Sideband asymmetries in RF Power LDMOS Before and After Digital Predistortion

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The merging of the fields of RF engineering and signal processing has introduced concepts such as behavioral modeling and enabled digital linearization schemes for wireless devices, such as power amplifiers (PAs). Despite that this process has been going on for a number of years much work remains to be done. The links between physical behavior and mathematical models are far from well-understood as are the optimum strategies for device design.

This study focus on digital predistortion properties of a one-stage PA consisting of a power transistor mounted in a test fixture. The device under test (DUT) is an Infineon PTF210451E, a 45W transistor intended for usage in the frequency bands 2010-2025 MHz and 2110-2170 MHz. The test fixture is also designed by Infineon Technologies.

The signal types used in the measurements are single and double carrier wideband code division multiple access (WCDMA) signals. The double carrier WCDMA signals have tone-spacings of 5, 10 and 15 MHz. Normal two-tone measurements are also presented.

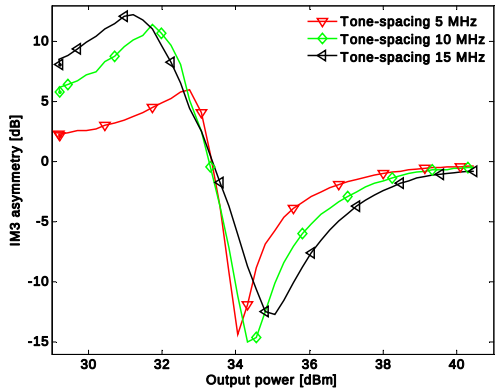

Fig. 1. The asymmetry in IM3 for the three tone-spacings 5, 10 and 15 MHz is shown.

Memory effects are commonly shown using a power-swept two-tone IM3 measurement. Such a graph for three different tone-spacings is shown in Fig. 1. The presence of asymmetry between the upper and lower IM-product shows that there is memory in the DUT. The WCDMA IM3 asymmetries with varying tone-spacings are shown in Fig. 2.

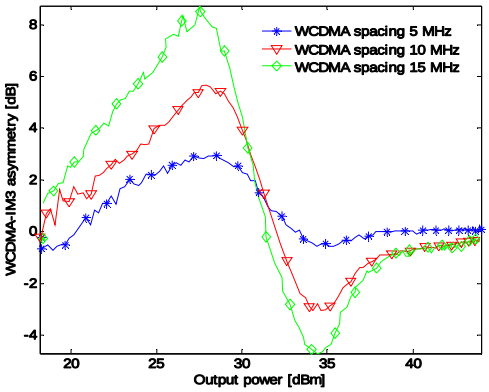

Fig. 2. Asymmetries in double carrier WCDMA shown for varying tone-spacings as function of output power.

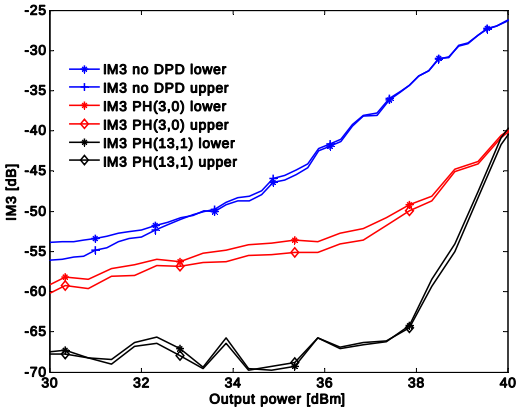

Fig. 3. The improvement in double carrier WCDMA IM3 dependence on the complexity of the predistorer. The graph indicates that a predistorter with memory is needed.

Predistortion of the double carrier WCDMA signals are tested. The improvement in WCDMA IM3 is shown in Fig. 3 showing that even for a simple device memory is needed in the predistorter.