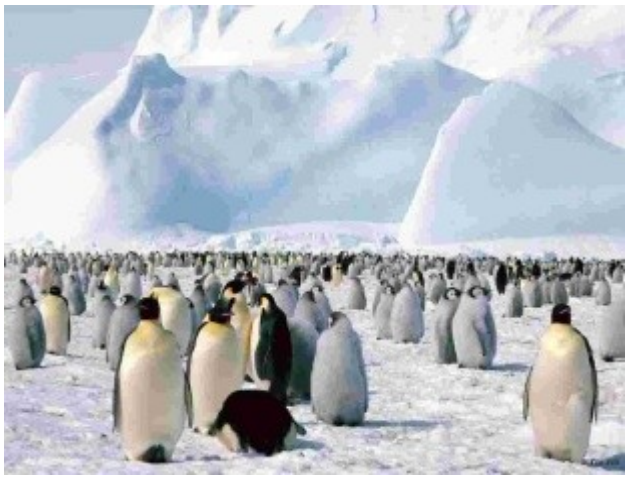
NMDG

LEADING BEYOND S-PARAMETERS

ZVxPlus

- Pulsed DC and RF Characterisation of Nonlinear RF/HF Components in Time and Frequency domain -



An extension kit for Rohde and Schwarz ZVA and ZVT

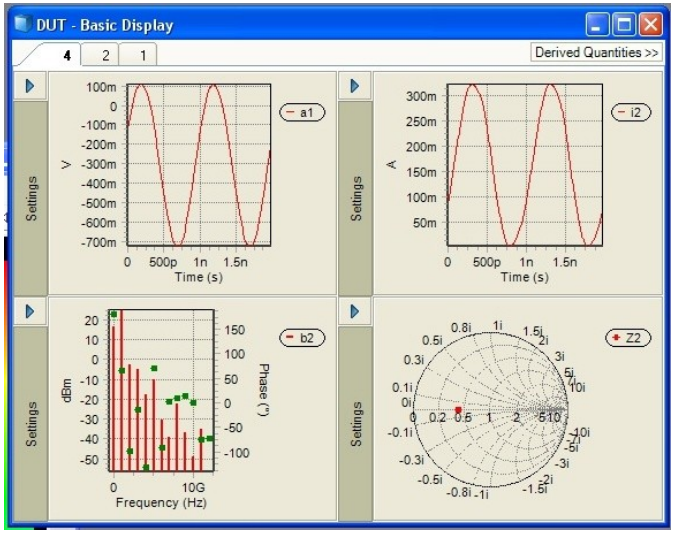
May 2011

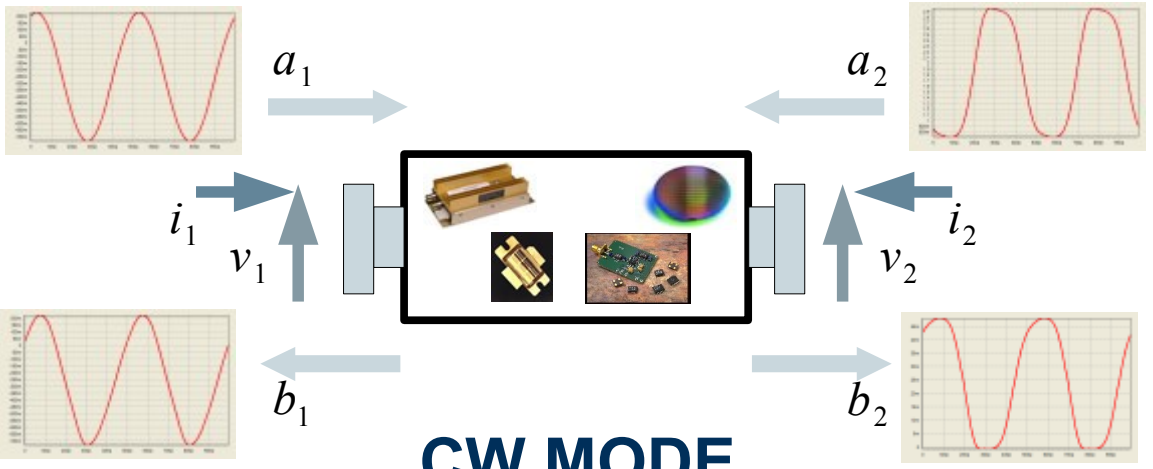
Outline

- ZVxPlus in CW Mode
- From CW to Pulsed DC and RF
- Generic Blockdiagram for Pulsed DC and RF Operation
- Generic Extensions in ICE supporting Pulsed DC and RF Operation
- Some Practical Setups
- Measurements
- Conclusion

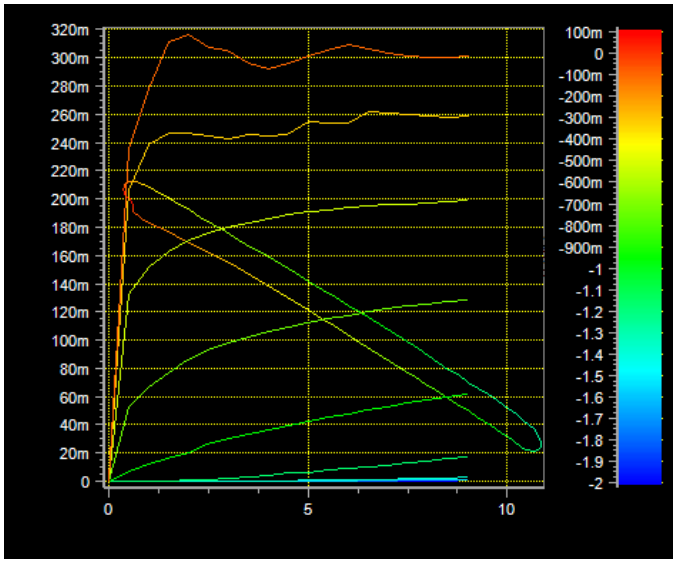
ZVxPlus

- **ZVXPlus measures**
  - The “complete” behaviour of a device under test i.e. the **v and i (or a and b) at all DUT ports**
  - Accurately
  - Under almost realistic conditions
    - Excitation and mismatch
  - Using a single connection
    - Including small-signal analysis



