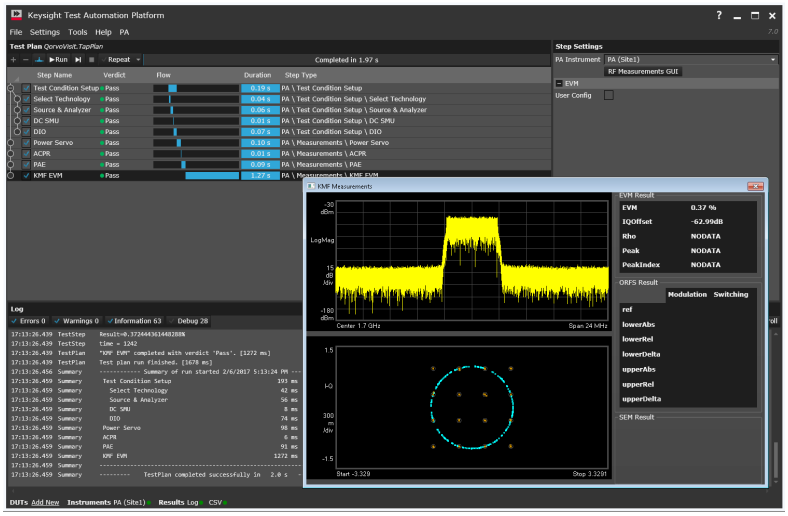
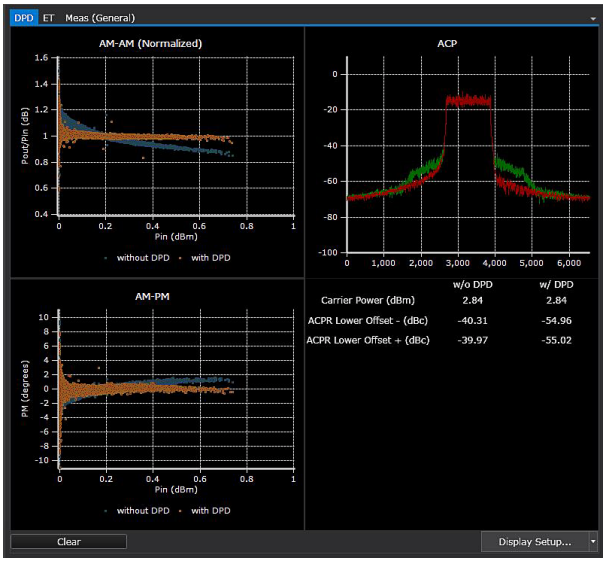
Keysight S8900A
PA Test Solution

- S8901A PA Test Software
- S8902A Noise Figure Measurement
- S8903A ET/DPD Measurement
- KS8400A Test Automation Platform
- Signal Studio

Technical Overview





KEYSIGHT TECHNOLOGIES

Next Generation RF PA/FEM Test Software Platform

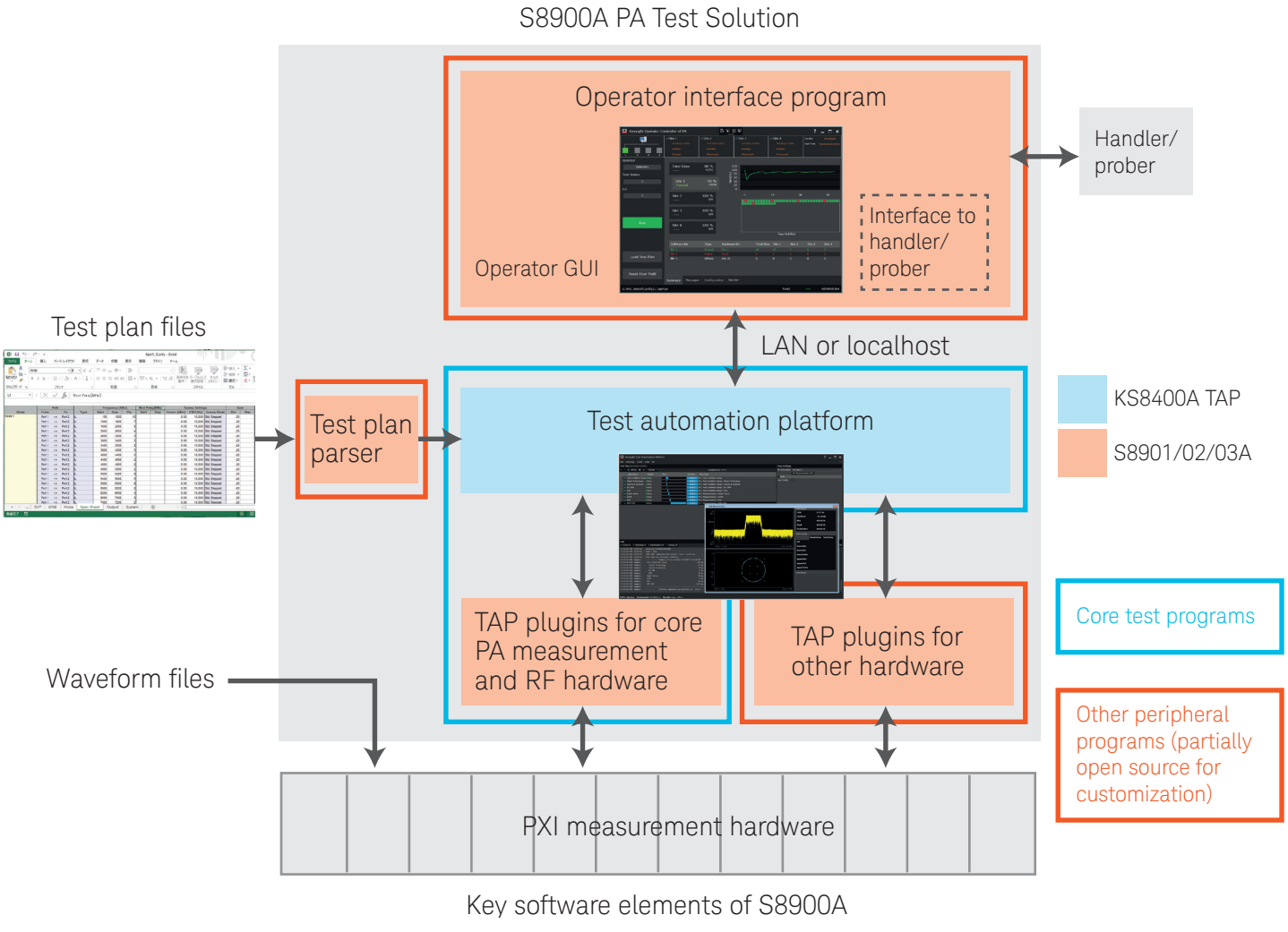
The Keysight S8900A PA Test Solution provides the next generation software for testing RF power amplifiers/front end modules (PA/FEM) for wireless mobile devices. In combination with flexibly configurable PXI hardware, the S8900A fully supports automated PA/FEM measurements and you can easily conduct fast and reliable testing in the design validation and manufacturing stages.

