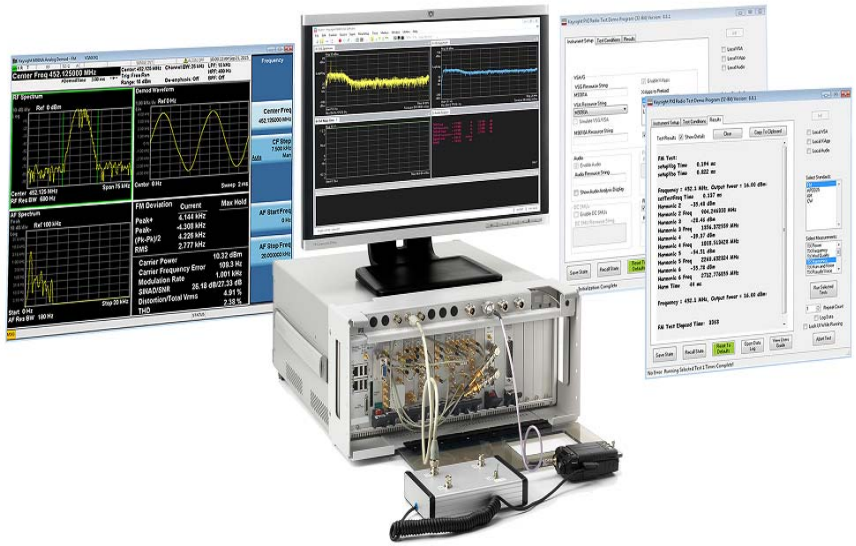
Keysight
Radio Test, Reference Solution

Speaker

Oct, 2015



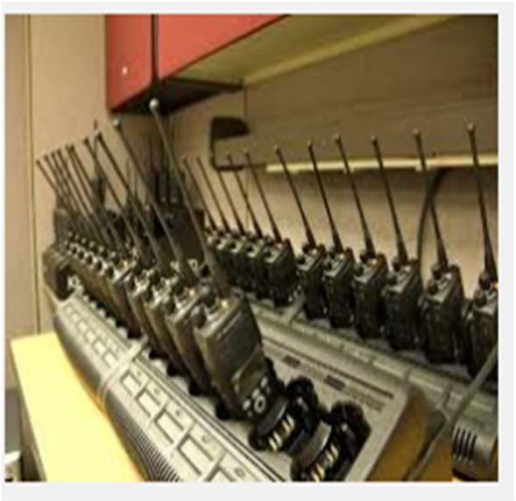
Agenda

– Radio Test Trends

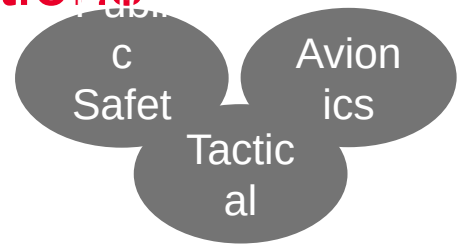
– Traditional Radio Test Solution

– What is Radio Test, Reference Solution

– The Hardware and Software



Radio Test Market Trends – Observations



Technology Dynamics

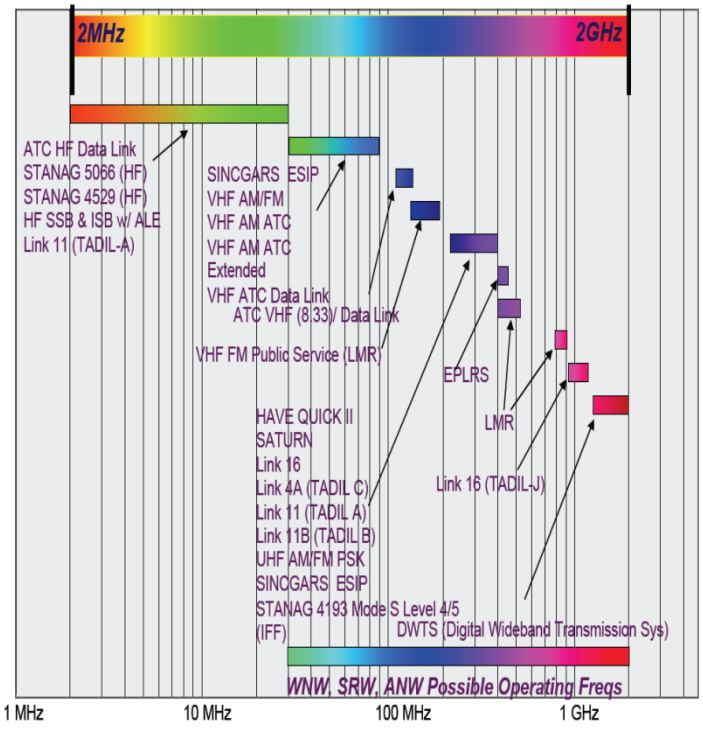
- Radio Technology fragmentation drives test equipment proliferation
- Commercial standards added to portfolio
- Higher frequencies and wider bandwidths
- Multi-channel capabilities
- Voice + data