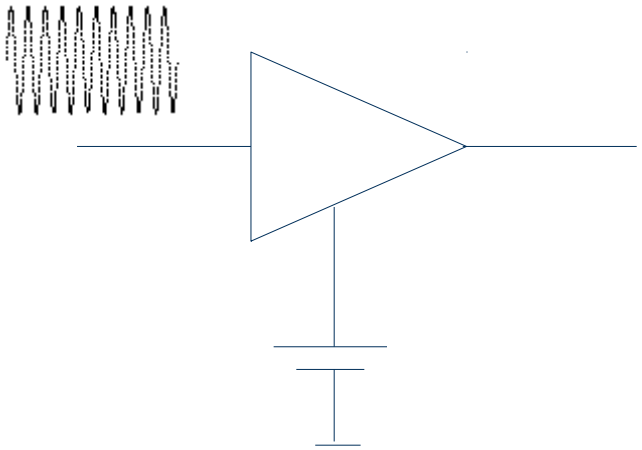


CW MODE

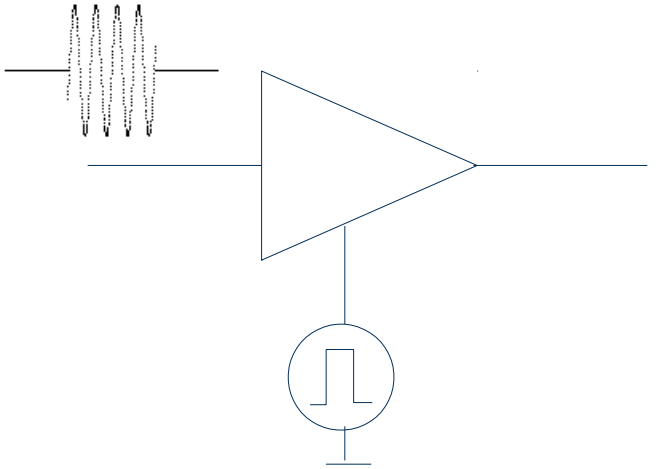


From CW to Pulsed DC and RF

CW

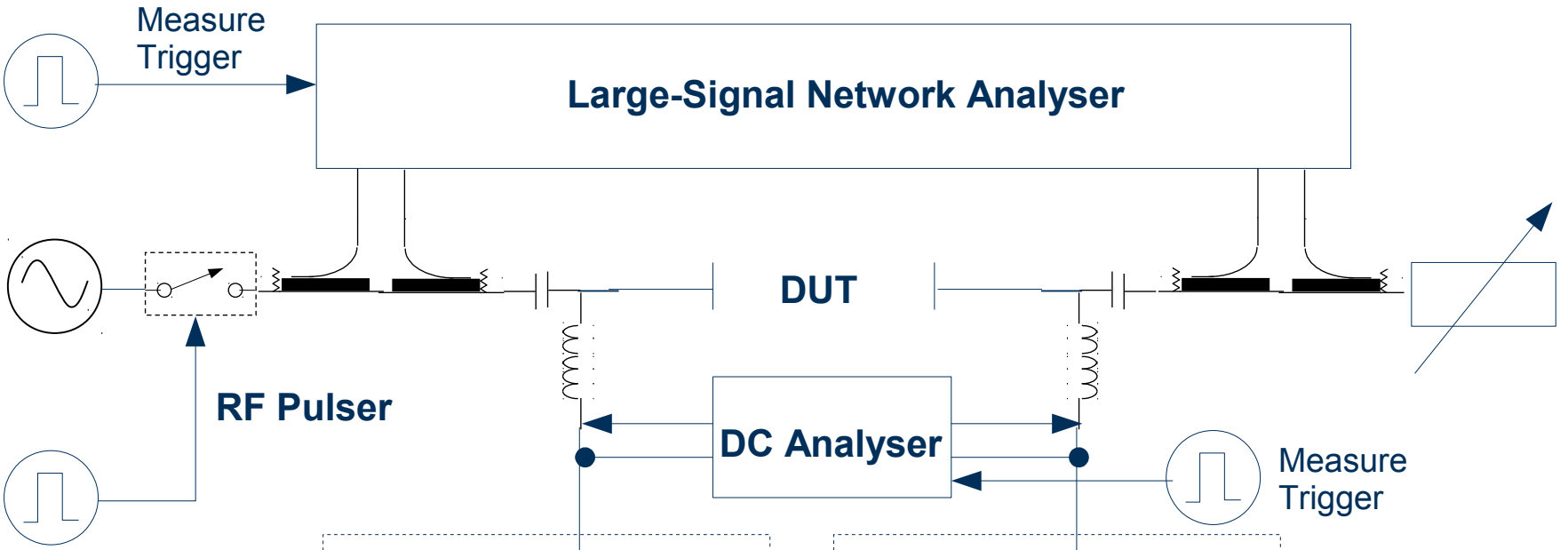


Pulsed DC and RF

