NMDG
LEADING BEYOND S-PARAMETERS

Integrated Component Characterization Environment "ICE"

"Do now with instruments what you could do for years with your nonlinear simulator"

April 2010

Outline

- Introduction
- Receivers and Analyzers
- Absolute Calibration Techniques
- Deembedding
- Ranging
- Configurable test-sets
- Tuners
- Record a replay measurements
- Pseudo real-time displays
- Build your own measurement setup
- Remote connection to test environments
- On-line help
- Architecture
- Driver support and applications
- Conclusion

- Want to try?

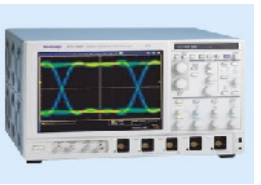
Integrated Component Characterization Environment

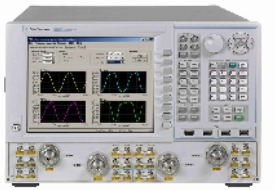
Stimuli

DC
CW
Tuner
...

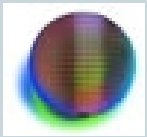
Receivers

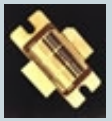
DC Meters
VNA
LSNA
...





ICE





Calibration Technology

“Real-Time” and Complete Stimulus – Response Characterization Active Components and Circuits

...

Model Verification and Tuning

Amplifier Design

S-functions

...

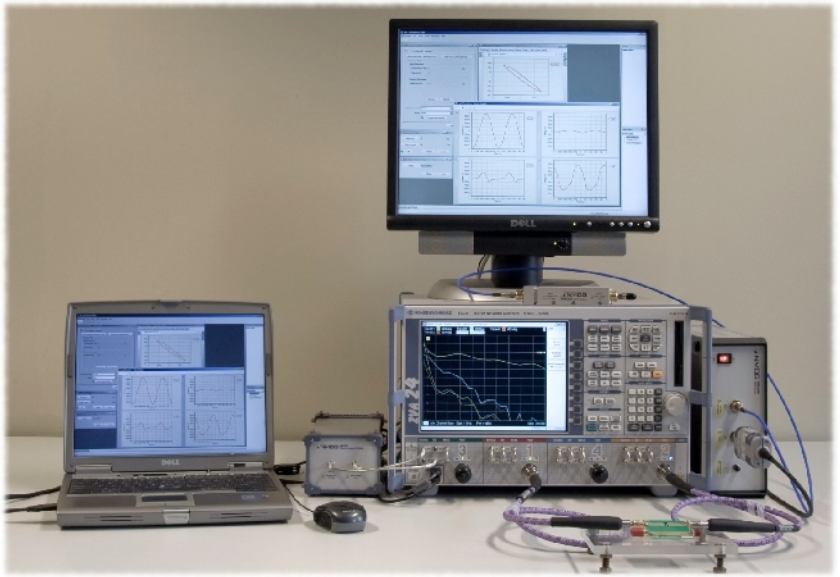
NMDG

Integrated Component Characterization Environment

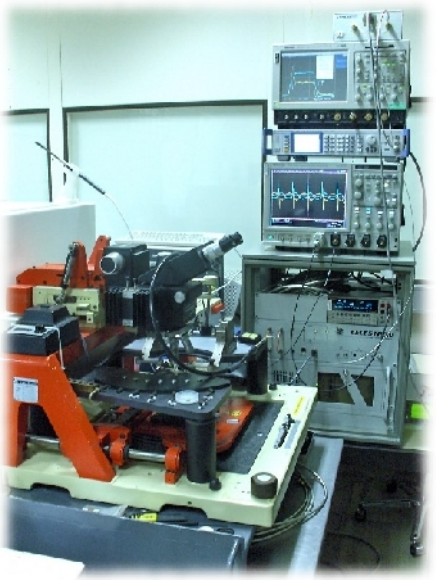
- Pseudo real-time active component characterization and tuning
  - Allows to use different stimuli in pseudo real-time
  - Measures accurately the voltage and current behaviour (V/I) at the ports of a device under test
  - Visualises in pseudo real-time the V/I measurements and derived specifications in different formats to gain insight in component behaviour

- Base platform for applications, solving specific customer problems
  - DC IV Characterization
  - Harmonic Distortion Analysis
  - S-functions
  - ...

ICE supports different receivers / analyzers

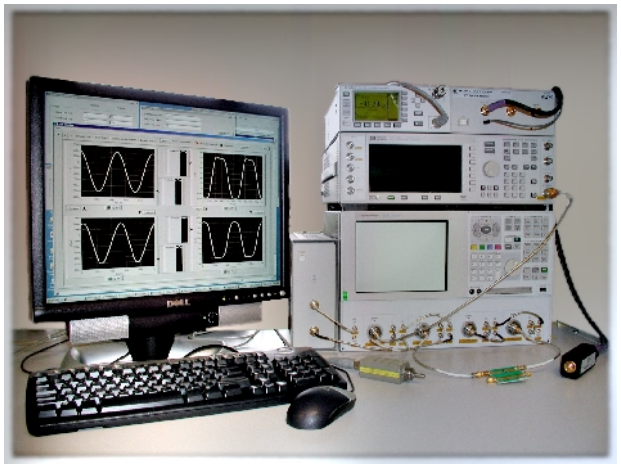


Rohde&Schwarz ZVA/T

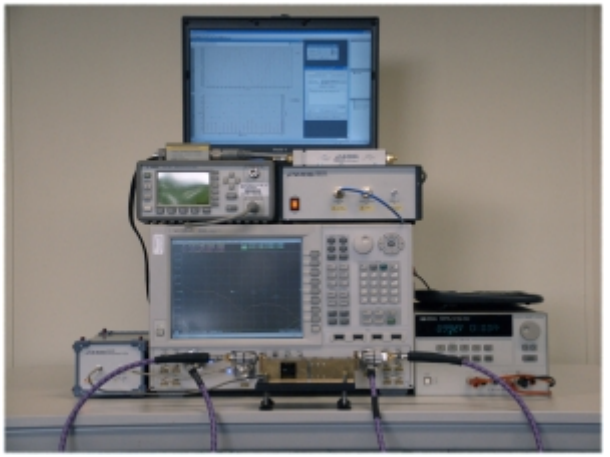


Tektronix HF Oscilloscope (*)

Maury MT4463, powered by NMDG



Agilent PNA-L



Agilent PNA-X

More to come...

