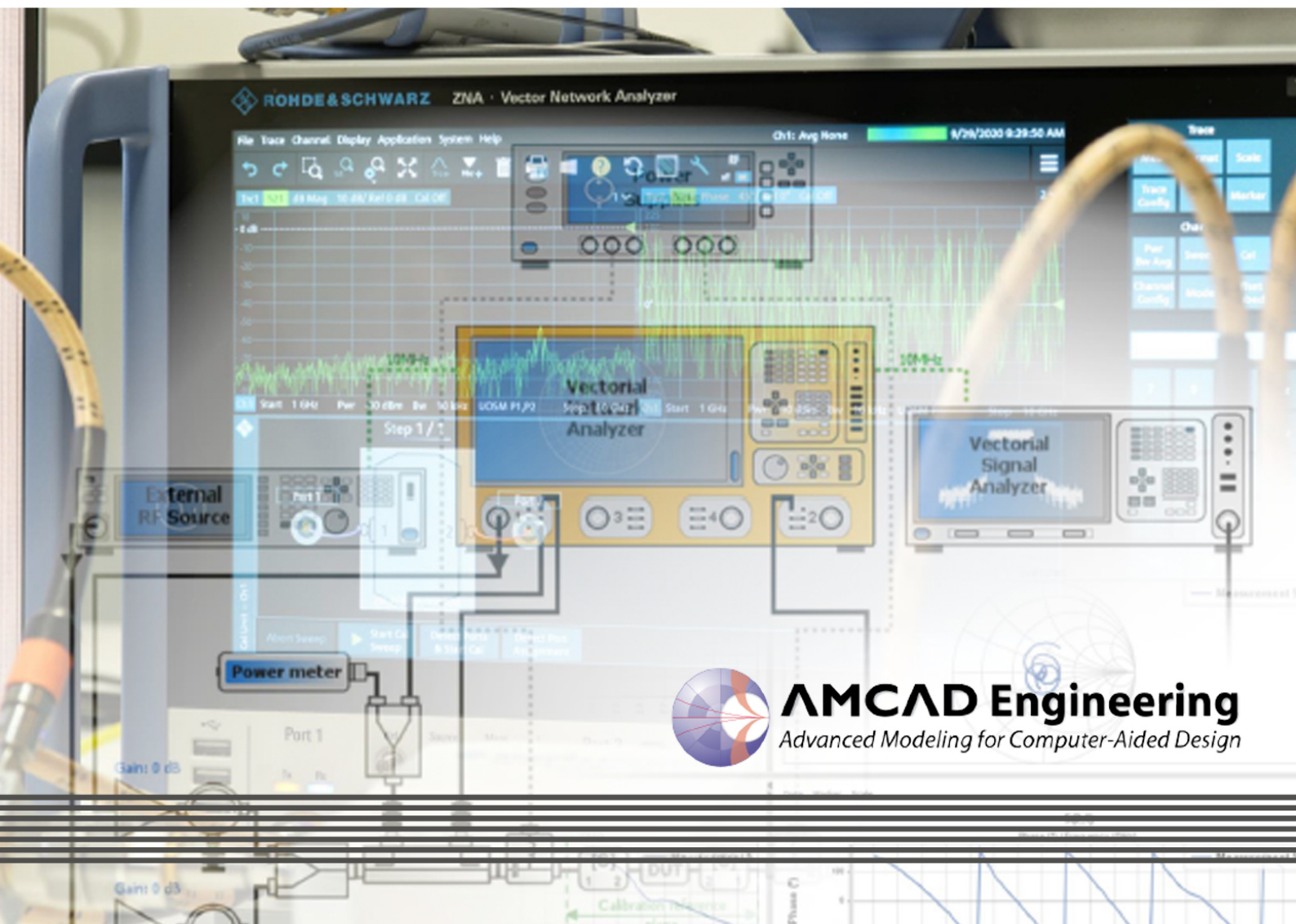


Remote controlling RF measurement with IQSTAR software from AMCAD Engineering.



