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Spectroscopy for cold atom gases in periodically modulated optical lattice potential[1] AKIYUKI TOKUNO, THIERRY GIAMARCHI, DPMC-MaNEP, University of Geneva — Cold atoms in optical lattices are vigorously studied experimentally and theoretically as one of the candidates for a quantum simulator. At the same time, further development of probes to microscopic structure of systems is needed. We propose a novel spectroscopy in cold atom experiments by use of periodic phase-modulation of optical lattice potentials. Corresponding to the statistics of atoms, we formulate the different observables: The energy absorption rate for bosonic atom gases, and the doublon production rate for fermionic atom gases. These observables are formulated within the linear response theory. Interestingly they are given by the imaginary part of the retarded current-current correlation function which is familiar as a quantity corresponding to an optical conductivity. As an example, we discuss one-dimensional Mott insulating state, and also compare our spectroscopy with another known spectroscopy by amplitude-modulation of an optical lattice.

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