

## NVNA Users' Forum at EuMW 2005

The NVNA Users' Forum was held on Oct. 6<sup>th</sup> in conjunction with the European Microwave Week in Paris, France. It was co-sponsored by ARFTG and by the European Network of Excellence TARGET. There were 20 participants.

### Agenda

- 4:30 p.m.–4:35 p.m.: Welcome
- 4:35 p.m.–5:05 p.m.: Discussion topic “TARGET NVNA Round Robin Results”
- 5:05 p.m.–5:25 p.m.: PhD research
- 5:25 p.m.–5:55 p.m.: Research updates
- 5:55 p.m.–6:00 p.m.: Announcements and Closure

### Discussion topic “TARGET NVNA Round Robin Results”



TARGET is a Network of Excellence that groups 49 European research labs. The target is to enhance research cooperations on various power amplifier related research topics.

One of the work packages within TARGET is called Lab Setup. It groups a number of ‘Virtual Labs’, which are each focused on a particular measurement capability. One of the Virtual Labs focuses on ‘Time Waveform Measurement Setups’. As its central activity during Spring 2005, a round robin measurement of an RF amplifier was organized. The amplifier was a general-purpose amplifier (AG201-63 from WJ), which was measured by eight groups under the same measurement conditions. The measurements were performed by means of an LSNA or MTA.

An overview of the results obtained by the eight participants was presented by Dominique Schreurs. By inter-comparing the results, the following conclusions could be drawn:

-*Amplitude*: The differences between measurements of the  $b_1$ -wave at the fundamental frequency are small. For the  $b_2$ -wave the differences are significantly larger.

-*Phase*: The phase differences for the  $b_1$ -wave at the fundamental frequency are large (~20 deg.), and small for the  $b_2$ -wave (~3 deg.). At the harmonic frequencies, phase-differences increase further.

In a second test, an isolator was placed in front of the amplifier to minimize source mismatches. This reduced the harmonic content of the excitation signal, but no significant influence on the  $b_2$ -wave was observed.

Questions that arise from the results are the following:

- Should we repeat the round robin? If yes, which steps do we need to take?
- Which DUT should be chosen?
- Should there be a link to a standards lab?
- Which tests should be performed?

### Reactions

\*) Too many degrees of freedom were available to perform a correct round robin. First define the type of connectors to be used, the type of interfaces and adapters.

Furthermore, a sensitivity analysis should be performed to understand the sensitivity of the component to bias variations and temperature. Marc Van den Bossche has measured a significant bias influence on the component. This should be avoided in the future.

\*) In order to avoid connector damages, the amplifier should be returned to a central point after each measurement, to ensure a permanent quality control. For the considered round robin, this was however not feasible as the complete study had to be completed in a three months time period. Doing a correct round robin takes much more time than three months.

\*) The different labs used different calibration algorithms. This can cause differences in the measurements.

\*) Are the differences due to calibration errors, measurement setup problems or due to biasing problems? To solve these issues, the round robin should start with a very simple DUT, without nonlinear effects. The linear behavior should be compared and care should be taken that no load-pull arises. Next, a device that requires no bias, like a diode, could be considered.

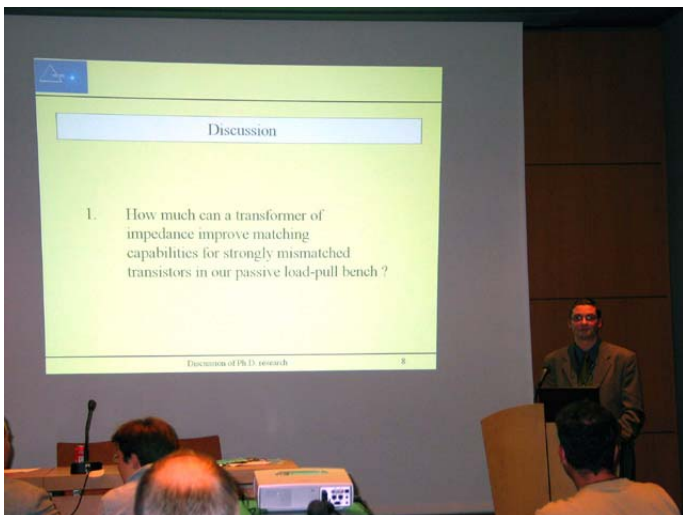
## Conclusions

The study needs to be continued but different precautions need to be taken into account:

- type of DUT
- sensitivity of DUT
- type of connectors
- type of calibration
- ...



## PhD research



Fabien De Groote from IRCOM, University of Limoges, presented an overview of his PhD research entitled “Pulsed time domain characterisation of high power GaN transistors”. He asked the following three questions to the attendees:

1. How much can a transformer of impedance improve matching capabilities for strongly mismatched transistors in our passive load-pull bench?
2. How can we judge the influence of the “wave probe” coupling method on group delays for harmonic frequencies phase measurements (better or not)?
3. Is it interesting to measure the dynamical bias effects induced by a burst of RF pulses?

The audience exchanged thoughts on the first two items, as a precise answer could not be formulated directly. On the third question, the reply was a strong 'yes'.

## **Research updates**

- As being a new LSNA user, Monica Barciela from Vigo University introduced her group and their on-going and planned LSNA research activities.
- Jean-Pierre Teyssier from IRCOM presented his newly developed pulsed control option board for LSNA embedded PC.



## **Announcements**

Next meetings of this Users' Forum are:

- @ Fall ARFTG (Washington DC, USA): Nov. 30<sup>th</sup>, 5:00 p.m.
- @ IMS 2006 (San Francisco, USA)