

# SESSION 14

## III-V DEVICES

**Chairs: Hidetoshi Kawasaki, Sony**  
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This session has five exciting papers that will address a wide variety of III-V device studies ranging from the device modeling, a circuit design with high-level ESD protection, a correlation of the device-level behavior to the error vector magnitude (EVM) performance, millimeter-wave integrated circuits (MMICs) using heterojunction bipolar phototransistors (HBTs) and a topic on light-emitting transistors. The first paper is an invited talk which will present an electric field sensitivity analysis in the field plate models. A two-transistor model with a field plate is modified for the device modeling of the gate-connected and source-connected field plated devices. A deep class-AB small-signal model topology will be discussed to provide insights to the source-connected field plate design and the associated impacts on the total gate-to-drain capacitance for high power gain, high voltage gain devices. The second paper will discuss a way to realize high-electron mobility transistor (HEMT)-based MMICs that allows for high level ESD protection with minimal impact on the chip size and cost. The inclusion of a new multi-gate enhancement-mode HEMT power clamp device provides an over-2kV human body model (HBM) ESD protection in HEMT MMIC's with large and designable turn-on voltage in the both directions. The third paper will discuss a method of correlating the current transient time constant to the EVM in the pseudomorphic HEMTs (pHEMTs). A simple device-level testing method was developed to correlate the transient behavior to the related circuit-level performance, which helps effective evaluation of different device processes for the circuit design, in-process control and epi supplier qualification. The fourth paper, which is a student paper, describes the development of a MMIC process based on InP/GaAsSb double HBTs (DHBTs) using an amorphous fluoropolymer as an inter-level dielectric layer. The measured RF results of inverted microstrip transmission lines, W-band amplifier and 50 GHz oscillators will be presented. The session will be concluded with another student paper that demonstrates an InGaP/GaAs heterojunction bipolar phototransistor integrated with a light-emitting transistor.

