

Abstract Submitted
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Noise spectroscopy for detecting multi-atomic composite states in optical lattices¹ HENNING MORITZ, Institute of Quantum Electronics, ETH Zurich, ANATOLY KUKLOV, CSI, CUNY — We propose and discuss methods ¹ for detecting quasi-molecular complexes which are expected to form in strongly interacting optical lattice systems. Particular emphasis is placed on the detection of composite fermions forming in Bose-Fermi mixtures. We argue that, as an indirect indication of the composite fermions and a generic consequence of strong interactions, periodic correlations must appear in the atom shot noise of bosonic absorption images, similar to the bosonic Mott insulator ². The composites can also be detected directly and their quasi-momentum distribution measured. This method – an extension of the technique of noise correlation interferometry ³ – relies on measuring higher order correlations between the bosonic and fermionic shot noise in the absorption images. The method is expected to work well for fermionic composites consisting of less than four atoms and for bosonic ones consisting of less than six atoms. Above these numbers, the uncorrelated noise becomes too large.

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²S. Fölling, et al., Nature **434**, 481 (2005)

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