

Excitation injector in an atomic chain: Long-ranged transport and efficiency amplification

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We investigate the transport of energy in a linear chain of two-level quantum emitters ("atoms") weakly coupled to a blackbody radiation bath [1]. We show that, simply by displacing one or more atoms from their regular-chain positions, the efficiency of the energy transport can be considerably amplified of at least one order of magnitude. Besides, in configurations providing an efficiency greater than 100% , the distance between the two last atoms of the chain can be up to 20 times larger than the one in the regular chain, thus achieving a much longer-range energy transport. By performing both a stationary and time-dependent analysis, we ascribe this effect to an elementary block of three atoms, playing the role of excitation injector from the blackbody bath to the extraction site. By considering chains with up to 7 atoms, we also show that the amplification is robust and can be further enhanced up to 1400%.

[1] P. Doyeux, R. Messina, B. Leggio, and M. Antezza, Phys. Rev. A 95, 012138 (2017).