Business Challenge

- Increase capability to test changing requirements
- Increase test speed (permutations)
- Reduce test Equipment inventory
- Reduce Operation/ Support /Training Costs
- Obsolescence management

Emerging needs

- Need flexibility & new measurements capabilities on top of traditional Radio Test features
- Need general purpose capabilities for troubleshooting
- Headroom for future needs



Keysight in Modular- A Growing Portfolio

Functional Test	Digital Comms	A/D	Wireless

High speed DMMs

Low frequency switching

RF switching

DAQ

VI source

M9195A Digital S/R

Digital IO

Logic analyzers

PCI express

HDMI

M8195A AWG

16/32GB BERT

Protocol analysis

uW VSA

M9393A PXIe performance VSA

M9391A RF VSA

M9290A CXA-m PXIe signal analyzer

PXI VNA

Signal conditioning

uWave switches

PXI 10 & 15-bit AWG

uWave switches

Digitizing scopes

IF digitizers

PXI dual channel VSA

N7109A 8-channel MIMO analyzer

M9380/81A RF VSG

PXI wideband MIMO VSA

M8190/95A AXI AWG

M9703A AXIe digitizer

M9037A Controller

Chassis, Controllers and IO

AXIe

Chassis & controller

PXI

Chassis & controller

M940xA PXI optical extenders

TS-8989 Functional Test Platform

Leverage Our Commitment to Measurement Integrity

Gain confidence

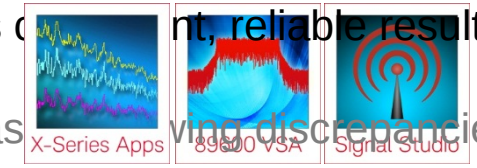
- Common measurement IP & algorithms in instruments & software
  - Count on truly specified performance from the recognized RF & microwave metrology experts
  - Gain greater freedom in managing measurement uncertainty with best-in-class accuracy

Optimize test solutions

- Address crucial objectives—performance, throughout, & more—across the product lifecycle
  - Rely on metrology-grade benchtop, modular and handheld instrumentation
  - Remove custom code uncertainty with shared measurement science that extends across hardware platforms

