

# Advanced calibration and instrumentation setups for nonlinear RF devices

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Modern wireless telecommunication applications are omnipresent in our day-to-day lives. One can no longer imagine life without the highly power-efficient and low-cost technology fortifying the advances in wireless telecommunication.

In order to satisfy the performance requirements, components are driven beyond their linear region of operation. Understanding the behaviour of nonlinearities is therefore essential when designing components that take part in a telecommunication loop.

One of the first setups capable of capturing the nonlinear behaviour of an RF component was the Large-Signal Network Analyser (LSNA).

When performing measurements with the LSNA, systematic errors arise due to imperfections of the measurement instrument. In order to minimise these errors a calibration is necessary.

Calibration boils down to comparing the known characteristics of a presumed ideal reference element or calibration standard to its measured response. The differences are attributed to the non-ideal response of the measurement instrument and should be eliminated.

This dissertation deals with the calibration of measurement instrumentation used for the characterisation of the nonlinear behaviour of RF devices.

Unfortunately, one of the key components in the calibration procedure of such instrumentation is restricted to a coarse frequency grid.

In this work a reference device and a reference signal are studied as two standards allowing a dense frequency grid calibration.

A reference device that is passive, inheriting a high stability and repeatability is proposed as a calibration standard.

A reference signal is specifically designed to meet the requirements of a dense frequency grid calibration.

The performance of both techniques is discussed in full detail and paves the way towards a calibration on a dense frequency grid.