Ready-to-use, easy-to-customize

As the development cycle of RF PA/FEMs is getting shorter, one of critical challenges for PA/FEM vendors is to reduce the burden of developing and maintaining in-house test programs. The S8900A addresses this challenge by providing ready-to-use but customizable test sequences which require no programming effort, as well as customizability to adapt to your unique test environments including the GUI for manufacturing test operators and the interface to the external hardware such as a handler or a wafer prober.

The S8900A PA Test Solution is the software bundle package which makes easier for you to identify and choose necessary software items to configure your PA/FEM test system. The S8900A consists of the following software items:

- S8901A PA Test Software
- S8902A Noise Figure Measurement (optional)
- S8903A ET/DPD Measurement (optional)
- KS8400A Test Automation Platform (TAP)
- Signal Studio (optional)



Key software elements of S8900A

S8901A PA Test Software

The S8901A is the core part of this PA test solution. The key software items provided by the S8901A are as follows:

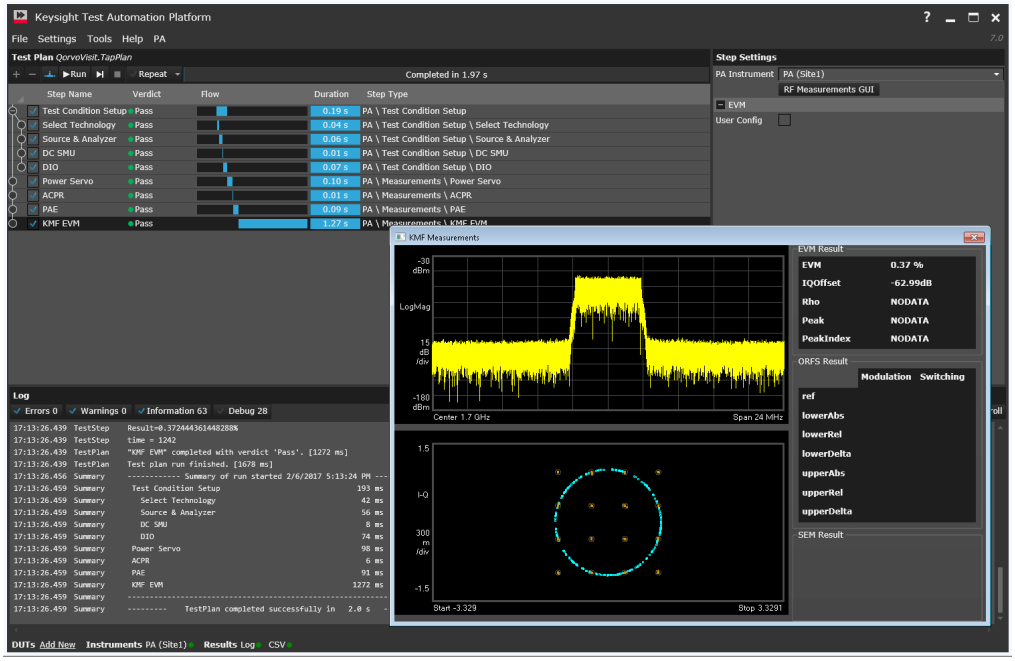
Measurement plugins/applications

The S8901A provides TAP plugins and other applications for PA measurements. The supported measurement items include:

- Power, gain, ACPR, DC current, PAE, harmonic, IM3, S-parameter
- EVM, Dynamic EVM, SEM, ORFS

The TAP plugins for core PA measurements and RF hardware fully covers key RF parameters of PA test in combination with the PXIe VSG/VSA, VXT, VNA, and other related instruments. Optimal measurement methods and algorithms are implemented in a ready-to-use manner, and you can easily perform RF parameter measurements with no programming efforts.