(*) Courtesy of On Semiconductor

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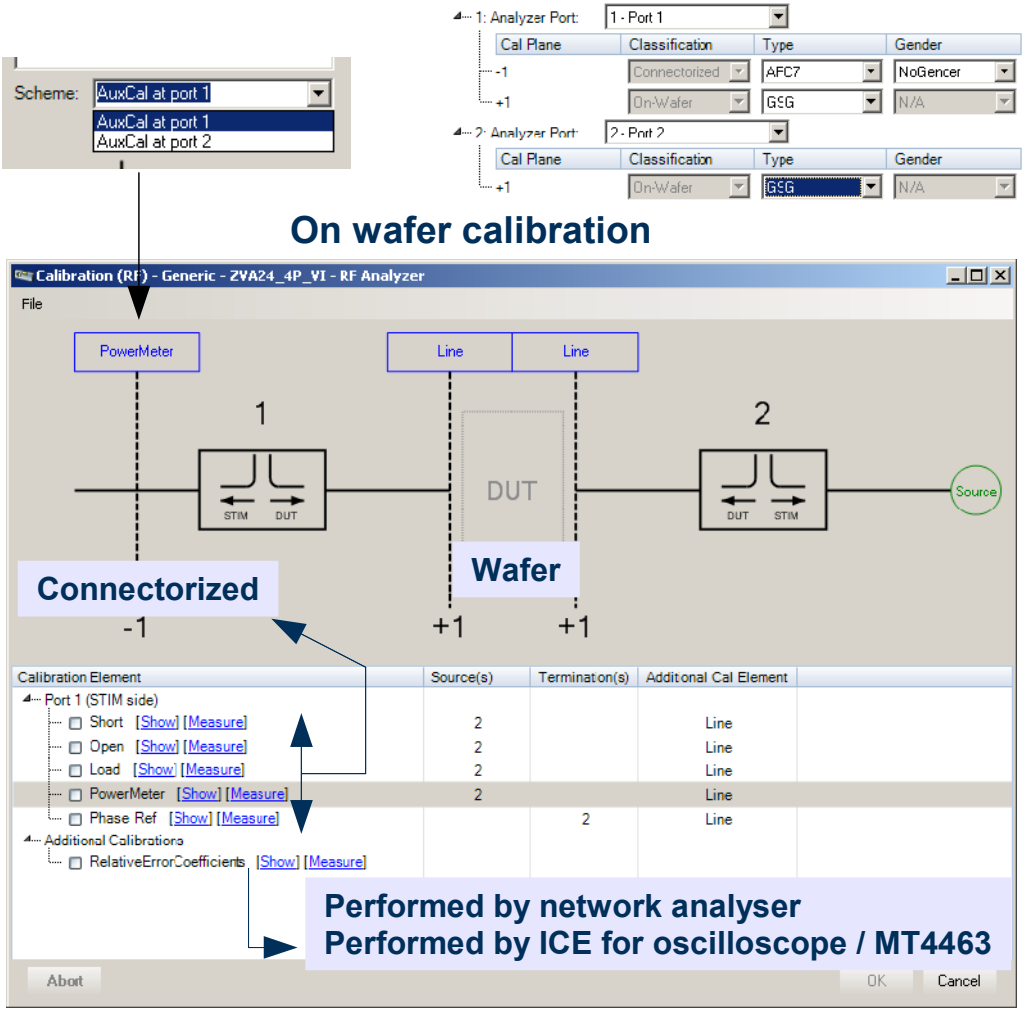
ICE supports absolute calibration techniques

- Absolute Calibration Techniques (connectorized, in-fixture and on-wafer)
  - Relative VNA calibration techniques
  - Power calibration
  - Phase calibration

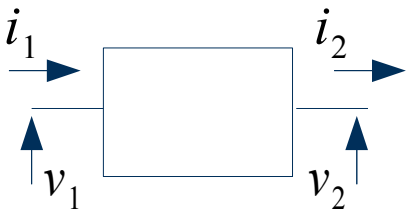
- ICE complements the calibration capabilities of the given receiver / analyser to provide absolute calibration techniques, adapted to the type of measured signals

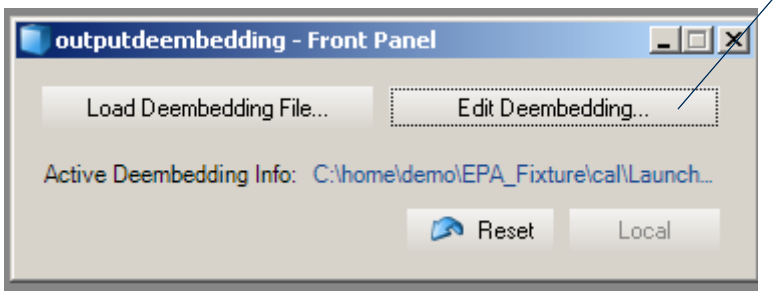
- When not available with receiver / analyser, NMDG sells a phase calibration kit