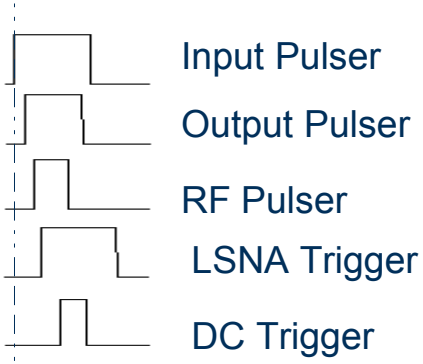


- Iso-thermal characterisation
- Trapping effects
- Radar Applications

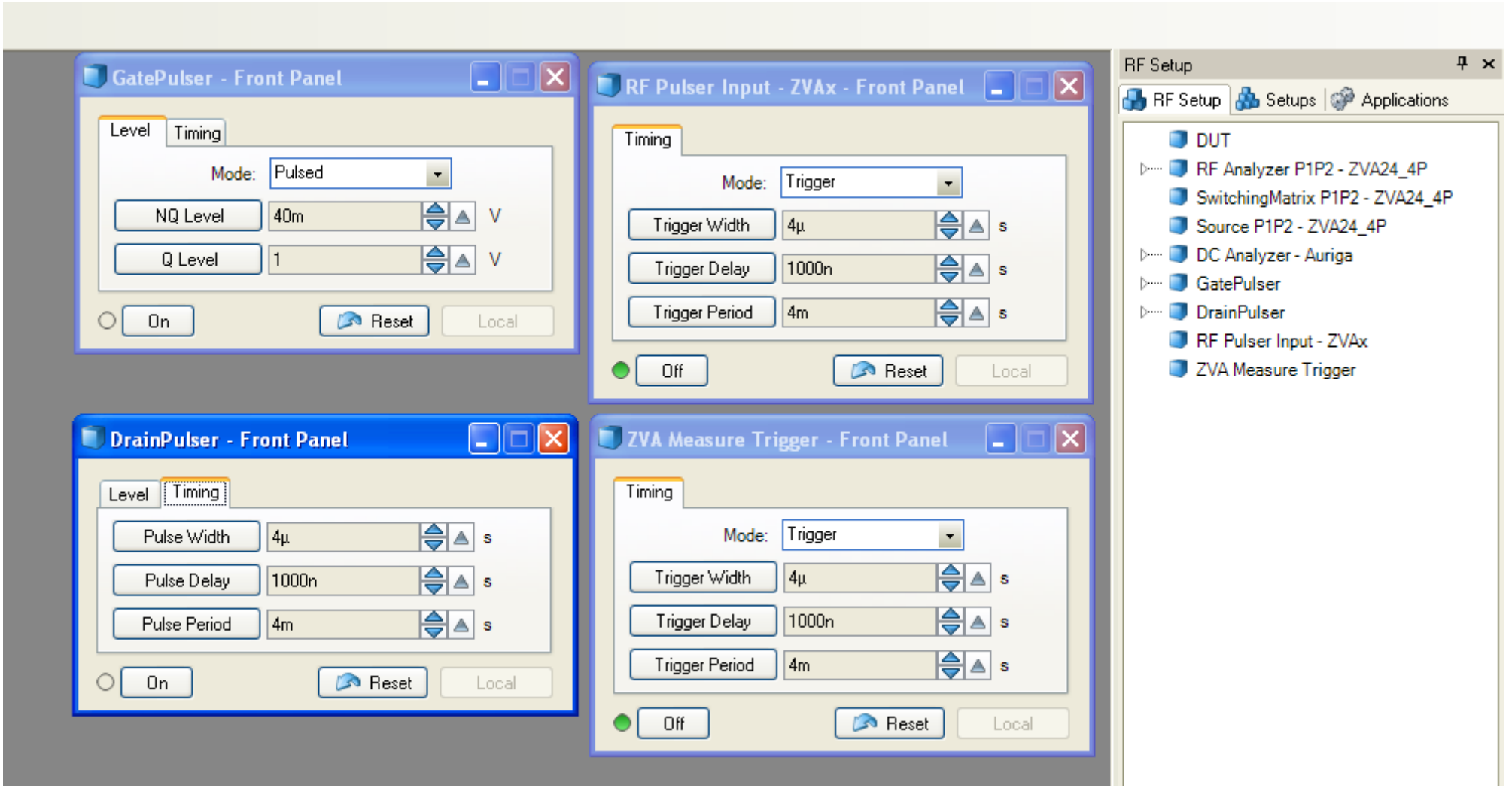
Generic Blockdiagram for Pulsed DC and RF Operation



