CURVED PLANAR WAVEGUIDE WITH COMBINED DIRICHLET AND NEUMANN BOUNDARY CONDITIONS IN UNIFORM MAGNETIC FIELDS

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A model of a thin straight strip with a uniformly curved section and with different uniform boundary conditions on the opposite edges subjected to the homogeneous magnetic field $\mathbf{B}$ is analyzed within the framework of the linear Schrödinger equation and is applied to the study of the processes in the bent magnetic multilayers and superconducting films. In particular, for the inner Dirichlet and outer Neumann boundaries it is shown that bend-induced enhancement of the superconductivity survives in the magnetic field with the order parameter $\Psi(\mathbf{r})$ being pushed stronger and stronger to the Neumann surface with increasing B and, simultaneously, the area where the nucleation of the superconductivity takes place is spread more and more in the straight arms. Various magnetotransport properties of the film such as interference blockade of the supercurrent flow at some special field-dependent temperatures, are also discussed with the special attention being paid to the formation and evolution of the vortices, which appear as a result of the bend-induced interaction between the different subbands; it is shown, in particular, that the number of vortices decreases with the field and some of them transform into the antivortices. A proof of the very close analogy between two kinds of strips: 1) pure Dirichlet condition on both edges and 2) inner Dirichlet and outer Neumann requirements, derived earlier for $\mathbf{B} = 0$ is extended to the case of nonzero fields.