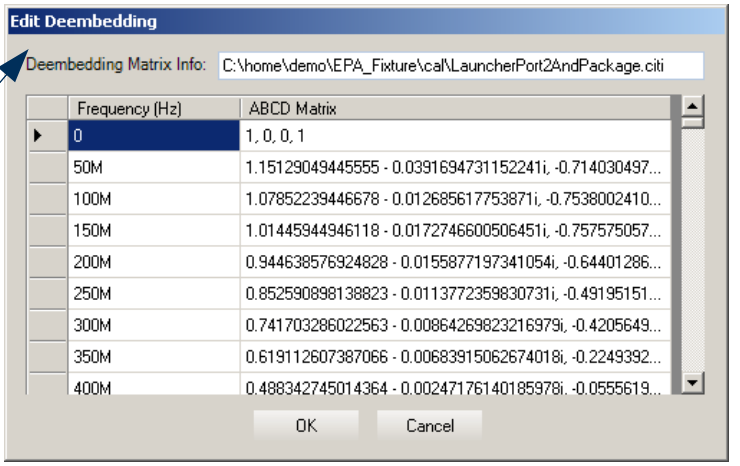


ICE supports deembedding

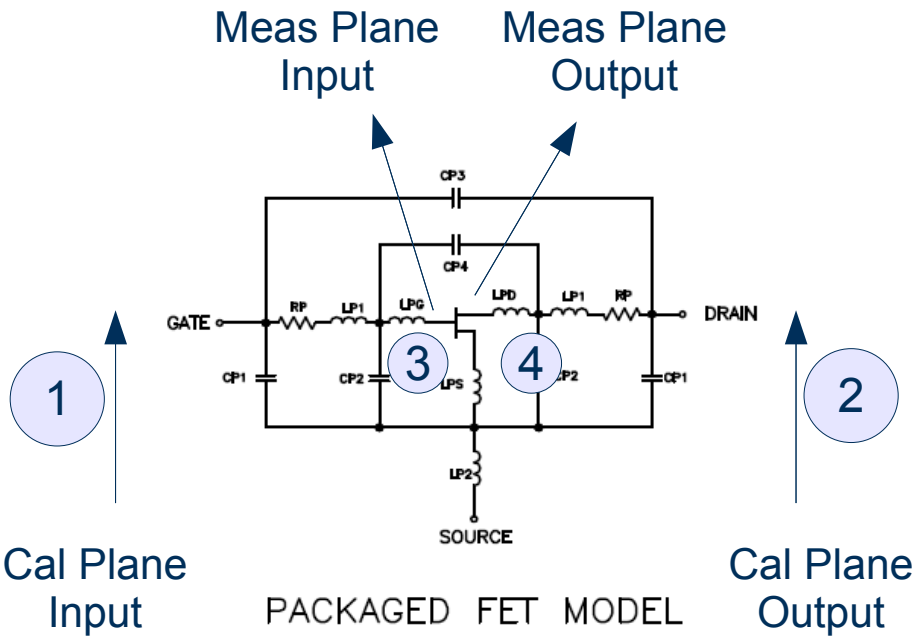
- Standard two-port deembedding

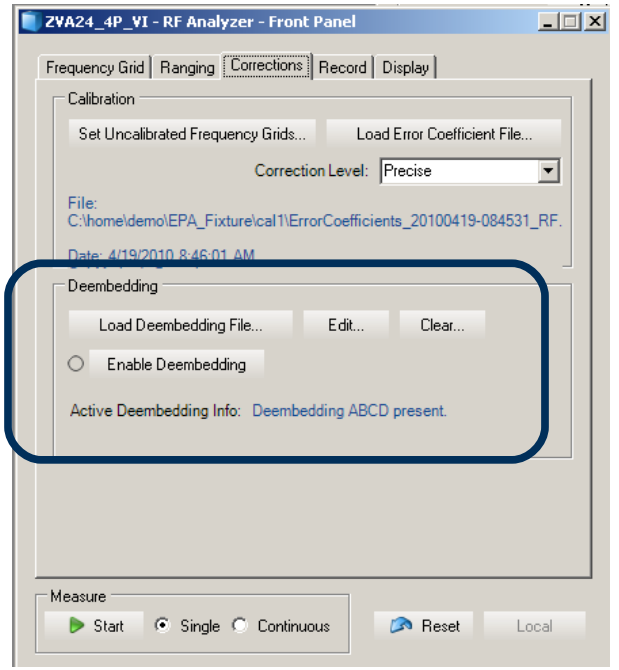






- Four-port deembedding supports parasitics to ground





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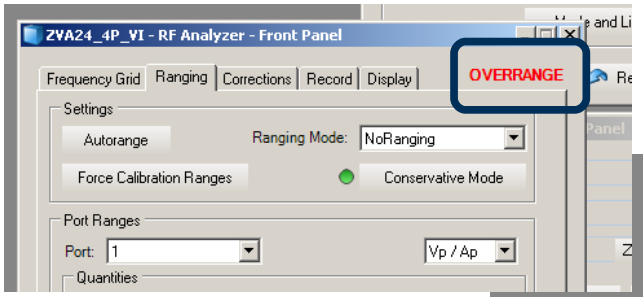
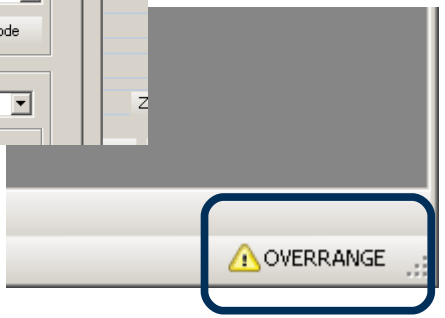
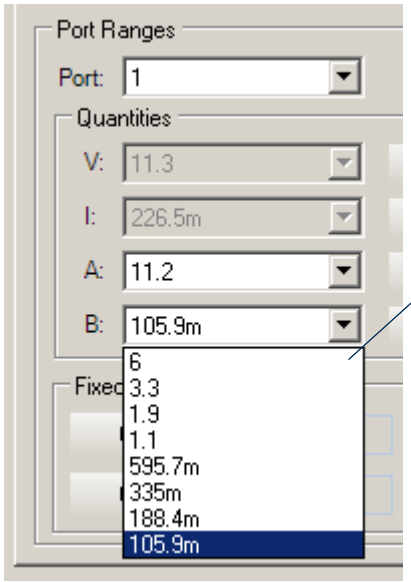
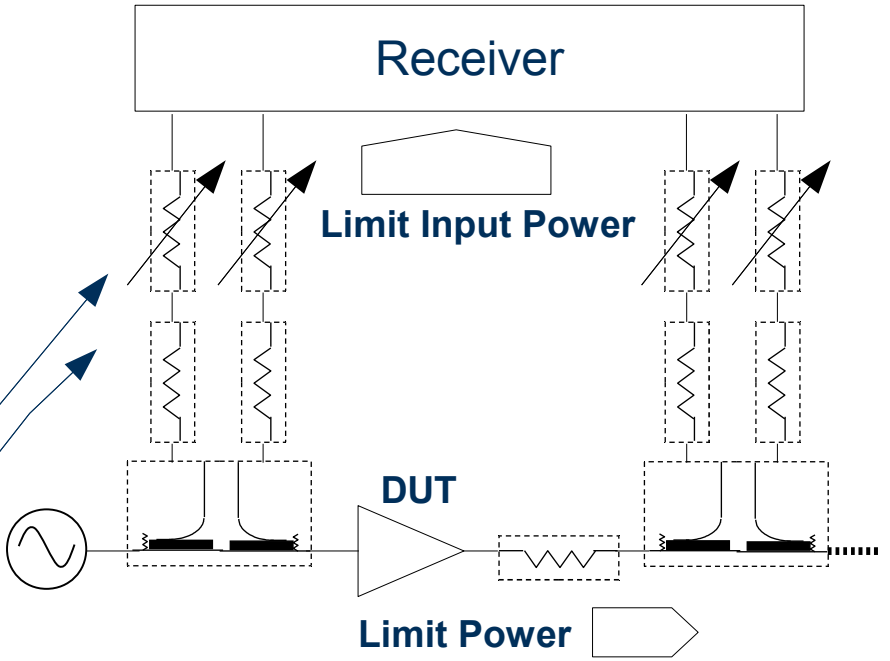
ICE supports ranging for best measurements

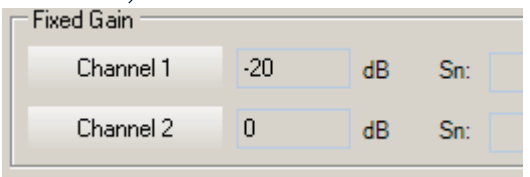
- Characterization of power devices requires proper attenuation
  - Protecting test-set
  - Limiting power going into receiver to avoid receiver compressing, causing measurement errors (nonlinearity of receiver instead of device under test)