For example, the EVM measurement is performed with the embedded Keysight Measurement Framework (KMF) which enables much faster EVM measurements than conventional methods. The TAP plugins for other instruments such as the DC SMU and RFFE DIO (DSR) are provided as partially open source sample DLLs which are customizable to your unique instruments and setups.



PA measurement with TAP test sequence.

S8901A PA Test Software (Continued)

Test plan parser

In addition to the basic test sequence creation method using the TAP editor, this software tool gives another method which is useful for DVT and manufacturing tests. The Test Plan Parser automatically converts your own test plan files into the TAP test sequence files (TAP plan files). It parses the test plans written in Excel files according to the definition you described in the XML file, and generates the corresponding TAP plan files.

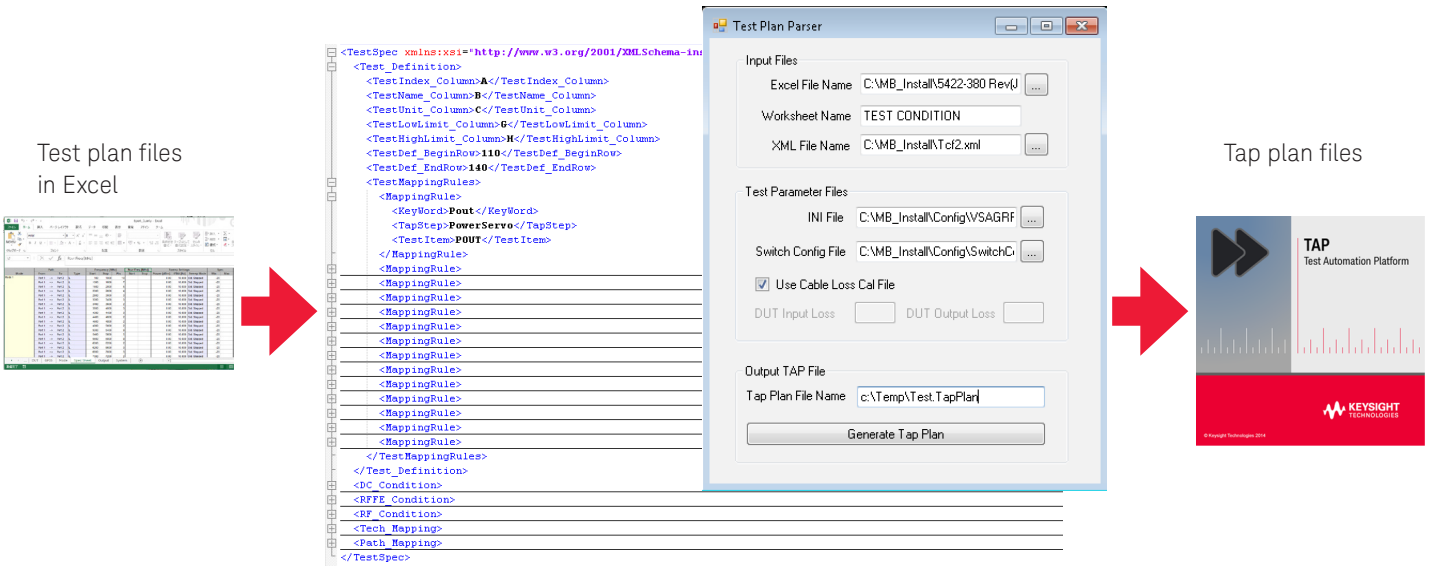
Operator interface

The Operator Interface program is an open source program that remote controls the TAP sequence from an external PC or within the same PXIe controller. The program provides an example code of remotely executing the TAP sequence and reading the test results through the API, along with an example GUI for test operators.

In addition, you can implement the code for interfacing to a handler or a prober to build your manufacturing test system. Or you can use this program just as a reference for modifying your own operator GUI program to let it communicate with the TAP sequence through the API.

Other useful tools

The S8901A provides other software tools that improve usability and productivity, including the Test Site Configurator for easily making PXI hardware connections of up to four test sites, and the System Diagnosis tool for executing hardware functional verification tests.



Test Plan Parser (XML and GUI)

