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Parametric dimensional evolution of the Fulde-Ferrell-Larkin-Ovchinnikov state of imbalanced fermionic-atom superfluids in an optical lattice of coupled tubes[1] C.J. BOLECH, K. SUN, University of Cincinnati — We study two-species imbalanced fermionic superfluids in an array of one-dimensional tubes that are coupled via particle tunneling between nearest neighbors. Incorporating the interplay of Cooper pairing, spin imbalance (or magnetization), and single-particle tunneling, we obtain imbalance profiles accompanied with oscillatory pairing reminiscent of a Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) state, and show that the magnetization of the system can undergo an incompressible-compressible transition by the tuning of the magnetic field as well as tunneling strength [Phys. Rev. A 85, 051607 (2012)]. The system's phase diagram is well described by an effective extended Bose-Hubbard model. In addition, we discuss another viable process of pair tunneling that strongly affects the evolution of the FFLO profiles. With this new element, one can build a model describing the development of signatures characteristic of the incipience of the dimensional crossover and in partial agreement with preliminary experimental data.

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