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Room temperature ballistic transport in InSb quantum well structures ADAM GILBERTSON, LESLEY COHEN, Imperial College, PHIL BUCKLE, Cardiff University, TIM ASHLEY, Warwick University, STUART SOLIN, Washington University in St. Louis, ANDOR KORMANYOS, COLIN LAMBERT, Lancaster University — We report significant advancements in InSb/AlInSb quantum well (QW) heterostructures for room temperature nanoelectronic applications. InSb/AlInSb heterostructures have phenomenally high room temperature mobility but display intrinsic parallel conduction in the buffer layer limiting exploitation for nanostructured devices where deep isolation etch processing is impractical. We demonstrate a strategy to reduce the parasitic conduction by the insertion of a pseudomorphic barrier layer of wide-band-gap alloy below the QW.[1] Mesoscopic geometric nanocrosses fabricated from such material clearly demonstrate ballistic transport at room temperature, as evidenced by very significant negative bend resistance (NBR). We have studied the interplay between sidewall and bulk scattering at 300K in relation to quantum calculations. DC measurements in the non-equilibrium (hot carrier) regime reveal that electrons remain ballistic at current densities in excess of 10^6 A/cm^2.

[1]A.M. Gilbertson, P.D. Buckle, T. Ashley, L.F. Cohen, Phys Rev B **84**, 075474 (2011).

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