S8902A Noise Figure Measurement

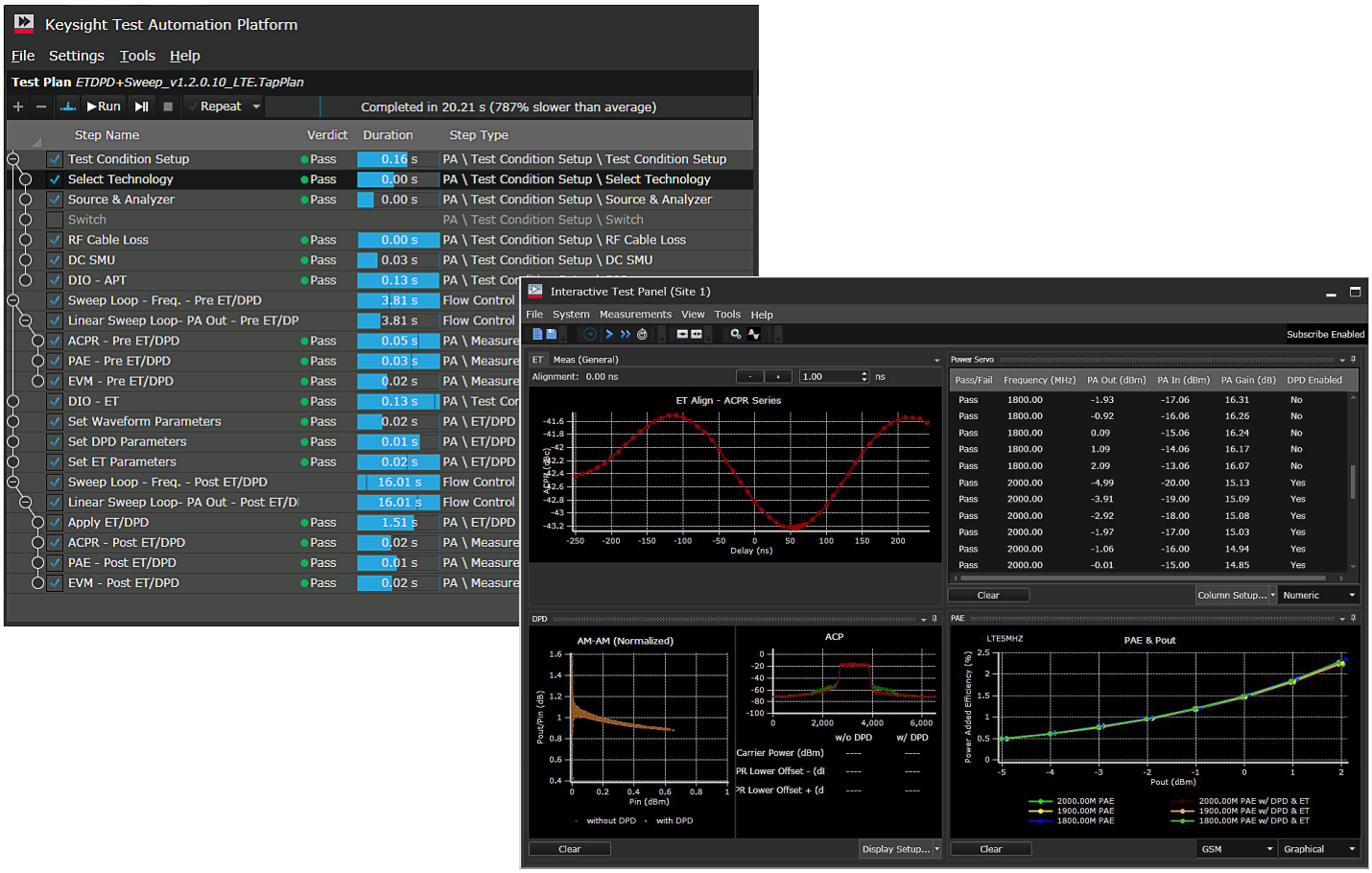
The noise figure is a critical test parameter for the LNA-integrated FEMs, as well as the inter modulation distortion IM3. The S8902A is the optional KMF library for measuring the noise figure with the PXIe VSA and VXT. Both the Y-factor and cold source methods are supported.

S8903A ET/DPD Measurement

ET (envelope tracking) and DPD (digital pre-distortion) are critical technologies for optimizing linearity and efficiency of today's power amplifiers. The combination of the S8903A ET/DPD Measurement and the N7614B Signal Studio for Power Amplifier Test adds ET/DPD capabilities to the S8900A PA Test Solution. Furthermore, the ET/DPD data processing speed can be significantly improved by using the M9451A Measurement Accelerator.

Signal Studio Waveform License

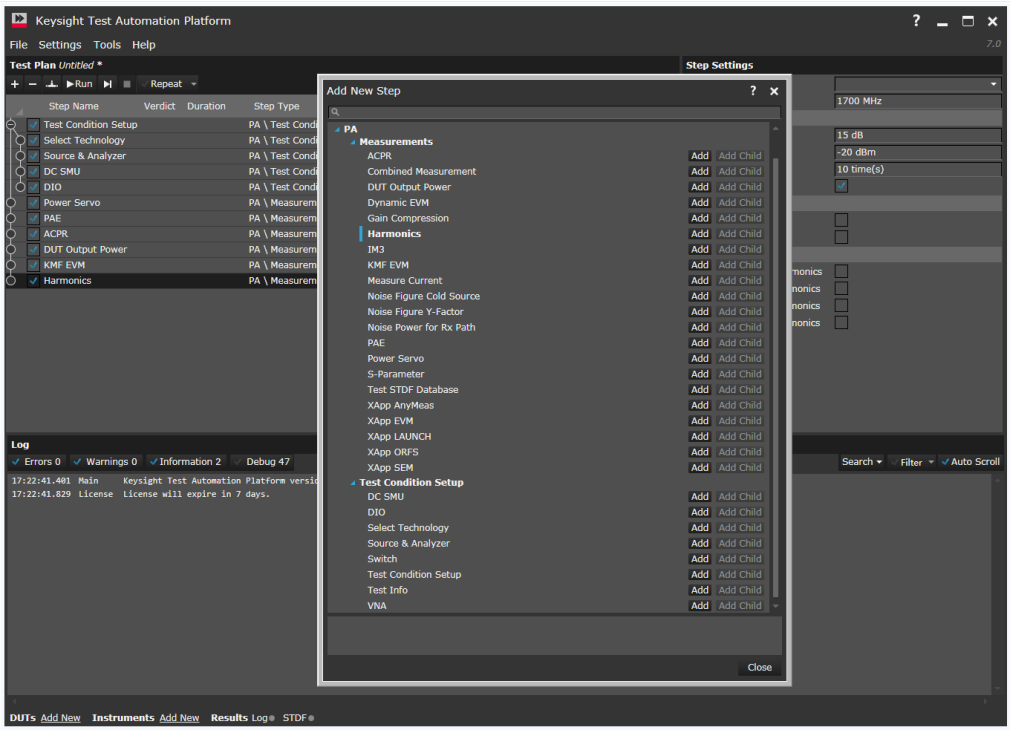
The S8901A PA Test Software provides sample waveforms of typical 18 cellular and WLAN formats that can be played without an additional license. This helps you quickly get started using the S8901A PA Test Software. For actual DVT and manufacturing tests, purchasing Signal Studio licenses such as the N7650B allows you to play the Signal Studio waveforms on the PXIe VSG or VXT.



