Challenge the Boundaries of Test
Agilent Modular Products

Be Ready for Tomorrow -- Today

M9381A PXIe Vector Signal Generator & M9391A PXIe Vector Signal Analyzer

Software & Modular Solutions Division

July 1, 2013

Agenda

- Introductions
- Agilent Modular Objectives
- Agilent's New PXIe Vector Signal Analyzer
- Agilent's PXIe Vector Signal Generator
- Application Challenges
- Wrap-up and Summary

High Level Positioning: Benchtop vs. Modular

Agilent Message: we have both!

Benchtop Instruments

PXI/AXIe Modules

Customer Considerations

Integrated CPU
Power Supply & Display

Upgradable

Flexible

Extensive Specs

Front-panel Operation

Compact Footprint

Multi-channel

Optimized For R&D

Portable

Optimized for ATE Solutions Development

General Purpose, highly integrated *"systems"* with optimized price/performance

Can be used in a test system *(e.g. PXA in "Rack and Stack" ATE)*

Standardized modules can be configured to create application-focused automated test solutions

Can be used as a single/general function instrument *(M9391A VSA)*

Why Modular?

Small footprint

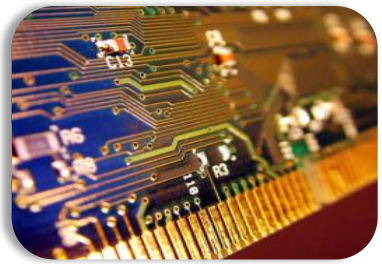
- No duplicate displays and front panels
- Support multiple channels in compact space

High throughput

- Direct backplane speed

Flexibility and scalability

- Assemble custom solutions – one to many



Latest technology

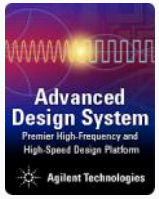
- New technologies available early

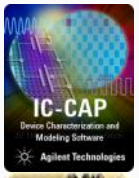
Combining these to drive down the cost of test

PXI

AXIe

Software and Modular Solutions Division





Delivering Agilent Measurement Technology and Quality in Software & PXI/AXIe/PCIe

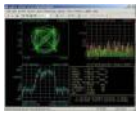
- World-wide development in US (CA, CO, WA), Switzerland, China, and India
- Home of Agilent design and simulation technologies and products
- Founding member of AXIe Consortium
- Strong partnership with internal and external solution partners

RF / Microwave

M9381A VSG

Signal Studio

M9392A Signal Analyzer



89600B VSA

- **New M9381A VSG plus 26 GHz Vector Signal Analyzer Leveraging Agilent RF Designs**
- **Signal Generation & Analysis Software**

High Speed Digital, AWGs and Digitizers

M8190A AWG

M9703A 8 Channel Digitizer

M9020A Digitizer

- **Highest Performance ADCs & DACs**
- **Next Generation Digital Bus Analyzers**

Chassis, Switching and Basic Instruments

PXIe Chassis

DMM

Switches

- **Highest Throughput PXIe Chassis**
- **Fastest DMM**
- **Switches from DC to Microwave**
- **+ many more**

Software and Hardware to take you from Design to Manufacturing

Design Simulation	R&D	Design Validation	Manufacturing
Save money	Time to Market	Flexibility, Configurability	Lowest cost per test

Modular Solutions
- *Hardware Platform Choices*

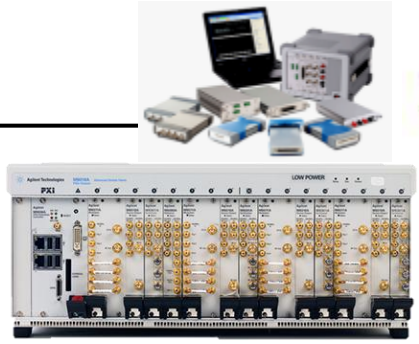
Computer Industry interfaces

USB

PCIe

LAN

GPIB



LAN to GPIB

Choice of product Platforms

Modular: A Growing Portfolio

Functional Test	Digital	A/D	Wireless	BERs
High Speed DMMs	Logic Analyzers	uW Vector Signal Analyzer	M9380/81A RF Source	
Low Frequency Switching	Protocol Analyzers	uWave Switches	Signal conditioning	
RF Switching	PCI Express	PXI 10 & 15-bit AWG	Digitizing Scopes	
DAQ	HDMI	PXI Dual Channel Vector Signal Analyzer	uWave Switches	
VI Source		M8190A AXI AWG	IF Digitizers	
Digital IO		M9703A AXIe Digitizer	N7109A 8-channel MIMO Analyzer	
			PXI Wideband MIMO Vector Signal Analyzer	

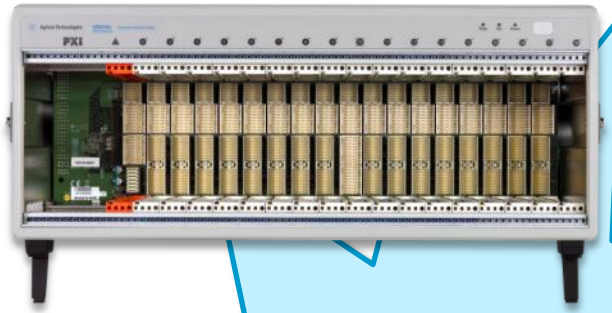
Chassis, Controllers and IO

AXIe Chassis & Controller

PXI Chassis & Controller

M940xA PXI Optical Extenders

Agilent PXI Interoperability Advantages



HW Designed for Compatibility:

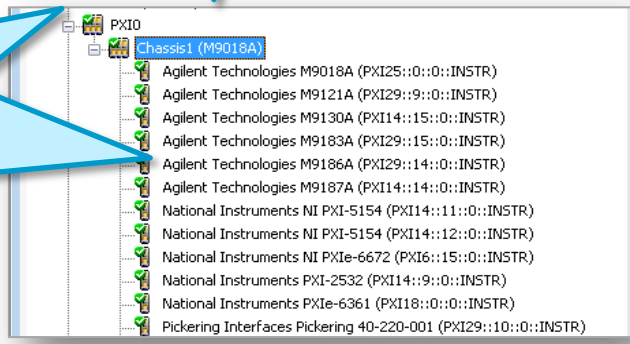
- M9018A all hybrid chassis
- New M9048A PCIe interface

Interoperability Testing:

- SMS Inter-op labs
  - e.g. Six mixed NI/Agilent combinations for M9036A
- Tested computer list

Open SW Environment:

- Agilent I/O Libs
- Support for multiple platforms

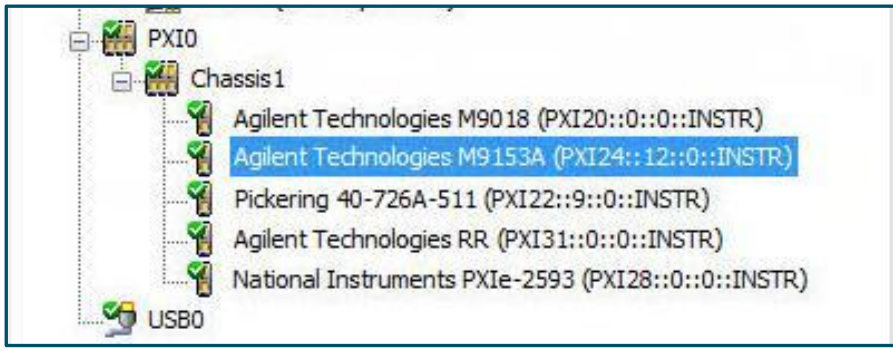


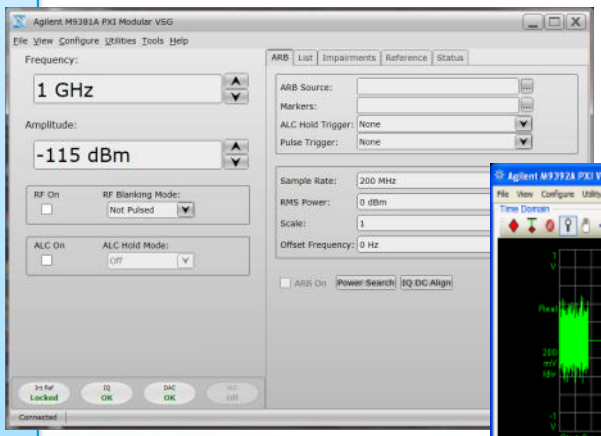
Agilent Software Architecture Advantages

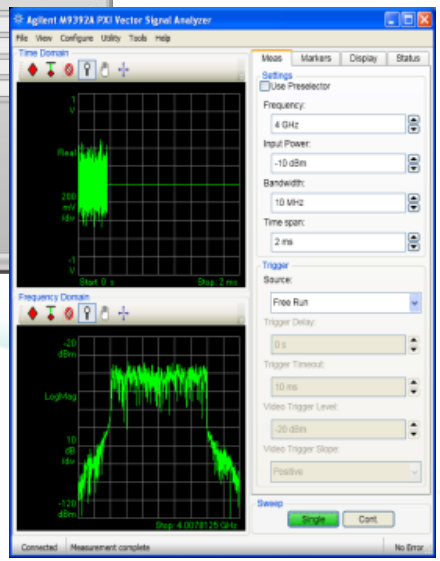
- Agilent IO Libraries identifies all modules within a chassis **regardless of vendor** via the Agilent Connection Expert (ACE)
- All modules include Soft Front Panel for easy instrument control
- NEW Agilent Command Expert offers GUI interface to build programming commands
- Multiple programming interfaces are supported with instrument drivers and example programs

MATLAB LabWindows CVI Visual Studio LabVIEW VEE

C#, C/C++
VB.NET







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M9391A PXIe Vector Signal Analyzer

Agilent Quality & Performance Vector Signal Analyzer in PXI

Description:

- PXIe Vector Signal Analyzer
- 1 MHz to 3 GHz or 6 GHz
- Up to 160 MHz Bandwidth

Key Features:

- Extremely **fast** Power Measurements
- Baseband tuning for **fast** ACPR Measurements
- **Real-time correction**s
- PXIe (PCIe) data bus for **fast** data transfer and test execution
- Soft front panel, IVI-COM drivers, and connectivity to 89600 VSA software and SystemVue

M9391A PXIe Vector Signal Analyzer

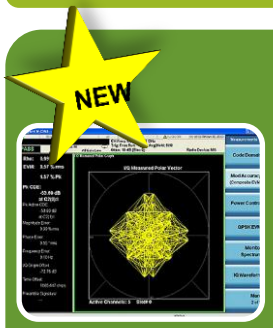
Application Software

Drivers

- M9391A IVI-COM Driver for IQ, Spectrum, and Power Measurements
- Soft Front Panel

89600 VSA connectivity

SystemVue connectivity

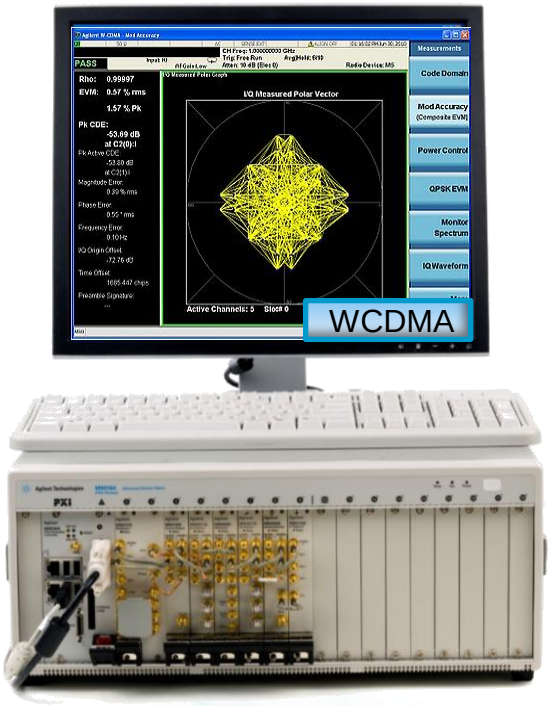


Modular Applications

- X-Series Applications for Modular Products
  - Same look & feel as benchtop analyzer applications
  - Same measurement algorithms
  - Same SCPI interface
  - One license supports up to four PXI VSAs

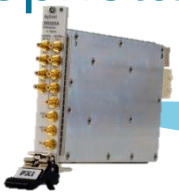
First Release (Sept. 2013)

