

Majorana edge modes at topological insulator-superconductor-junctions in three dimension

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Certain classes of topological insulator-superconductor-junctions in three dimension support Majorana edge modes at line defects. The conditions for the existence of gapless modes at a boundary between two insulators is well known as "bulk-boundary correspondence" which implies that difference of the topological number between two insulators leads to the existence of gapless edge modes. Recently the conditions for the existence of gapless modes in arbitrary topological defects such as the topological insulator-superconductor-junctions is proposed.¹ It is suggested that the existence of gapless modes follows from topologically nontrivial Hamiltonian which varies with material parameters surrounding the defects.

In this study, we survey the existence of Majorana edge modes at topological insulator-superconductor-ferromagnet junctions following the approach of Ref. Moreover we compare it with other results obtained from an effective two dimensional theory at an interface, and the topological field theory for Axion electrodynamics.

¹Jeffrey C.Y. Teo and C.L. Kane, Phys. Rev. B **82**, 115120 (2010).