ET/DPD measurement using TAP

KS8400A Test Automation Platform

The KS8400A Test Automation Platform (TAP) is the base software which manages and executes test sequences of the S8900A PA test system. The TAP's modular architecture allows you to flexibly create and customize test sequences. You can easily construct and modify test sequences in the TAP editor, by adding the setup and measurement steps provided by the S8901A plugins. Most of the S8901A's PA measurement items are available as TAP test steps and editable here.



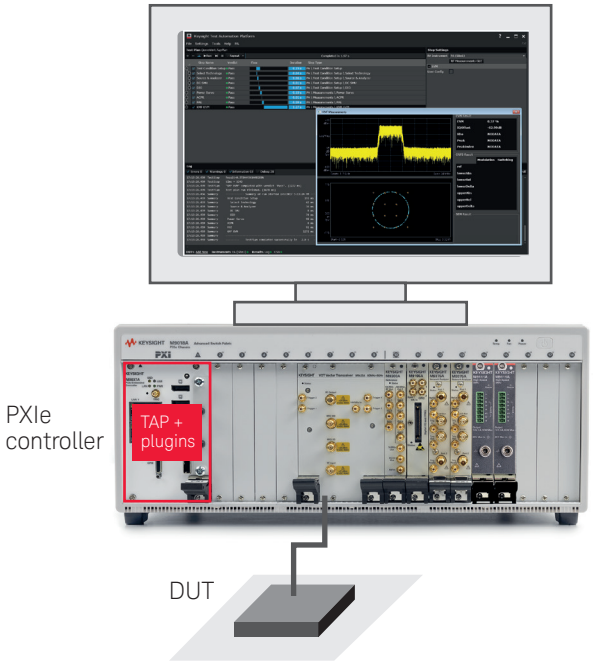
Easily create and modify PA test sequence in TAP editor.

Flexible Test Configurations

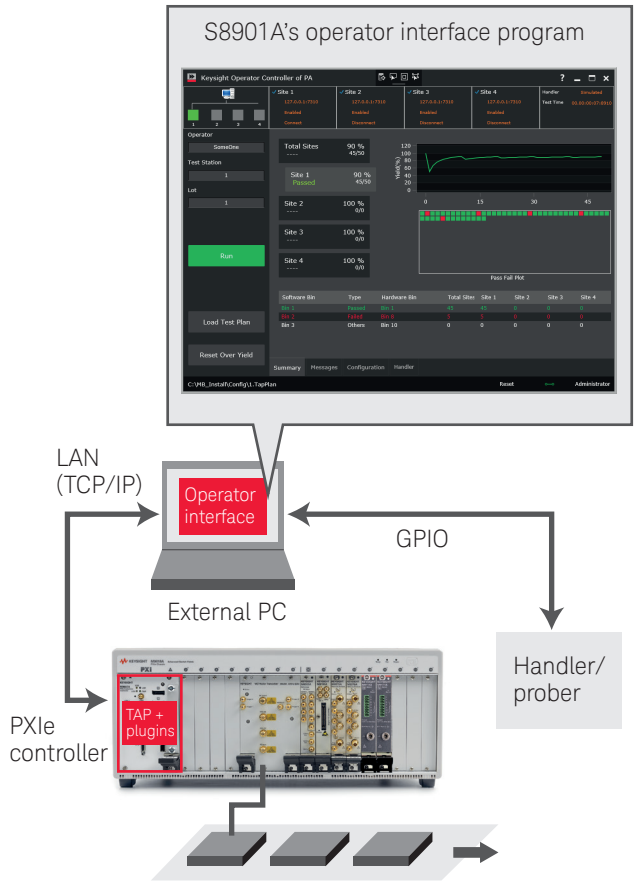
You can flexibly configure your test systems depending on your test needs. Here are examples of typical test system configurations.

In the manual handling test configuration for DVT (design validation test), the test is performed by directly operating on the TAP GUI. In the fully automated test configuration for manufacturing, the Operator Interface program controls the TAP instance being operated in its remote control mode, along with controlling the handler.

