Abstract Submitted
for the TSS12 Meeting of
The American Physical Society

QMSA Measurements of III-V Heterostructures on Silicon THIESS CUNNINGHAM, Texas State University, RICHARD HILL, MAN HOI WONG, SEMATECH, RAVI DROOPAD, Texas State University, TEXAS STATE UNIVERSITY TEAM[1], SEMATECH TEAM[2] — There is widespread consensus that high mobility III-V channel materials will enable increased performance and reduced power consumption at scaled geometries [1]. The industry is currently targeting the 11 nm technology node for their introduction. One of the most significant challenges is the heterointegration of III-V channel materials on Si substrates, which is essential to access large diameter cost effective silicon substrates. We compare carrier transport of MBE grown InGaAs/InAlAs HEMTs on InP and Si substrates using Quantitative Mobility Spectrum Analysis (QMSA). Measurements were taken to determine the effect of epitaxial defects on channel transport and buffer leakage. The continued scaling of Si CMOS devices has reached the point where, alternative solutions to the conventional MOSFET device need to be found. One solution being considered is the use of III-V compound semiconductors as the channel materials. However, the requirement is that these materials need to be epitaxially integrated onto silicon and be able to withstand the thermal budget in the various CMOS processing modules. In this presentation, we will present the electrical characterization of MBE grown III-V InGaAs/InAlAs heterostructures on silicon. Transport measurements at various temperatures ranging from 10k-room temperature in magnetic fields from 0-10T. From these measurements, QMSA of the data is carried out to the densities and mobilities of the conducting and buffer layers.

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Date submitted: 18 Feb 2012 Electronic form version 1.4