- WLAN, WCDMA/HSPA, LTE-FDD, LTE-TDD, GSM/EDGE, TD-SCDMA, 1xEV-DO, cdma2000



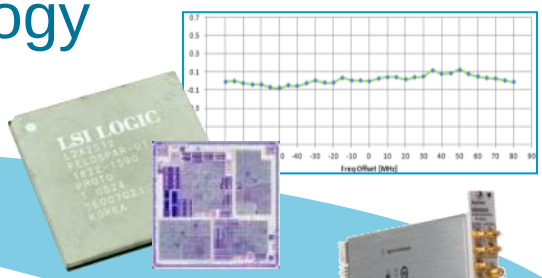
Innovation in PXIe Signal Analysis

Proprietary Agilent technology



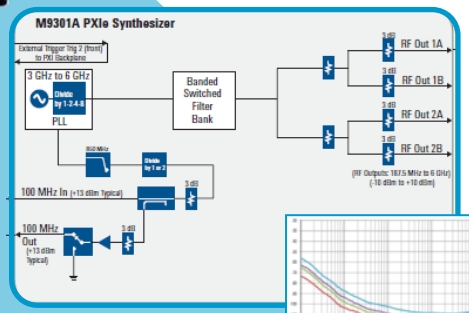
Frac-N engine

Fast, High accuracy step attenuators in Down Converter

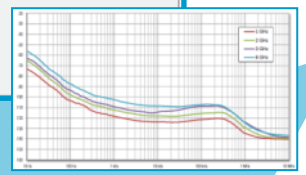


ASIC enabled real-time amplitude and phase corrections

Broad Frequency Calibrator



Fast, compact Single-Loop synthesizer



Frac-N engine in Frequency Reference	**Lower Spurs**
Downconverter	**Speed & Broad, Accurate Amplitude Range**
ASIC enabled superior real-time corrections	**Speed & EVM Performance Real Time Power Measurements & Vector Averaging**
Broad Frequency Calibrator	**Superior Amplitude accuracy over frequency**
Single-Loop, Low pedestal noise Synthesizer	**Speed & LTE EVM**

Agilent PXIe Vector Signal Analyzer

M9391A Vector Signal Analyzer
Data Acquisition Modes

M9391A Signal Processing ASIC Offers Three Acquisition Modes:

IQ Mode
- Time records of IQ data with Arbitrary Sample Rates
- Configurable Channel Filter

Spectrum Mode
- Complex or Power Spectrum Data
- Configurable Span, RBW and Window Shape
- Configurable Averaging: Peak or Average, Time or Count, % Overlapped

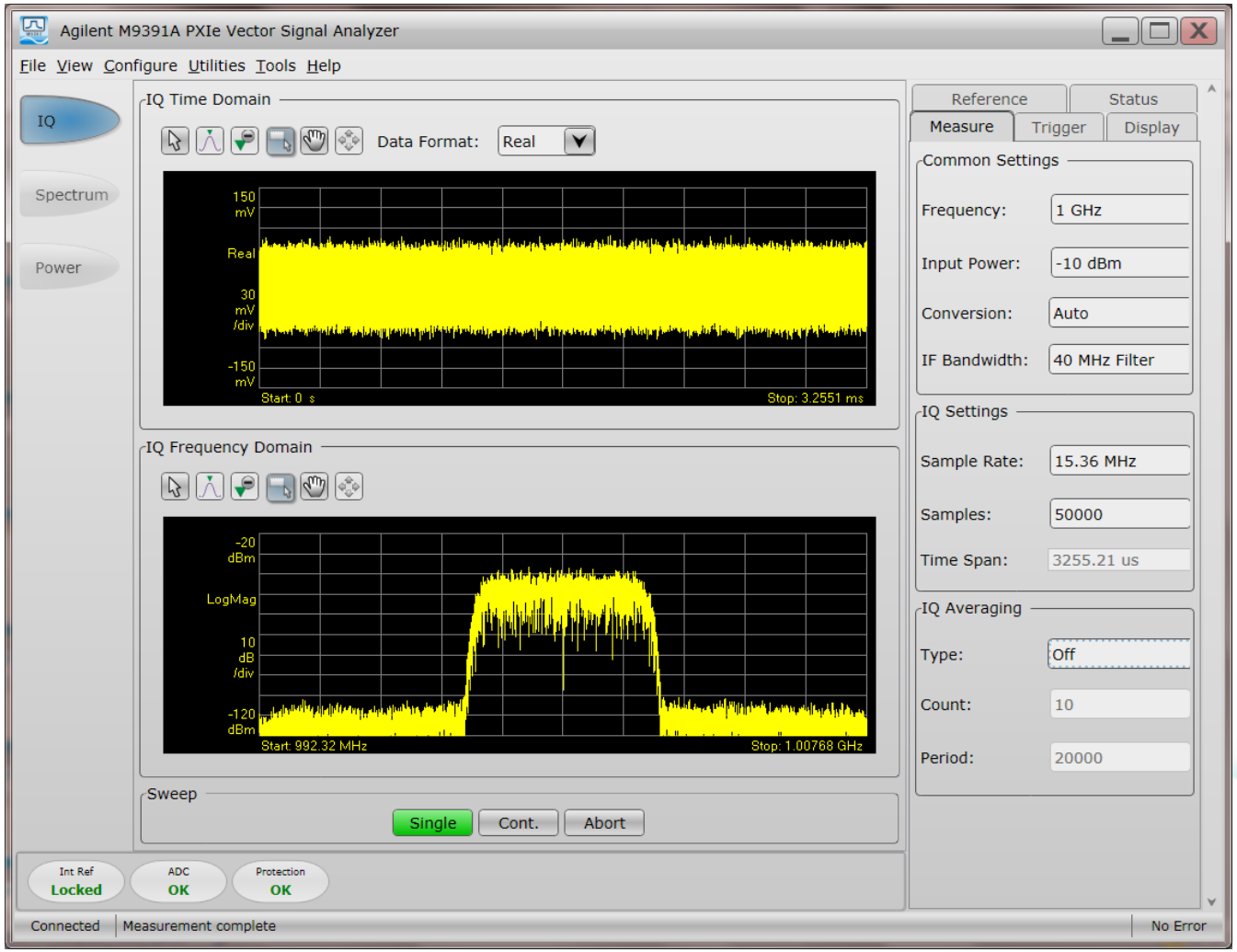
Power Mode
- Single Value for Integrated Power Measurement
- Configurable Bandwidth, Acquisition Time and Channel Filter

Faster Throughput
- Data is acquired at desired sample rate so less data is downloaded with each measurement

Easy to Use
- Built in measurements

Faster Throughput
- Data is acquired and processed in ASIC so less data is downloaded with each measurement

M9391A Soft Front Panel
IQ Acquisition Mode



Conversion Mode:
- Single High Side
- Single Low Side
- Image Protect
- Auto

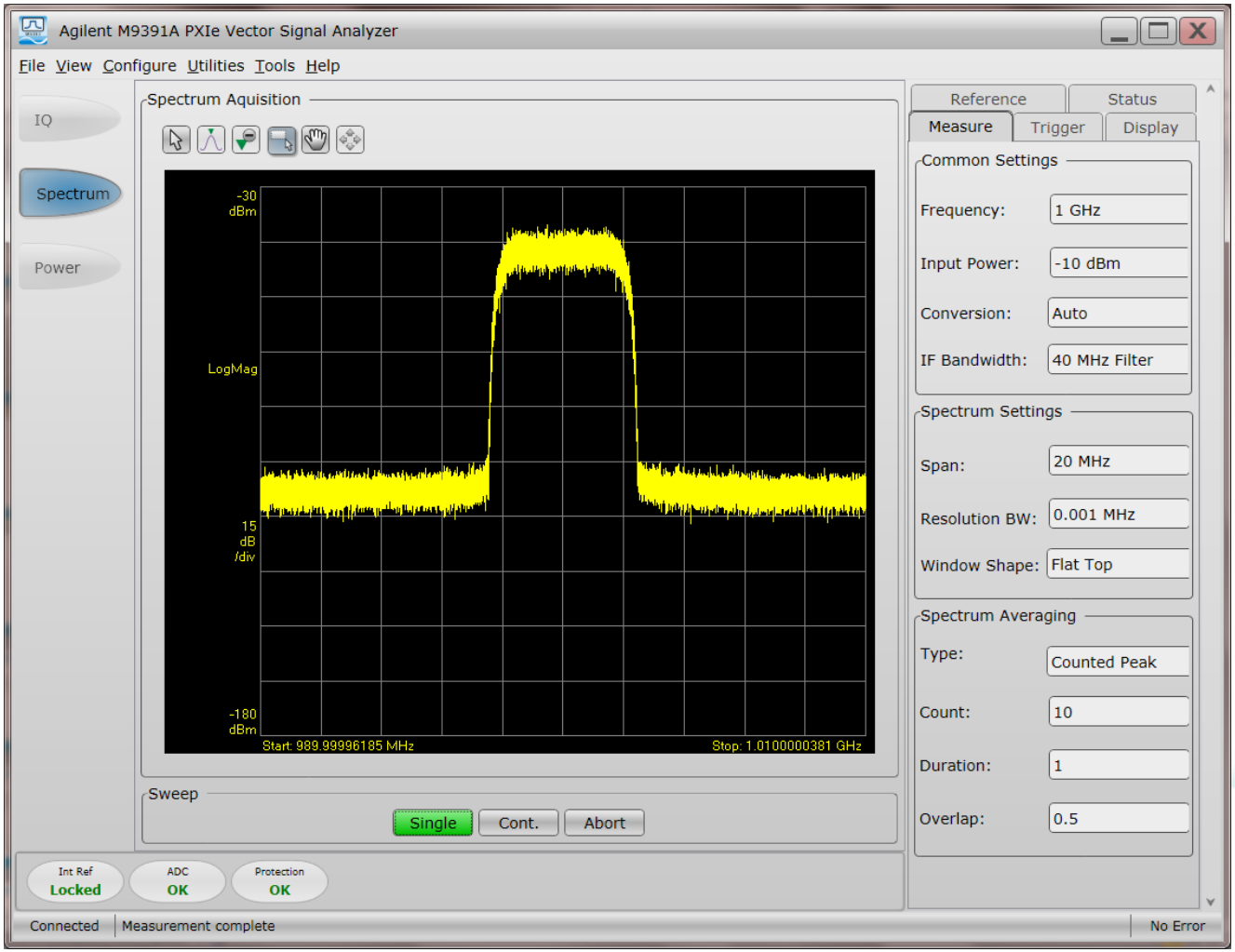
IF Filter Bandwidth:
- 15 MHz
- 40 MHz
- 160 MHz

