Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Persistent ferromagnetism and topological phase transition at the interface of a superconductor and a topological insulator[1] WEI QIN, ZHENYU ZHANG, University of Science and Technology of China — At the interface of an s-wave superconductor and a three-dimensional topological insulator, Majorana zero modes and Majorana helical states have been proposed to exist respectively around magnetic vortices and geometrical edges. Here we first show that randomly distributed magnetic impurities at such an interface will induce bound states that broaden into impurity bands inside (but near the edges of) the superconducting gap, which remains open unless the impurity concentration is too high. Next we find that an increase in the superconducting gap suppresses both the oscillation magnitude and period of the RKKY interaction between two magnetic impurities. Within a mean field approximation, the ferromagnetic Curie temperature is found to be essentially independent of the superconducting gap, an intriguing phenomenon due to a compensation effect between the short-range ferromagnetic and long-range anti-ferromagnetic interactions. The existence of robust superconductivity and persistent ferromagnetism at the interface allows realization of a novel topological phase transition from a non-chiral to a chiral superconducting state at sufficiently low temperatures, providing a new platform for topological quantum computation.

[1]Supported by NSF of China.

Wei Qin
University of Science and Technology of China

Date submitted: 14 Nov 2014 Electronic form version 1.4