

Abstract Submitted  
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**Detector Readout of Analog Quantum Simulators<sup>1</sup>** IRIS SCHWENK, Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany, LIN TIAN, School of Natural Sciences, University of California, Merced, CA 95343, USA, MICHAEL MARTHALER, Institute of Theoretical Solid State Physics, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany — An important step in quantum simulation is to measure the many-body correlations of the simulated model. For a practical quantum simulator composed of a finite number of qubits and cavities, in contrast to many-body systems in the thermodynamic limit, a measurement device can generate strong backaction on the simulator, which could prevent the accurate readout of the correlation functions. Here we calculate the readout of a detector coupled to analog quantum simulators. We show that reliable characterization of the many-body correlations of the simulators can be achieved when the coupling operators obey the Wicks theorem. Our results are illustrated with two examples: a simulator for an harmonic oscillator and a simulator for the free electron gas. We also present a method, which under certain constraints, allows for the reconstruction of the ideal correlators from the measurements on a perturbed quantum simulator.

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