Sample Rate:
- Arbitrary
- 1 Hz to 200 MHz

Channel Filter:
- See Power Acquisition Slide

M9391A Soft Front Panel

Spectrum Acquisition Mode



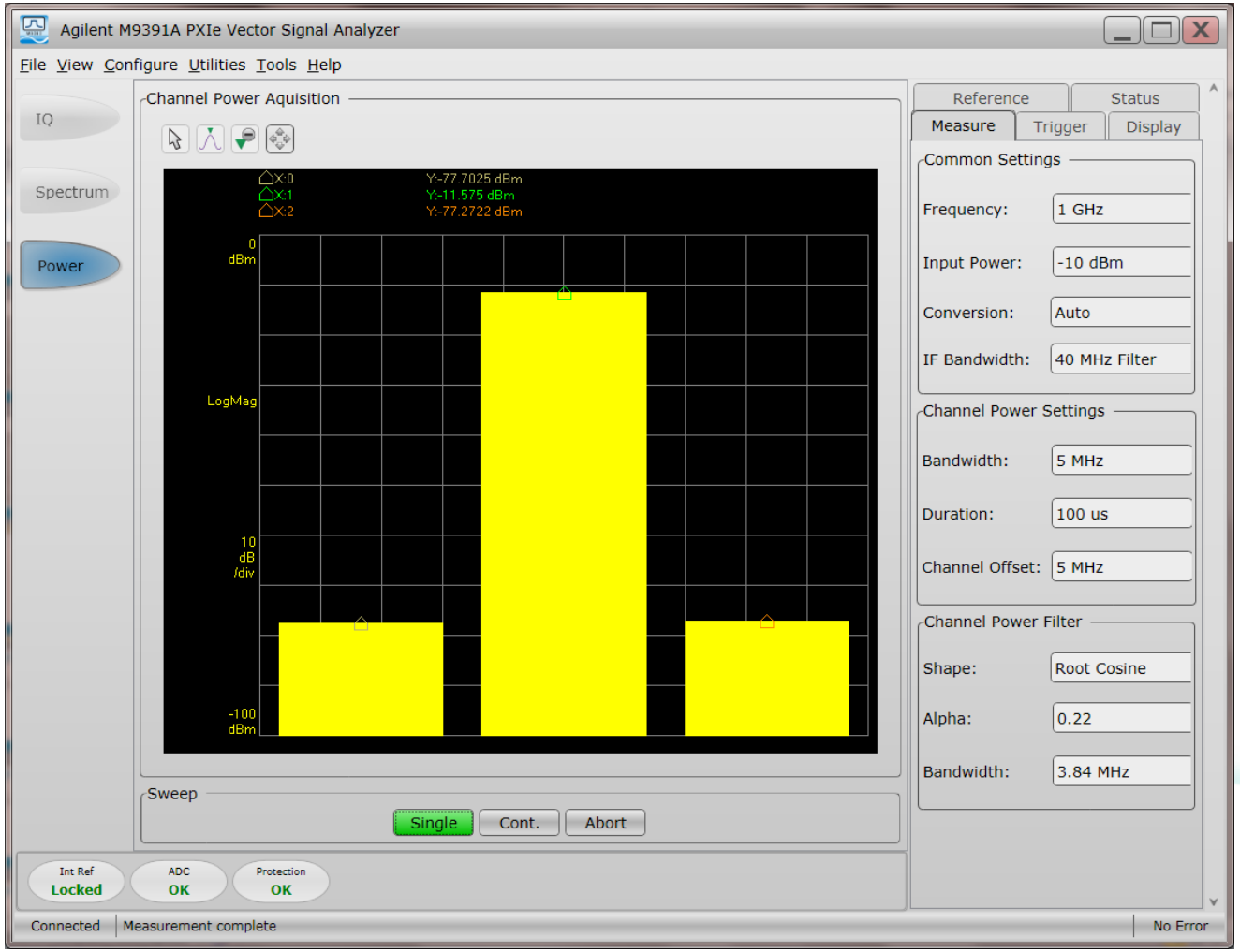
Span:
- 1Hz to 160 MHz

RBW:
- 1Hz to 40 MHz

Window Shape:
- Flat Top
- Flat Top2
- Gaussian
- Hanning
- Uniform

Averaging Types:
- Counted/Time
- Average/Peak

M9391A Soft Front Panel
Power Acquisition Mode



Channel Bandwidth
- 1 Hz to 160 MHz

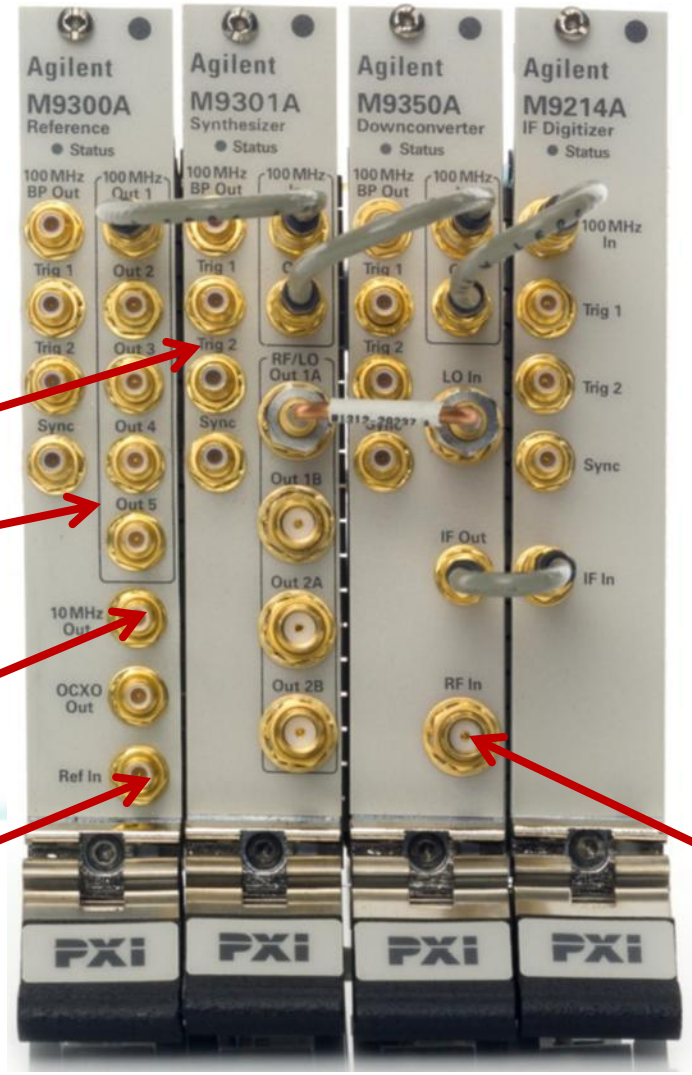
Channel Offset:
- +/- 80 MHz using Baseband Tuning

Channel Filter:
- None
- Rectangular
- Gaussian
- Raised Cosine
- Root Raised Cosine

M9391A: A Closer Look

Combination of high performance modules create uncompromising VSA performance in PXI

- M9350A Downconverter
- M9214A IF Digitizer
- M9301A Synthesizer
- *M9300A Freq. Reference*



Input Triggers and Sync

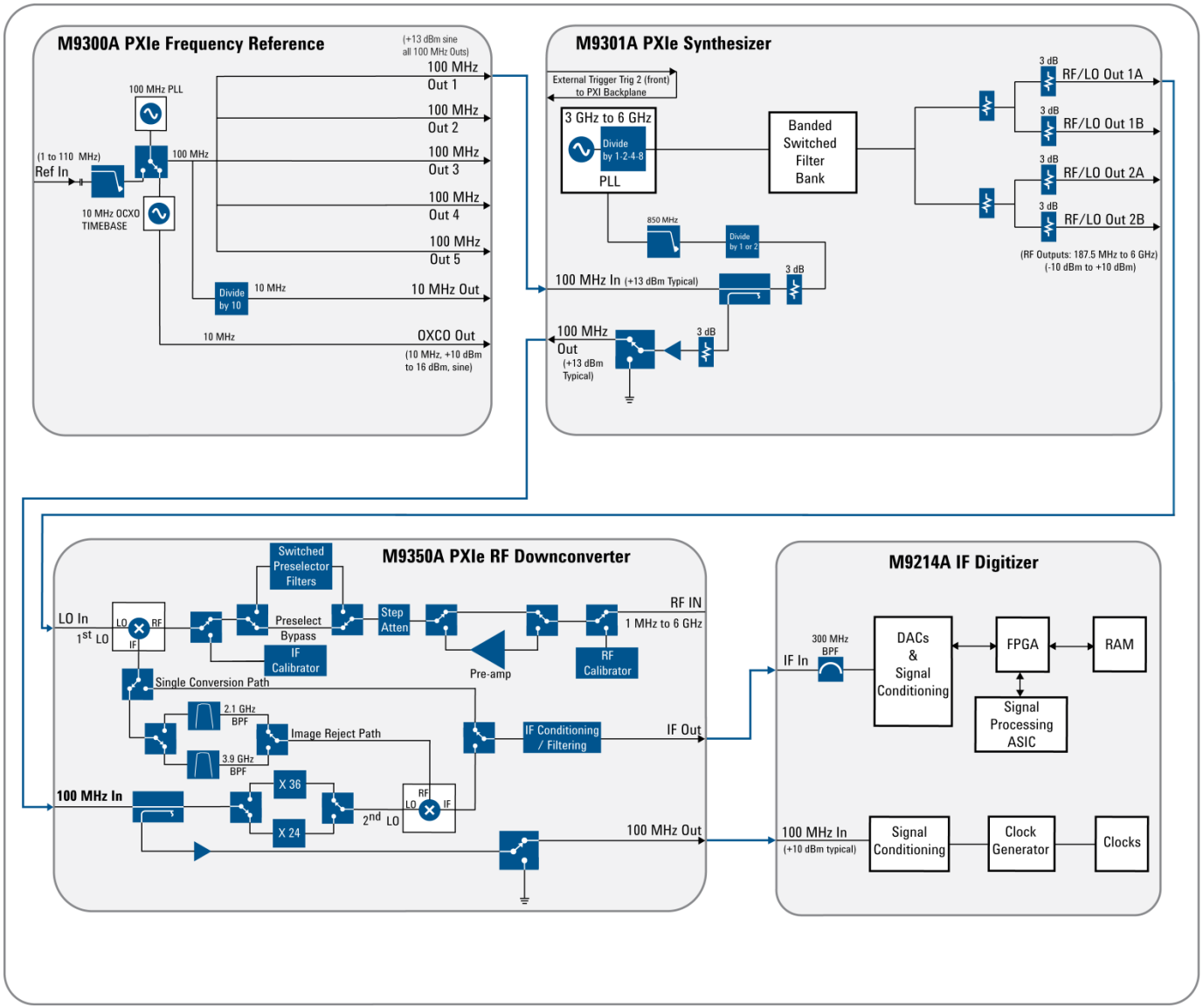
Five 100MHz Freq outputs
for multi- channel systems

10MHz Ref output

Ext Ref input
1 to 110 MHz

RF INPUT

M9391A Block Diagram



Agilent Signal Analyzer Specs Comparison



Key Spec	M9391A (preliminary)	MXA	PXA
Analyzer Type	FFT	Swept/FFT	Swept/FFT
Frequency Range	1 MHz to 3/6 GHz	10 Hz to 3.6/8.4/13.6/26.5 GHz	3 Hz to 3.6/8.4/13.6/26.5/44/50 GHz
Analysis BW	40/100/160 MHz	25/40 MHz	10/25/40/160 MHz
Tuning Time	<300 µs (list) <3 ms (non-list)	16 ms	33 ms (<3.6 GHz) 59 ms ((>3.6 GHz)
Amplitude Switching Speed	<150 µs typ (list) <3 ms (non-list)		
Amplitude Acc <=3 GHz > 3 GHz Includes Frequency Response	± 0.77 dB ± 0.92 dB (± 1 Degree within Field Alignments)	± 0.78 dB (± 0.4, 95th percentile) ± 1.83 dB (± 0.81, 95th percentile)	± 0.59 dB (± 0.35, 95th percentile) ± 1.74 dB (± 0.63, 95th percentile)
TOI @ 2 GHz @ 6 GHz	+16 dBm (23 dBm, nom) +19.5 dBm (23.5 dBm, nom)	+16 dBm (+19, typ) + 15 dBm (+18, typ)	+21 dBm (+23, typ) + 15 dBm (+22, typ)
DANL @ 2 GHz, Pre-Amp OFF @ 2 GHz, Pre-Amp ON	-140 dBm/Hz (-140 SC) -156 dBm/Hz (-155SC) SC=Single Conversion	-151 dBm/Hz (-154, typ,) -163 dBm/Hz (-166, typ)	-153 dBm/Hz (-155, typ; -162, NFE) -165 dBm/Hz (-166, typ; -172, NFE) NFE=Noise Floor Extension
SSB Phase Noise @ 1 GHz, 10 kHz offset	-121 dBc/Hz, nom	-103 dBc/Hz (-106, typ.)	-129 dBc/Hz (-132, typ)
WCDMA ACLR dyn range @ 2 GHz, Adjacent Channel @ 2 GHz, Alternate Channel	-68.1 dBc, typ -70.7 dBc, typ	-73 dBc, typ (-78, noise corrections) -79 dBc, typ (-82, noise corrections)	-82.5 dBc, typ (-83.5, noise corrections) -87 dBc, typ (-89, noise corrections)
Residual Responses @ 2 GHz, Input Terminated	-120 dBm, nominal	-100 dBm	-100 dBm
Software	Modular X-Apps 89600 VSA SW Matlab	X-series Measurement Applications 89600 VSA SW Matlab	X-series Measurement Applications 89600 VSA SW Matlab
Entry Price	**$28K – 30.5K USD** (Chassis and controller not included)	**$31K - 48K USD**	**$53K - 95K USD**

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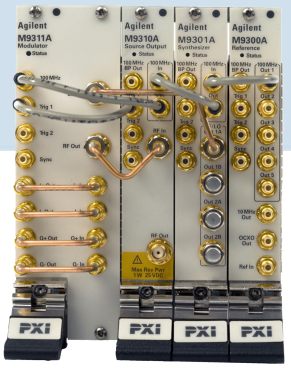
M9381A PXIe Vector Signal Generator

Agilent Quality & Performance Vector Signal Analyzer in PXI

M9381A PXIe Vector Signal Generator

M9380A PXIe CW Source



M9381A PXIe VSG

M9380A PXIe CW

Key Features:

- Frequency range 1 MHz up to 3 or 6 GHz
- 160 MHz BW for emerging 802.11ac, (± 0.3 dB flatness)
- +19 dBm output power; ±0.4 dB level accuracy
- Class leading power, linearity & accuracy
- Frequency & Amplitude Switching Speed to within 1ppm
  - **<220us, <10 us using baseband switching**

Signal Studio Connectivity

Software:

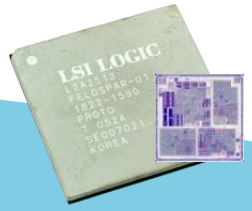
Signal Studio, SFP, programming examples, drivers, lower-level software, SystemVue, MATLAB

Innovation in PXIe Signal Generation

Proprietary Agilent technology

Frac-N engine

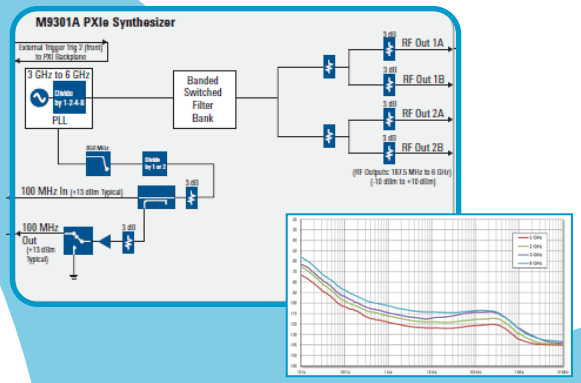
Fast, High accuracy step attenuators in ALC loop



