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**Majorana bound states and non-local spin correlations in a quantum wire on a topological superconductor** SHO NAKOSAI, Dept. Appl. Phys., Univ. of Tokyo, JAN BUDICH, Dept. Phys., Stockholm Univ., YUKIO TANAKA, Dept. Appl. Phys., Nagoya Univ., BJOERN TRAUZETTEL, Inst. Theor. Phys. and Astrophys., Univ. of Wuerzburg, NAOTO NAGAOSA, Dept. Appl. Phys., Univ. of Tokyo, CERG, RIKEN, CMRG, RIKEN — We theoretically study the proximity effect of the one-dimensional quantum wire of usual metal without the spin-orbit interaction on the substrate of unconventional superconductor. Three cases are considered for the substrate, i.e., (i) chiral superconductor in class D with broken time reversal symmetry, and class DIII superconductor (ii) with and (iii) without the nontrivial $Z_2$ number. The Cooper pairs are induced into the wire, resulting effective one dimensional superconducting system. We found the degenerate zero energy Majorana bound states at both ends of the wire for all the cases, unlike single Majorana state in spin-orbit coupled system with $s$-wave superconductor, which might have been experimentally observed. The degenerate Majorana bound states are unstable against the spin-orbit interaction in case (i) while are protected by time reversal symmetry in cases (ii) and (iii). These degenerate Majorana bound states constitute the spin 1/2 degrees of freedom at each end of the wire. It is also shown that the non-locally correlated two spins at the two ends of the wire can be controlled by the gating potential on the wire.

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