Timing



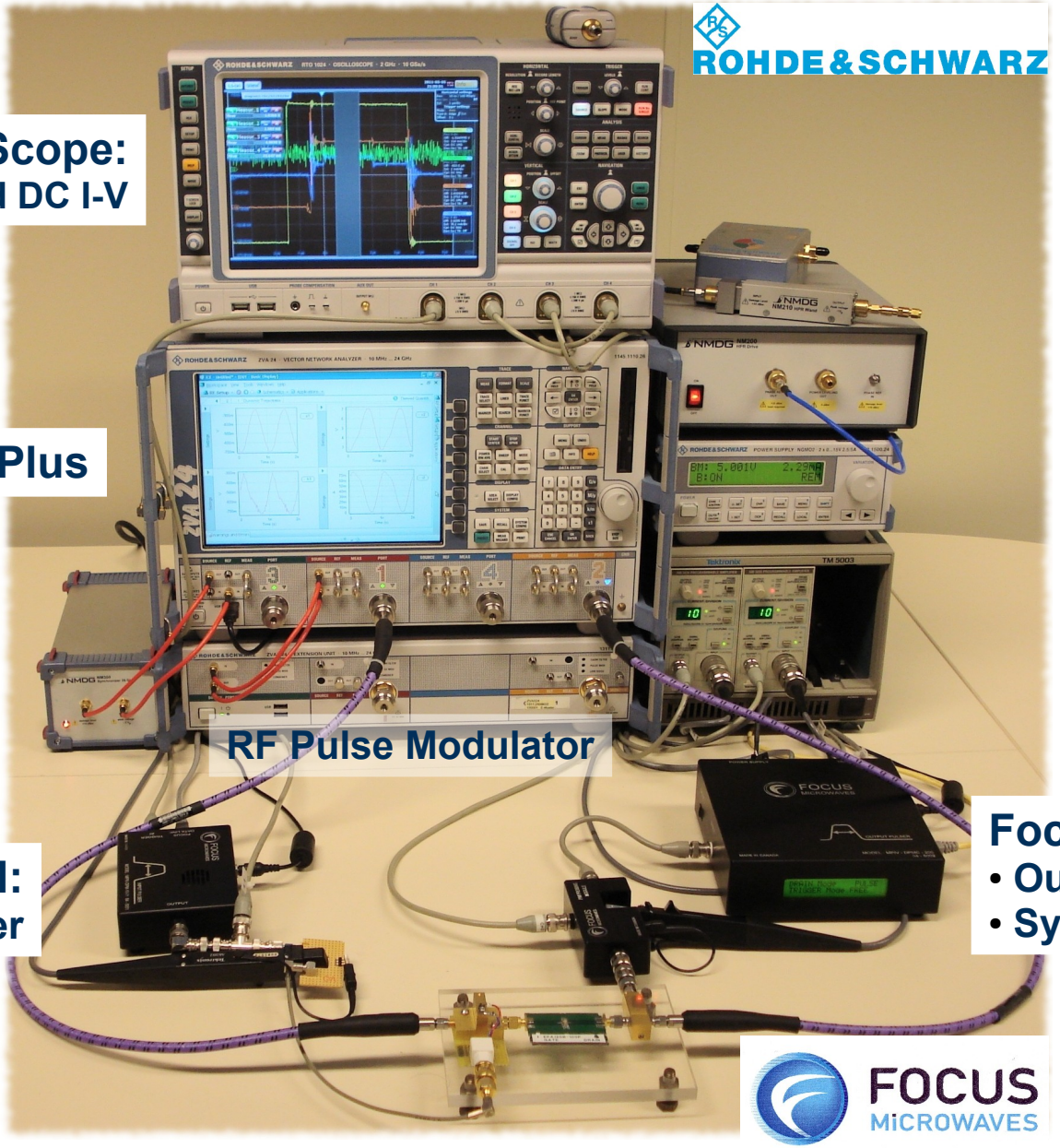
Generic ICE Extensions in support of DC and RF Pulsing