ASIC enabled real-time amplitude and phase corrections

Frac-N engine in Frequency Reference	**Lower Spurs**
ALC Loop Source Output	**Accuracy, Speed**
ASIC enabled superior real-time corrections	**Speed & EVM Performance**
Single-Loop, Low pedestal noise Synthesizer	**Speed & LTE EVM**
Unique HW, SW, and Calibration designed for true mix &match	**Swappable modules**

Fast, compact Single-Loop synthesizer



Agilent PXIe signal sources

M9381A: A Closer Look

Combination of high performance modules create uncompromising VSG performance in PXIe

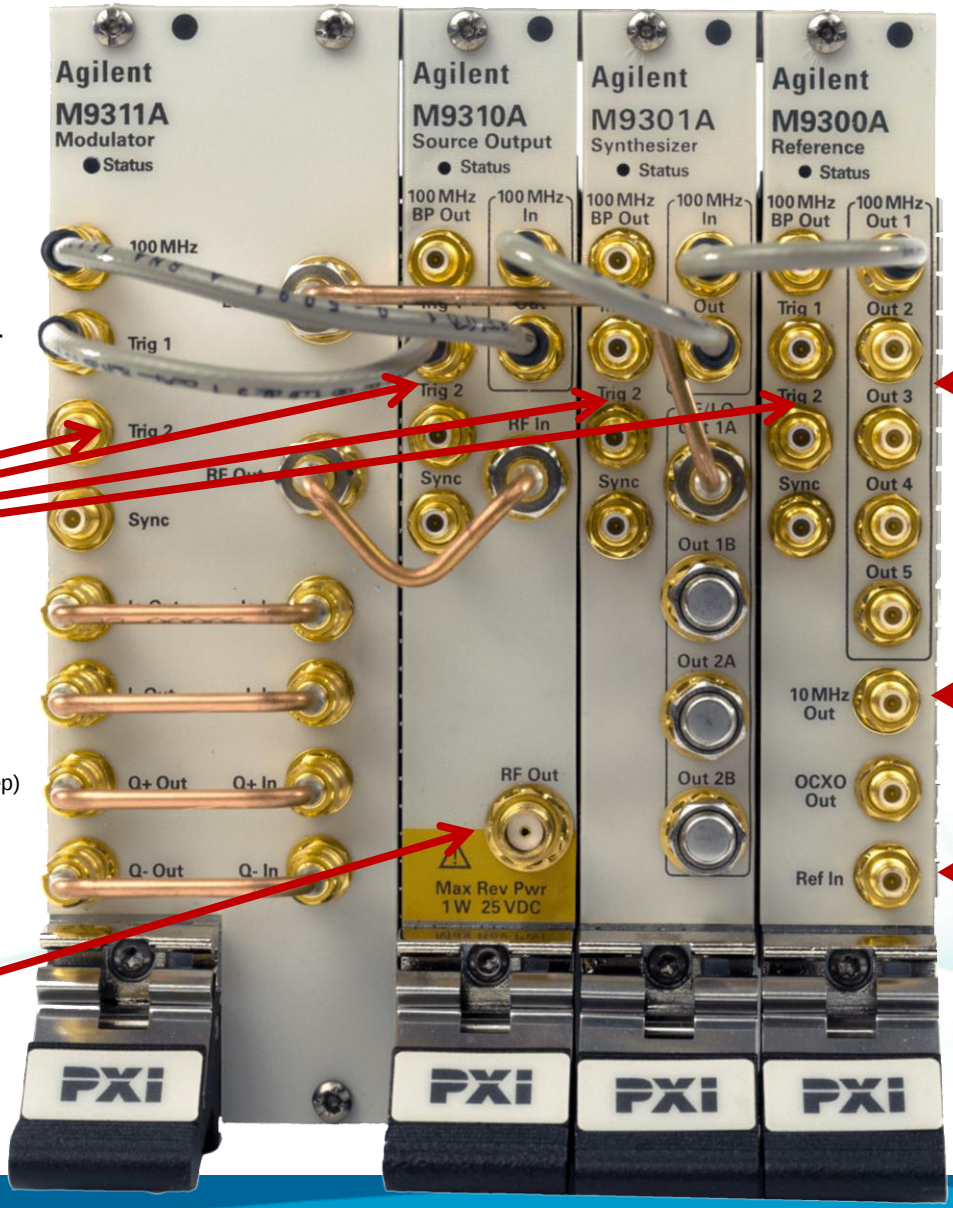
- M9311A Digital Vector Modulator
- M9310A Source Output
- M9301A Synthesizer
- M9300A Reference

Input Triggers and Sync

M9311A:
- Trig 1: Pulse Blanking Output to M9310A Trig 1
- Trig 2: Synchronization Output Trigger to User

M9310A:
- Trig 1: Pulse Blanking Input to M9311A Trig 1
- Trig 2: Source Settled Output to User

M9301A:
- Trig 1: External Trigger (Start ARB, List or List Step) from User
- Trig 2: End Output (ARB File, List or List Step) to User



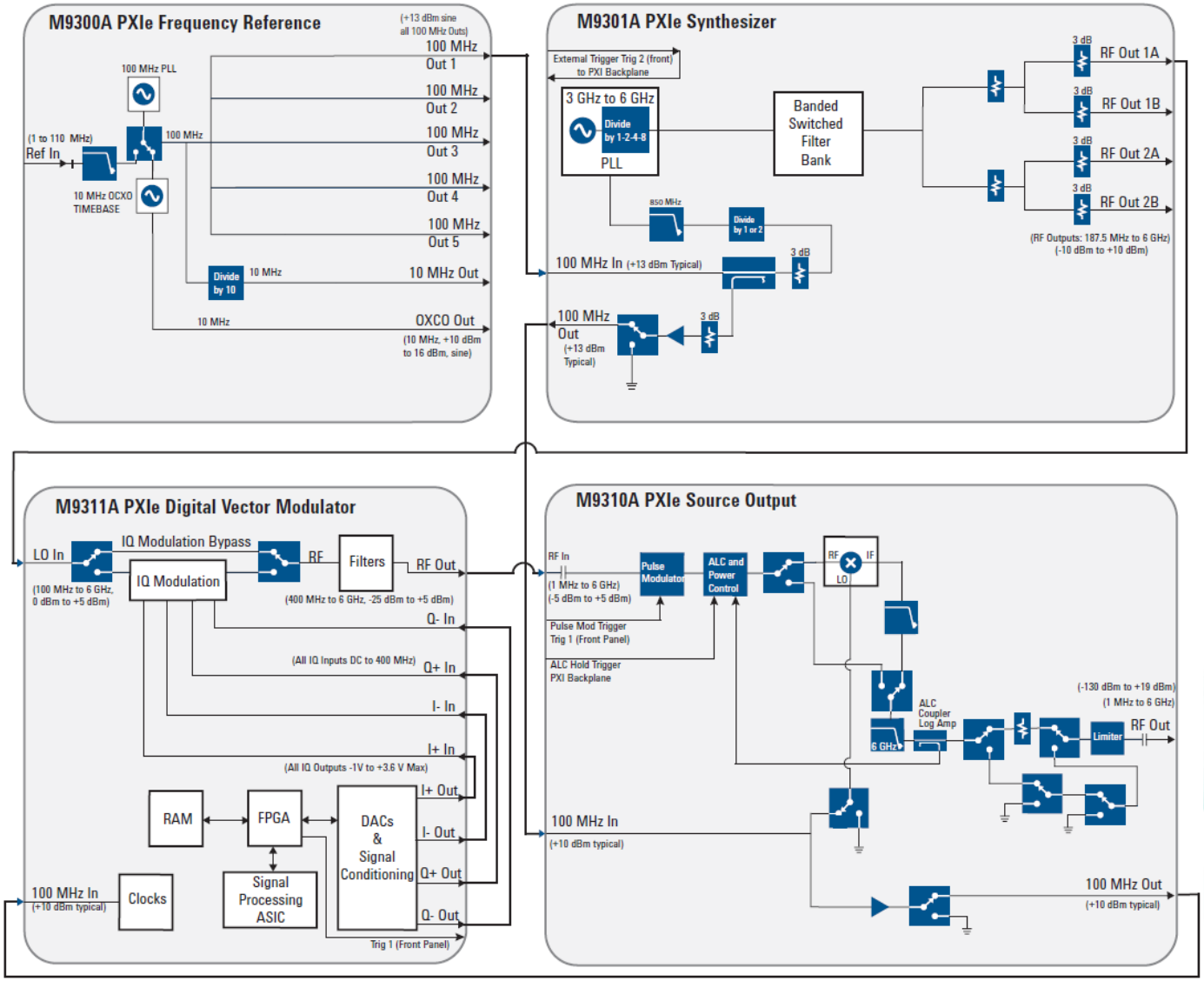
RF OUTPUT

Five 100MHz Freq outputs for multi- channel systems

10MHz Ref output

Ext Ref input 1 to 110 MHz

M9381A Simplified Block Diagram



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Application Challenges

- Increase test speed and throughput even as test complexity increases

- Best performance with continuity in trusted results

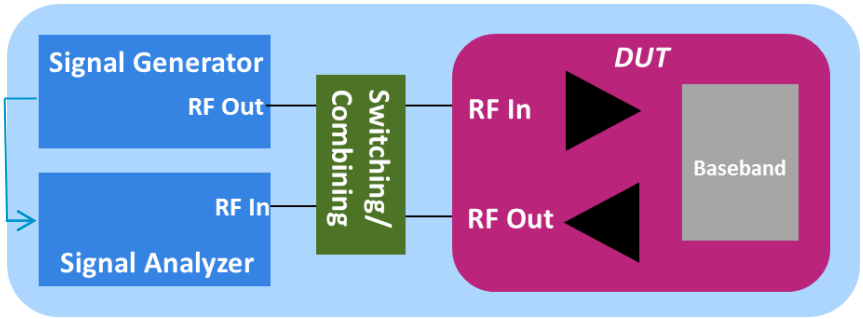
- Fast and easy integration into test platforms

- Lower maintenance costs and minimize downtime

Transceiver Calibration

Maximize throughput with a synchronized test sequence

Transceiver Test Setup



APPLICATION CHALLENGE

- Calibration for both Tx output power level and Rx input level
- Synchronization between test equipment and DUT over many states

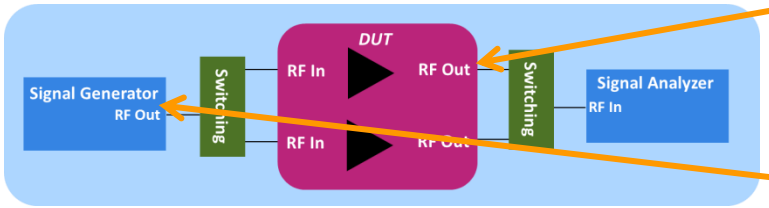
BENEFITS

- List mode with fast step times and flexible triggering
  - 10µs switching speed for fastest step times on the source
  - 3201 points for long list sequences
  - 80 channel parameters for flexible sequences

Power Amplifier and Front End Module Test

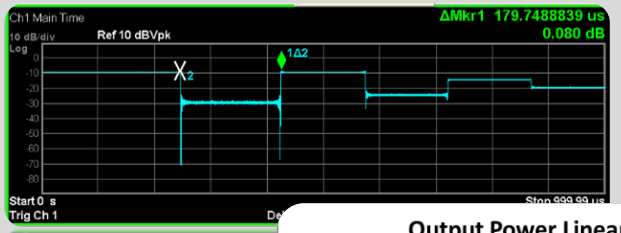
Fastest speed when using programmed commands

Amplifier & Front End Module

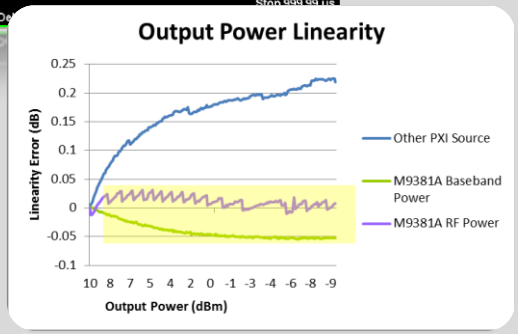


APPLICATION CHALLENGE

- DUT is specified at an exact RF Out power level
- VSG RF Out is iteratively adjusted by command from the VSA to achieve that exact power level
- Adjustment routine takes up to 40% of test time



250 µs switching speed from programming interface is 40x faster than other PXI sources



M9381A linearity error within ±0.05 dB.