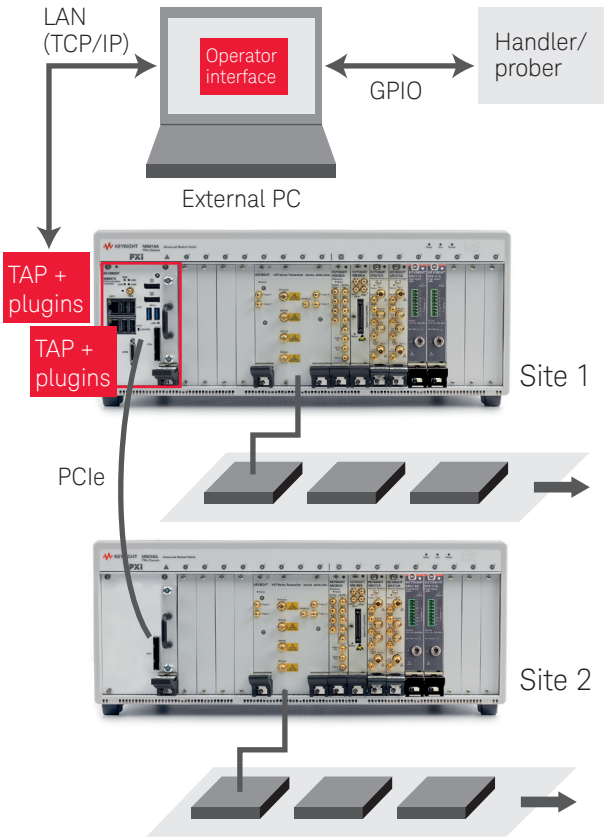
In the multisite test configuration using two PXIe chassis, multiple TAP instances are executed in the PXIe controller on the first chassis.



Typical configuration for DVT.



Typical configuration in manufacturing (single site).



Typical configuration in manufacturing (Dual site: 2 TAP instances in PXIe controller).

S8900A Software Product Structure

S8900A PA test solution

Included software

S8901A PA test software
S8901A-1FP fixed perpetual license
S8901A-1TP transportable perpetual license
S8901A-1FL fixed 1-year license
S8901A-1TL transportable 1-year license
KS8400A test automation platform [1]
KS8400A-1FP fixed perpetual license
KS8400A-1TP transportable perpetual license
KS8400A-1FY fixed 1-year license
KS8400A-1TY transportable 1-year license

Optional measurement software

S8902A noise figure measurement
S8902A-1FP fixed perpetual license
S8902A-1TP transportable perpetual license
S8902A-1FL fixed 1-year license
S8902A-1TL transportable 1-year license
S8903A ET/DPD measurement [2]
S8903A-1FP fixed perpetual license
S8903A-1TP transportable perpetual license
S8903A-1FL fixed 1-year license
S8903A-1TL transportable 1-year license

Optional Signal Studio software [3]

N7614B Signal Studio for Power Amplifier Test
N7650B Signal Studio Waveform Licenses for M9381A and M942xA (5/50 pack)
N7600B Signal Studio for W-CDMA/HSPA+
N7602B Signal Studio for GSM/EDGE/Evo
N7612B Signal Studio for TD-SCDMA/HSPA
N7617B Signal Studio for WLAN 802.11a/b/g/j/p/n/ac/ah/ax
N7624B Signal Studio for LTE/LTE-Advanced FDD
N7624B Signal Studio for LTE/LTE-Advanced FDD
N7601B Signal Studio for cdma2000®/1xEV-DO
N7614B Signal Studio for Power Amplifier Test

1. In addition, the KS8400A has floating network license options 1NP/1NY.
2. The N7614B Signal Studio for Power Amplifier Test is also required as the ET/DPD calculation engine for the S8903A.
3. For information about license options, please visit www.keysight.com/find/signalstudio.

Hardware Supported by S8901A/S8902A/S8903A

M9381A PXIe Vector Signal Generator	
Frequency range	1 MHz to 3, 6 GHz
Modulation bandwidth	Up to 160 MHz
Output power	+20 dBm
M9391A PXIe Vector Signal Analyzer	
Frequency range	1 MHz to 3, 6 GHz
Analysis bandwidth	Up to 160 MHz
Absolute amplitude accuracy	± 0.45 dB, typical
M9393A PXIe Performance Vector Signal Analyzer	
Frequency range	9 kHz to 8.4, 14, 18, 27 GHz
Analysis bandwidth	Up to 160 MHz
Absolute amplitude accuracy	± 0.15 dB, nominal
M9420A/M9421A PXIe Vector Transceiver	
Frequency range	60 MHz to 3.8 or 6 GHz
Modulation and analysis bandwidth	Up to 160 MHz
Output power	Up to +20 dBm
Absolute amplitude accuracy	± 0.20 dB typical
M3201A/M3202A PXIe Arbitrary Waveform Generator	
Real-time bandwidth	200 MHz (16 bits), 400 MHz (14 bits)
Maximum sample rate	500 MS/s, 1G S/s
M937xA PXIe Vector Network Analyzer	
Frequency range	300 kHz to 4, 6.5, 9, 14, 20, 26.5 GHz
Dynamic range	≥ 122 dBrms typical (IFBW=10 Hz)
Trace noise	< 0.001 dB typical (IFBW=1 kHz)
M9195B Digital Stimulus and Response with PMU	
Per pin functionality	Logic level, edge placement, delay, PMU, timing
Max pattern and DUT clock rate	250 MHz
Site (test sequences) per module	1 or 4, selectable
M9451A-DPD Measurement Accelerator with Digital Pre-Distortion and Envelope Tracking Gateware	
Bus interface and compatibility	PXI Express peripheral module (x1, x4, x8 PCIe® specification v2.1)
FPGA	Altera Stratix V A7 (5SGXMA7K3F40C2)
Memory	4 GB DDR3 memory – 2 independent DDR3 banks at 1200 MT/s, 600 MHz each
M9111A PXIe High-Speed Source/Measure Unit	
Measurement accuracy:	
Current, 3 A range	0.05% + 300 uA
Current, 1 mA range	0.05% + 100 nA
Current, 100 uA range	0.05% + 10 nA
Voltage, 13 V and 6 V ranges	0.05% + 1 mV

