

PHASE MEASUREMENTS FOR HIGH-POWER MICROWAVE AMPLIFIERS WORKING UNDER NON LINEAR CONDITIONS

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Abstract: Phase measurements are crucial for some applications, such as radio telemetry, coherent detection and amplifier design. When an amplifier is driven into its saturation region, its output signal is often distorted as a phase deviation, function of the delivered output power. This is commonly measured in terms of the amplitude to phase distortion or AM-PM distortion. Phase characterization is fundamental since phase linearity of the system is desired and some linearization techniques could be used to achieve the desired response. On the other hand, the traditional topology used for designing high power amplifiers is driving an array of parallel transistors and combining its power, this technique increases the current, and as a consequence, the delivered power. The drawback of this technique is the phase stability of the transistor itself, since the AM-PM distortion is seldom similar between devices, and phase unbalance reduces the combined power.

AM-PM distortion for low power applications can be measured by a Vectorial Network Analyzer (VNA), Nevertheless, phase characterization is not easily measured for high power amplifiers. In this paper, an alternative solution for measuring phase in high power applications is presented, that is, a setup which allows obtaining the AM-PM distortion behavior. A power amplifier measurement is shown to demonstrate its viability. Furthermore, some low power measurements are performed to validate the technique with the VNA.