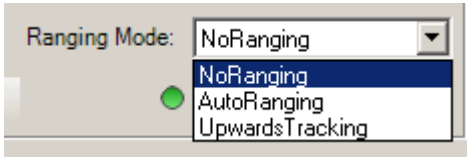










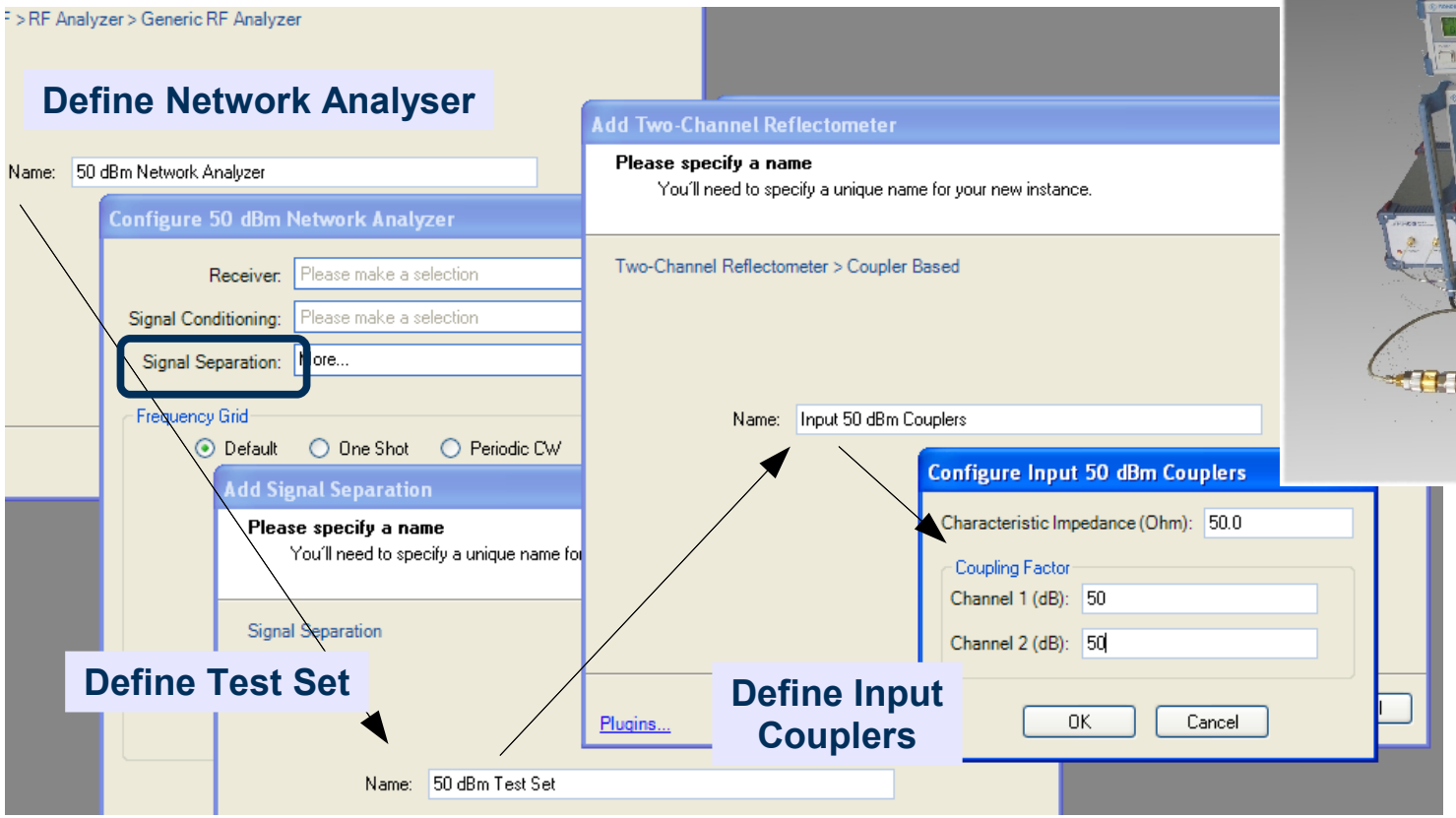


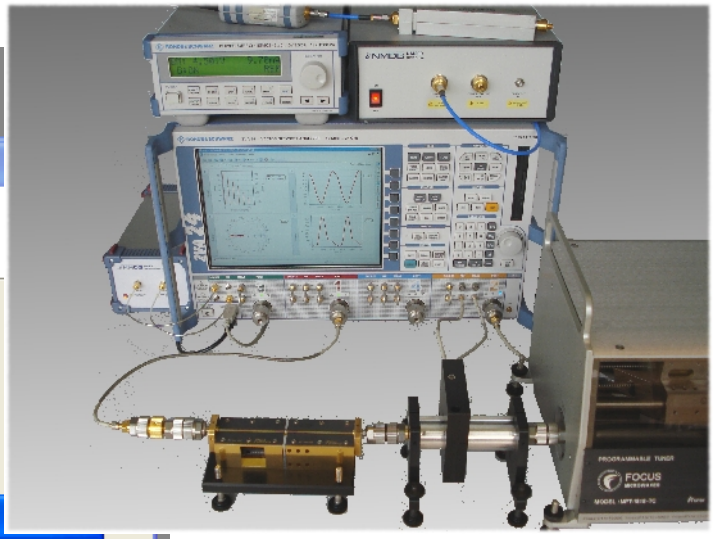
Automatic adaptation of error coefficients

ICE supports and configures different power test - sets

- External test-sets are required when power exceeds the damage level of the standard network analyzer

- ICE allows to configure your own network analyzer, combining a receiver, possibly part of a standard network analyzer, with an external test-set

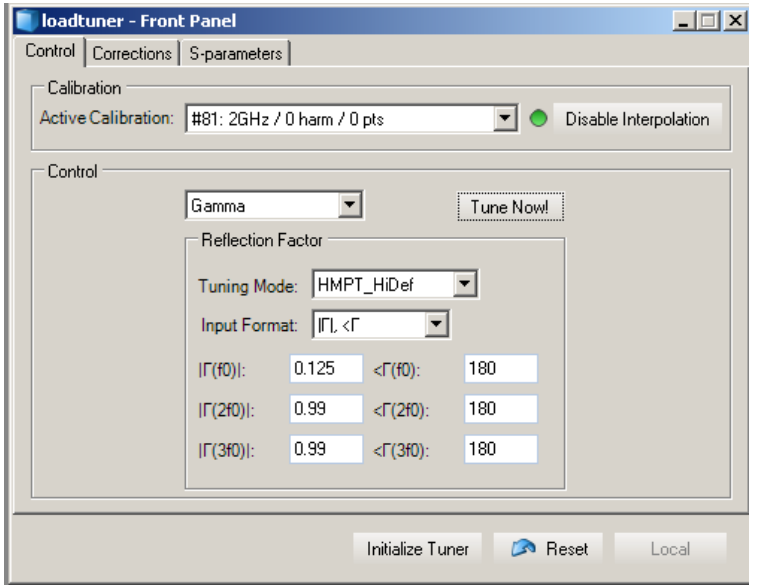




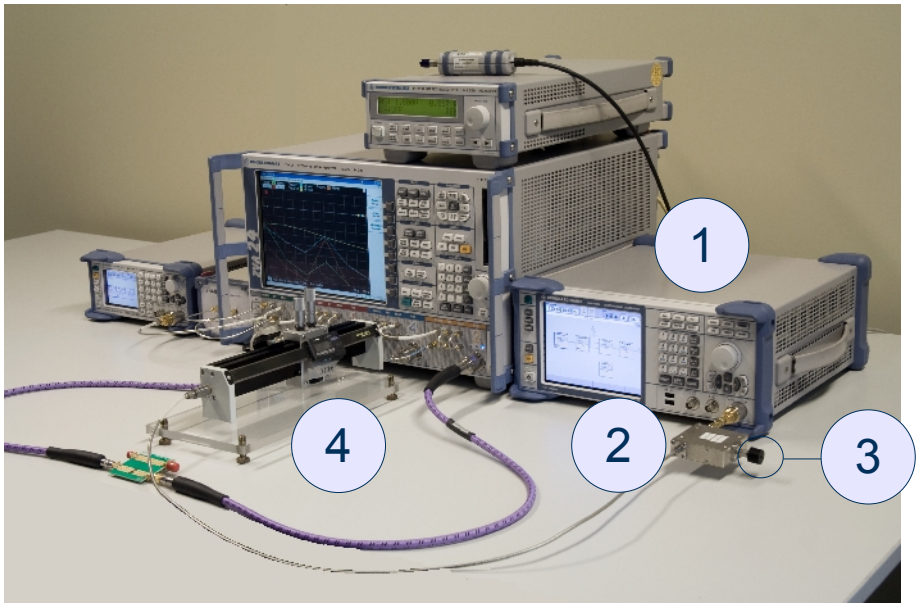
Focus MPT with Focus VI Probe as couplers at output [low insertion loss - high power]

