Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Gate Bias Dependent Two Layer Conduction in InAlN/AlN/GaN Heterostructures HAILING CHENG, CAGLIYAN KURDAK, Physcis, University of Michigan, JACOB LEACH, XIANFENG NI, XING LI, MO WU, UMIT OZGUR, HADIS MORKOC, ECE, Virginia Commonwealth University, LIN ZHOU, DAVID SMITH, Physics, Arisona State University, IGOR VURGAFTMAN, JERRY MEYER, Naval Research Laboratory, PHYSICS, UNIVERSITY OF MICHIGAN TEAM, ECE, VIRGINIA COMMONWEALTH UNIVERSITY TEAM, PHYSICS, ARIZONA STATE UNIVERSITY TEAM, NAVAL RESEARCH LABORATORY TEAM — We studied InAlN/AlN/GaN heterostructures with In compositions near 17% grown by Organo-Metallic Vapor Phase Epitaxy. These structures are free of strain and provide the confinement needed for a relatively high density and high mobility two-dimensional electron gas. The cross-sectional TEM images indicate the presence of an inadvertent GaN layer formed between the InAlN and AlN layers during the growth. Using Shubnikov-de Haas and Hall measurements performed on gated Hall bar samples at 4.2 K, we find that this additional GaN layer acts as a parasitic conduction channel. The quantitative mobility spectrum analysis of our data indicates that this parasitic channel has a very low mobility, and can be depleted by the application of a negative gate voltage.

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Date submitted: 28 Nov 2009 Electronic form version 1.4