University of Stuttgart
Institute of Robust Power Semiconductor Systems

Burak Güven Özat, M.Sc.
Pfaffenwaldring 31, Room 2.207
70569 Stuttgart
+49 711 685-68987
burak.oezat@ilh.uni-stuttgart.de
14.10.2024

Research Project / Master´s Thesis

RF

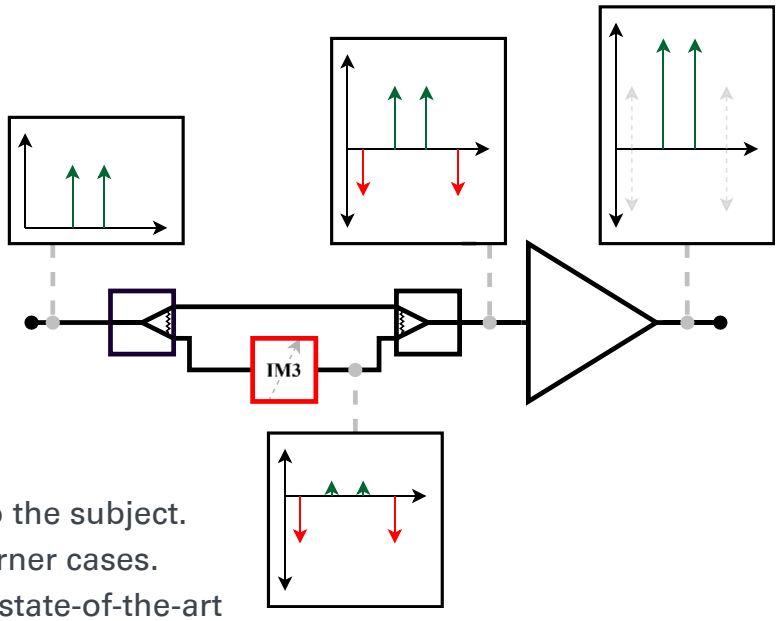
Adaptive Wideband IM3 Generator Design with Enhanced Fundamental Carrier Suppression

Motivation:

The everlasting developments in the transistor technologies and modulation techniques paved the way for high data-rate wireless communication applications. For a reliable, robust, long-distance communication, power amplifiers with high output powers are needed in many cases. By their nature, the amplifiers suffer from the nonlinearities at high power levels, and consequently their gain is compressed and strong unwanted spurs like higher harmonics or intermodulation products appear in the spectrum. In order to avoid the impairments caused by the nonlinearities degrading the signal quality and spectral efficiency, analog & digital pre-distortion techniques are widely used in the literature. Before proceeding the signal to the amplifier, by deliberately distorting the signal and manipulating the distorted signal in terms of amplitude and phase afterwards, the inverse of the spectral products generated by the nonlinearities, can be obtained. Thus, the pre-distorted signal can be fed to the amplifier accompanied by the actual signal and the unwanted frequency products can be canceled out or suppressed and the linear range of the amplifier can be enhanced. By this motivation, to eliminate the third-order-intermodulation products (IM3) generated by the amplifier, design of a pure, wideband IM3 generator circuit is aimed.

Goals:

Realize a schematic / layout design of a circuit in a 130 nm SiGe HBT technology in the V-band, which purely generates IM3 products and suppress the fundamental carriers at the output. The IM3 generator should be adaptive against the errors in the large signal transistor models, fabrication tolerances and changes in the input power levels.



Tasks:

- Comprehensive literature research related to the subject.
- Design and verification of the circuit with corner cases.
- Scientific report of the work including state-of-the-art comparison.