BENEFITS

- Fastest switching speeds via program commands reduce time for each iteration
- Real-time calculation of channel power reduces time
- Accurate power linearity & outstanding repeatability
  - <1ms Servo Loop Step Time
  - <7 ms ACPR Measurements

M9391A WCDMA Power Measurements

Repeatability vs. Acquisition Time vs. Power Level

Pref	0 dB			-25 dB			-50 dB			-75 dB	
	Power	Time		Power	Time		Power	Time		Power	Time
Min	1.668415	0.000216		-23.3324	0.000208		-48.462	0.000211		-66.4404	0.000209
Max	1.8262	0.000382		-23.1828	0.000324		-47.8952	0.003227		-63.6651	0.0009
AVG	1.767361	0.000266		-23.2444	0.000264		-48.2046	0.000279		-65.047	0.000297
SDEV	0.033105	2.89E-05		0.031725	2.42E-05		0.108387	0.000299		0.550126	0.000134

Acquisition Time:

10 us

Pref	0 dB			-25 dB			-50 dB			-75 dB	
	Power	Time		Power	Time		Power	Time		Power	Time
Min	1.875489	0.00027		-23.1443	0.000316		-48.1623	0.000321		-65.4593	0.000292
Max	1.925576	0.001985		-23.103	0.003037		-47.9583	0.032696		-64.6917	0.000861
AVG	1.895269	0.000386		-23.1134	0.000385		-48.0546	0.000706		-65.0729	0.000426
SDEV	0.007027	0.000171		0.005252	0.000269		0.034463	0.003232		0.167882	0.000138

100 us

Pref	0 dB			-25 dB			-50 dB			-75 dB	
	Power	Time		Power	Time		Power	Time		Power	Time
Min	1.750469	0.001808		-23.2481	0.001786		-48.21	0.001825		-65.2446	0.001753
Max	1.764527	0.016923		-23.2429	0.017754		-48.1545	0.018412		-64.9032	0.004883
AVG	1.75785	0.002238		-23.2458	0.002353		-48.177	0.002207		-65.0594	0.002051
SDEV	0.002877	0.001616		0.001169	0.002204		0.01048	0.001686		0.058773	0.000355

1 ms

Measured on 1 unit at room temperature

Application Challenges

- Increase test speed and throughput even as test complexity increases

- Best performance with continuity in trusted results

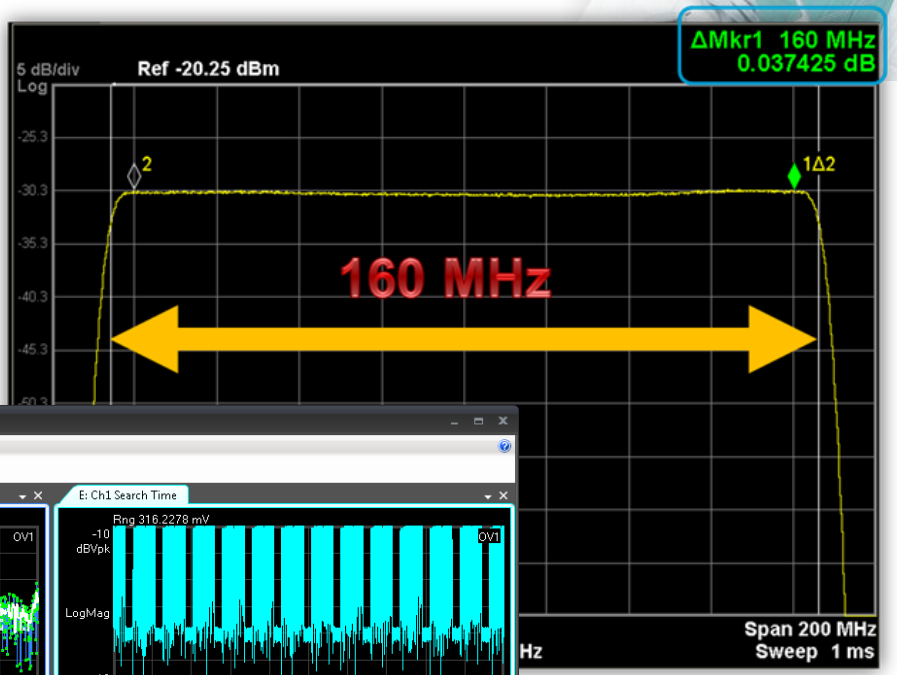
- Fast and easy integration into test platforms

- Lower maintenance costs and minimize downtime

Widest Bandwidth

160 MHz with <± 0.3 dB flatness

Support for next generation standards like 802.11ac with excellent EVM performance



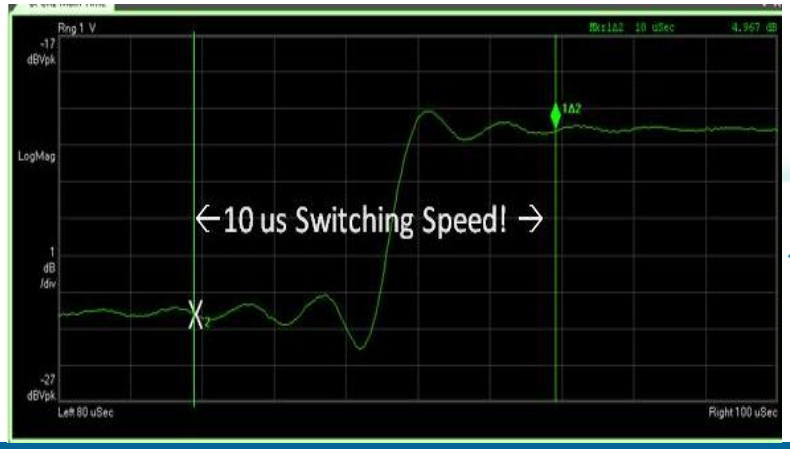
Industry Leading RF Switching Speeds

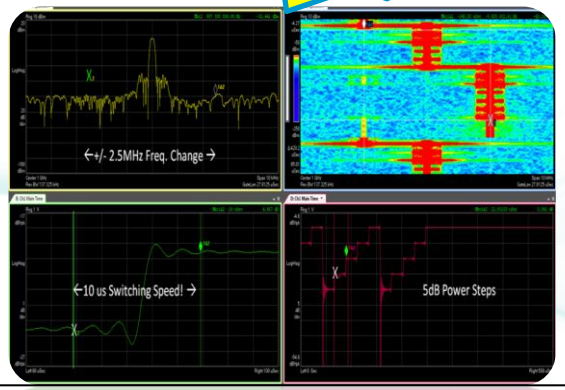
Type	RF Tuning	Baseband Tuning
Definition	Changes to the RF carrier frequency and output attenuation using the “RF” interface	Changes to the Frequency Offset and Power Offset in the signal processing ASIC
Range	Frequency range: 1 MHz to 6 GHz Amplitude range: +19 dBm to -130 dBm	Frequency range: ± 80 MHz from RF carrier frequency Amplitude range: 0 to -20 dB from RF power level
Command driven	2 ms	250 µs
List Mode	220 µs freq/amp (125 µs amp only)	10 µs

5x faster than competition

40x faster than competition

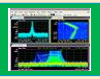
30x faster than competition





25 point list of baseband frequency and power tuning. Three frequencies and 5 power levels at each frequency. Switching time is < 10 us. Step time is less than 25 us.

Performance & Continuity in Trusted Results



89600 VSA Software

X-Apps

PXA PXI VSA

Device Under Test

MXG PXI VSG

Signal Studio

RF Component Design Lifecycle

Design	Turn-on	Validation	Manufacturing
Simulate	Debug	Characterization	

Application Challenges

- Increase test speed and throughput even as test complexity increases

- Best performance with continuity in trusted results

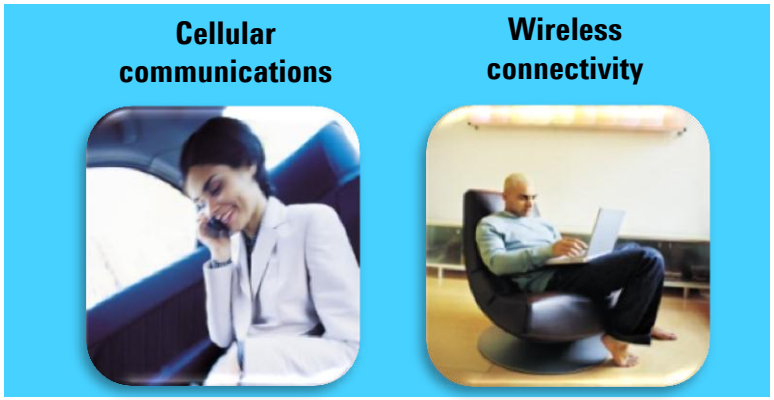
- Fast and easy integration into test platforms

- Lower maintenance costs and minimize downtime

Trusted Agilent Application Software

Signal Studio

M9381A supports deep playback memory with up to 1 Gsample of simulation



W-CDMA/HSPA+
cdma2000/1xEV-DO
GSM/EDGE/EVO
LTE/LTE-Advanced FDD
LTE/LTE-Advanced TDD
TD-SCDMA/HSDPA

WLAN
802.11a/b/g/n/ac
Bluetooth
Broadcast radio
Digital video
Mobile WiMax

Waveform Creation Software

- Connectivity License:
  - N76xxB-9TP connect to M9381A, transportable, perpetual license
  - N76xxB-9FP connect to M9381A, fixed perpetual license
- Selected Signal Studio Formats at introduction →

Flexible Waveform Playback

- Licensed to controller (embedded or remote PC)
  - Playback on up to **four** channels per license
- 5-pack and 50-packs for cost sensitive manufacturing allow waveform playback without purchasing software packages

Trusted Agilent Application Software

X-Series Applications for Modular Products

Widest applications portfolio

Cellular Communication

LTE-FDD
LTE-TDD
W-CDMA/HSPA/HSPA+
TD-SCDMA/HSPA
GSM/EDGE/EDGE Evo
cdma2000/cdmaOne
1xEV-DO

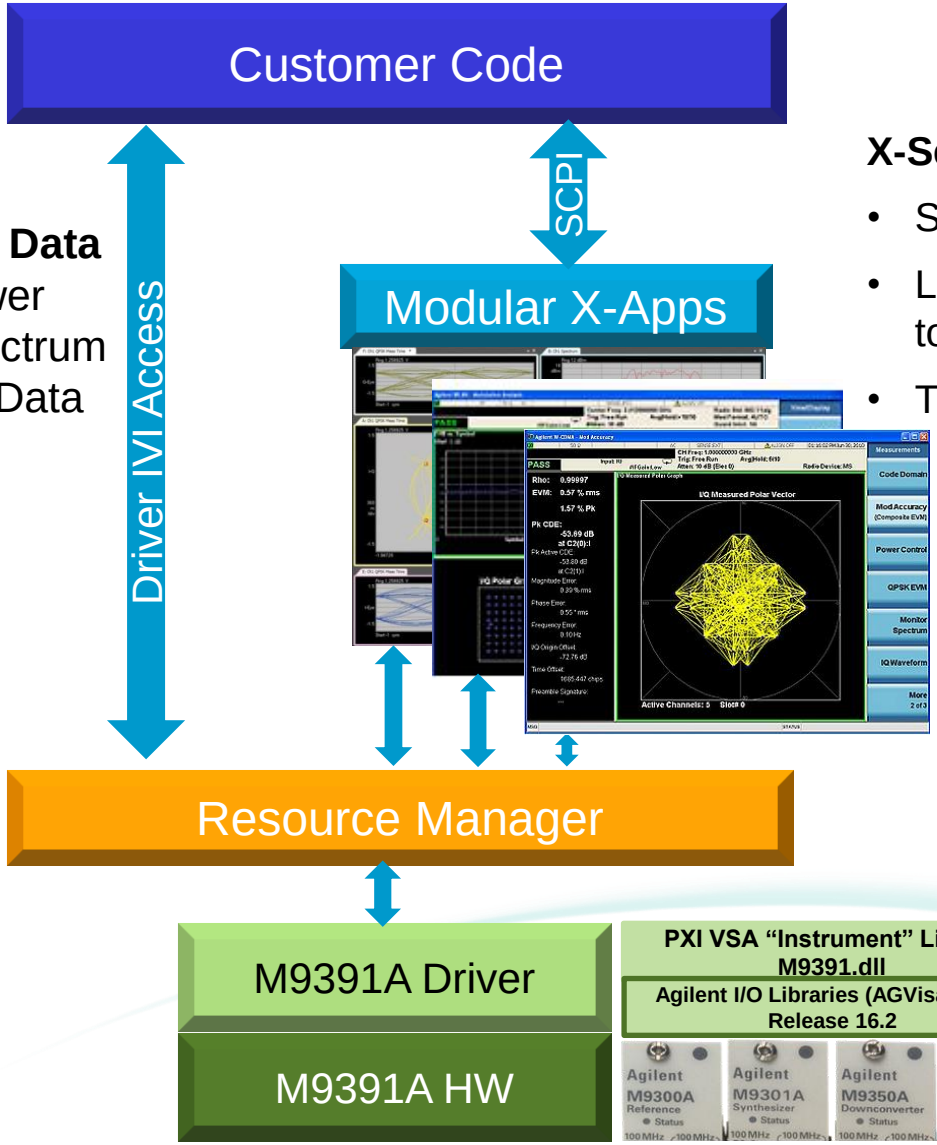
Agilent PXI VSG/VSA

- Uplink & downlink
- Greatest breadth of measurement coverage
- First to market for new standards
- Fast measurements
- Compatibility from design through production

