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Probing higher-order interactions with an array of double-well optical-lattice interferometers[1] PHILIP JOHNSON, American University, EITE TIESINGA, CARL WILLIAMS, NIST, Gaithersburg — In the double well optical lattice number (squeezed) states can be loaded into individual wells via the Mott insulator phase transition, and then the wells can be dynamically split or merged in a variety of ways. One simple picture for the subsequent splitting and merging of wavefunctions is to view the system as an array of beam splitters. We show how this system can be used as an array of interferometers for sensitively probing higher-order interactions usually neglected in Bose-Hubbard models of optical lattice physics. In addition to potentially revealing new and interesting physics, these higher-order interactions could also be an important source of dephasing in lattice-based quantum computers. Characterizing them is an important step toward mitigating any unwanted effects and potentially exploiting new types of interactions.

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