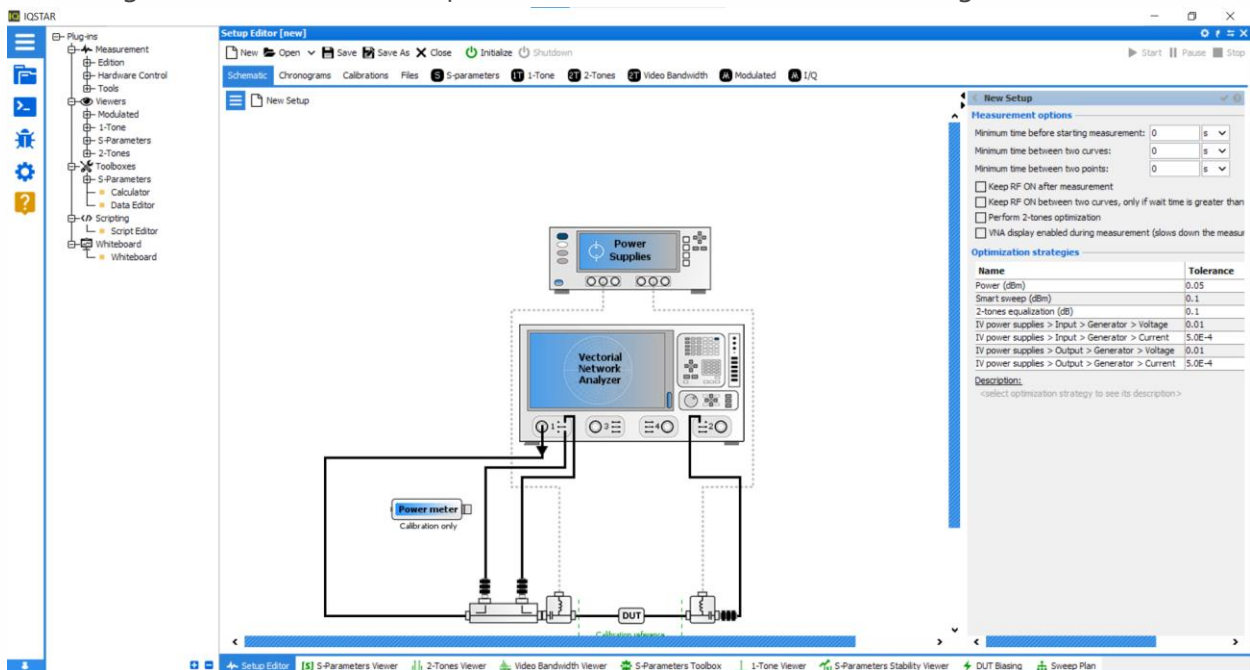
Even today, automated testing can be something of a challenge. Especially for advanced RF-applications, there are different instruments from various manufacturers required. To automate these benches, different types of instrument-software is needed and many of them using their own file formats. Choosing a programming environment requires lots of time and expertise. Valuable test and engineering time are spent on writing scripts to have test and measurement equipment running the desired test programs. Time which could have been used to focus on what really matters: testing and analysing the devices under test.

For in-house developed solutions, the moment the test engineer who wrote the scripts has moved to different positions, support and maintenance can become an issue; and cause possible disruptions. These risks are mitigated by using a third-party product, which is fully focused on this specific task and which is being maintained and expanded by a dedicated external company.