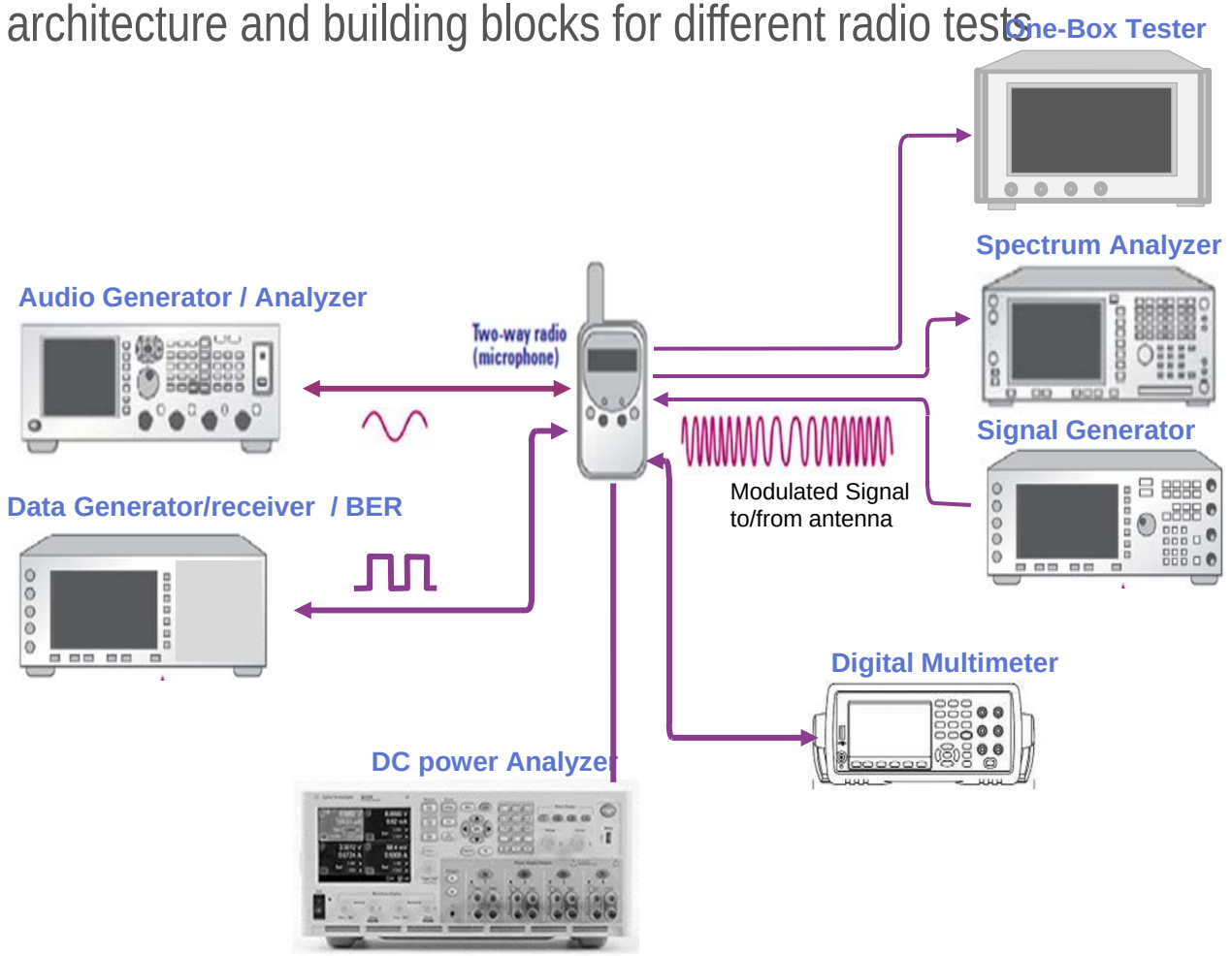
Achieve greater efficiency, minimize development time, & reduce risk

- Measurement integrity ensures c nt, reliable results that correlate across the product lifecycle
  - Pinpoint & solve problems fas ving discrepancies likely reside in DUT, not test hardware
  - Leverage software across test hardware: X-Series measurement applications, 89600 VSA software, Signal Studio software



Typical Radio Test Hardware Configuration

Common architecture and building blocks for different radio tests



Radio Test, Reference Solution

Key Features

- RF and audio signal generation and analysis
- Analog, APCO P25, Tetra
- RF/AF Spectrum
- Tx and Rx measurements: hum and noise, harmonics and spur, SINAD and THD, sensitivity, modulation quality

Personality

- High Density, High Throughput
- All in one single, flexible and scalable chassis
- Complete, efficient, cost-effective test development & execution
- Open architecture for programing
- GP measurement capabilities for troubleshooting
- Same look & feel as benchtop instrumentation

Radio Test Reference Solution Measurements and Standards Support*

Available in Jan 2016

	Transmitter Test		Receiver Test	
AM	• AM Deviation • AM Hum and Noise Ratio • Harmonics	• Audio distortion (SINAD, THD, etc) • Spurious emissions • ACPR	• Audio distortion (SINAD, THD, etc.) • Rx Displacement BW • sensitivity	
FM	• FM Deviation • Hum and noise ratio (residual FM) • Audio distortion (SINAD, THD, etc.) • Tx tests with sub-audible signaling • Attack and transient behavior	• RF output power • RF frequency (carrier frequency stability) • Spurious emissions • ACPR • Harmonics • OBW • Pseudo-Voice Signal generation		
APCO P25 P1/P2	• Modulation quality (See X-apps) • Burst rise/fall time		• Generation APCO P25 Phase 1 CQPSK/C4FM • User-defined payload • User-defined filters	• Generation ARIB T98/101 • User-defined payload • User-defined filters
APCO P25 P2	• Modulation quality (See X-apps) • Burst rise/fall time		< not committed>	
TETRA 1 / 2	TETRA 1**		TETRA 1	

* The features support may change later

** M9064A VXA supports TETRA1.0, 89600 VSA supports TETRA2.0

Radio Test, Reference Solution PXI Hardware Platforms

Signal Generators

M9381A
Vector
1 MHz – 6 GHz

M9380A
CW
1 MHz – 6 GHz

Signal Analyzers

M9393A
High performance
9 kHz – 27 GHz

M9391A
Mid-range RF
1 MHz – 6 GHz

M9290A
Mid-range uW
10 Hz – 26.5 GHz

Audio Generation/Analysis

Adlink PXI 9527
2-ch In/ 2-ch Out
Designed for audio testing

M9380A PXIe CW Signal Generator

Keysight Quality with high power levels giving you accurate measurements

Description:

