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Phase diagram of 1D spin-orbit coupled Fermi gases in optical lattices[1] CHUNLEI QU, MING GONG, CHUANWEI ZHANG, Department of Physics, The University of Texas at Dallas, Richardson, TX, 75080 — We consider a one dimensional spin-orbit coupled Fermi gas in optical lattices with open boundary condition. This system belongs to the BDI symmetry class because the Hamiltonian can be made real when the Zeeman field is assumed to be along the z direction, thus the topological superfluid is characterized by Z, instead of Z_2 class. In the optical lattice system, each site admits at most two fermions. The system can host plenty of phases depending on the filling factor and the Zeeman field. At finite Zeeman field we observe a strong competition between the topological superfluid phase and the Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) phase. The latter phase is more likely to be observed near the half filling. The spin-orbit coupling plays the role of enhancing the topological superfluid phase and suppressing the FFLO phase, which the Hartree shift plays an utterly opposite role. The possible observation of topological phase is also discussed in the presence of a harmonic trap.

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