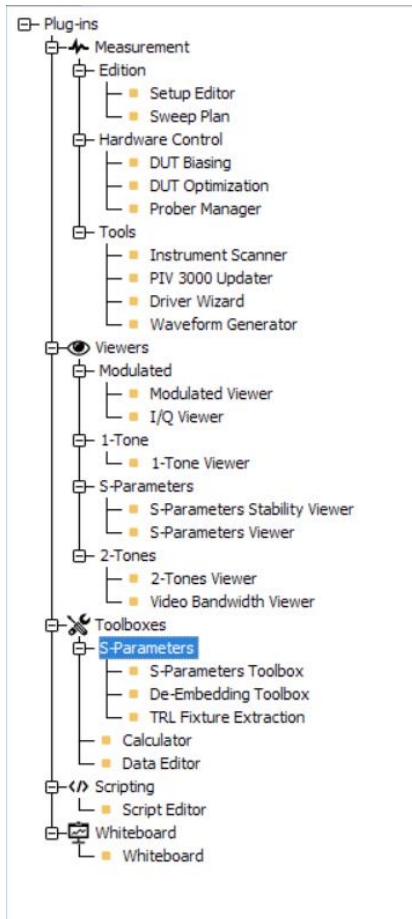
The COVID 19 pandemic also forces a lot of test engineers to work remotely. By using IQSTAR, the test bench and reporting can be fully operated remotely, ensuring optimum efficiency and return on investment from the test equipment.

IQSTAR OVERVIEW

Within IQSTAR, AMCAD Engineering designed a complete test-, automation- and reporting environment. The software includes control of Instruments, calibration- and measurement routines. Measurement results can be analysed and even dynamic datasheets can be made. Launching IQSTAR, the software opens with the window shown in the image here below:



From here the user can make a number of choices. As IQSTAR is modular build software of five major parts, e.g. *Measurement, Viewers, Toolboxes, Scripting and Whiteboard*.



Measurement: Allows the user to control measurement hardware and probe station. Within this section the type of measurement is defined

Viewers: Allows the user to analyse and compare measurement results.

Toolboxes: Allows the user to do de-embedding and extract S-parameters out of the measurement results

Scripting: Allows the user to setup a script and automate multiple tests with different configurations. E.g. S-Parameters with a VNA and modulation with VSG and VSA.

Whiteboard: Allows the user to generate a dynamic datasheet for colleagues or customers.

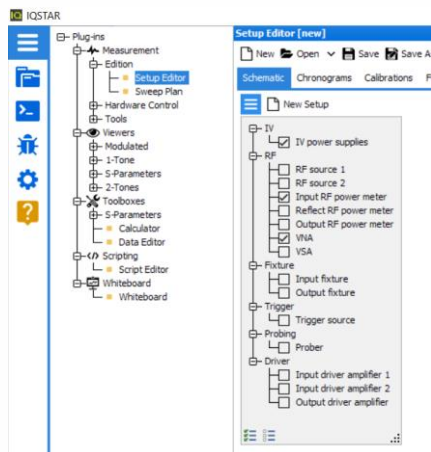
IQSTAR MEASUREMENT CONFIGURATION

Working remotely means standardization of drivers is mandatory. Only this way, the user can ensure connectivity to his setup. Like any other commercially available automation software, IQSTAR requires VISA-Libraries in order to control connected instruments. An installation of NI Measurement & Automation Explorer or Keysight IO Libraries suite is required.

A great benefit within IQSTAR is one driver controls several instruments. For example:

- The "Rohde&Schwarz" driver controls the ZVA, ZVB, ZVT, ZNA, ZNB, ZNBT, ZNC and ZND of Vector Network Analysers.
- The "Keysight Generic VNA" driver controls the ENA, PNA-L, PNA and PNA-X series of Vector Network Analysers.
- For doing IV-Measurements the user can select drivers from various Power Supplies, Oscilloscopes and Source Measurement units. (Not IV-Curves as these are made within IVCAD.)

Basically, IQSTAR has drivers for most common instruments of many different T&M manufacturers. In case the lab-operator replaces one instrument for another, the remote engineer only needs to do a new calibration to get his setup up and running again.

