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Majorana bound states in two-channel time-reversal-symmetric nanowire systems[1] ERIKAS GAIDAMAUSKAS, JENS PAASKE, KARSTEN FLENSBERG, Center for Quantum Devices, Niels Bohr Institute, University of Copenhagen — In this work consider time-reversal-symmetric two-channel semiconducting nanowires proximity coupled to the s-wave superconductor. We made an analysis for the conditions for a topologicaly non-trivial phase, and find that necessary requirements are 1) the determinant of the pairing matrix in channel space must be negative, 2) spatial inversion symmetry must be broken, and 3) the two channels must have different spin-orbit couplings. The first condition can be realized in semiconducting nanowire systems with different tunnel couplings between the channels and superconductor, while the parity can be broken by tuning the chemical potentials of the channels. For the case of parallel spin-orbit directions, we derive the expression for the topological invariant applying the block diagonalization of the Hamiltonian into the two chiral symmetric blocks. Making the projection to the low-energy sector we solve for the bound states explicitly and investigate the influence of the magnetic field.

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