Abstract Submitted
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Loss-tolerant photonic cluster state generation for one-way quantum repeaters[1] YUAN ZHAN, SHUO SUN, JILA and University of Colorado Boulder — By encoding qubits into specific types of photonic cluster states, one can realize one-way quantum repeaters that enable fast entanglement distribution rate approaching classical communication. However, the generation of these photonic cluster states requires a formidable resource overhead using traditional approaches based on linear optics and fast feedforward. To overcome this challenge, we propose a scheme to deterministically generate tree-like photonic cluster states with a single quantum emitter [1]. Photonic entanglement is established through both emission and re-scattering from the same emitter, enabling fast and resource-efficient entanglement generation. In addition, we quantitatively analyze the one-way repeater performance based on the repeater graph states and the tree states, respectively. We compare the performance between our generation scheme and previous works using ancillary quantum memories, and identify the optimal scheme at different system parameters. Our results constitute an important scheme for loss-tolerant photonic cluster state generation with feasible resources, and lay out the parameter requirements for future experimental realizations of one-way quantum repeaters. [1] Y. Zhan and S. Sun, Phys. Rev. Lett. 125, 223601 (2020)

[1]Loss-tolerant photonic cluster state generation for one-way quantum repeaters

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