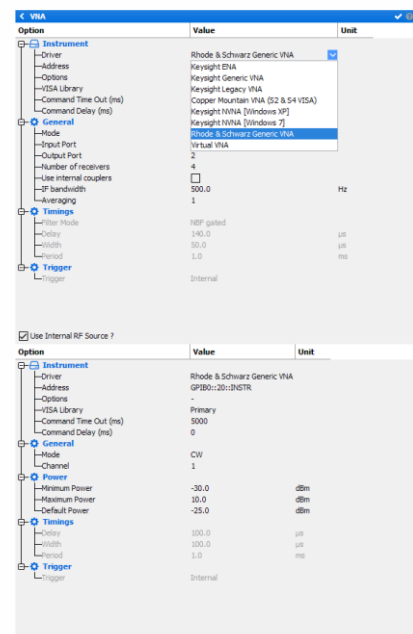


Adding or removing instruments is just done by selecting or de-selecting an instrument from the "Hardware activation menu". Doing so, the software connects all instruments automatically.

By a simple mouse click, the instrument menu is opened to select the right driver. From here also the instrument can be set. For example, the image here below is for a Vector Network Analyzer.

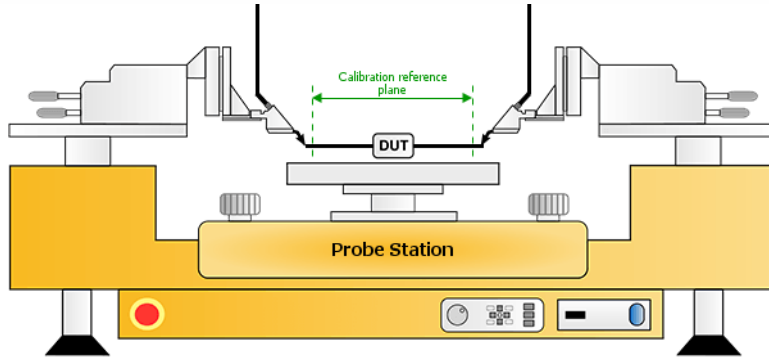
A great benefit for IQSTAR, is that measurement results can be compared, even when measured on separate benches and with different instruments. Development teams working remotely across the world do make use of the same set of drivers, the same calibration and the same measurement routines. Standardization lowers risk of errors, increases efficiency especially when measuring remotely.

After configuring the instruments in the "Setup Editor" window the whole setup needs to be calibrated but actually from this stage the software is fully configured.



For making on-wafer measurements, IQSTAR has a built-in "Probe Manager" to control the probe station. The software has drivers for Formfactor (Nucleus and Velox) and MPI SENTIO.

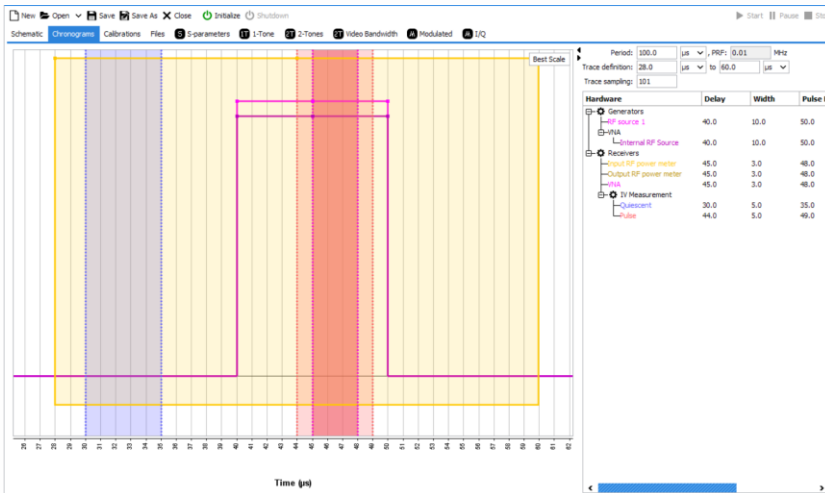
This allows engineers to do a complete automated wafer mapping without necessarily being in the lab.