- PXIe Signal Generator
- 1 MHz to 3 or 6 GHz
- Ideal for interference injection and LO substitution

Key Features:

- Better than ± 0.4 dB absolute amplitude accuracy
- Output power of +18 dBm across the frequency range
- Generate CW and Pulse signals
- Soft front panel, IVI-COM drivers, LabVIEW, and MATLAB drivers

M9381A PXIe Vector Signal Generator

Reduces test time with fast amplitude and frequency switching

Description:

- PXIe Vector Signal Generator
- 1 MHz to 3 or 6 GHz
- Modulation bandwidth**:** 40 std. or 100, 160 MHz (optional)

Key Features:

- Output Power +19 dBm to -120 dBm
- Phase Noise (10 kHz offset @ 1GHz carrier) -125 dBc/Hz typical
- Frequency Settling Time to within 1kHz <220 us
- Amplitude Settling Time <120 us
- RF Flatness Corrected <0.4 dB (140 MHz BW)
- Real-time corrections
- Modulation AM, FM, PM, pulse, and multitone all standard
- Standard IVI-COM, IVI-C, LabVIEW, MATLAB drivers
- Supported Software includes Waveform Creator, Signal Studio and SystemVue

M9290A PXIe CXA-m Signal Analyzer

Keysight Quality & Basic Performance Vector Signal Analyzer in PXI

Description:

- PXIe CXA-m Signal Analyzer
- 10 Hz to 3.0, 7.5, 13.6, or 26.5 GHz
- 10 MHz Modulation Bandwidth standard, 25 MHz optional

Key Features:

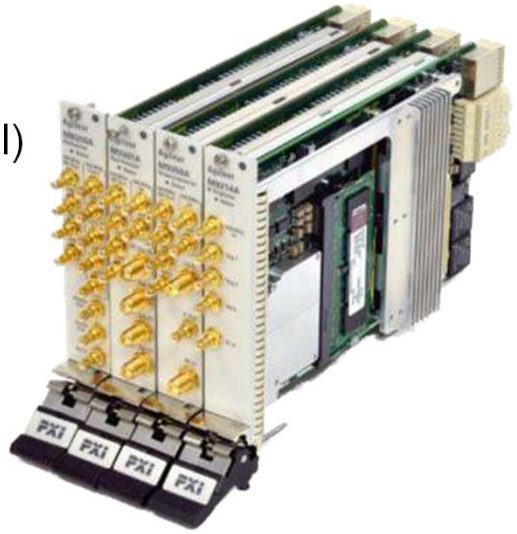
- Very **fast** Power Measurements
- Baseband tuning for **fast** ACPR Measurements
- PXIe (PCIe) data bus for **fast** data transfer and test execution
- Supports X-Apps Measurement Software
- Phase Noise at 1.0 GHz CF, 10 kHz offset: -106 dBc/Hz; 100 Hz offset: -90 dBc/Hz nominal
- -160 dBm/Hz displayed average noise level (DANL) with preamplifier on @ 10 MHz to 1.5 GHz
- Soft front panel, IVI-COM drivers, and connectivity to 89600 VSA software and SystemVue
- Code compatible with X-Series and ESA signal analyzers

M9391A PXIe Vector Signal Analyzer

Keysight Quality & Performance Vector Signal Analyzer in PXI

Description:

- PXIe Vector Signal Analyzer
- 1 MHz to 3 GHz or 6 GHz
- Modulation bandwidth**:** 40 standard; 100 or 160 MHz (optional)



Key Features:

- Extremely **fast** Power Measurements
- Baseband tuning for **fast** ACPR Measurements
- PXIe (PCIe) data bus for **fast** data transfer and test execution
- Phase Noise at 1.1 GHz CF, 10 kHz offset: -120 dBc/Hz
- -157 dBm/Hz displayed average noise level (DANL) with preamplifier on @ <1.1 GHz
- Soft front panel, IVI-COM drivers, and connectivity to 89600 VSA software and SystemVue

M9393A PXIe Performance Vector Signal Analyzer

Keysight Quality & High Performance Vector Signal Analyzer in PXI

Description:

