

Highly-linear and Efficient mm-Wave GaN MMICs: Challenges in Model and Validation

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ABSTRACT

Realizing high-performance mm-Wave 5G and beyond communication systems will require transistors with higher linearity and efficiency than current technology options. While GaN HEMTs offer excellent power density, their limited linearity and efficiency compromise overall system performance; this requires substantial DC power consumption and power back-off to circumvent.

Here, we will present the linearity and efficiency of graded-channel GaN HEMTs [1-7] with the linearity figure-of-merit, OIP3/PDC, of 20 dB at 30 GHz, well beyond the 10 dB rule of thumb. For power amplifier applications, a two-tone PAE of 62% was obtained experimentally at 30 GHz, which is a state-of-the-art result. We find that ~3 dB back-off from peak PAE is sufficient to achieve a carrier to third-order intermodulation (C/IM3) ratio of 30 dBc. Recent Ka-band and W-band MMICs with graded-channel GaN technology illustrate their potential for future linear and efficient mmW applications. We will talk about challenges associated with accurate linearity and efficiency modeling and validation at mmW MMICs.

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