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Refraction and interference of electrons on the topological insulator surface RYUJI TAKAHASHI, Tokyo Institute of Technology, SHUICHI MURAKAMI, Tokyo Institute of Technology, and PRESTO, JST — We theoretically study electron transport on the topological insulator surface, in analogy with optics. The surface states are represented by spinors, unlike optics, and therefore different behaviors from those in optics are expected. First, we consider the refraction phenomena at the boundary between the surfaces of two different topological insulators, where the velocities of the surface states are different. We compare its transmission and refraction coefficients with optics. Furthermore, we discuss the case when the velocities of the surface states of the two topological insulators have opposite signs. Second, we study interference phenomena on the surface states. The result shows that if the detector is very far from the scatterer or the slit, the interference is asymptotically similar to ordinary two-dimensional scattering problems. We also study the spin directions of scattered wave due to the surface interference phenomena.

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