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**Floquet FFLO superfluids and Majorana fermions in a shaken fermionic optical lattice** ZHEN ZHENG, The University of Texas at Dallas; University of Science and Technology of China, CHUNLEI QU, The University of Texas at Dallas, XUBO ZOU, University of Science and Technology of China, CHUANWEI ZHANG, The University of Texas at Dallas — Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) superfluids, Cooper pairings with finite momentum, and Majorana fermions (MFs), quasiparticles with non-Abelian exchange statistics, are two topics under intensive investigation in the past several decades, but unambiguous experimental evidences for them have not been found yet in any physical system. Here we show that the recent experimentally realized shaken optical lattice provides a new pathway to realize FFLO superfluids and MFs. By tuning the shaking frequency and amplitude, various coupling between the $s$- and $p$-orbitals of the lattice (denoted as the pseudo-spins) can be generated. We show that the combination of the inverted $s$- and $p$-band dispersions, the engineered pseudo-spin coupling, and the on-site attractive interaction, naturally allows the observation of FFLO superfluids as well as MFs in different parameter regions.

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