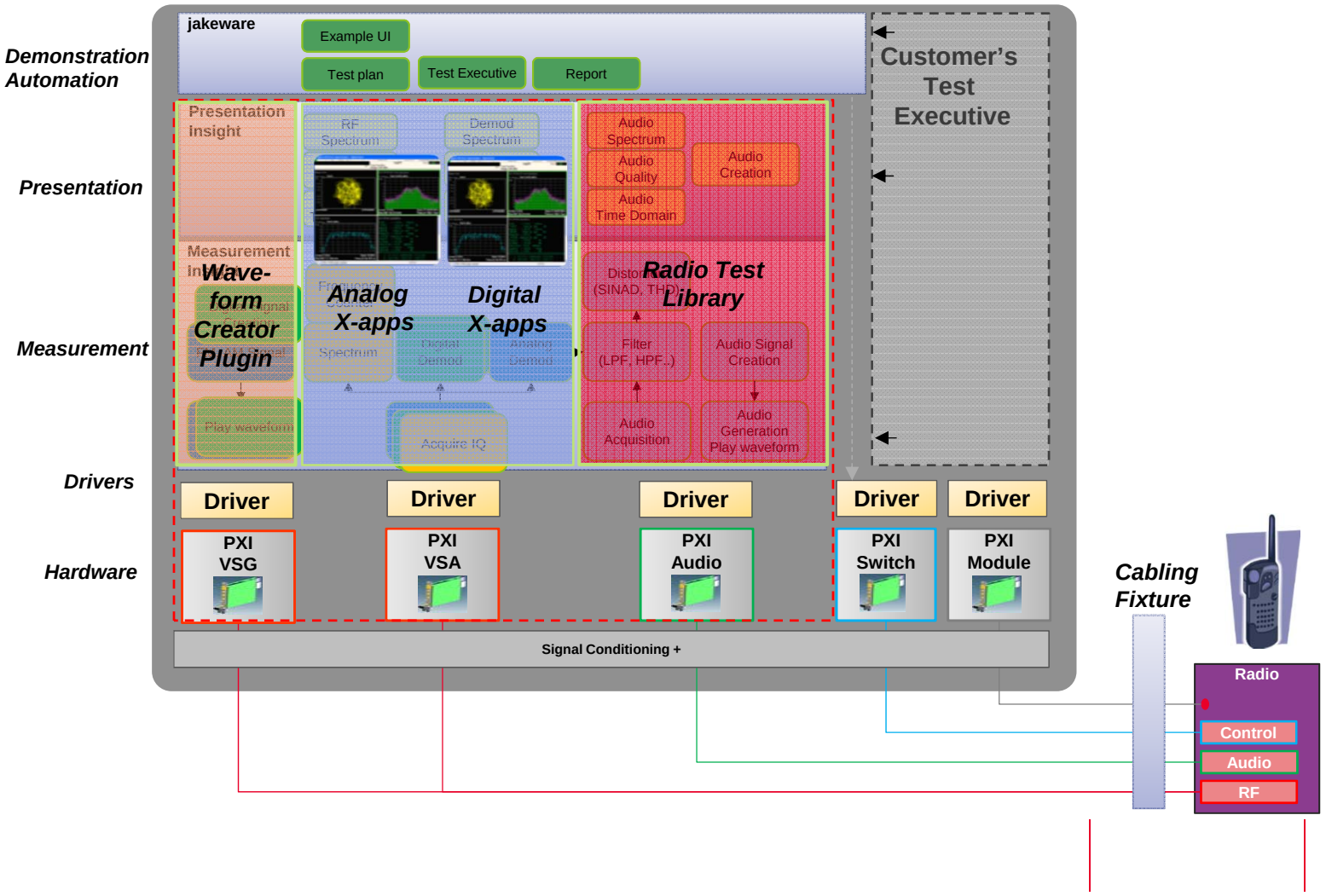
- PXIe Performance Vector Signal Analyzer
- 9 kHz to 8.4, 14, 18, or 27 GHz
- Modulation bandwidth**:** 40 standard; 100 or 160 MHz (optional)

Key Features:

- Extremely **fast** Power Measurements
- Baseband tuning for **fast** ACPR Measurements
- PXIe (PCIe) data bus for **fast** data transfer and test execution
- Phase Noise at 1.0 GHz CF, 10 kHz offset: -107 dBc/Hz; 100 Hz offset: -88 dBc/Hz typ.
- -168 dBm/Hz displayed average noise level (DANL) with preamplifier and noise correction on @ 51 MHz to 2.8 GHz
- Soft front panel, IVI-COM drivers, and connectivity to 89600 VSA software and SystemVue

Radio Test, Reference Solution PXI Software Package

Waveform Creator + X-Apps + Radio Test Library



(Current Proposal*)

