Abstract Submitted
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Digital-analog quantum simulation of generalized Dicke models with superconducting circuits[1] LUCAS LAMATA, University of the Basque Country — We propose a digital-analog quantum simulation of generalized Dicke models with superconducting circuits, including Fermi-Bose condensates, biased and pulsed Dicke models, for all regimes of light-matter coupling. We encode these classes of problems in a set of superconducting qubits coupled with a bosonic mode implemented by a transmission line resonator. Via digital-analog techniques, an efficient quantum simulation can be performed in state-of-the-art circuit quantum electrodynamics platforms, by suitable decomposition into analog qubit-bosonic blocks and collective single-qubit pulses through digital steps. Moreover, just a single global analog block would be needed during the whole protocol in most of the cases, superimposed with fast periodic pulses to rotate and detune the qubits. Therefore, a large number of digital steps may be attained with this approach, providing a reduced digital error. Additionally, the number of gates per digital step does not grow with the number of qubits, rendering the simulation efficient. This strategy paves the way for the scalable digital-analog quantum simulation of many-body dynamics involving bosonic modes and spin degrees of freedom with superconducting circuits.

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