

Title of the talk: Semiconductor Devices for 5G Communication Technology
Small Signal Equivalent Circuit Model Parameter Extraction and Effective
Mobility extraction of AlGaN/GaN HEMT using S-parameter

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Abstract: The extrinsic and intrinsic parameters were extracted from the experimental S-parameters using 16- and 22-element small signal equivalent circuit model for GaN HEMT with different source to drain length and gate width over 500 MHz to 26 GHz range. The extraction using 22-element model shows good consistency to measured S-parameters and the maximum gain, stability factor, delta factor and K-factor with less percentage error than 16-element model. As the source to drain length is increasing, the accuracy of parameter extraction is enhanced for 22-element model. For increased number of fingers, the 22- element model shows more accuracy.

The effective mobility (μ_{eff}) plays a key role to characterise the transport in high electron mobility transistor. One of the well-known methods for effective mobility (μ_{eff}) extraction is the split capacitance-voltage (C-V) technique. For the extraction of effective mobility, the scattering-parameters (S-parameters) are used. The external parasitic gate capacitances ($C_{\text{gs_ext}}$ and $C_{\text{gd_ext}}$) are calculated using the measured S-parameter and de-embedded from the intrinsic S-parameters from which the effective mobility is calculated. The effective mobility was extracted for different gate-source voltages (V_{gs}). Also, the dependence of effective mobility on drain-source voltage (V_{ds}) and gate-source voltage (V_{gs}) has been studied.