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Demonstration of InSb quantum wells on InSb substrates[1] MIHIR PENDHARKAR, JOON SUE LEE, BORZOYEH SHOJAEI, DANIEL J. PENNACHIO, ANTHONY P. MCFADDEN, CHRIS J. PALMSTROM, Univ of California - Santa Barbara — Highly spin orbit coupled InSb material system has been central to the realization of novel phenomenon, fundamental for topological quantum computation. Quantum confined electrons in InSb/AlInSb heterostructures have until now been plagued with a very high density of defects and dislocations, due to their growth on lattice mismatched GaAs and GaSb substrates. In this work, Molecular Beam Epitaxy growth of InSb quantum wells on InSb substrates has been demonstrated. Low temperature magneto-transport measurements of the quantum wells showed an onset of Shubnikov-deHaas oscillations at 0.2 Tesla, corresponding to the quantum mobility of 50,000 cm2/Vs which is believed to be the highest reported to date. HAADF-STEM of epilayers grown, showed abrupt interfaces while AFM was used to confirm a dramatic reduction in screw dislocation density on the surface. This work paves the way for investigation of gate control and lithographically defined nanostructures necessary for scalable topological quantum computation on an InSb platform.

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