Platform	Function	Analog Mod	Digital Mod	Analog Demod	Digital Demod	Audio Gen	Audio Analysis
WFC	Signal Creation	✓	✓				
X-Apps	Signal Analysis			✓	✓		
Radio Test Library	Audio Package					✓	✓

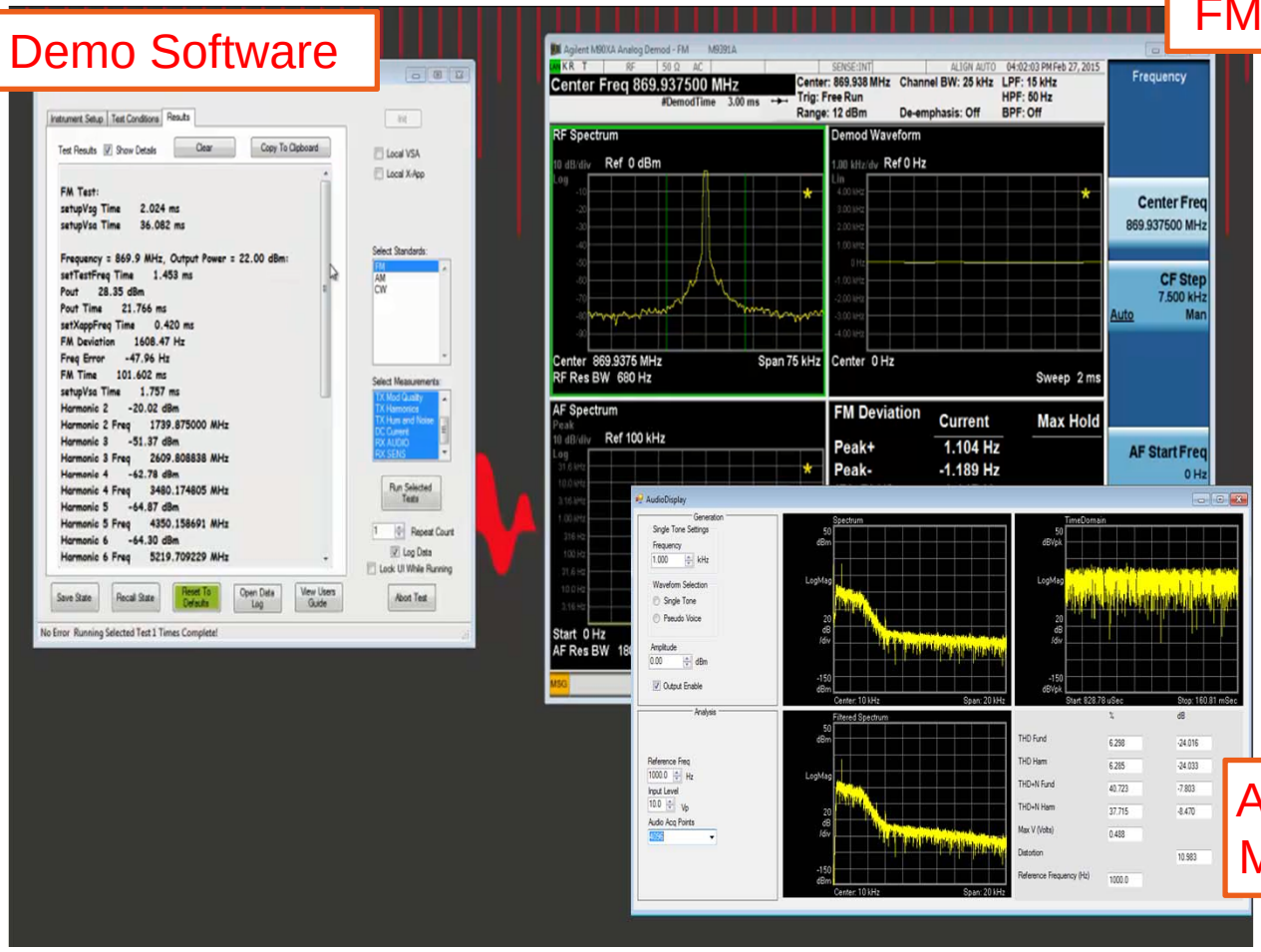
- AM , FM, analog modulation measurement application → N9063A, M9063A X-series
- APCO , Tetra, Digital Modulation measurement application → N9064A, M9064A X-Series
- Commercial standards LTE measurement application → N9080A, M9080A X-series
- 89600 for deep R&D tool
- Waveform generation → Signal Studio