Setup supporting DC and RF Pulsing with Focus MPIV

R&S RTO Scope:
- **Measuring CW/Pulsed DC I-V**

ZVxPlus

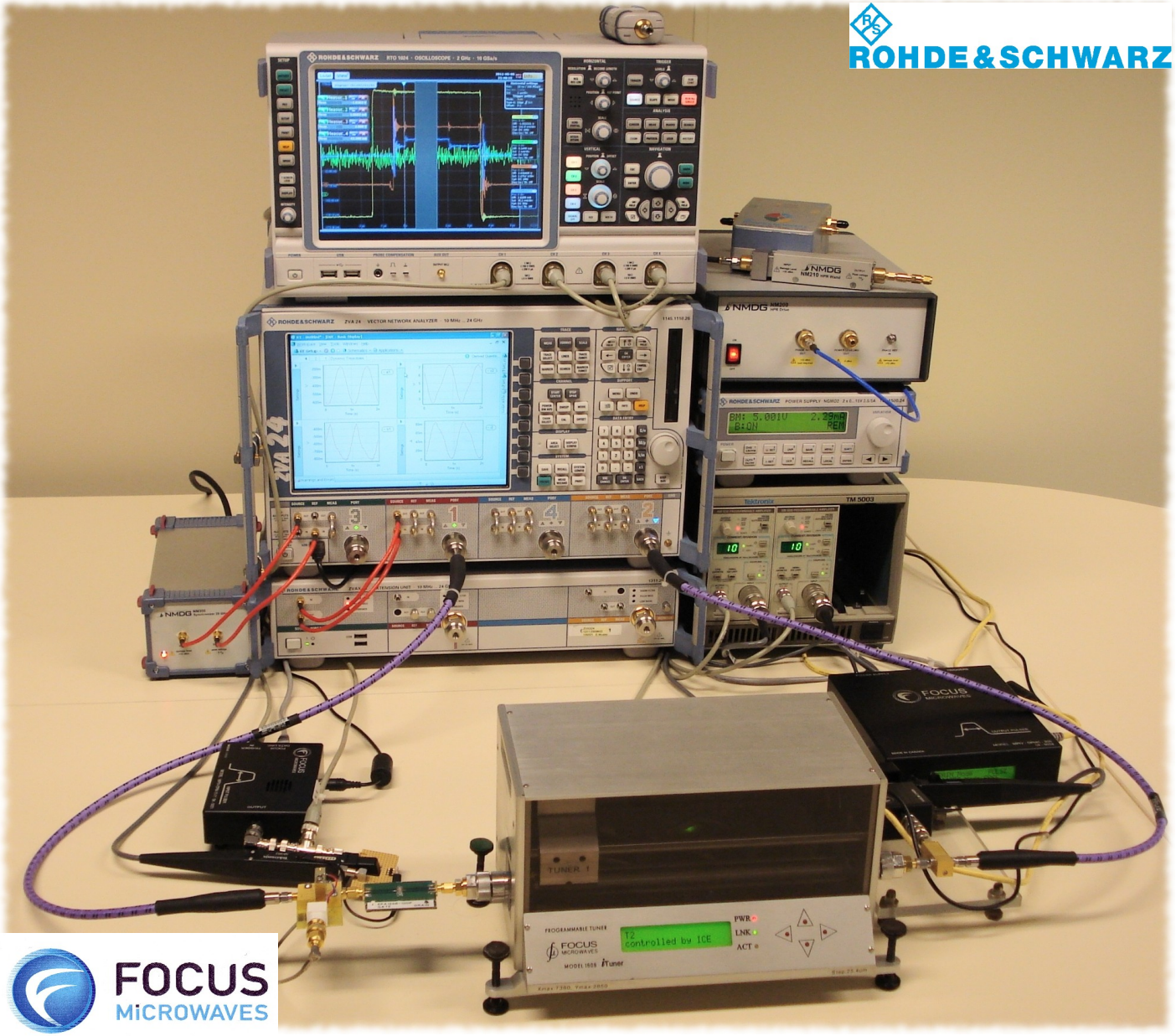


RF Pulse Modulator

Focus MPIV-GPM:
- **Input DC Pulser**

Focus MPIV-DPMC:
- **Output DC Pulser**
- **Synchronisation DC - RF**

Non-50 Ohm setup supporting DC and RF Pulsing with Focus PIV



Dissection of Setup with Focus MPIV System

Focus Microwaves:

- **MPIV System**
  - DC Pulsers
  - Synchronization DC Pulsers, RF Pulse Modulators and VNA & Scope Measurements
- **CCMT / MPT tuners**
  - Source and load tuning

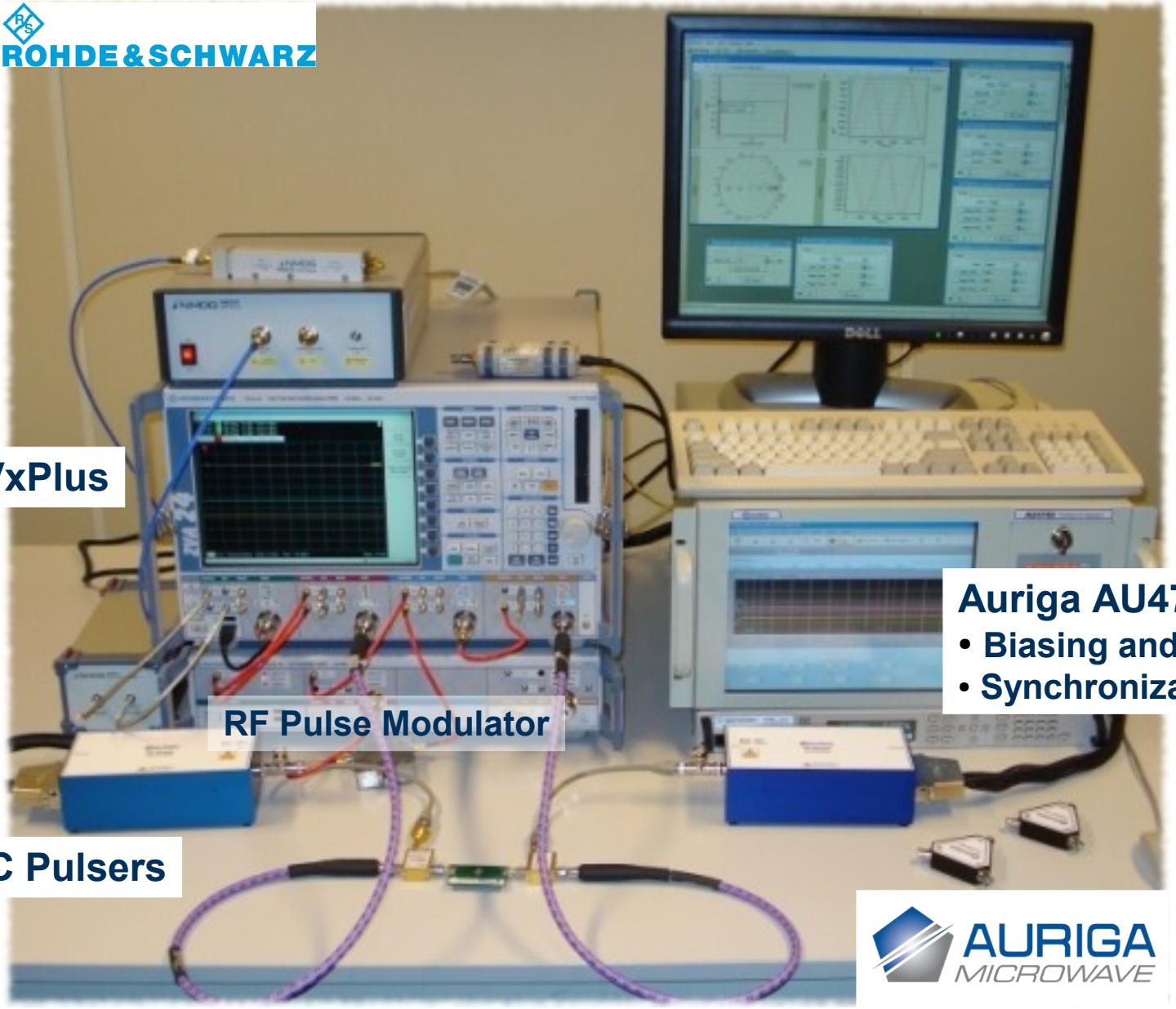
Rohde & Schwarz:

- **ZVA and ZVT series network analyzer and ZVAx**
  - S-parameters and Wave quantities
  - Pulse measurements
    - Average pulse mode
    - Point in Pulse
    - Pulse Profile: Presently not supported through ZVxPlus / ICE
  - ZVAx contains pulse modulators
- **RTO Scope**
  - DC IV measurements under CW/pulsed conditions

NMDG:

- **ZVxPlus and ICE**
  - Coherent combination of all instruments for nonlinear characterization under pulsed conditions in non-50 Ohm environment