IQSTAR CHRONOGRAMS

If "Pulsed" mode is selected for the DC bias or the RF, a visual overview of the timings is generated in the Chronograms. It is also possible to re-adjust the timings directly from this window in order to synchronize pulsed RF, Pulsed Power Supplies and Pulsed and Quiescent IV Measurements.

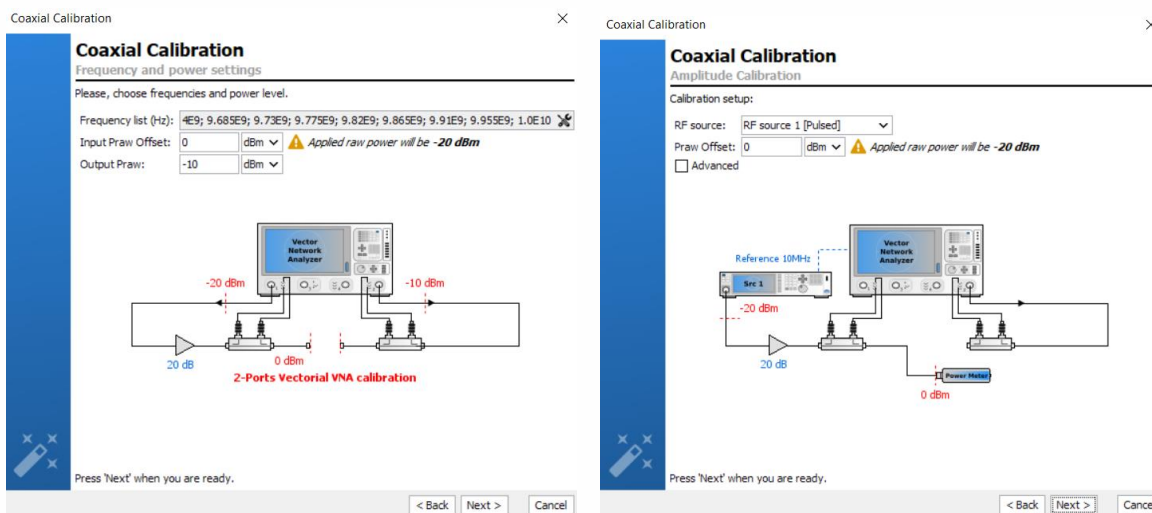
All these information (pulse delays, pulse width, period) can be entered in the schematic.



However, for easier handling, all these data can be displayed in the Chronograms window. The mouse cursor can also be used to move manually the timing in the Chronograms window. The middle button needs to be kept pressed over the stars and moved.

IQSTAR CALIBRATION ROUTINE

After configuration of all the instruments and timing (if Pulse-mode is selected) the setup needs to be calibrated. Based on the configuration, IQSTAR allows the engineers to perform different types of calibration. On completing a calibration, all data is stored within IQSTAR. These calibration files can be exported and shared among team members. In the situation where an engineer is working remotely, he can import a calibration file, for instance made by the lab-operator (locally) and so perform accurate measurements.

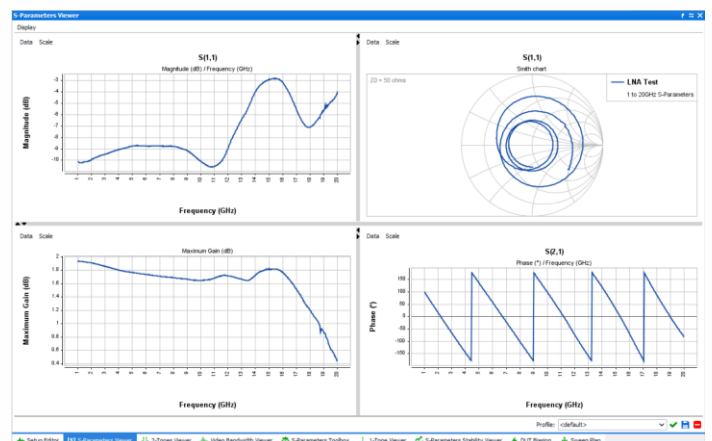


IQSTAR MEASUREMENTS AND MODULES

After completing the calibration routine and initializing the bench virtually, no person is required within the lab controlling instruments and probes station. Depending on the defined setup and the active calibration, the measurement panel allows to choose different tabs to set and perform:

- S-parameters measurements,
- power sweeps,
- frequency sweeps,
- 2-Tone and video-bandwidth analysis,
- modulated signal measurements.

