**Studying noise contributions in Nonlinear Vector Network Analyzer (NVNA) measurements**

**Description:**

Nonlinearities are becoming very ‘hot’! After some years of hesitation, the high-frequency measurement world now finally has acknowledged the need to measure the nonlinear behavior of a device or system correctly. Pushed by the modeling world, which clearly needs good ‘nonlinear’ measurements to obtain good ‘nonlinear’ models, some ‘nonlinear’ measurement instruments were developed. Two different approaches to design a measurement instrument that is able to measure the nonlinear time domain waveforms correctly can be followed: a sampler-based methodology or a mixer-based methodology. A sampler-based measurement instrument uses samplers to perform the down conversion of the high-frequency signals to the IF spectrum and is hence based on the harmonic sampling principle. A mixer-based measurement instrument uses the heterodyne principle to downconvert the RF signals to the IF spectrum. This principle can be found in the Nonlinear Vector Network Analyzer (NVNA).

The goal of this master thesis is in a first step to learn how to measure with a state-of-the-art measurement instrument, the NVNA. You will acquire a lot of insight in nonlinear measurements and their interpretation. Secondly, the focus will be put on studying the noise behavior of a nonlinear system. A nonlinear device will treat input noise in a completely different way compared to a linear device. Hence, adapted signal analysis and modeling techniques are required.

The measurement part of this thesis will be performed at HIG, Gävle; while the signal processing part of the thesis will be performed at the VUB, Brussels, Belgium. This master thesis is a joint effort of 2 research groups: HIG, Sweden and M2ESA, VUB both specialized in measurement techniques and signal processing. This master thesis, consisting of both signal analysis and experimental work, offers you challenging research opportunities within the framework of on-going research projects.

*Illustration 1: Nonlinear Vector Network Analyzer*

**Link to webpage or article related to the subject (optional):**

* **http://www.home.agilent.com/agilent/product.jspx?cc=BE&lc=dut&ckey=1381958&nid=-35211.775208.00&id=1381958&cmpid=21255**

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