M9381A PXIe Vector Signal Generator, 1 MHz to 3/6 GHz

www.keysight.com/find/m9381a

Designed for fast data interfaces and high-speed automated test systems, the M9381A generates RF signals up to 6 GHz with 160 MHz bandwidth. The M9381A is compatible with the full range of Signal Studio communications applications. A typical M9381A configuration includes 4 individual PXIe modules – M9311A digital vector modulator, M9310A source output, M9301A synthesizer and M9300A frequency reference (may be shared with other signal generators and analyzers in the same chassis).

M9391A PXIe Vector Signal Analyzer, 1 MHz to 3/6 GHz

M9393A PXIe Vector Signal Analyzer, 9 kHz to 8.4/14/18/27 GHz

www.keysight.com/find/m9391a
www.keysight.com/find/m9393a

Designed for fast power and demodulation measurements in high-speed automated test systems, the M9391A / M9393A analyze signals with 160 MHz bandwidth. Perform power measurements quickly with real-time signal processing and analyze harmonic distortion. The M9391A and M9393A are compatible with the full range of X-Series Measurement Applications for signal analysis.

A typical M9391A configuration includes 4 individual PXIe modules – M9301A synthesizer, M9214A digitizer, M9350A downconverter and the M9300A frequency reference.

A typical M9393A configuration includes 4 individual PXIe modules – M9308A synthesizer, M9214A digitizer, M9365A downconverter and the M9300A frequency reference. (The M9300A may be shared with other signal generators and analyzers in the same chassis.)

M9420A, M9421A PXIe Vector Transceivers (VXT), 60 MHz to 3.8/6 GHz

www.keysight.com/find/vxt

The Keysight M9420A and M9421A PXIe VXT vector transceivers are purpose-built for rapid solution creation and faster throughput in manufacturing test of wireless components and IoT devices. The module combines both vector signal generation and signal analysis with frequency range from 60 MHz to 6 GHz and bandwidth up to 160 MHz in only four PXIe slots.

With FPGA-accelerated measurements and deep software, the ready-to-run VXT lets you start closer to your finish line. Additionally, a comprehensive self-calibration routine enables extremely accurate, repeatable results on the VXT. This results in tighter test margins and better pass/fail results.

The M9420A addresses manufacturing tests of broad range of wireless components and devices. And the M9421A is the new addition to the VXT family that offers enhanced features more optimized for PA/FEM tests, including improved EVM measurements for WLAN PAs and noise figure measurements in combination with the S8902A Noise Figure Measurement.

M9195B PXIe Digital Stimulus/Response (DSR)

www.keysight.com/find/m9195b

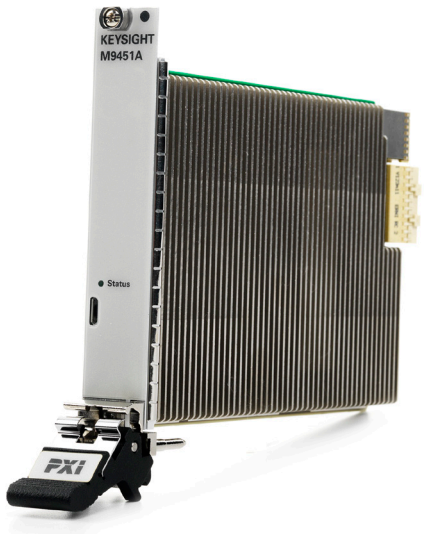
Designed for IC design validation and production test environments, the M9195B can easily emulate standard serial interfaces like the MIPI® RF front-end interface for DUT (PA) control. The 16-channel, single slot PXI module utilizes a high performance pattern cyclizer for powerful pattern creation and per-vector timing changes. It supports multiple drive edges per cycle for flexible edge placement. It can also support up to four independent multi-sites for quick test development with multiple test fixtures.

Software tools included with the M9195B allow the user to modify vector and pattern parameters without requiring the user to recompile and download tests. It includes ATE features such as: deep vector memory, per pin programming of voltage levels, real time compare, parametric measurement unit (PMU), response delay cable compensation, and a high speed pattern application rate up to 250 MHz.

M9451A-DPD PXIe Measurement Accelerator with Digital Pre-Distortion & Envelope Tracking Gateway

www.keysight.com/find/m9451a

With the M9451A-DPD, closed/open loop digital pre-distortion (DPD) and envelope tracking (ET) measurements can be made in tens of milliseconds, reducing overall test time to <100 msec. The measurement accelerator module uses an Altera Stratix V “A7” FPGA with 4 GB DDR3 memory and trusted DPD/ET algorithms built on years of close cooperation with leading wireless manufacturing customers. Peer to peer connectivity with Keysight M9381A PXIe VSG, M9391/93A PXIe VSA, and M9420/21A PXIe VXT, achieves fast PA/FEM test times without sacrificing performance.



