Spin correlations and doublon production rate for fermionic atoms in modulated optical lattices

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Cold atom gases confined in optical lattices provide a controlled realization of strongly correlated many-body systems, e.g., the Hubbard model, and in such systems probing magnetism is of prime importance. However, it is not easy so far in cold atom experiments. We discuss potential ability of the lattice modulation spectroscopy as a probe of magnetism, in which the doublon production rate (DPR) induced by periodic modulation of an optical lattice is measured [1]. We focus on the quantity of the integrated DPR (IDPR) over modulation frequency. We straightforwardly implement the modulation frequency integral of the general DPR spectrum formula derived by the linear response theory, and the IDPR is deductively found identical to the nearest-neighbor (NN) spin correlation function in the incoherent hopping regime. In addition, the Monte-Carlo calculation is employed to see the temperature dependence of the IDPR in the limit of the large repulsion for commensurate fillings.

[1] A. Tokuno and T. Giamarchi, Phys. Rev. A **85**, 061603(R) (2012).