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**Many-body localization in an array of superconducting transmon devices** MATTI SILVERI, University of Oulu, Finland Yale University, USA, RICHARD BRIERLEY, Yale University, USA, XIONGJIE YU, BRYAN K. CLARK, University of Illinois at Urbana-Champaign, USA — Superconducting circuits hold promise for excellent platform of quantum simulations. Up to date, fabrication disorder of superconducting circuits has been an obstacle for realizing large scale quantum simulations of realistic condensed matter models. To overcome this problem, we study theoretically the prospect of quantum simulation of strongly disordered and interacting quantum matter in an array of superconducting transmon devices. Specifically we are interested in bosonic many-body localization. Transmons interact via capacitive dipole-dipole interaction and the many-excitation interaction, that is crucial for many-body localization, is provided by the anharmonicity of the transmon energy spectrum. The disorder strength of the on-site energy is in-situ tunable over an order of magnitude through combining over-all flux-tuning to disorder in transmon loop area, providing a possibility for studying phase transitions. High controllability of superconducting circuits can be used for detailed quantum measurements and coherent driving of transmons. Using the recently developed DMRG like method for finding highly-excited eigenstates, we will explore features of many-body localization in an array of superconducting transmon devices.

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