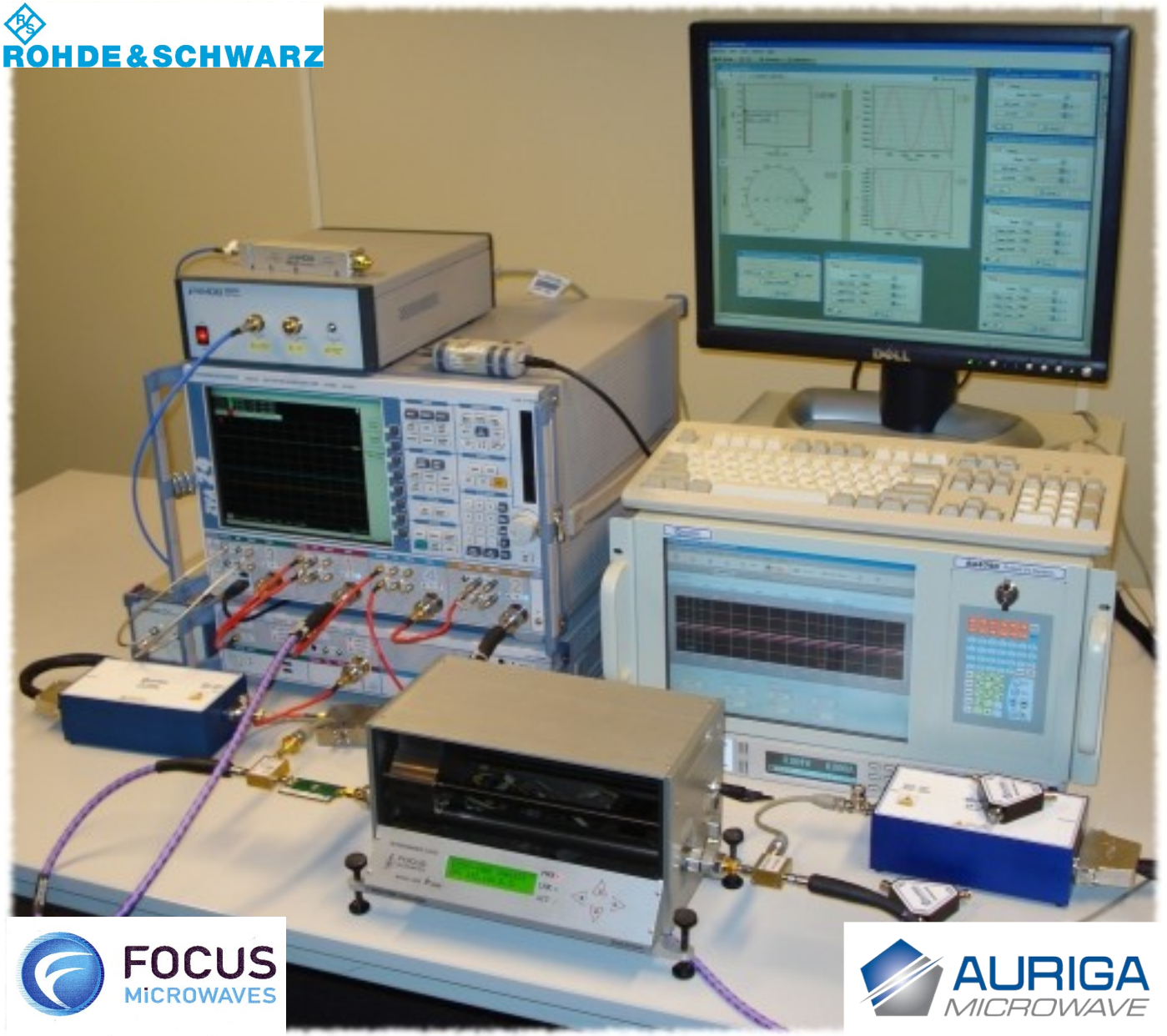
Setup supporting DC and RF Pulsing with Auriga System



Auriga AU4750

- Biasing and Measuring CW/Pulsed DC
- Synchronization DC - RF

Non-50 Ohm setup supporting DC and RF Pulsing with Auriga System



Dissection of Setup with Auriga System

Auriga Microwave:

- **AU4750 Pulsed IV System**
  - DC Pulsers
  - Synchronization DC Pulser, RF Pulse Modulators and VNA Measurements
  - DC IV characteristics under pulsed conditions
  - Bias-dependent S-parameters under pulsed conditions by synchronisation between Auriga system and network analyser

Rohde & Schwarz:

