SESSION 6b: HBTs

Chairs: Charles Fields, *Agilent Technologies*
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Heterojunction Bipolar Transistor (HBT) IC technology is ideal for many high speed and RF applications. Presentations in this section describe a range of practical challenges associated with HBT devices and integrated circuits. The first paper of the session is a student paper from the University of Illinois at Urbana-Champaign. The authors discuss the device performance results of two types of InP based DHBTs designed to address the requirement of higher breakdown voltage, namely, Type I InP/InGaAs/InP DHBT and Type-II GaAsSb/InP DHBTs. They review their recent results of a novel Type-I/II DHBT with AlInP emitter and GaAsSb base layers which demonstrated higher gain, balanced f_T / f_{MAX} > 400 GHz and BVCEO > 4V. They benchmark the DC and RF linearity performance of submicron Type-I/II DHBTs made at UIUC against Type-I DHBTs obtained from two foundries.

The second paper of the session, from WIN Semiconductor, presents a "New Bi-HEMT Technology with Low On-Resistance pHEMT for LTE Application", which reviews their work developing monolithic integration of pHEMT and InGaP HBT Technology on 150-mm GaAs wafers. The HBTs are used for the power cell to provide sufficient power output and linearity where required and the pHEMTs are used for bias-circuits and power switching to achieve high efficiency at low power mode.

The next paper, also from WIN Semiconductor, discusses "An Ultra-High Ruggedness InGaP/GaAs HBT for Multi-Mode / Multi-Band Power Amplifier Application". InGaP/GaAs HBT technology has been widely used in power amplifier (PA) design for wireless communications due to its high linearity and high efficiency. They present an ultra-high ruggedness HBT technology that can sustain a VSWR mismatch of 50:1 without trading off RF performance.

The final paper, from Skyworks, discusses their work to develop a "Novel Passivation Ledge Monitor in an InGaP HBT Process". The performance and reliability of the HBT is greatly influenced by the effectiveness of the emitter ledge. This ledge reduces the recombination current providing better device scaling and improved reliability. They review a new ledge-monitoring structure which uses Tantalum Nitride as a barrier between first metal and the InGaP layer which results in improved Schottky behavior for the top electrode leading to the desired MIS capacitor formation. The measurement of the structure as a diode I-V provides information on the InGaP ledge thickness/quality.