

Abstract Submitted
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Collective modes at a surface of a topological insulator¹ JHH-SHENG WU, M.M. FOGLER, D.N. BASOV, UCSD — We investigate hybrid plasmon-phonon modes of a polar topological insulator that originate from interaction among the quasiparticles of surface and bulk states, and also optical phonons. As an example, we study electron-doped Bi₂Se₃. We analyze the dispersion of the collective modes of this compound for (i) a bulk sample with a depletion layer created by acceptor adsorbates on the surface and (ii) a thin film. In the first case, we show that a depletion layer gives rise to two energy-momentum regions, where the surface states dominate the collective modes over the bulk carriers. In a thin film, the phonons are more prominent than the bulk carriers. The anisotropy of the phonon response makes the thin film behaves as a waveguide. We discuss how these various collective modes can be detected by scanning near-field optical microscopy.

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Michael Fogler
UCSD

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