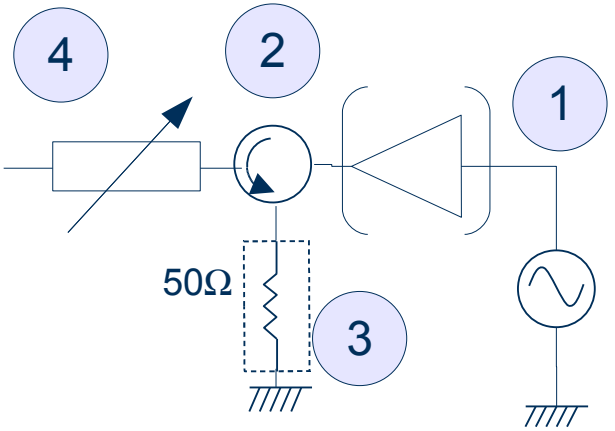
ICE supports different tuners

- Focus Microwaves - CCMT and MPT

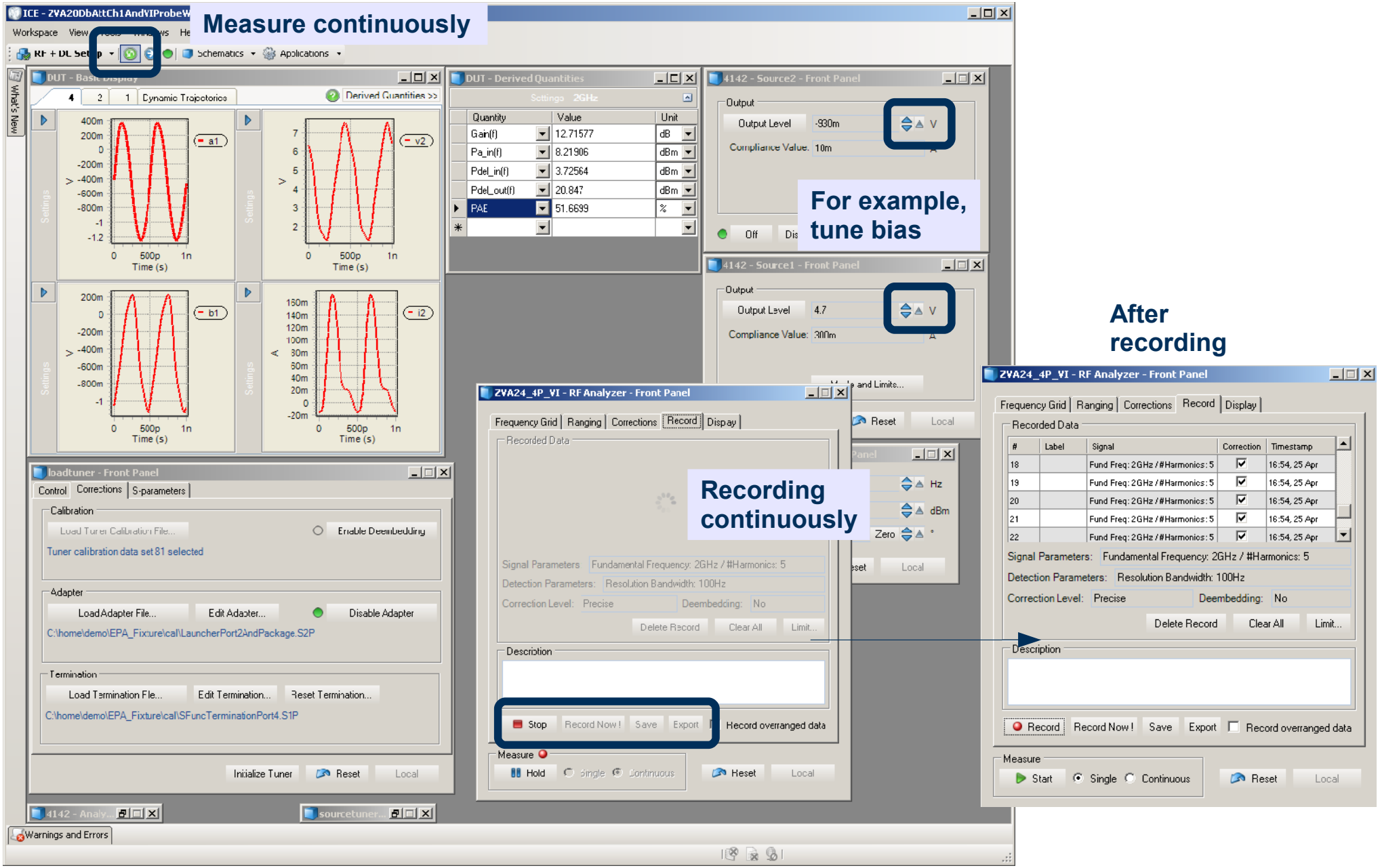


- Active tuning

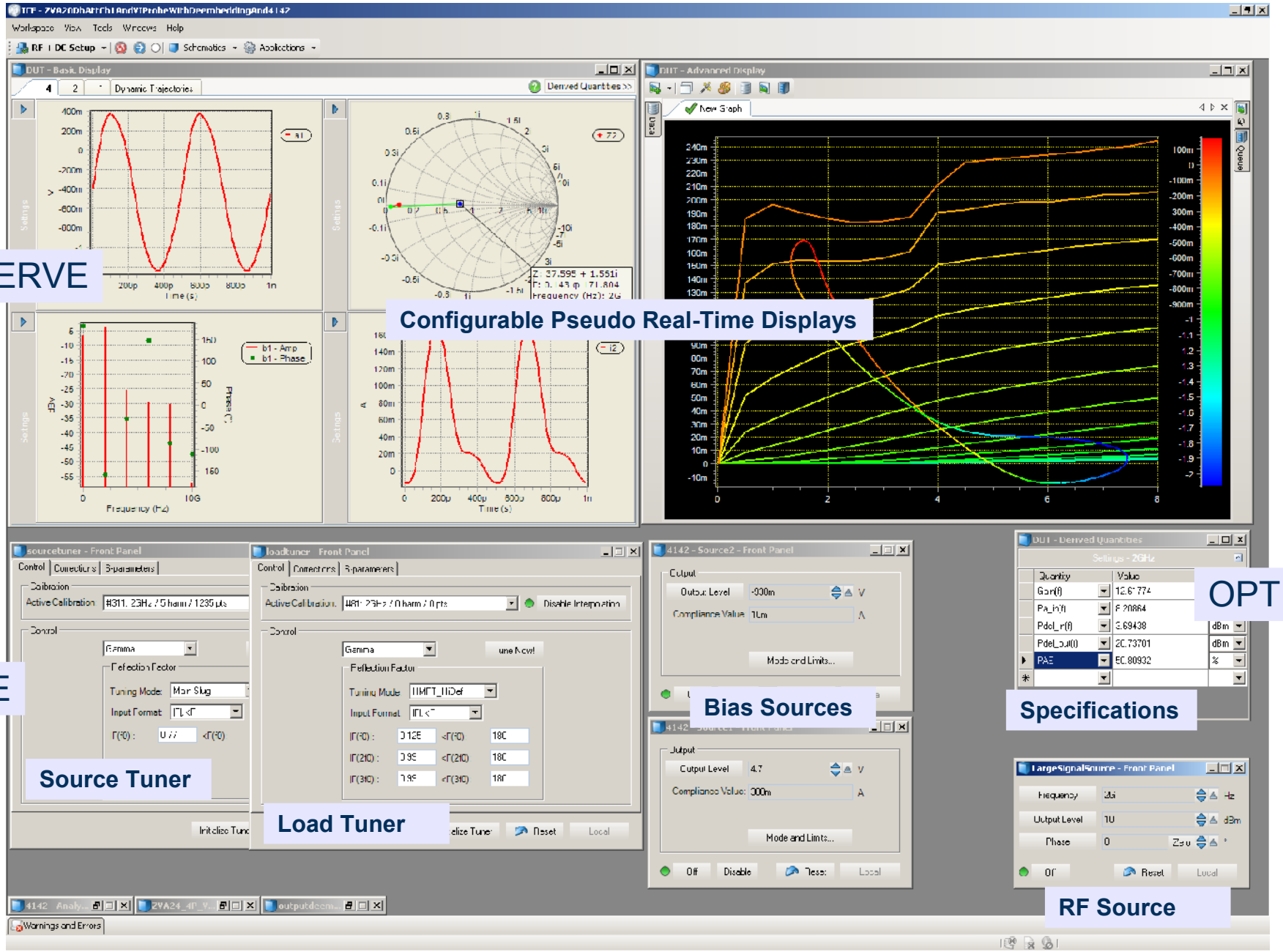




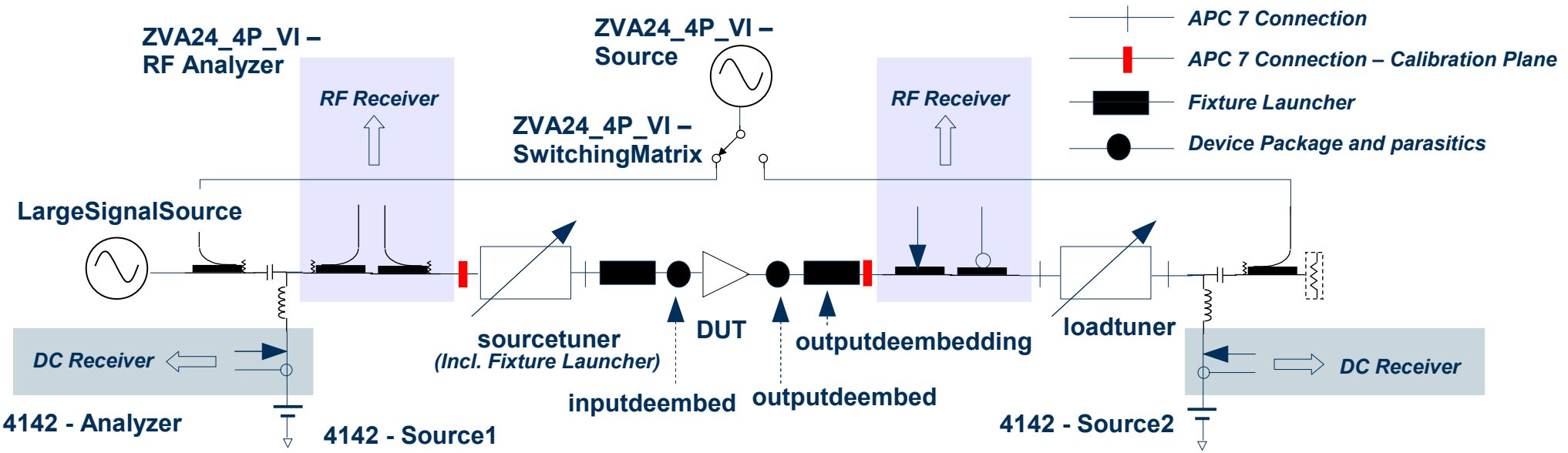
ICE allows recording and replay of measurements



