SESSION 10b: SIMULATION AND CHARACTERIZATION

Chairs: Jon Abrokwah, *Avago Technologies and* Sharon Woodruff, *Northrop Grumman (ES)*

This session features five papers describing simulation and characterization research on GaN devices. The first paper by Takuji Yamamura and Kazutaka Takagi of Toshiba Corporation reports on the difference in thermal design of GaN and GaAs FETs. Simulations and measurements show that while GaAs device thermal resistance depends on total gate geometry, pitch and substrate thickness, GaN FETs fabricated on SiC have much less dependence, due to the 6X greater thermal conductivity of SiC compared to GaAs. Thermal resistance of AlGaN/GaN HEMTS depends mostly on die size.

The second paper by M Bernardino et al. of University of Parma, Italy discusses modeling of the impact of boundary conditions on AlGaN/GaN HEMT self-heating. The effects include die-attach, finite backside heat-sinking, thermal boundaries between GaN and SiC and the thermal boundaries of the top metallization.

After that A. Christou of University of Maryland describes using FMEA (Failure Modes and Analysis), to review the primary failure modes of GaN based microwave devices, indicating that trapping is the dominant mechanism for device degradation and failure. They discuss effects of piezoelectric charges, tensile strain, and defect formation. In addition, models to predict electrical behavior, such as current collapse, power soak, DC and RF degradation are discussed. Next by S. A. Chevtchenko et al, of Ferdinand-Braun-Institute, Germany, discuss their investigation and reduction of gate leakage in AlGaN/GaN HFETs through optimization of the process of the first and second SiN passivation dielectric to reduce stress.

Finally, N. Killat et al. of University of Bristol and MIT present a lucid description of electroluminescence capacitance measurements and simulation to show impact ionization phenomenon in InGaN/GaN HEMTs.