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Interplay of helical and chiral states in a 2D-Topological Insulator lateral junction M. REYES CALVO, CIC Nanogune, FERNANDO DE JUAN, RONI ILAN, University of California Berkeley, JING WANG, ELI FOX, ANDREW J. BESTWICK, Stanford University, PHILIPP LEUBNER, CHRISTOPHER AMES, MATHIAS MUEHLBAUER, CHRISTOPH BRUENE, LAURENS W. MOLENKAMP, Wuerzburg University, DAVID GOLDHABER-GORDON, Stanford University — A 2D topological insulator has an inverted band structure. Quantum Spin Hall states cross the gap at the material's edge, giving rise to helical edge modes where backscattering is forbidden by time reversal symmetry. This situation is predicted to persist near zero-density, unprotected from backscattering, up to a critical magnetic field where band inversion is lifted. When 2D carriers are accumulated, magnetic field drives the system to the Quantum Hall regime and chiral states propagate at the edge. Here, we study electrostatically-gated lateral junctions in a HgTe quantum well, the canonical 2D topological insulator, at zero and under applied magnetic field. At finite carrier densities out and inside the junction, we observe fractional plateaus of conductance characteristic of equilibration between different number of chiral Quantum Hall modes. When the junction is tuned near zero density, we observe coherent oscillations that we attribute to Fabry-Perot interference induced by backscattering of the helical edge mode. Zero field oscillations are also observed at zero field and in the bipolar regime, which we attribute to interference from bulk carriers.

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