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Digital quantum simulations with superconducting circuits URTZI LAS HERAS, LAURA GARCIA-ALVAREZ, LUCAS LAMATA, University of the Basque Country, Spain, ENRIQUE SOLANO, University of the Basque Country and IKERBASQUE, Spain — Superconducting circuits are a promising quantum technology for the implementation of quantum information protocols. In particular, digital quantum simulations are an efficient method for reproducing dynamics that are not produced naturally in the simulating system. We propose a method for simulating efficiently the dynamics of prototypical spin and fermionic models in circuit quantum electrodynamics architectures with either qubit-qubit pairwise interactions or resonators acting as quantum buses. We show how to implement Ising and Heisenberg spin models, and the Fermi-Hubbard model, making use of the Jordan-Wigner mapping and Mølmer-Sørensen gates.

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