Nonlinear Modelling of K-Band GaN Power Amplifier

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Abstract: An innovative nonlinear (NL) modeling of K-band power amplifier (KPA) designed and fabricated in Gallium Nitride (GaN) technology operating at frequency f0 = 24 GHz is investigated in this paper. Two KPA prototypes are characterized by single-and double-frequency tests (SFT and DFT). Then, fitting memory NL model from SFT established for input-output power (Pin-Pout) characteristic f0 enables the confirmation of KPA performance. Accordingly, the KPA presents 27.8 dB gain when Pin increases from −5 dBm to 20 dBm, 40.8 dBm saturation output power, and 38.6% saturation power added efficiency (PAE). Moreover, the DFT with f1 = 23.995 GHz and f2 =

24.005 GHz enables the assess to the third-order intermodulation distortion (IMD3) which is assessed from 10.4 dBc to 35 dBc. The KPA critical IMD3 is identified with the Pout variation range from 16.35 dBm to 36.35 dBm. The developed NL model is useful in the future for the electromagnetic interference prediction of multi-carried front-end transceiver communication system due to NL distortion signal.

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