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Multifunctional sensors operating at 300 K based on quasi-ballistic InSb quantum well nanostructures ADAM GILBERTSON, DOMINIC MOSELEY, MIKHAIL KUSTOV, STUART SOLIN[1], LESLEY COHEN, Imperial College London, SIMON BENDING, University of Bath — The high mobility (μ) of InSb quantum well (QW) heterostructures at 300 K makes them ideally suited for both magnetic and optical sensing. While macroscopic InSb Hall sensors offer the best magnetic sensitivity at 300 K of any material, the operation of sub-micron InSb QW Hall probes have not been reported. Ballistic transport at 300 K in nano-InSb devices was recently described [1]. Here we report the 300 K sensing properties of InSb QW structures fabricated into scanning probe geometries operating in the photoconductive (PC), Hall, and magnetoconductive modes. Sub-micron InSb QW probes exhibit excellent magnetic sensitivity $<1\mu\mathrm{T}/\sqrt{\mathrm{Hz}}$ and are demonstrated in a scanning Hall probe measurement. InSb QWs exhibit long lived negative photoconductivity in the visible to near-IR for cw excitation, however, significant improvements in dynamic response are found with ac modulated techniques. From spatially resolved PC measurements we determine $\mu\tau \sim 3.5$ x10^{-3} cm^2/V. These results provide a benchmark for developing novel InSb QW-metal hybrid nanosensors [2].

[1] A.M. Gilbertson et al., *Appl. Phys.Lett.* **99**, 242101 (2011)
[2] A.K.M. Newaz et al., *Appl. Phys. Lett.* **97**, 082105 (2010)

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