* The support of software building blocks may change later

Radio Test, Reference Solution Measurement Example

Radio Test Demo Software

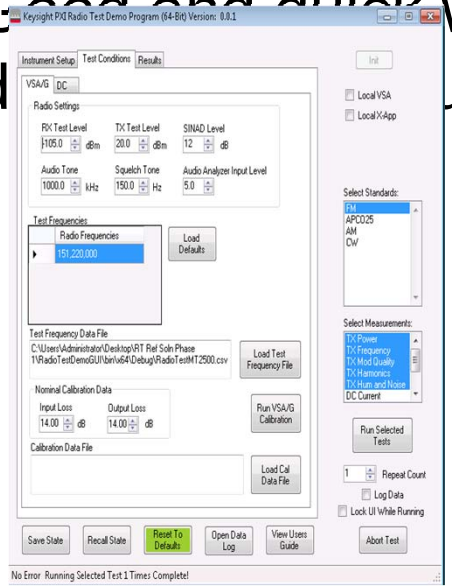
FM demodulation

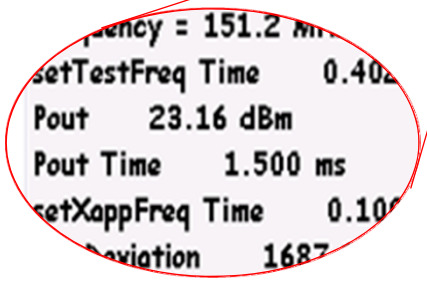


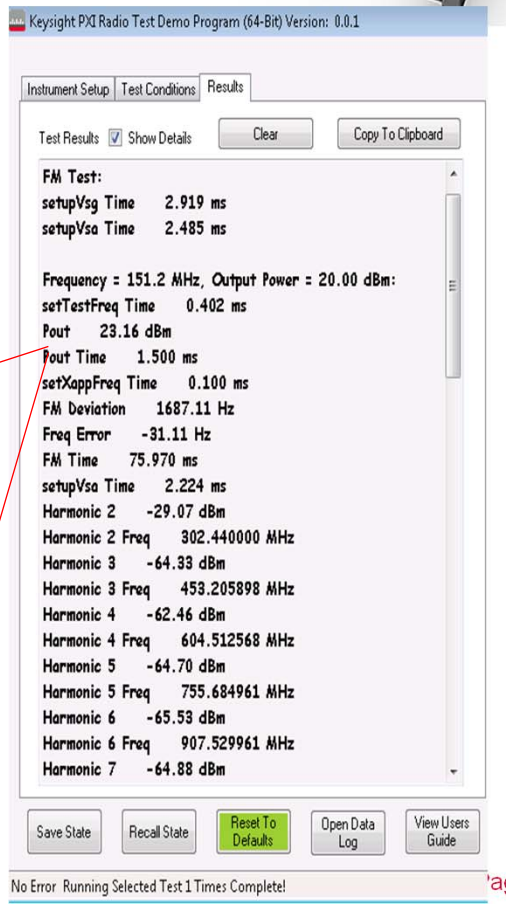
Audio Measurements

Radio Test Evaluation GUI

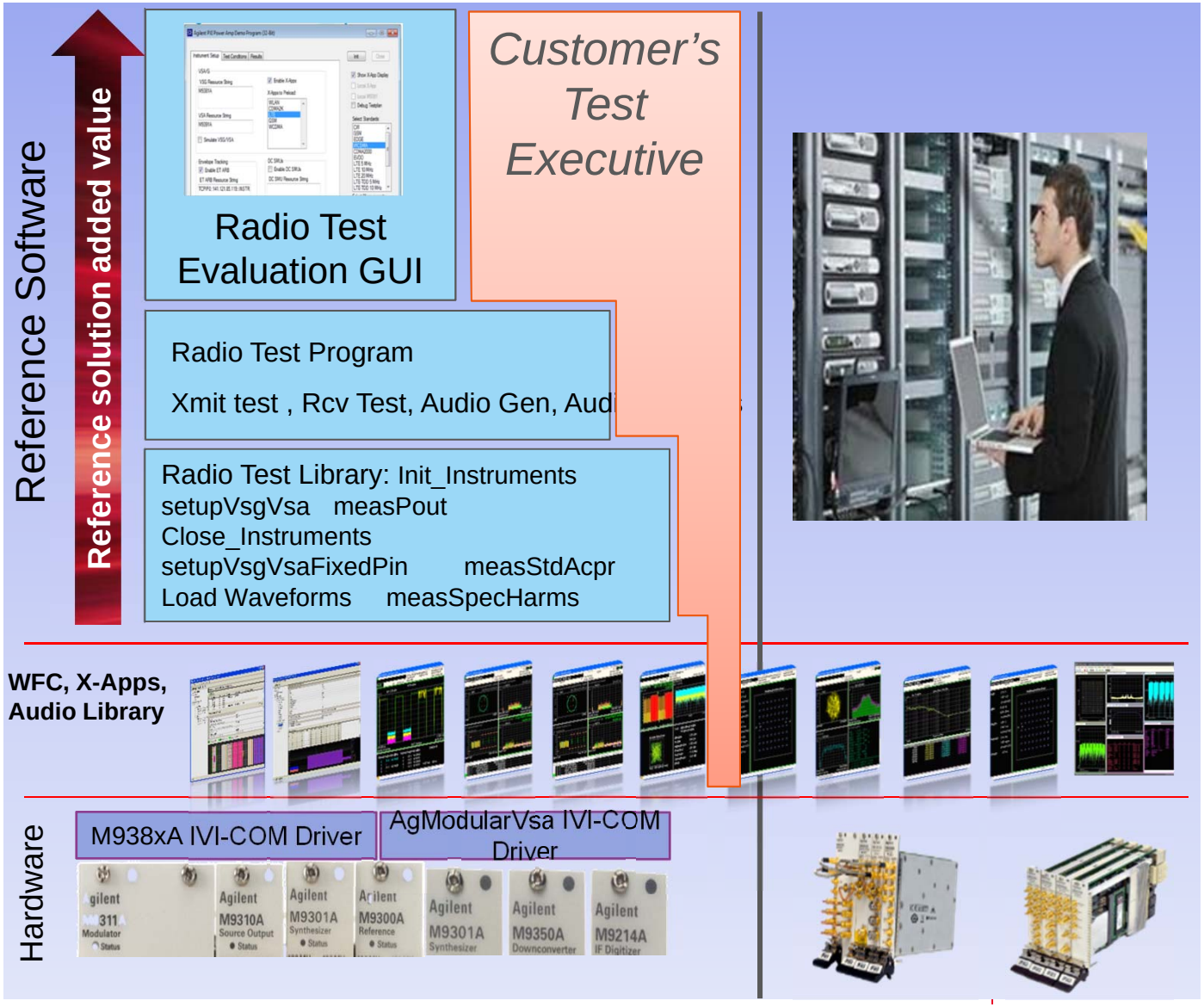
- Easy HW configuration and control
- Quick selection for available measurements
- Simple and clear test results
- Good and quick way to d ution





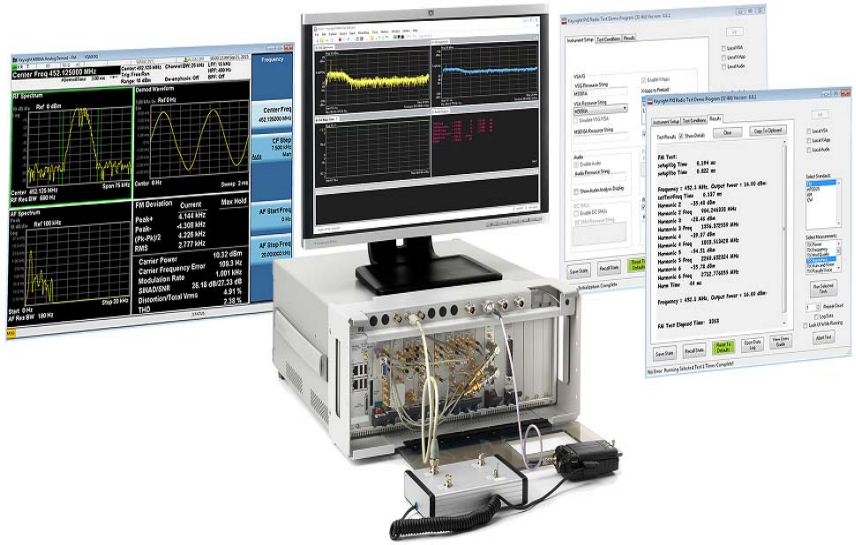


Automation & Integration



Radio Test, Reference Solution – One page

RF and audio signal generation and analysis with a combination of PXI hardware and software in a single, flexible, scalable chassis.



- RF VSA/VSG 27 GHz
- RF/AF Spectrum
- Analog/Digital modulation
- Audio Measurements
- BER Measurements
- APCO P25 /Tetra
- GP measurements
- Same look&feel as benchtop

- Open modular platform to accelerate automation and integration special for customized request
- Keysight recognized expertise and trusted stable and repeatable measurements
- General purpose capabilities for troubleshooting and commercial standard LTE support for next generation tactical and public safety radios

Questions ?