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Role of Coulomb Interaction in the Bulk Gap of inverted InAs/GaSb bilayers[1] LINGJIE DU, RUI-RUI DU, Rice Univ, GERARD SULLIVAN, Teledyne Scientific and Imaging — Inverted InAs/GaSb bilayers have been shown to support the quantum spin Hall effect, characterized by an insulating 2D bulk and a Kramer's pair of counter propagating 1D helical edge states. Since the Fermi energy of electrons and that of holes can be individually turned by gates, the degree of band inversion can be readily controlled in experiments. Here we perform the inplane field magneto-measurement of InAs/GaSb samples, in the two limits of band inversion. In the deeply inverted regime where electron and hole density exceed 10e11/cm2, we found that the bulk gap closes under several Tesla field, consistent with previous results in the same regime (M. J. Yang et al, Phys. Rev. Lett. 78, 4613). On the other hand, in the shallowly inverted regime close to inverted-normal band transition we find that the bulk gap remains open to very high fields (up to 35T). These results suggest that the nature of the bulk gap in InAs/GaSb in the shallowly inverted regime is not well understood. We will discuss the possible role of Coulomb interaction in this regime, where dilute electron-hole gases are unstable against the formation of bilayer exciton.

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