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Non-equilibrium dynamics of a superfluid Fermi gas with time-periodic modulation: Higgs mode and higher-order harmonic excitation KUI-TIAN XI, QIJIN CHEN, GENTARO WATANABE, Zhejiang University — Motivated by the recent experiment on observation of the Higgs mode in a strongly interacting superfluid Fermi gas [A. Behrle *et al.*, Nat. Phys. **14**, 781 (2018)], we study the non-equilibrium dynamics of a superfluid Fermi gas with a time-periodic modulation in the BCS-BEC crossover by solving the time-dependent Bogoliubov-de Gennes (BdG) equations. By tuning the modulation amplitude and frequency of the coupling constant, we have demonstrated that the Higgs mode can be excited with the time-periodic modulation. For a small modulation amplitude, the long-lived Higgs mode comparing to the current experimental result exists when the modulation frequency is slightly red-detuned. When the modulation frequency is blue-detuned, the single-particle excitation appears along with the Higgs mode. For a large modulation amplitude, the higher-order harmonic excitation is generated due to the nonlinearity. The exploration of other optimal ways of exciting the Higgs mode in a superfluid Fermi gas is also discussed.

Kui-Tian Xi
Zhejiang University

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