Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Theoretical Carrier Mobilities in δ-doped AlInSb/InSb Hereterostructures[1] Y. SHAO, S. A. SOLIN, Washington University in St. Louis, L. R. RAM-MOHAN, Worcester Polytechnic Institute — Ultrathin films with thicknesses (<100 nm) and very high (>1 m^2/Vs) room temperature carrier mobility are of immense practical importance in a number of magnetic sensor applications.[2] The electron transport mobilities in δ-doped AlInSb/InSb heterostructures had been studied. The sub-band electron occupation and the energy levels were numerically obtained by solving the Schrödinger and Poisson equations self-consistently as a function of spacer layer thickness, well width and temperature. The quantum energy levels were found within the quasi-classical approximation. The electron mobilities were calculated by combining ionized impurity, background impurity, deformation potential acoustic phonon and polar optic phonon scattering. The dependencies of the electron mobility on temperature, spacer layer thickness and quantum well thickness were simultaneously obtained. At 0K and room temperature, mobilities as high as 1.3x10^3 and 10 m^2/V s, respectively, were obtained at larger spacer layer (400nm) and well widths (400nm). In contrast to privious work, for the application of device design, the product of electron density and mobility was studied to maximize the transconductance. The model we used can be adaped to study other heterostructure.

[1]Supported by NSF ECS-0329347 and WU Center for Materials Innovation
[2]S.A. Solin, and D.R. Hines, J. Magn. Magn. Mater., **226,** 1976 (2000).

Y. Shao
Washington University in St. Louis

Date submitted: 28 Nov 2005 Electronic form version 1.4