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Imaging current in quantum spin Hall insulator InAs/GaSb

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Scanning superconducting quantum interference device (SQUID) microscopy allows us to visualize how currents flow in materials by imaging magnetic fields. I will give an overview of our technique and focus on the quantum spin Hall edge states we observed in Si-doped InAs/GaSb quantum wells. The main feature of 2D topological insulators is the topologically-protected edge modes that are a result of their special band structure. We used a SQUID to image current in the edge modes, which are present when the chemical potential lies in or near the insulating gap. The unique spin-texture of the edge states restricts how electrons can backscatter, leading to ballistic transport in small enough devices. In more resistive, longer devices which we study, the temperature dependence of the resistance of the edges due to backscattering is flat and does not match any of the allowed backscattering mechanisms which have been theoretically investigated.