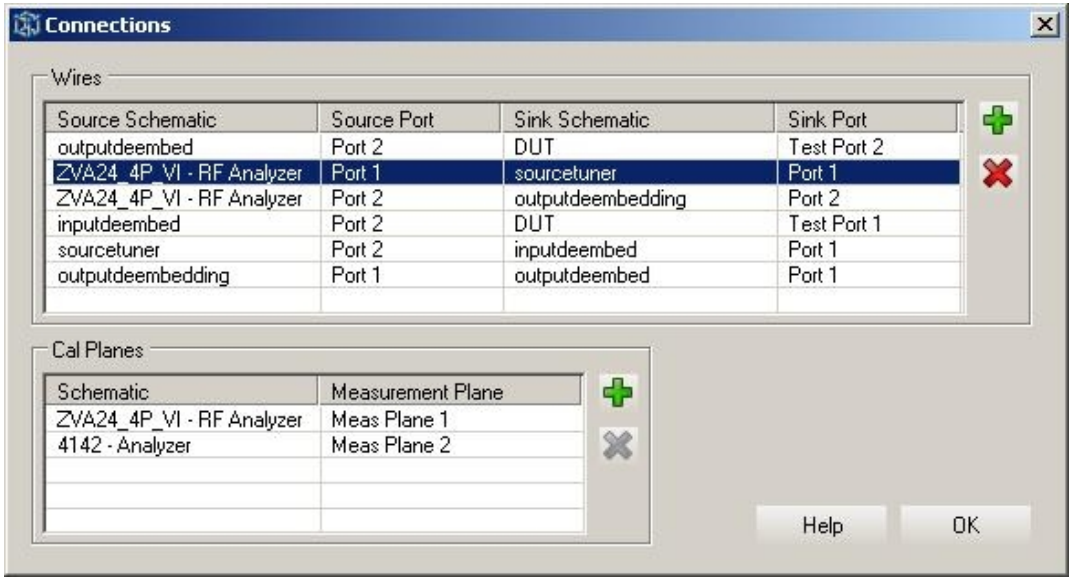
ICE supports pseudo real-time displays

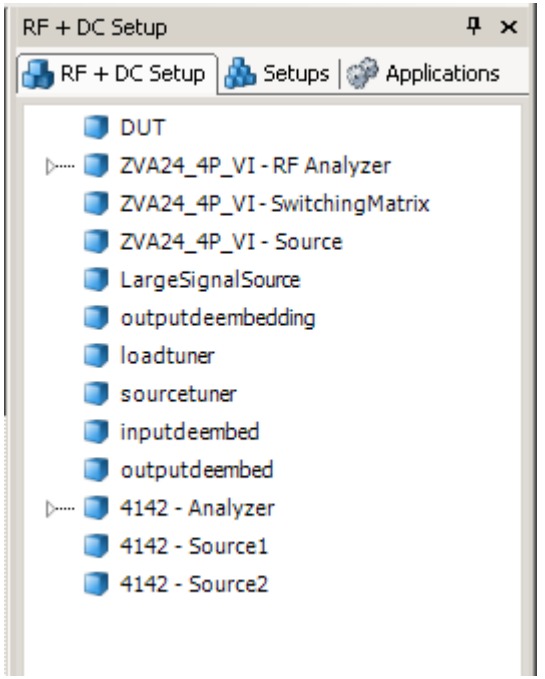


Build your own measurement setup with ICE



Connection Scheme



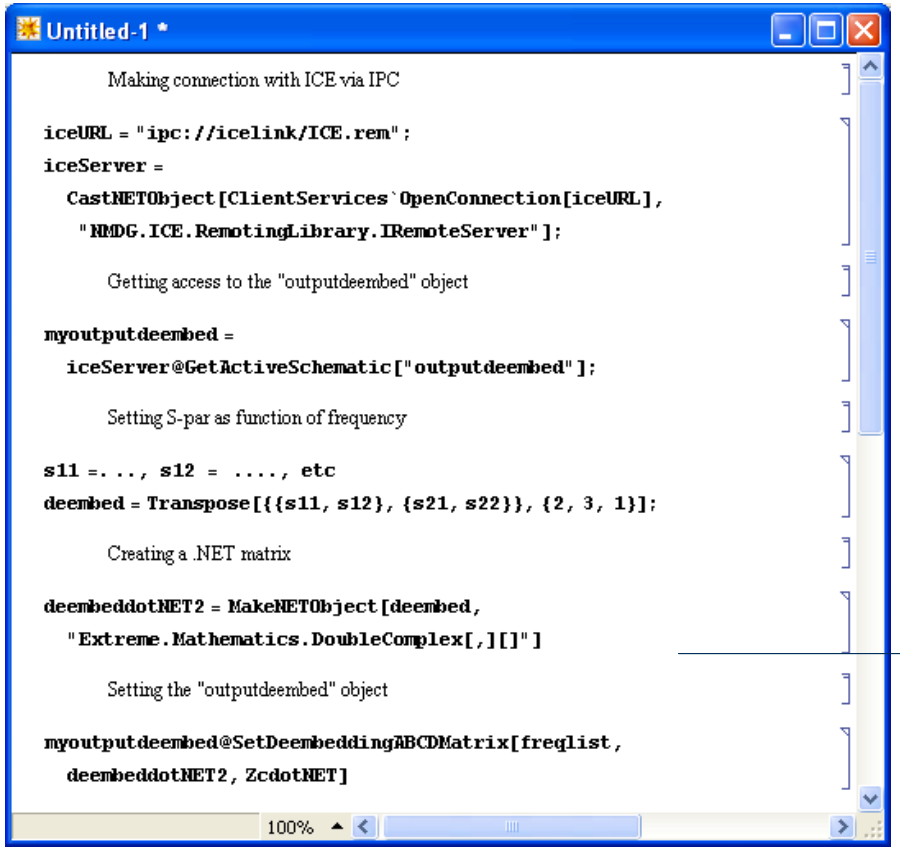


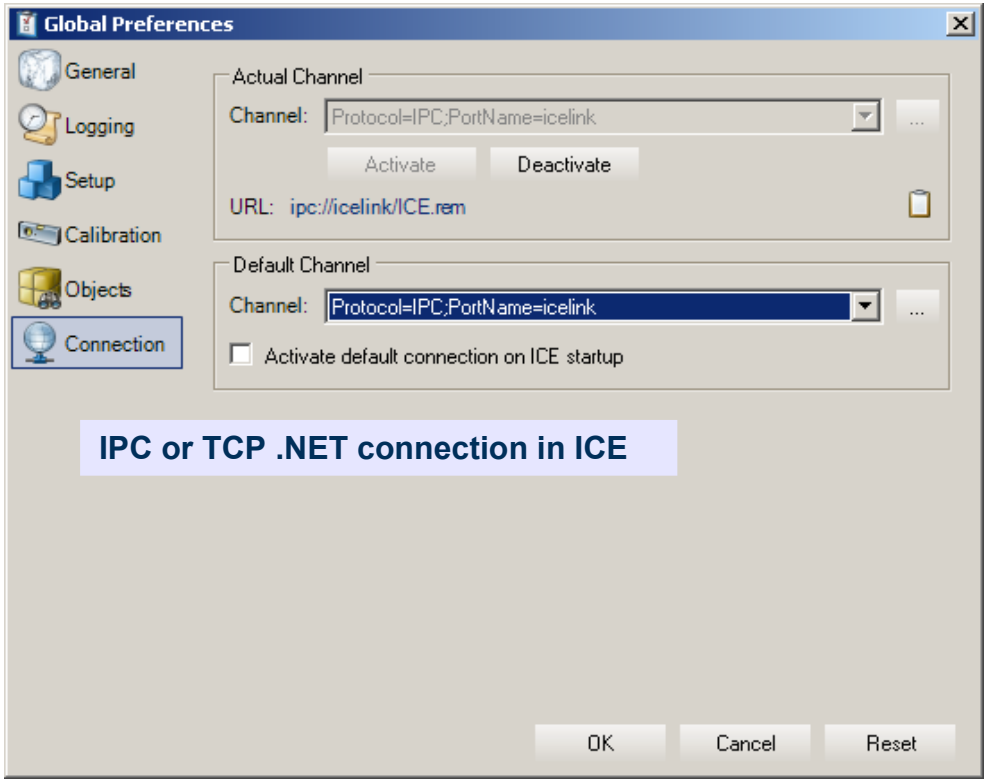
ICE integrates smoothly with your test-environment

