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Coexistence of 2D-surface and 3D-bulk Fermi surfaces in Bi<sub>2</sub>Se<sub>3</sub> ROSS MCDONALD, OSCAR AYALA VALENZUELA, MOAZ ALTARAWNEH, NHMFL-Los Alamos, JAMES ANALYTIS, JIUN-HAW CHU, IAN FISHER, Stanford University — The resurgence of interest in Bi<sub>2</sub>Se<sub>3</sub>, and related compounds, has been driven by the prediction that these materials can fulfill the requirements for the observation of a topological insulating state, i.e. the electronic spectrum being fully gapped in the bulk with a gapless, dissipationless surface state. The key to interpreting transport data from these materials is resolving the relative contributions of surface and bulk conductivity. To this end, we use high magnetic field, rf- and microwave-spectroscopy to selectively couple to the surface conductivity at high frequency. In the frequency range of a few GHz we observe a crossover from quantum oscillations indicative of a small 3D Fermi surface, to cyclotron resonance indicative of a 2D surface state. The implications of this observation with respect to the existence of a topologically protected Dirac-cone will be discussed.

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