- **ZVA and ZVT series network analyzer and ZVAx**
  - S-parameters and Wave quantities
  - Pulse measurements
    - Average pulse mode
    - Point in Pulse
    - Pulse Profile: Presently not supported through ZVxPlus / ICE
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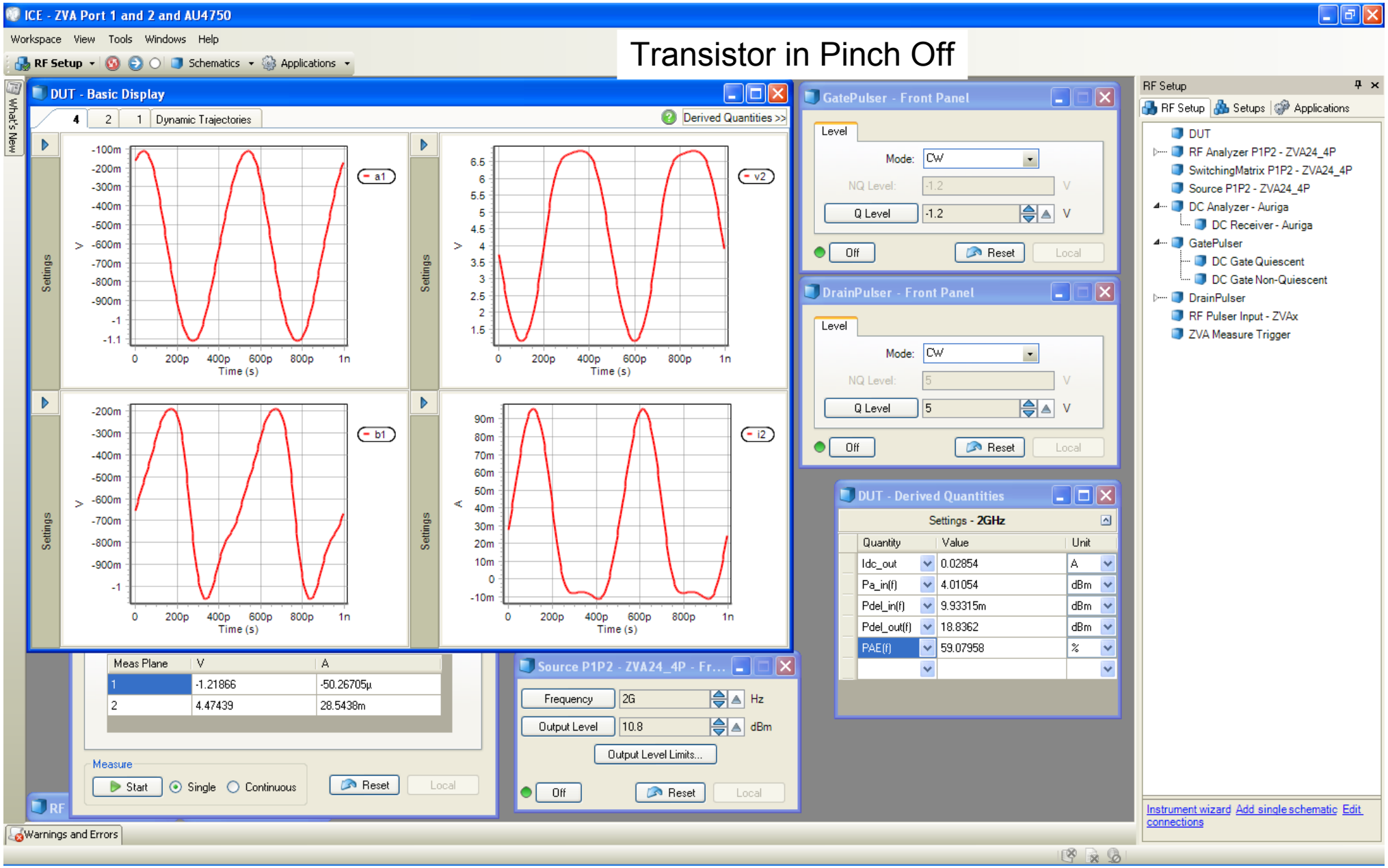
Focus Microwaves:

- **CCMT / MPT tuners**
  - Source and load tuning

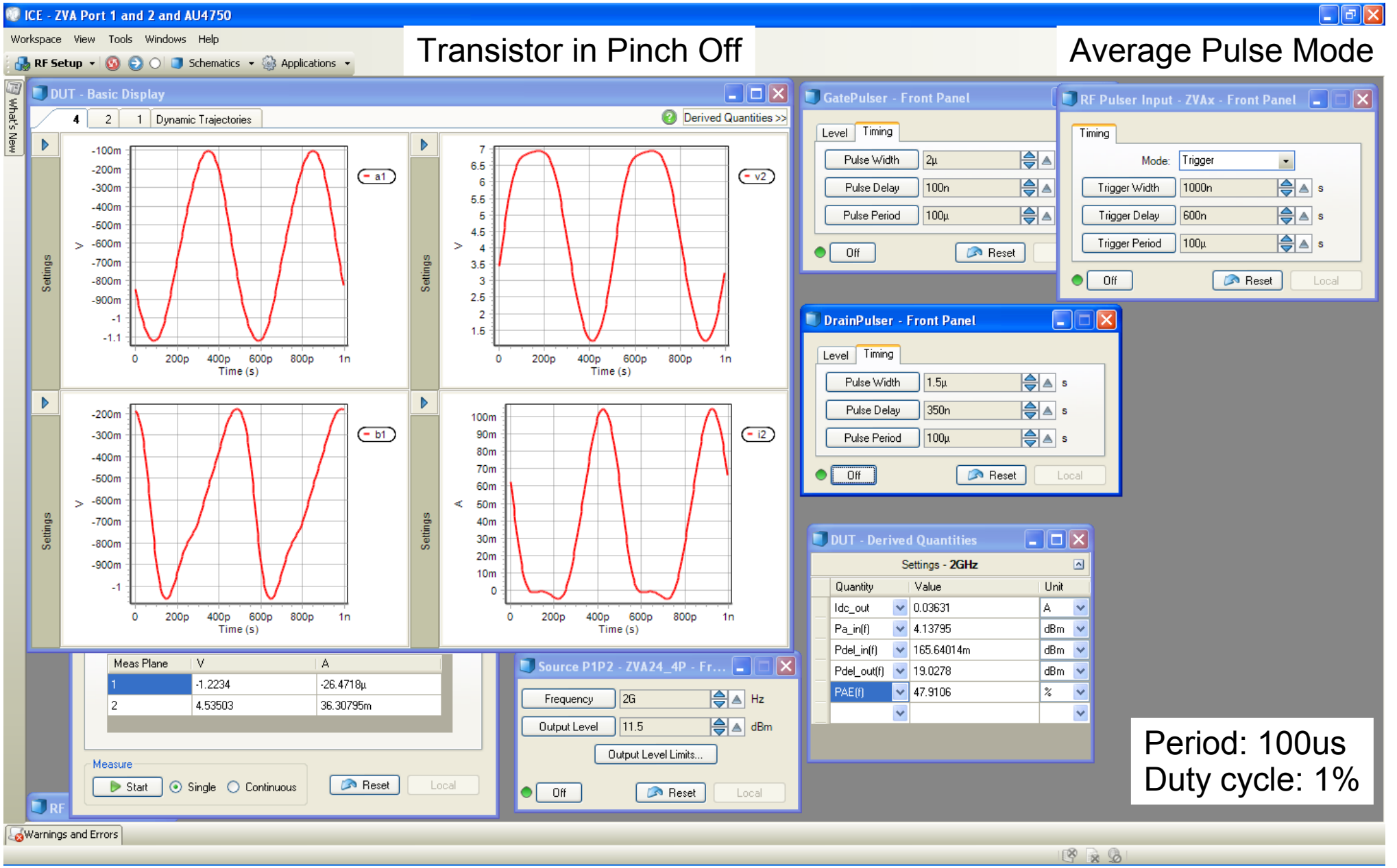
NMDG:

