efficient energy transport efficiencies in natural light-harvesting systems.

Abstract category

Quantum Optics

Primary author: HOLZINGER, Raphael (Institute for Theoretical Physics, University of Innsbruck)

Co-authors: Prof. RITSCH, Helmut (Institute for Theoretical Physics, University of Innsbruck); Mr PETER, Jonah (Harvard University); Dr OSTERMANN, Stefan (Harvard University); Prof. YELIN, Susanne (Harvard University)

Presenter: HOLZINGER, Raphael (Institute for Theoretical Physics, University of Innsbruck)

Session Classification: Talks