Test Environments:

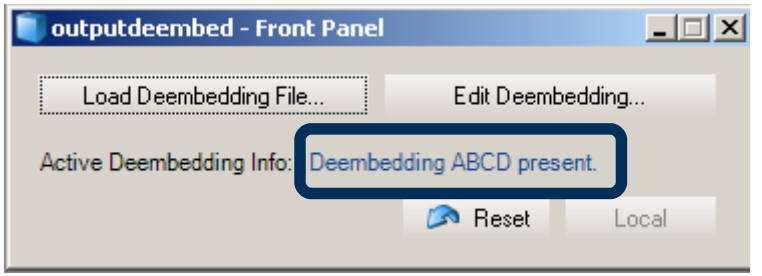
Matlab
LabView
Mathematica
...

Example: Setting deembedding matrix (Mathematica)





IPC or TCP .NET connection in ICE



On-line help and Tutorial

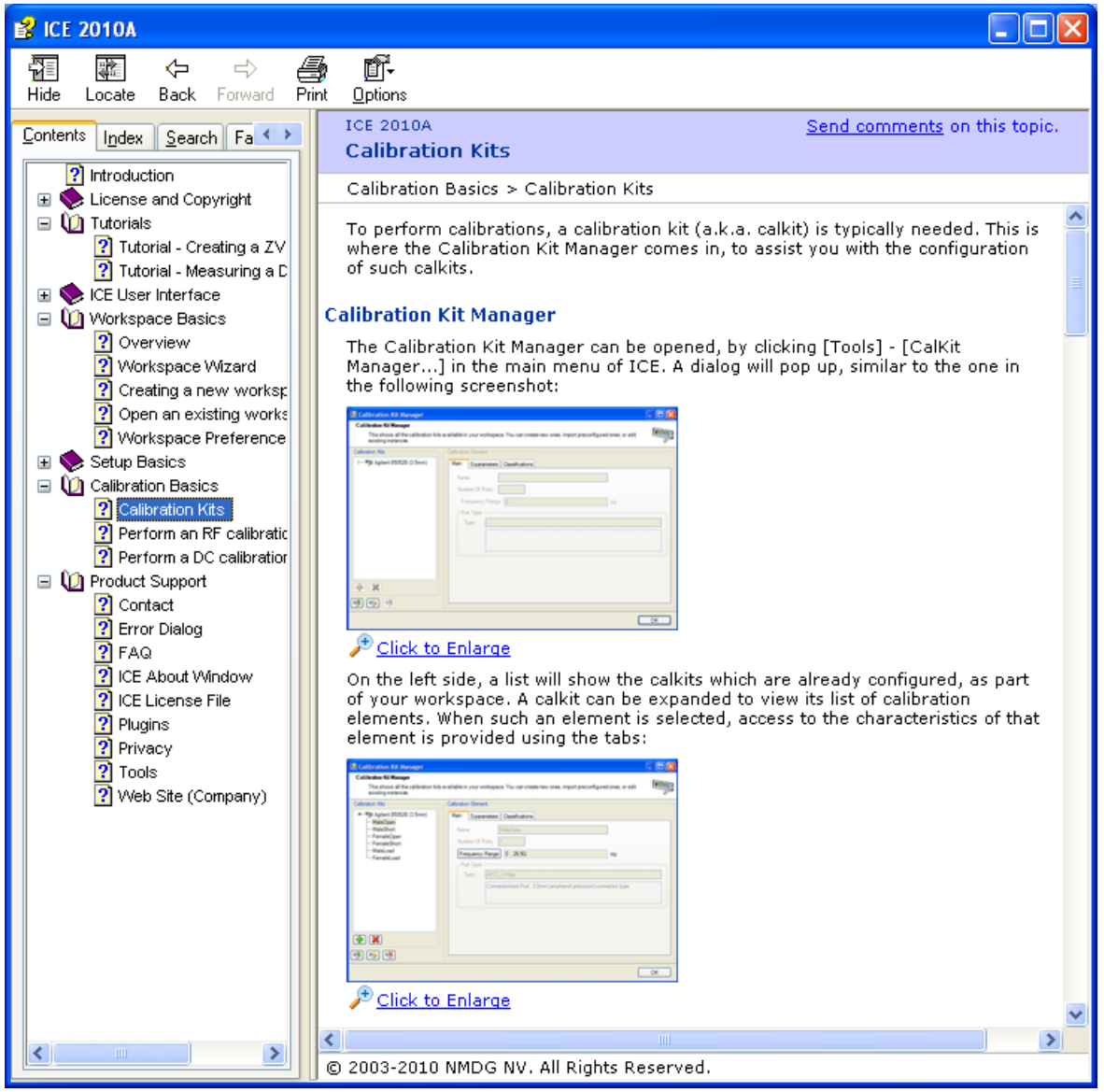
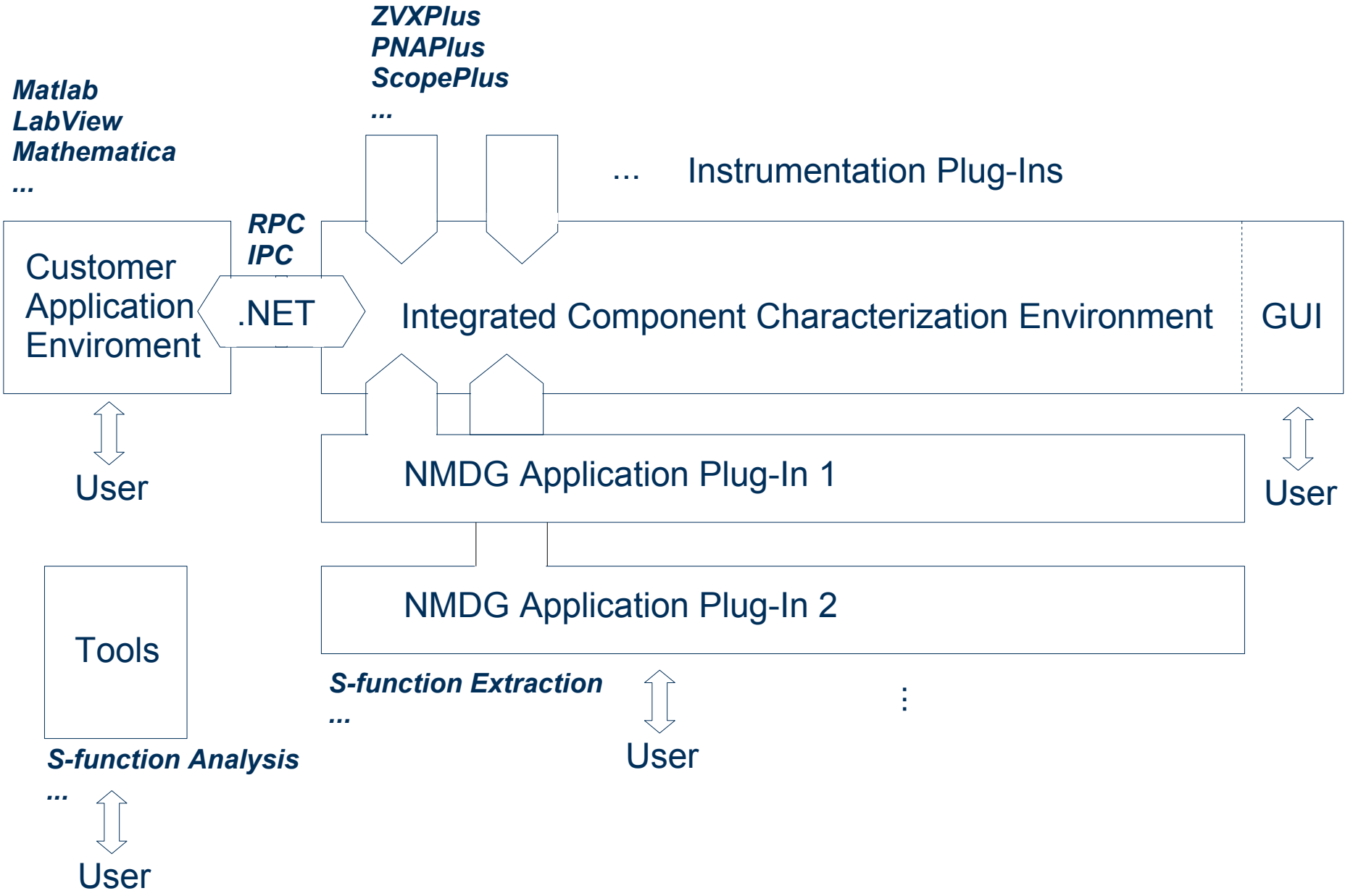


