Planar topological Josephson junctions and Majorana zero modes

Yu.Makhlin

Condensed-Matter Physics Laboratory, HSE University, Moscow, Russia
Landau Institute for theoretical physics, Chernogolovka, Russia

Key words: Josephson, Majorana, topological

Planar STIS Josephson junctions are actively studied experimentally [1] as a platform for realization of Majorana zero modes (MZM) and topological quantum computations. It is important to analyze experimental manifestations of the MZM's.

We study the Josephson current in a long junction and its suppression by magnetic field, where MZM's contribute to modification of the Fraunhofer pattern due to their hybridization [2,3]. These modifications, further, depend on their quantum state, opening possibilities for quantum readout.
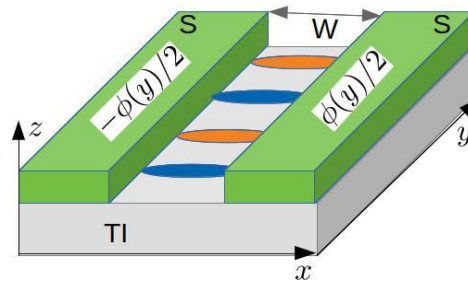

Fig.1 Majorana zero modes in a planar STIS junction

Bibliography
[1] A. C. Potter and L. Fu, Phys. Rev. B 88, 121109 (2013); S. S. Hegde et al., Ann. Phys. 423, 168326 (2020); G. Yue et al., Phys. Rev. B 109, 094511 (2024)
[2] S. Backens et al., JETP Lett. 116, 891 (2022)
[3] K.Piasotski et al., Phys. Rev. B 111, 174527 (2025)