

Spring NVNA Users' Forum

Philadelphia, June 12th 2003

Introductions

During the first part of the meeting, the attendees had the opportunity to briefly introduce their (latest) activities related to vector large-signal measurements in their Institutes or Companies. The presenters and their topics were:

- [Jan Verspecht](#) (Jan Verspecht BVBA, Belgium): *Advanced sampling techniques*
- [Alessandro Cidronali](#) (Univ. Florence, Italy): *Mixer conversion matrices using LSNA measurements*
- [Mike McKinley](#) (Georgia Tech., USA): *Long-memory effects using VNA methods*
- Gary Simpson (Maury Microwave, USA): *New manufacturer of LSNA. Load-pull system associated with LSNA.*
- [Marc Vanden Bossche](#) (NMDG Engineering, Belgium): *Calibration methods for LSNA-based load-pull measurements.*
- [Adalbert Beyer](#) (Univ. Duisburg, Germany): *Small-signal measurements for large-signal design*
- Andrew Moulthrop (West Aerospace, USA): *MTA-based system. Technique to measure LO feedthrough.*
- Jean-Pierre Teyssier (University of Limoges, France): *Embedded PC cards for LSNA control*
- [Sergey Cherepko](#) (Lehigh University, USA): *Load-pull with MTA-based system.*
- [Dominique Schreurs](#) (K.U.Leuven, Belgium): *Time-domain behavioral modeling from LSNA measurements*
- [Kate Remley](#) (NIST, USA): *Multisine signals for ACPR approximation and calibration of wireless test equipment. Phase detrending method for multisines.*
- [Wendy Van Moer](#) (VUB, Belgium): *New three-port NVNA for mixer measurements and other three-port measurements*

The following participants had no presentation but gave a description of their work:

- Dylan Williams (NIST, USA): *Measurement of comb generators for phase calibration*
- Paul Tasker (Cardiff University, United Kingdom): *Capabilities: Two MTA systems, multi-harmonic loadpull system. IF band measurement capability, high- and low-power measurements, modulated signals.*
- John Wood (Agilent Technologies, USA): *Extracts data for behavioral models from LSNA measurements. 50 GHz capability.*

Round Table Discussion

There was an observation that most of the attendees are coming from an academic background. A suggestion was made to ensure that the Users' forum announcement also reaches industry. This apparent focus on academia is even more pronounced by the fact that the current activities on vectorial large-signal measurements are mainly

concentrated around modelling activities. By focussing more directly on applications, like power amplifier characterization, it was believed that more interest in the meeting could be created.

Next, the attendees had the opportunity to 'express their dreams'. An important item is to have multi-port (>2 ports) systems available. A three-port set-up in a research phase already exists, but there is a strong interest in differential measurements as well. Related to this, it was commented that multiport capabilities would open interesting research issues, as it is still unclear how behavioural modelling can be extended to three ports, especially concerning the experiment design.

A second 'dream' touched upon is the dynamic bias. Here as well, there already exists a university-level solution, but there seemed to be a large interest in having this measurement capability widely available. The high frequency end was also discussed. While MTA users currently have capabilities to 40 GHz, the 'standard' LSNA set-up works up to 20 GHz. An upgrade up to 40 GHz (switches and phase reference generator are the limitations) is apparently rather straightforward. Even higher frequencies would be further down the road, because this still requires significant new development.

Also, the harmonic loadpull was touched. Most current systems are limited to max. three harmonics, mainly due to cost reasons, but three harmonics also seems to be a good number for satisfactory power amplifier design. Since all these possible extensions would result in a complex instrument, there was a proposal to offer it as a modular instrument, tailored to everyone's needs (and budget, ...).

Logistics

The next point on the agenda is the location of future meetings. The first Users' Forum (in Washington DC, Dec. 2002) and this one are organised with the support of ARFTG. However, since there is a large number of European users right now, there is interest to hold this meeting in Europe as well. After some discussion, the proposal is to keep the Spring meeting linked to the Spring ARFTG (which is organised in the IMS week), and to alternately switch between the Fall ARFTG meeting and a European event. The latter could for example be organised in connection to the European Microwave Conference, but it is not clear yet at this point how this could be supported, although ARFTG has agreed to offer its name as a sponsor. It was already announced that the next meeting will take place in connection to the Fall ARFTG, in Dec. 2003 in Boulder, CO.

The final point on the agenda concerned the name for the class of instruments that is the focus of this Users' forum. Several possibilities were thrown on the table and motivated. At the end, we had an informal vote to assess the opinions. The names concerned were: LSNA (Large-Signal Network Analyser): 13; NVNA (Non-linear Vector Network Analyser): 5, VNNA (Vectorial Non-linear Network Analyser): 0; ANNA (Absolute Non-linear Network Analyser): 6. Other possibilities that were suggested after the meeting are: ANA (absolute network analyser) and VLSMS (Vectorial Large-Signal Measurement Set-ups). This item will be continued by an e-mail based discussion.

Wrap-up

A webpage will be created that assembles the slides of all the short introductions. Also, the list of attendees (31 in total) will be compiled as an e-mail distribution list.