Wireless Connectivity

802.11 WLAN

Measurement Application Software



X-Series Applications

- Stay familiar with the X-Apps GUI
- Leverage existing SCPI test code to control the PXI VSA
- Trusted measurement algorithms

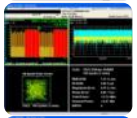
Resource Manager provides:

- Direct hardware access for fastest Power, Spectrum & I/Q data (e.g. ACP)
- Seamless switching between direct hardware access and X-Apps for fast mode switching

X-Series Applications for Modular Products – Cellular Communication

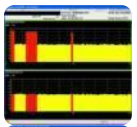

LTE FDD

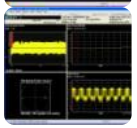

LTE TDD

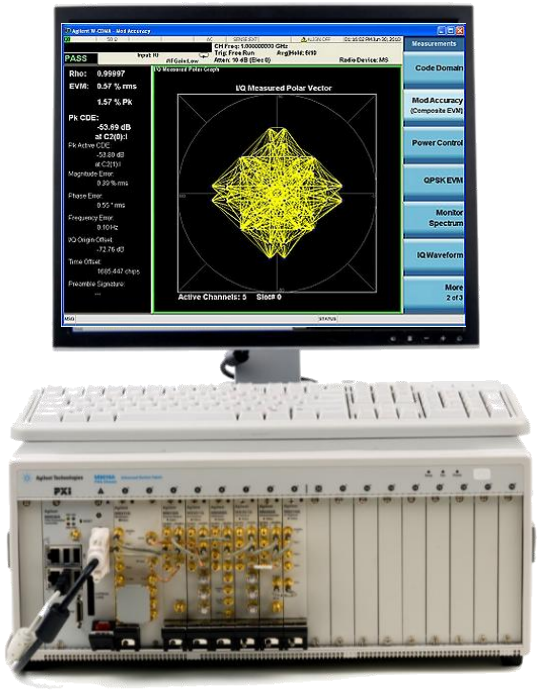

W-CDMA/HSPA/HSPA+


GSM/EDGE/EDGE Evo


TD-SCDMA/HSPA


cdma2000/cdmaOne


1xEV-DO



Common algorithms, programming commands and shared library of measurement applications across X-Series signal analyzers and M9391A PXI VSA ensure consistent, repeatable results

www.agilent.com/find/xseriesapplications

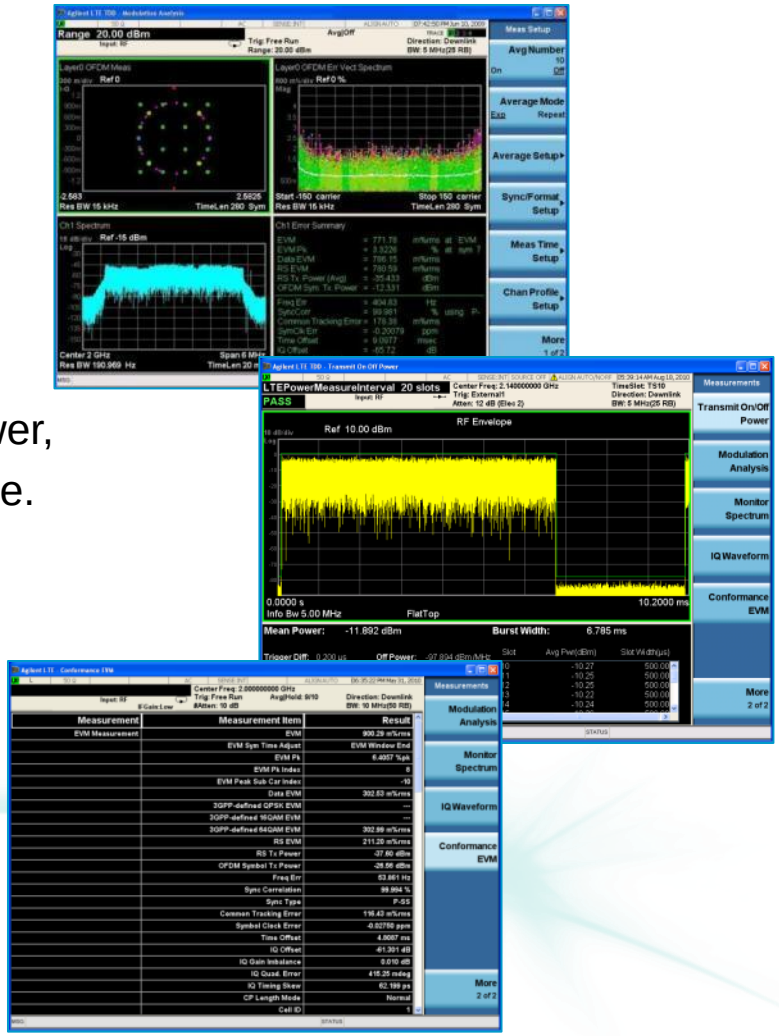
LTE FDD Modular Measurement Application - M9080A

- ✓Supports 3GPP Rel 9 (2011-12) standard
- ✓Downlink & uplink analysis in a single option
- ✓All LTE bandwidths: 1.4 MHz to 20 MHz
- ✓Transmitter characteristic measurements:
  - **Base station (eNB):** EVM, freq error, DL RS Power, RSTP, OSTP, SEM, ACLR and more.
  - **User equipment:** EVM, freq error, I/Q offset, in-band emissions, SEM, ACLR and more
  - **Multiple color coded result views:** EVM vs. subcarrier, symbol, slot, resource block etc..
- ✓Transport layer channel decoding

www.agilent.com/find/M9080A

LTE TDD Measurement Application – M9082A

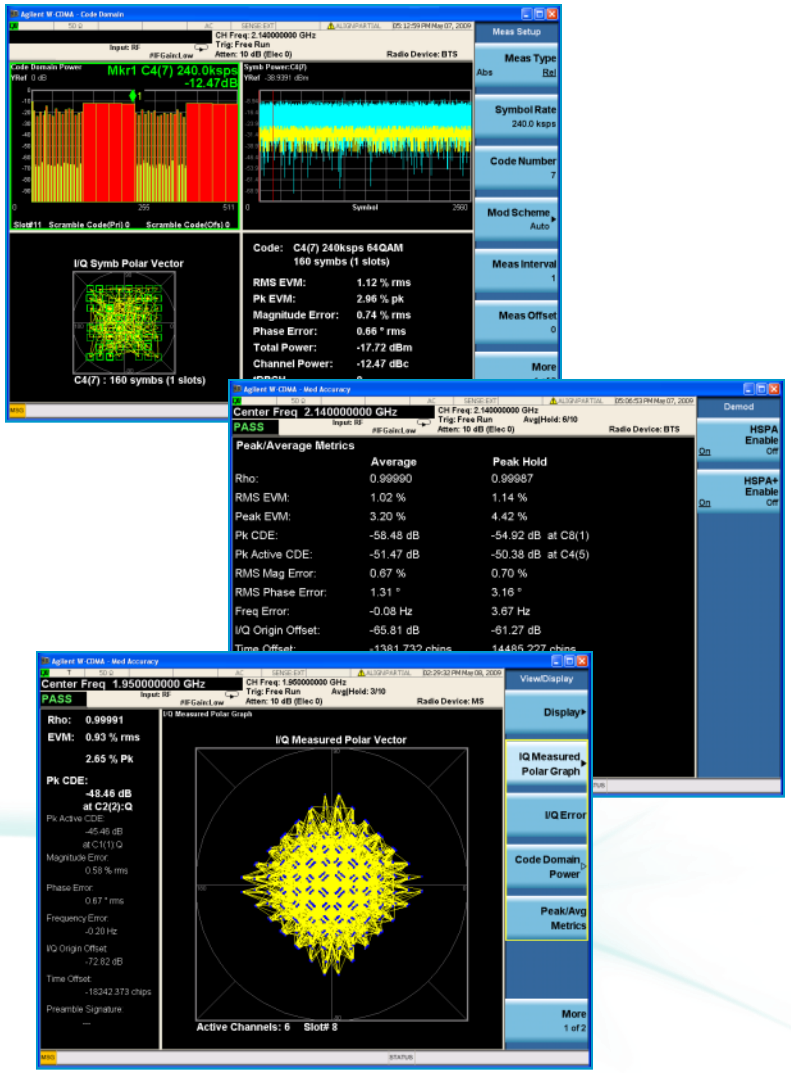
- ✓Supports 3GPP Rel 9 (2011-12) standard
- ✓Downlink and uplink analysis in a single option
- ✓All LTE bandwidths: 1.4 MHz to 20 MHz
- ✓All DL/UL configurations and special subframe length configurations
- ✓Transmitter characteristic measurements:
  - **Base station (eNB):** EVM, freq error, DL RS Power, RSTP, OSTP, transmit on/off power, SEM and more.
  - **User equipment :** EVM, freq error, I/Q offset, in-band emissions, SEM, ACLR and more
  - **Multiple color coded result views:** EVM vs. subcarrier, symbol, slot, resource block etc..
- ✓Transport layer channel decoding



www.agilent.com/find/M9082A

W-CDMA/HSPA/HSPA+ Measurement Application – M9073A

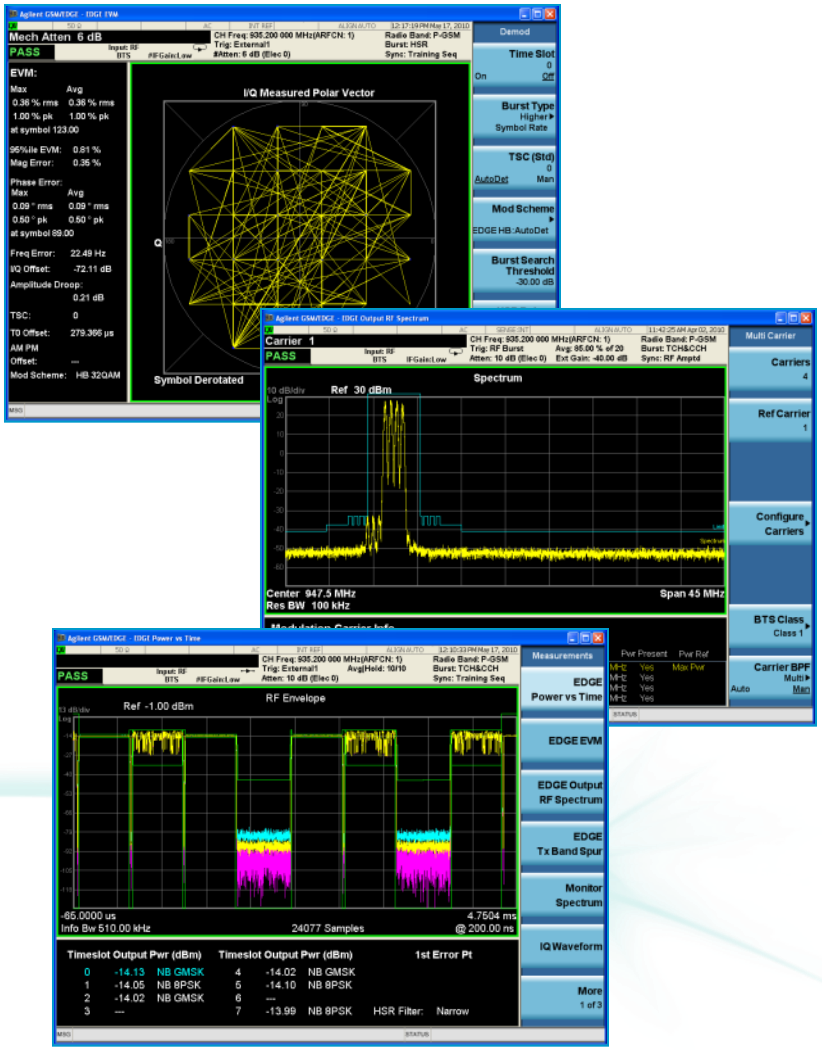
- ✓W-CDMA, HSPA and HSPA+ per 3GPP release 99 to 8
- ✓Analysis of both uplink and downlink in single option
- ✓One-button transmitter measurements :
  - **Downlink:** EVM, freq error, CPICH power, 64QAM RCDE, SEM, ACLR plus more
  - **Uplink:** EVM, freq error, PkCDE, RCDE, slot power, SEM, ACLR plus more
  - **Multiple result views:** constellation, code domain, numeric display plus more
- ✓Automatic detection of all channels and signals
- ✓Single Acquistion Combined Measurement option for fastest measurement speed



www.agilent.com/find/M9073A

GSM/EDGE/EDGE Evolution Measurement Application – M9071A

- ✓GSM, EDGE and EDGE Evolution per 3GPP GERAN standard
- ✓Analysis of both base station and mobile station in a single option
- ✓One-button transmitter measurements:
  - **Base station:** EVM; phase and frequency error; output RF spectrum (ORFS), power vs. time (PvT) and more
  - **Mobile station:** EVM; phase and frequency error; ORFS; PvT; TX band spur and more
- ✓Multi-Carrier BTS (MCBTS) and adaptive QPSK (AQPSK) modulated VAMOS[1] measurements per Rel-9 of 3GPP TS 45 standard
- ✓Single Acquisition Combined Measurement option for fastest measurement speed

