

## Minutes of the NVNA Users' Forum at European Microwave Week (EuMW) 2006

The meeting was attended by 19 participants. This was the first NVNA Users' Forum meeting for three of the attendees.

### **\*) Discussion topic I: *Figures of Merit (FOM) for behavioral model comparison* (Led by Michael Gadringer and Daniel Silveira – TUWien, Austria)**



Two main questions arise:

1. *Classical FOM such as IP3 and ACPR seem not sufficient to compare the accuracy of nonlinear dynamic models? Are there better ones?*

This important question gives rise to a lot of other questions:

- What is the measurement time?
- Are the same measurements needed for all models?
- What are the strengths and weaknesses of the different models?

In order to derive some good FOM, one needs to make some hypotheses:

- The measurements are correct.
- The impedance of the measurement system is 50Ohm.

An important conclusion of this topic is that many people tend to look more to numbers than to graphics! So solid FOM are needed!

2. *Is there a FOM which also considers the computational efficiency of the model extraction process and the number of parameters of the model?*

This remains an open question...

### **\*) PhD research topic: *Increasing the dynamic range in high power RF measurements using step attenuators* (Presented by Nilaped Russamee – University of Cardiff, UK)**

The goal of this PhD research project is to increase the dynamic range in high power measurements by using step attenuators in the measurement setup. Questions were asked of the audience, with replies given below.

- What is the maximum power level that can be measured?
- How can the calibration be performed?  
In-situ calibration: calibration of the attenuators while the system is running.
- Hot switching is not considered here.



**\*) Research Updates:**

***-High power RF load-pull measurements (John Wood – Freescale)***



During this update different calibration methods for load-pull measurements were compared. The impact of inaccuracy during load-pull measurements was highlighted. After the update a few questions were asked:

- Can the measurements be done with a Vector Network Analyzer? Yes, but this has not yet been reported.
- How to deal with harmonics? This work considers only passive, fundamental load-pull

***-Comparison between Phaser-Quattro and LSNA from a modeller's point of view (Alessandro Cidronali – University of Florence, Italy)***

The speaker explained that one main advantage of the Phaser-Quattro from a modeller's point of view is the extended bandwidth at low frequencies. The lower frequency limit for the Phaser-Quattro is 300 kHz, whereas this is only 600 MHz in the case of the LSNA and VNAPLUS. Furthermore, the resolution is 100 kHz across the entire measurement bandwidth. This is also the minimum tone spacing for modulated signals.



**\*) Discussion topic II: *THE Name* (Led by Dominique Schreurs, K.U.Leuven, Belgium)**

As more implementations of measurement systems that enable vector large-signal measurements are being developed (LSNA, MTA, Phaser Quattro, VNAPLUS, ...), it is a good moment to revitalize the discussion within the Users' Forum on the appropriate name to denote this class of instruments. When a similar discussion was held in Dec. 2003 in Boulder, Colorado, the top three results of an informal poll were as follows:



1. NNA (Nonlinear Network Analyzer)
2. LSNA (Large-Signal Network Analyzer)
3. NVNA (Nonlinear Vector Network Analyzer)

After a discussion among the attendees in Manchester, a new poll was held with the following result:

1. NNA (Nonlinear Network Analyzer)
2. NVNA (Nonlinear Vector Network Analyzer)
3. LSNA (Large-Signal Network Analyzer)

In other words, LSNA and NVNA switched positions. The explanation is that LSNA is commonly associated with a commercially available product.

As most attendees were Europeans, it is intended to continue this discussion at the Fall NVNA Users' Forum in Broomfield, Colorado, to also hear the opinion of the US users.

**\*) Announcement: *Future NVNA Users' Forums* (Dominique Schreurs, K.U.Leuven, Belgium)**

At the end of the meeting, Dominique asked what the feeling is about future NVNA Users' Forums in Europe. The overall opinion of the attendees is that there is clearly interest in maintaining such an event. It was noted though that it would be more convenient to plan this event earlier in the EuMW week. This has turned out to be not easy, due to the very low availability of seminar rooms in the first part of the week, caused by the high number of parallel sessions of the EuMIC and EuMW conferences. This has to be discussed with the local EuMW organizing committee on an annual basis. It was agreed that if no appropriate time slot can be obtained at EuMW 2007, then the INMMIC workshop, which will take place in Fall 2007 as well, could be a valuable alternative.

**\*) Next Meeting: *Fall NVNA Users' Forum Meeting at the 68<sup>th</sup> ARFTG Conference, Wednesday November 29, 2006 from 5:00 to 7:00 PM.***

The next NVNA Users' Forum meeting will be held in conjunction with the 68<sup>th</sup> ARFTG Microwave Measurement Conference in Broomfield, Colorado, USA. The program will consist of two moderated discussion topics, a discussion of Ph.D. research in the area of nonlinear measurements, and research updates.

Please contact Dominique Schreurs <Dominique.Schreurs@esat.kuleuven.be> or Kate Remley <remley@boulder.nist.gov> if you have suggestions for the program. We hope to see you there!