An advanced and fully customizable real time visualization tool, embedding measurement history display and tuning target features, allows the user to verify the behaviour of the circuit while the measurements are running.



In the table below, different modules of IQSTAR can be found with its corresponding measurement capabilities. IQSTAR can export data files in CSV, MDIF formats for circuit simulators.

SCALAR BENCH CONTROL, 1-TONE (IQS100B10)	VECTOR BENCH ADD-ON (IQS100B11)	2-TONE MEASUREMENTS ADD-ON (IQS100B210)	MODULATED SIGNAL ADD-ON (IQS100B30)	I/Q MODULE ADD-ON (IQS100B40)
<ul style="list-style-type: none"> Power & frequency sweeps Gain Compression PAE Power Gain (3 power meters are needed) Transducer Gain (2 Power meters are needed) 	<ul style="list-style-type: none"> AM-PM Return Loss Harmonic power (Requires Frequency Offset option on the VNA) 	<ul style="list-style-type: none"> complete IMD characterization of the Power Amplifier 	<ul style="list-style-type: none"> Adjacent Channel Power Ratio (ACPR) Error Vector Magnitude (EVM) Complementary-Cumulative-Distribution-Function (CCDF) Peak-to-Average Power Ratio (PAPR) Spectrum Dynamic AM/AM and AM/PM (available only with NI PXI VSA for now) Digital Pre-Distortion (available only with NI PXI VSA for now) 	<ul style="list-style-type: none"> IQ Data ACPR CCDF with Trace Dynamic AM/AM and AM/PM DPD, Linked to customers Matlab script. EVM and Constellation.

IQSTAR SUMMARY

- Turnkey software solution for 50Ω circuit characterization
- Fully customizable with flexible setup schematic
- Complete characterization flow, including:
 - Instrument control
 - Calibration process
 - Different measurement configurations
 - S-Parameters (Pulsed and CW)
 - 1-Tone (Pulsed and CW)
 - 2-tone signals
 - Modulated signal
 - Flexible DC measurements and control (up to 20 DC stages)
 - Automation and test sequencing
 - Data export to standard formats (MDIF, CSV...)
 - Data analysis
 - Reporting
- Instrument agnostic solution
- A large list of instrument drivers available
- Compatible with most instrument vendors
- A simple implementation of new drivers using a Driver Wizard.
- No programming skills required
- Compatible for coaxial, waveguide, fixtured, and on-wafer measurements
- Export data files in CSV or MDIF formats for commercial circuit simulators

CONCLUSION:

Companies invest heavily in state-of-the-art test & measurement equipment to maintain innovative. It is important to achieve the highest Return-of-Investment of this equipment. The best way of achieving this is by obtaining the highest efficiency out of your bench. This means improving the actually time spend on testing your devices and reducing the time spend on setting up, debugging, etc. IQSTAR will provide you the framework to do this and help engineers to focus on what's important , which is obtaining measurement data. This data is repeatable among different setups when measurements are performed by different people. IQSTAR truly standardizes the whole measurement process. Data can be shared and compared without having discussions about the measurement process. With IQSTAR, working remotely does not compromise accuracy, repeatability and measurement speed. Even when due to COVID-19 just a few people are allowed within labs, benches controlled with IQSTAR can operate with maximum efficiency.

For more information:

<https://www.amcad-engineering.com/software/iqstar/>

Hi-Tech RF & Microwave Solutions

Dirk Faber
Business Development

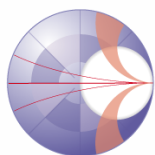
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