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Quantum phase transition of light as a control of the entanglement between interacting quantum dots ANGELA BARRAGAN, Instituto de Fisica, Universidad de Antioquia, Medellin, Colombia; Instituto de Ciencias Nucleares, Universidad Nacional Autonoma de Mexico, Mexico, CARLOS VERA-CIRO, Instituto de Fisica, Universidad de Antioquia, Medellin, Colombia; Kapteyn Institute, University of Groningen, Groningen, The Netherlands, IAN MONDRAGON-SHEM, Instituto de Fisica, Universidad de Antioquia, Medellin, Colombia; Department of Physics, Cornell University, Ithaca, NY, USA — We study coupled quantum dots arranged in a photonic crystal, interacting with light which undergoes a quantum phase transition. At the mean-field level for the infinite lattice, we compute the concurrence of the quantum dots as a measure of their entanglement. We find that this quantity smoothly changes in the vicinity of the phase transition, and in a step-like fashion in the Mott-insulator phase. This behavior can be externally monitored through the second-order correlation function for the light in each lattice site. For the finite case, we discuss boundary induced effects using a mean-field ansatz, as well as the impact of having finite temperatures on the entanglement of the quantum dots.

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