# Quantum simulation of the Anderson Hamiltonian with an array of coupled nanoresonators: delocalization and thermalization effects

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The possibility of using nanoelectromechanical systems as a simulation tool for quantum many-body effects is explored. It is demonstrated that an array of electrostatically coupled nanoresonators can effectively simulate the Bose-Hubbard model without interactions, corresponding in the single-phonon regime to the Anderson tight-binding model. Employing a density matrix formalism for the system coupled to a bosonic thermal bath, we study the interplay between disorder and thermalization, focusing on the delocalization process. It is found that the phonon population remains localized for a long time at low enough temperatures; with increasing temperatures the localization is rapidly lost due to thermal pumping of excitations into the array, producing in the equilibrium a fully thermalized system. Finally, we consider a possible experimental design to measure the phonon population in the array by means of a superconducting transmon qubit coupled to individual nanoresonators. We also consider the possibility of using the proposed quantum simulator for realizing continuous-time quantum walks.