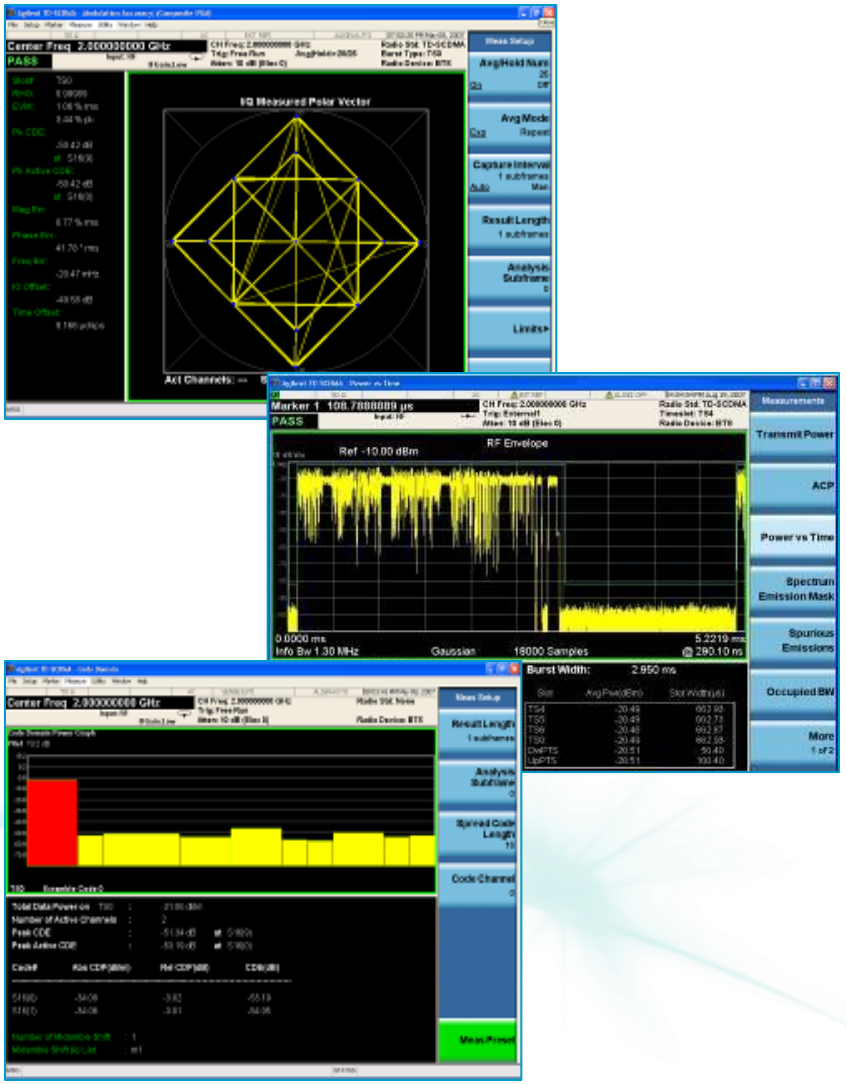


www.agilent.com/find/M9071A

1. VAMOS is Voice services over Adaptive Multi-user channels on One Slot

TD-SCDMA/HSPA Measurement Application – M9079A

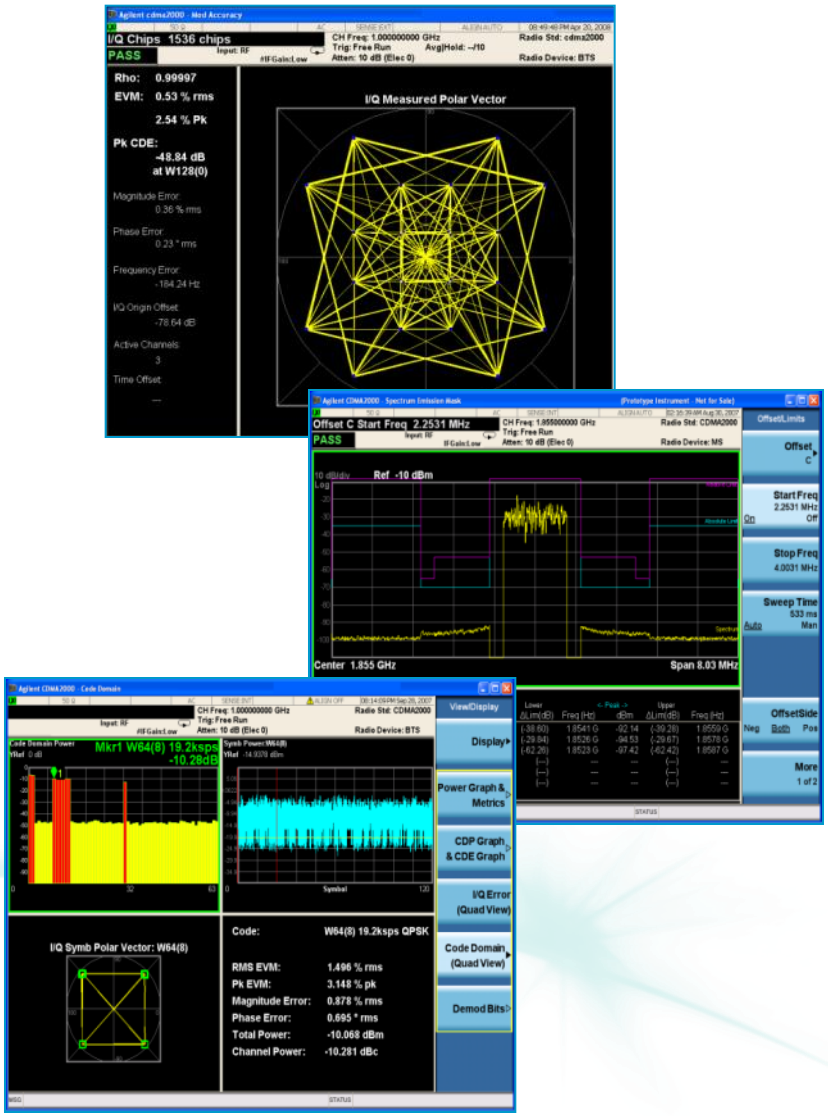
- ✓TD-SCDMA, TD-HSDPA/HSUPA/8PSK per 3GPP release 99 to 8
- ✓Analysis of both uplink and downlink in single option
- ✓One-button transmitter measurements :
  - **Downlink:** EVM, frequency error, power vs. time, transmit power, code domain power, SEM, ACLR, and more
  - **Uplink:** EVM, freq stability, transmit ON/OFF power, PkCDE, SEM, ACLR, and more
  - **Multiple result views:** constellation diagram, code domain, numeric display, spectrum, time domain



www.agilent.com/find/M9079A

cdma2000/cdmaOne Measurement Application – M9072A

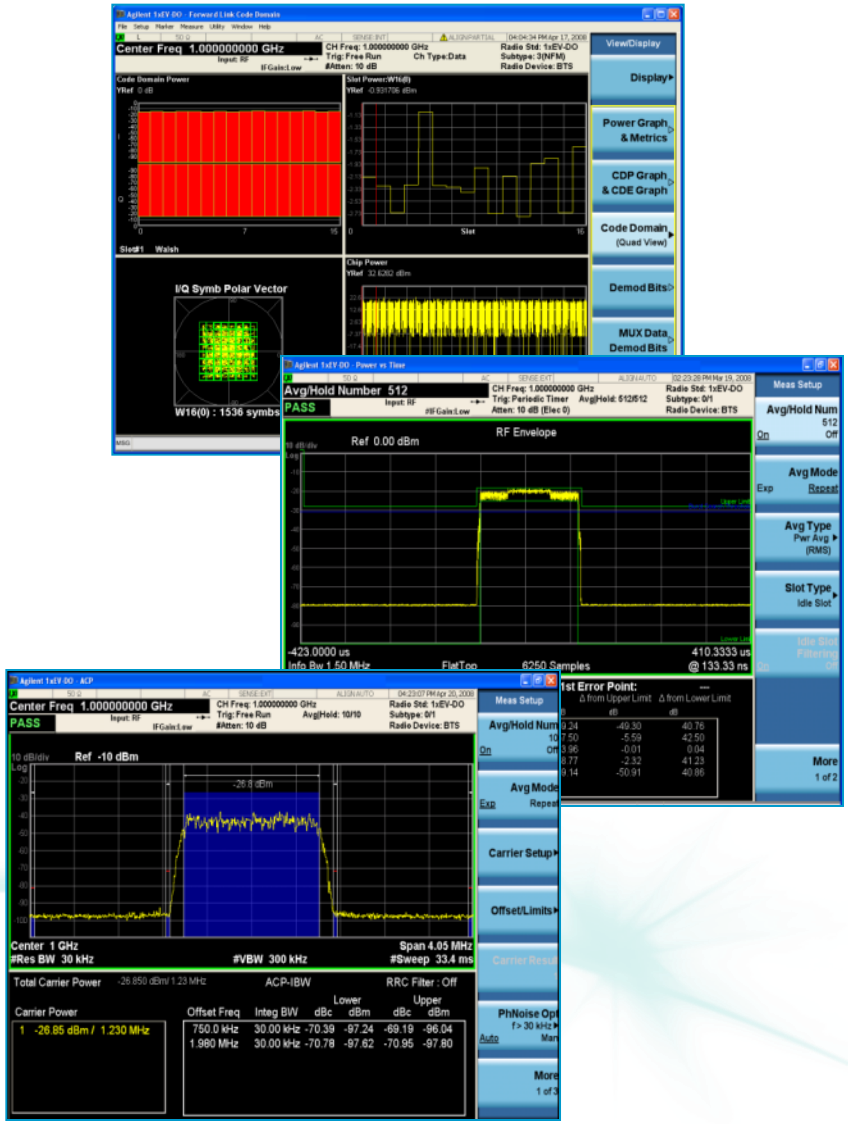
- ✓cdmaOne and cdma2000 per 3GPP2 Release A
- ✓Analysis of forward link and reverse link in single option
- ✓Supports forward link radio configuration (RC) 1 thru 5 and reverse link RC1 thru 4.
- ✓One-button Tx measurements with pass/fail per 3GPP2 standard:
  - ✓**Modulation accuracy:** Composite Rho and EVM, frequency error, I/Q offset plus more…
  - ✓**Code domain power:** displayed in hadamard code order or bit-reverse
  - ✓**Power and spectrum measurements:** channel power, ACP, SEM, spurious emissions plus more



www.agilent.com/find/M9072A

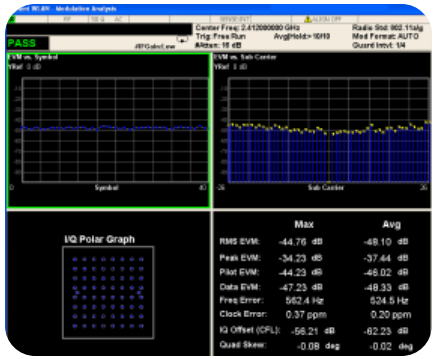
1xEV-DO Measurement Application – M9076A

- ✓1xEV-DO per Rel 0, Rev. A and Rev B of 3GPP2 standard
- ✓Analysis of both forward link and reverse link in single option
- ✓Auto detection for data channels QPSK, 8PSK, 16QAM and 64QAM
- ✓One-button Tx measurements with pass/fail per 3GPP2 standard:
  - **Modulation accuracy**: composite EVM and rho, CDP, CDE, I/Q chip error plus more
  - **Power and spectrum measurements**: channel power, power vs. time, ACP, SEM, spurious emissions plus more



www.agilent.com/find/M9076A

X-Series Applications for Modular Products - Wireless Connectivity



WLAN 802.11 a/b/g/n/ac

Common algorithms, programming commands and shared library of measurement applications across X-Series signal analyzers and M9391A PXI VSA ensure consistent, repeatable results

www.agilent.com/find/xseriesapplications
www.agilent.com/find/wirelessconnectivity

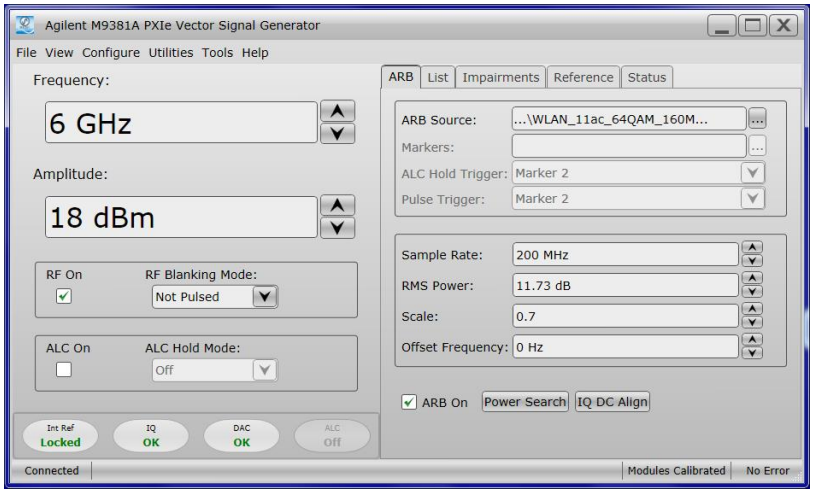
WLAN 802.11a/b/g/n/ac Measurement Application - M9077A