M9111A PXIe High-Speed Source/Measure Unit (SMU)

www.keysight.com/find/m9111a

The M9111A is a 1-slot, 2-quadrant PXIe SMU that combines the capabilities of a voltage source, a current source, an ammeter and a voltmeter to provide stable, glitch-free sourcing and sinking, and high accuracy measurements. The output ratings are up to 13 V, ± 1 A or up to 6 V, ± 3 A, 18 W, and the speed. The Up to 20X faster than previous generation Keysight SMUs. By offering superior transient performance, the M9111A SMU dramatically reduces the transient voltage drop due to pulsed loading and recovers quickly to its program voltage.

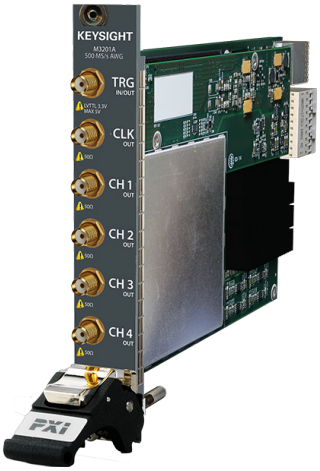
N6700B Mainframe and N6782A Source/Measure Unit (SMU)

www.keysight.com/find/n6700B

For PA/FEM measurements that require the DC power synchronized with the PA’s burst signal, the N6782A 2-quadrant SMU with the N6700B system mainframe is the solution. Designed for glitch-free operation the N6782A with the N6700B ensures safe usage with the DUT during output and measurement range changes, even with capacitances of up to 150 uF. The N6700B is a 1U high modular power mainframe that accepts the N6782A SMU designed for precision sourcing and measurement.

M3201A/M3202A PXIe Arbitrary Waveform Generator

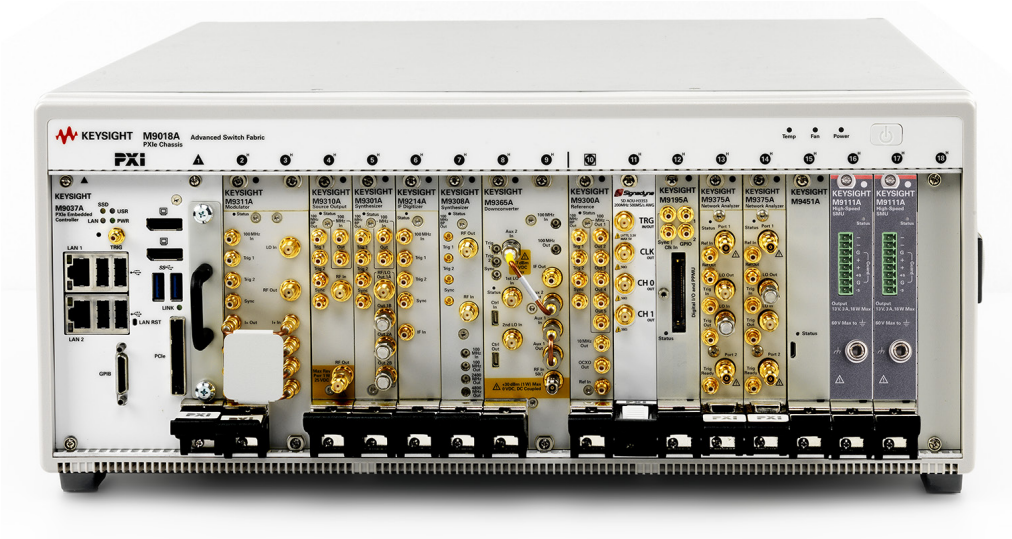
Designed for high-speed waveform generation, the single-slot M3201A/ M3202A AWG enables fast envelope generation for use in high-speed automated test applications. Combine with the M9381A PXIe Vector Signal Generator for synchronized RF and envelope signals.



M937XA PXIe Vector Network Analyzer, 300 kHz to 4/6.5/9/14/20/26.5 GHz

www.keysight.com/find/pxivna

Designed for fast S-parameter measurements in high-speed automated test systems, the M937XA series analyzes signals up to 26.5 GHz. This single-slot, full 2-port VNA enables multiport/multi-site capability in a very small package. Excellent total performance including the dynamic rage of typically 122 dB ensures reliable testing of general multiport devices. Easily add or subtract VNA modules based on the needs of your test station. The full N-port correction capability allows for complete and accurate characterization of multiport devices.



Hardware configuration example for DVT(VSG/VSA, Reference, AWG, Accelerator, DSR, VNAs, and SMUs).

www.axiestandard.org

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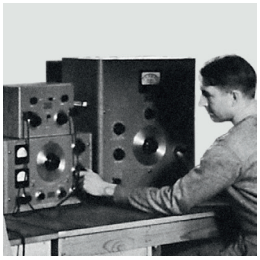
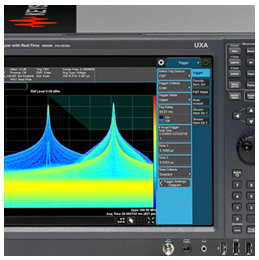


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