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Interface gapless states from interfacial symmetries RYUJI TAKAHASHI, Department of Applied Physics, University of Tokyo, SHUICHI MURAKAMI, Department of Physics, Tokyo Institute of Technology — Previously we have shown that at an interface between two topological insulators with opposite Dirac velocities, gapless interface states protected by mirror symmetry appear [1]. We can calculate the interface dispersion using the Fu-Kane-Mele (FKM) tight-binding model, and it typically consists of Dirac cones. In this presentation, we report another kind of interface metallic states; the Fermi surface forms loops (“Fermi loop”) [2], rather than isolated Dirac points, sometimes seen in the interface of the FKM models. Such a degeneracy along a loop is unexpected. This Fermi loop appears when the whole junction system preserves particle-hole symmetry, while each system breaks particle-hole symmetry. We call this symmetry “interfacial particle-hole symmetry” (IPHS). We discuss the IPHS in general systems and show that the Fermi loop results from a sign change of a Pfaffian of some matrix, defined only in junctions with IPHS symmetry [2].

[1] R. Takahashi, S. Murakami, Phys. Rev. Lett. 107,166805 (2011).

[2] R. Takahashi, S. Murakami, to appear in Phys. Rev. Lett..

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