

# EMI Characterization from GaN Power Amplifier Nonlinearity Test for 16-QAM 5G Communication

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**Abstract:** Today, the anywhere, anyhow and anytime application scenarios of 5G system force designer to challenge on electromagnetic interference (EMI) requirements. Despite the technological progress, relevant test techniques are necessary to minimize the future communication system EMI risk. In this paper, the EMI characterization from nonlinearity (NLT) of 5G system Gallium Nitride (GaN) power amplifier (PA) is studied. Firstly, the PA NLT is evaluated by 1-dB/3-dB/6-dB compression point and 3rd-order intermodulation distortion (IMD3). Then, a measurement platform is built based on vector signal

generator and EMI receiver including digital modulation system. According to the adjacent channel leakage ratio (ACLR), error vector magnitude (EVM) and signal-to-noise ratio (SNR), the EMI characteristics of 3.5-GHz carrier signals modulated by 16-Quadrature Amplitude Modulation (16-QAM) distorted by the GaN PA NLT are discussed. Due to the GaN PA 3rd order intermodulation (IM3) product, the SNR degrades from 34.8 dB to 14.6 dB when the input signal power increases from  $-10$  dBm to 6 dBm. The EMI effect is confirmed by significant signal distortion observed with 16-QAM constellation diagram. Research work is currently ongoing for extending the EMI test technique for 6G communication system.

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