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Inhomogeneous superconducting states and Umklapp processes in ferromagnet/superconductor nanostructures M.G. KHUSAINOV, Kazan State Technical University, Russia, N.G. FAZLEEV, University of Texas at Arlington, USA, YU.N. PROSHIN, Kazan State Univeristy, Russia — A new boundary-value problem is derived for a ferromagnetic metal/superconductor (F/S) nanostructure assuming that superconductivity in a structure is characterized by a superposition of the BCS pairing with zero total momentum in the S layers and the Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) pairing with nonzero 3d coherent momentum **k** in the FM layers. The processes of mutual transformation between the BCS and FFLO pairs at the S/FM boundary are shown to be the Umklapp processes during which the excess coherent pair momentum k becomes confined in the F layer. As a result, significantly new boundary conditions are introduced for Eilenberger equations. The interplay between the BCS and 3D FFLO states is explored in F/S bilayer, F/S/F trilayer, and F/S superlattice. Two π phase superconducting states with electron-electron repulsion in the F layers are predicted in F/S/F trilayers. Two π phase magnetic states (0π and $\pi\pi$) are also predicted in F/S superlattices. Theoretical results are used to explain the data on measurements of Tc in Gd/La superlattice.

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