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Universal spin-triplet superconducting correlation of Majorana Fermions XIN LIU, JAY DEEP SAU, Condensed Matter Theory Center and Joint Quantum Institute, Department of Physics, University of Maryland, College Park, Maryland 20742-4111, USA — In this work, we show that Majorana fermions (MFs) on the boundary of topological superconductors (TSCs) only have spin-triplet superconducting correlation no matter the bulk superconducting gap is spin singlet or triplet. This is universal for all TSCs as long as they have, on the boundary, odd number of MFs for BDI or D class and odd number pairs of MFs for DIII class. As a result, the Andreev reflection induced by the Majorana fermions always introduces spin-triplet Cooper pairs in the leads. This spin-triplet condensate results in the the spin-orbit coupling (SOC) controlled oscillatory critical current without $0 - \pi$ transition in the TSC/SOC-semiconductor/TSC Josephson junction. The observation of this unique current-phase relation can serve as a signal of Majorana fermions. Moreover our study open a new way to manipulate Majorana fermions based on their spin-triplet superconducting correlation.

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