- **ZVxPlus and ICE**
  - Coherent combination of all instruments for nonlinear characterization under pulsed conditions in non-50 Ohm environment

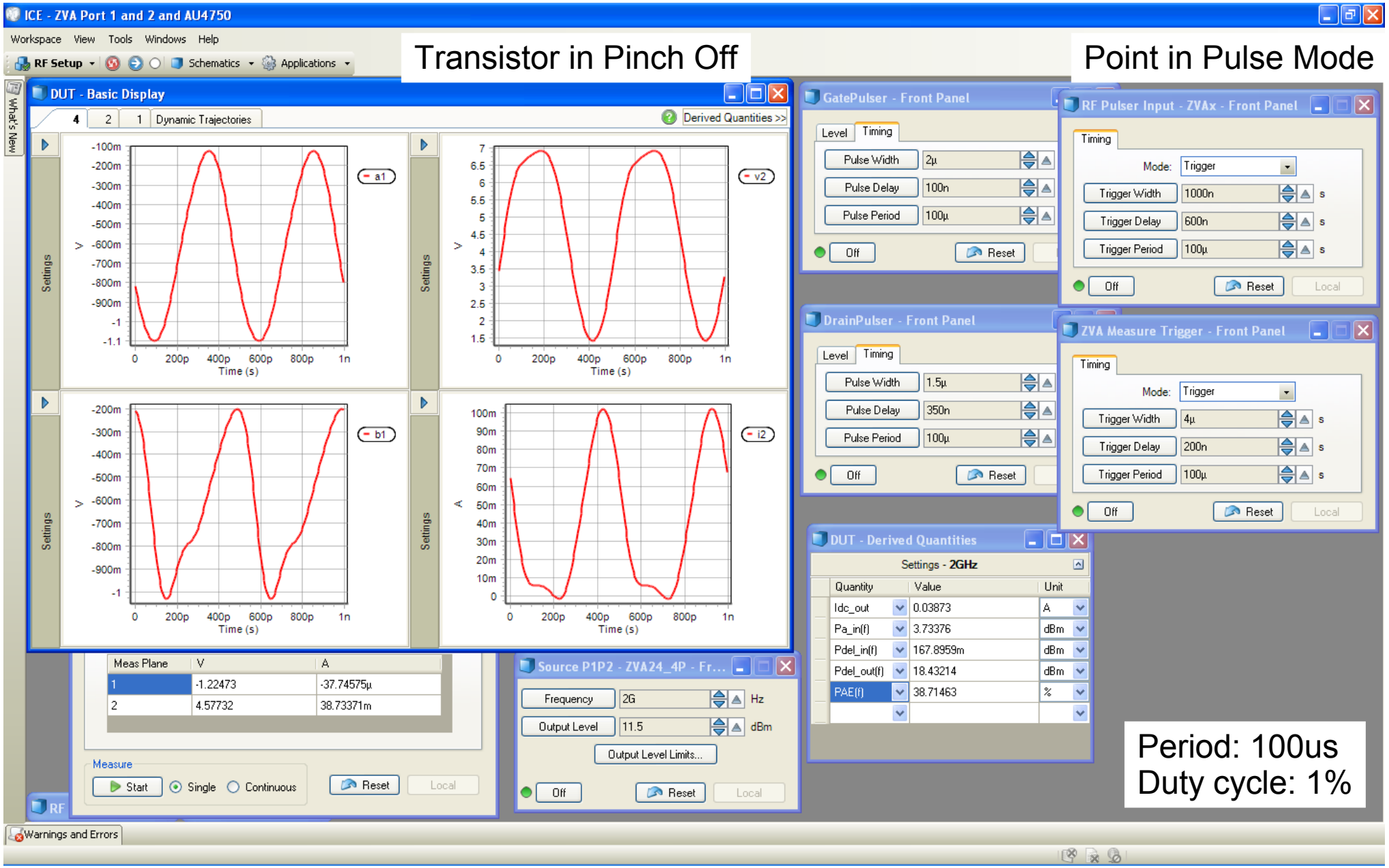
Measurement Results – CW



Measurement Results – DC and RF Pulsed



Measurement Results – DC and RF Pulsed



Conclusion

- With an incremental investment on a suitable R&S ZVA or ZVT, it is possible to characterise devices with one single connection
  - small-signal behaviour: S-parameters
  - large-signal harmonic behaviour under realistic conditions: complete input and output waveforms
  - under pulsed DC and RF conditions
  - possibly in a non-50 Ohm environment
- The accurate and complete large-signal harmonic measurements enable new insights in component behaviour, resulting in
  - better semiconductor technologies
  - better models and design kits
  - better designs
  - faster ways of testing, possibly in non-50 Ohm environments

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Want to try?

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