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Quantum interference and quantum oscillation on the surface of mirror symmetric topological insulators[1] CHEN FANG, University of Illinois at Urbana Champaign, ARIS ALEXANDRADINATA, Princeton University, MATTHEW GILBERT, University of Illinois at Urbana Champaign, SU-YANG XU, ZAHID HASAN, ANDREI BERNEVIG, Princeton University — We first study the quasiparticle interference (QPI) of the surface states in crystalline topological insulators which possess mirror symmetry and time-reversal symmetry, by analyzing the Fourier transformed local density of states (FT-LDOS), $\rho(bq, \omega)$ around a single static impurity on the surface. The topological characters of the surface states of these new materials lead to QPI patterns distinct from those of 2D metals and of surface states on 3D time-reversal TI's. We apply the general analysis to the QPI on the $\langle 001 \rangle$-surface of $Pb_{1-x}Sn_xTe$ and predict all vanishing singularities in $\rho(bq, \omega)$. We also demonstrate that QPI can also be used to probe the Lifshitz transition of the surface states observed in recent ARPES experiment. We next study the Shubnikov de Hass oscillation of these surface states and show that the oscillation has a single period before the Lifshitz transition and two distinct periods after the transition. Adding in-plane magnetic field before the Lifshitz transition leads to splitting of the period into two close periods and a beating thereof.

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