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Dynamics of macroscopic quantum self-bound states in arrays of transmon qubits CLAUDIA DE GRANDI, STEVEN M. GIRVIN, Yale University — We consider the many-body physics of an array of transmon qubits in a cavity. Due to the negative anharmonicity and the exchange coupling between the qubits, such a system realizes a Bose-Hubbard model with attractive interactions and thus the N-excitation manifold is expected to have self-bound states. We study the existence of such macroscopic states in the one-dimensional case with open boundary conditions as a function of the parameters of the model, comparing the classical and the quantum predictions. We then analyze the dynamics of the self-bound states in the experimentally relevant scenario of an open dissipative system, where the qubits have a finite energy relaxation time T_1. We numerically simulate the dynamics with a quantum trajectory approach supported by a Lanczos diagonalization procedure.

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