Table of content

ICE Architecture

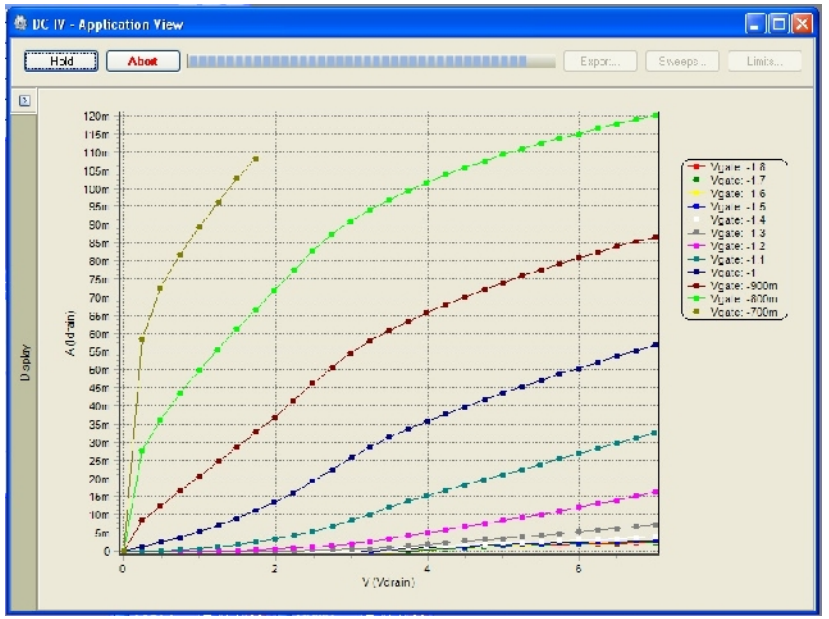


Driver support

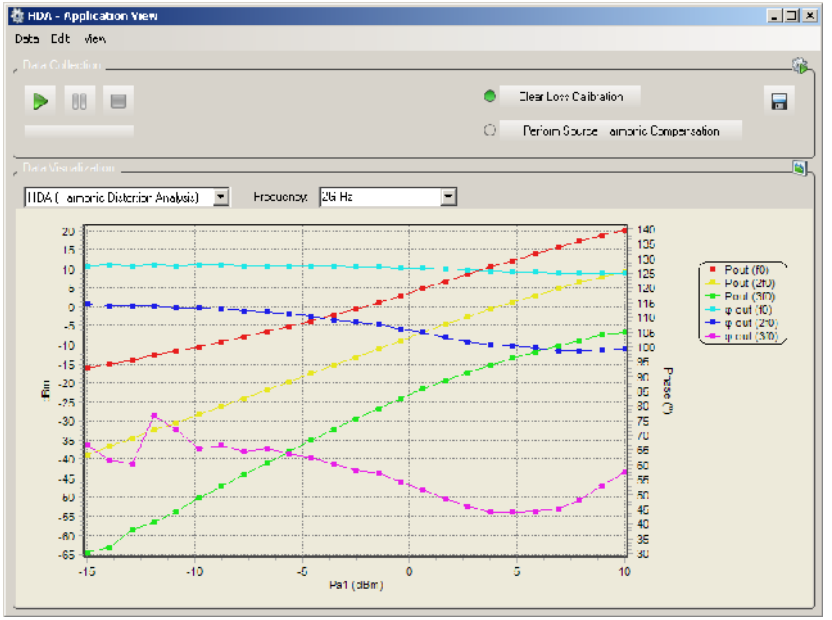
- DC Sources
  - R&S, Agilent, …
- DC Voltmeters, Currentmeters
  - Agilent, …
- DC Force / Sense
  - Keithley, …
- RF Source CW and Modulation
  - R&S, Agilent, Anritsu, …
- RF Power Meters
  - R&S, Agilent, Anritsu, …
- Tuners
  - Focus Microwaves, Maury Microwave
- Receivers
  - R&S, Agilent, Tektronix, …

- Drivers for different instruments are developed on customer demand

Application Plug-ins

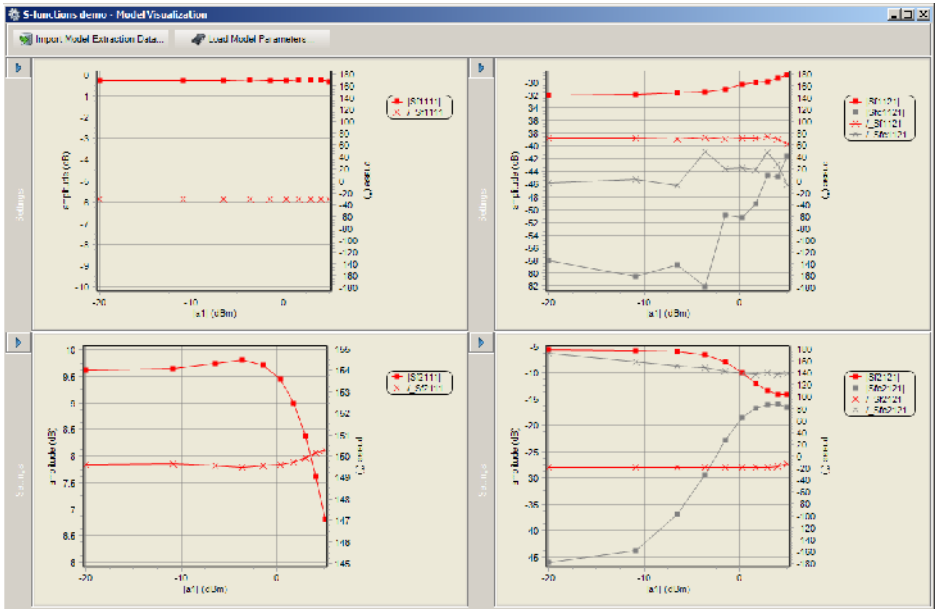


DC IV Characterization



Harmonic Distortion Analysis

S-functions



More to come ...

Conclusion

- ICE is your “real-life simulator”
  - Tune your different stimuli
  - Observe in pseudo real-time
  - Gain insight in the behaviour of your active RF components
  - Optimize the specifications with strong guidance

- ICE is the base platform for applications, solving customer problems

- ICE is made to incorporate the latest advancements in HF measurement science
- ICE is based on the latest software technologies to realize a fast development cycle focusing on the measurement problems

For more information info@nmdg.be

www.nmdg.be

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