

European Microwave Week
5th NVNA User's Forum
Amsterdam, October 12th 2004

Extraction of the conversion matrix with a variable IF

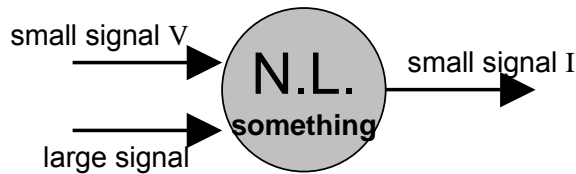
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from the Automatic RF Techniques Group



Background and Motivations

Conversion Matrix extraction out of NVNA measurements of a nonlin. cell:

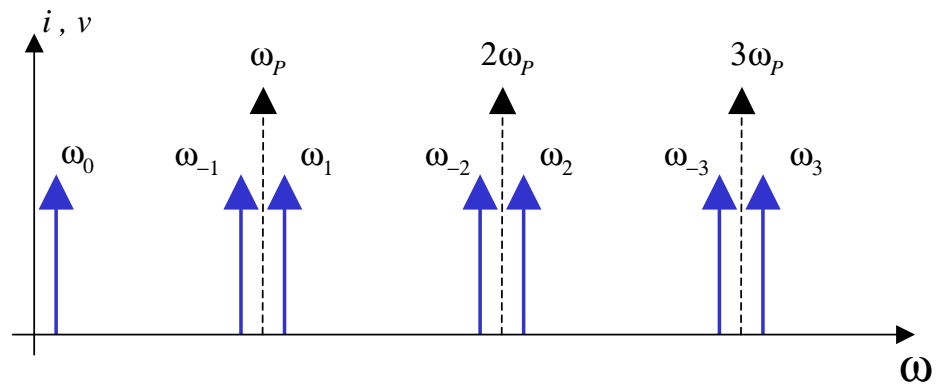
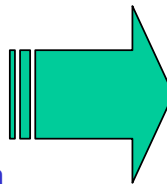


NVNA measurements



$$I = Y \cdot V \Rightarrow Y = I \cdot V^{-1}$$

Solving this equations requires separate experiments, therefore a question about **synchronization** rises



The “safest” way is identified in locking to the **fundamental** of the frequency grid

[J. Jargon et al., “Calculating Ratios of Harmonically Related, Complex Signals with Application to Nonlinear Large-Signal Scattering Parameters,” 60th ARFTG Conference Digest pp.113-120, Dec 2002]

Time is then shifted so that large signal status is identical within all the experiments

DRAWBACKS: you need the fundamental to be there, you must stay in the grid

an in-band characterization of a device/circuit/system is impossible



Variable IF conversion matrices

New analytical results enable to lock to the **Large Signal**:

Apart from calibration issues, only that signal has to stay in the grid;

Modulated Signal Mode can be exploited.

Experimental Results

On-wafer device: $2 \times 30 \mu\text{m}$ pHEMT, $V_g = -0.8\text{V}$, $V_d = 3\text{V}$
IF = $650\text{MHz} \pm \text{offset}$; LO = 4.55GHz , 0dBm ; RF = $5.2\text{GHz} \pm \text{offset}$