- ✓ Supports IEEE 802.11a/b/g/n/ac standard
  - ✓ Presets include 802.11a/g, 802.11b/g, 802.11g DSSS-OFDM, 802.11n 20MHz and 802.11n 40MHz signals
- ✓ One-button, standard-based measurements with pass/fail tests
  - **I/Q demodulation measurements:** Modulation accuracy, Power vs. time, Spectral flatness, Power Stat CCDF
  - **Swept spectrum measurements:** Spectrum emission mask, Spurious emissions, Occupied bandwidth, Channel power
- ✓ Fully bandwidth support of 11ac coving 20/40/80/160 and 80+80 MHz
- ✓ Legacy/mixed/Greenfield mode supported for IEEE 802.11n signals
- ✓ Custom demodulation settings to analyze 802.11j, Turbo Mode, 802.11p signals

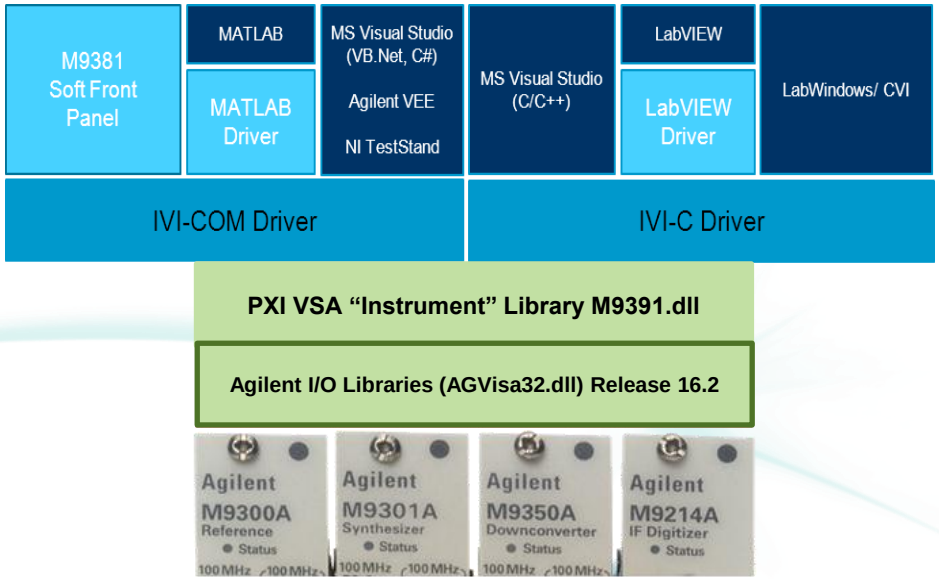
www.agilent.com/find/M9077A

Easy Integration Into Your Test Systems

- One-step installation for drivers, example programs, documentation
- Integrated soft front panel allows for quick instrument set up

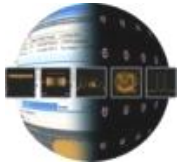


- One integrated PXI VSG or PXI VSA driver controls instrument functions
- Program in your language of choice
- Generate complex signals using MATLAB, Agilent's Signal Studio Software or other environments that support .BIN or .CSV formats



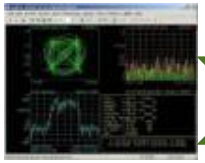
Software leverage and reuse

Compatible with existing license



Signal Studio

New license required for PXI VSG to play waveforms



89600 VSA

Compatible with existing license
Must also purchase Connectivity Option 200

X-Apps

New license required for PXI VSA measurements
(one license supports 4 PXI VSAs)

Application Challenges

- Increase test speed and throughput even as test complexity increases

- Best performance with continuity in trusted results

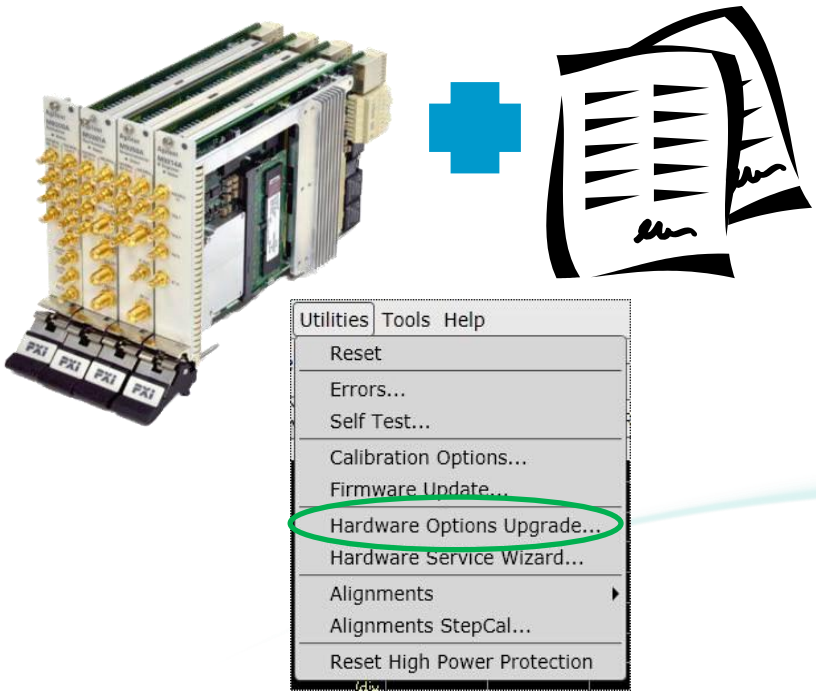
- Fast and easy integration into test platforms

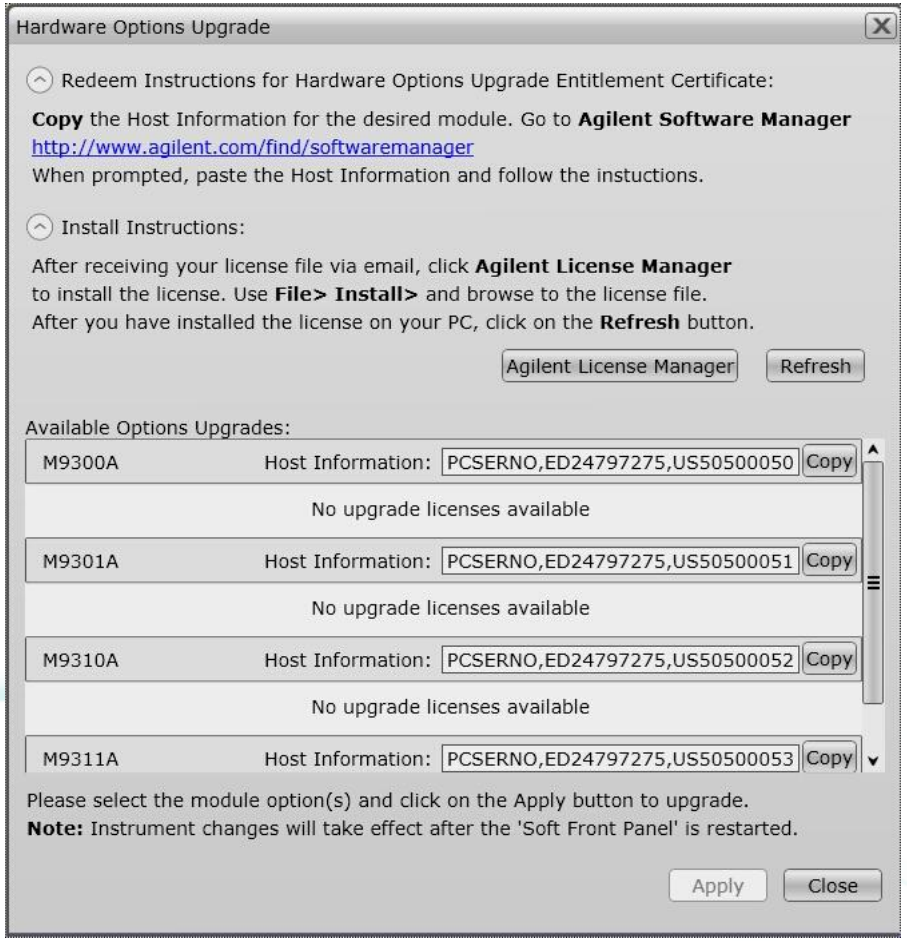
- Lower maintenance costs and minimize downtime

License Key Upgrade Options

Purchase what you need, as your needs change, upgrade without changing the physical hardware

Utility Provides the ability to upgrade Module options via license key





Agilent's RF Modular Product Calibration

- RF Modular product calibration will be available through the N7800A TME Calibration software. M9381A Available December 2012

ISO/IEC 17025:2005

- Calibration procedures are ISO 17025A and Z540.3 compliant

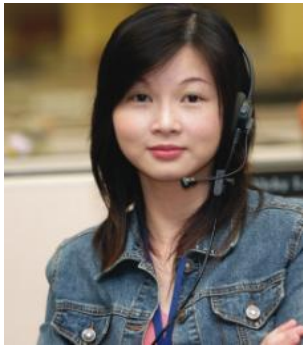
- Calibration can be perform at Agilent Service Centers, On-site, or by Self-maintainer.

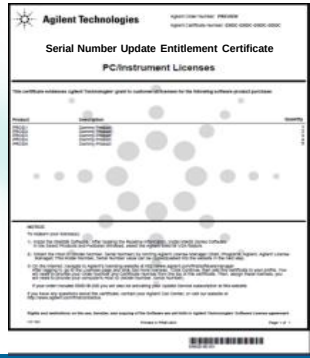
- Calibration will be performed either at the Multi-Module Instrument level or individual module level based on their specifications

- Multi-Module Instrument level Calibration Certificates contain each individual module model & serial number

WorldWide Service and Support

- Agilent quality in PXIe with 3 Year Warranty Included
- 50 Agilent Service and Support Centers world-wide
- Return to Agilent calibration and repair
- **NEW** Modular Replacement Core Exchange Assembly repair process.
  - Enables quick and easy replacement of the module assembly while retaining the modules original serial number.
  - Replacement assembly ships with a serial number updated entitlement certificate
- Return to Agilent Express Warranty with 5 day turn around time (TAT)




Agilent Technologies

Serial Number Update Entitlement Certificate

PC/Instrument Licenses

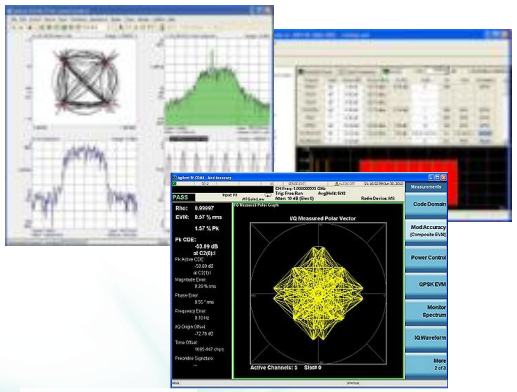
Agenda

- Introductions
- Agilent Modular Objectives
- Agilent's New PXIe Vector Signal Analyzer
- Agilent's PXIe Vector Signal Generator
- Application Challenges
- Wrap-up and Summary

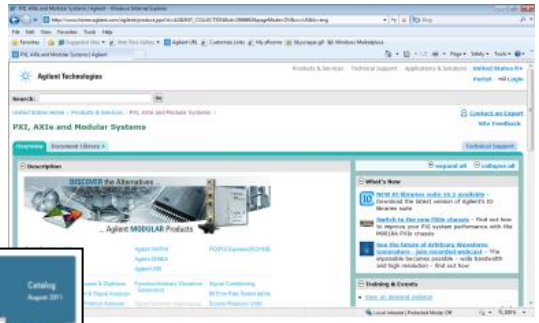
Summary

Agilent PXI VSA/G is the next logical step in signal generation and analysis

- Innovation in Agilent PXI RF Sources and Analyzers
  - Excellent RF Parametric Specifications
  - Proprietary Baseband Tuning
  - Upgradable Options
  - Core Exchange Assembly repair
  - Express Warranty
- Consistent measurement science applied across the portfolio
  - Signal Studio
  - X-Series Applications for Modular Products
  - 89600 VSA SW
- Delivering the software needed for effective modular solutions – *for any development environment.*



More Information



- For more information about the Agilent portfolio of PXI and AXIe products www.agilent.com/find/modular
- Download the Agilent PXI portfolio catalog

  http://cp.literature.agilent.com/litweb/pdf/5990-7367EN.pdf

Go to: www.agilent.com/find/M9381A

  - Datasheet
  - Application overviews – Topics include:
    - How the VSG can influence and enhance test systems for power amplifiers
    - Calibration of transceivers
  - Product Video

Discussion / Questions