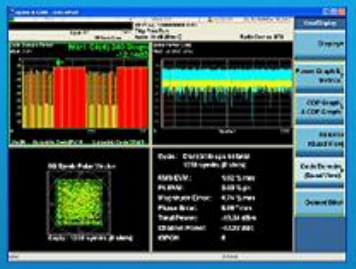
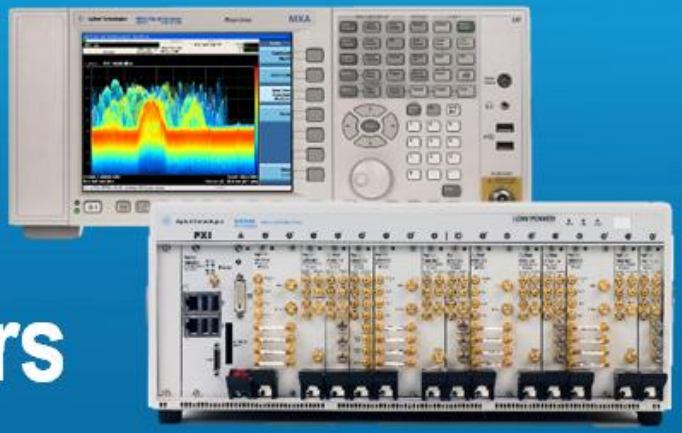
One Measurement Science



Multiple Form-Factors



Gustaaf Sutorius

Application Engineer

Agilent Technologies

AGENDA & Objectives

1. Name Change: Agilent => Keysight
2. Same Measurement Science, Different Form Factors.
   a) Both PXI and Benchtop
   b) Short demonstration PXI and Benchtop
3. AXEi: AXEi vs PXI
4. Morphable aspects Benchtop Instruments
5. Conclusion

One RF Measurement Science for Multiple Instrument Form Factors

AGENDA

1. Introduction
2. Name Change: Agilent => Keysight
3. **Same Measurement Science, Different Form Factors**.
   a) Why both PXI and BenchTop
   b) Short demonstration PXI and BenchTop
4. AXEi: AXEi vs PXI
5. Morphable aspects Benchtop Instruments
6. Conclusion

One RF Measurement Science for Multiple Instrument Form Factors

Measurement Science Along the Product Life Cycle

Electronic system design software

Vector signal analysis software

Signal Analyzers with a variety of wireless Measurement Apps

Signal Generators with Signal Studio software

Scopes and Logic Analyzers

LTE Signalling, RF, protocol and pre-conformance test platforms

Design Simulation

Module and Chipset Development

RF and BB Design Integration

System Design Validation

Manufacturing Test

Battery Drain Test

Baseband generator and channel emulator

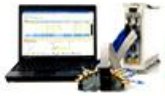
Interactive functional test SW

Widest bandwidth analysis for chipset design & verification

RF and Protocol Conformance test systems

PXI solutions

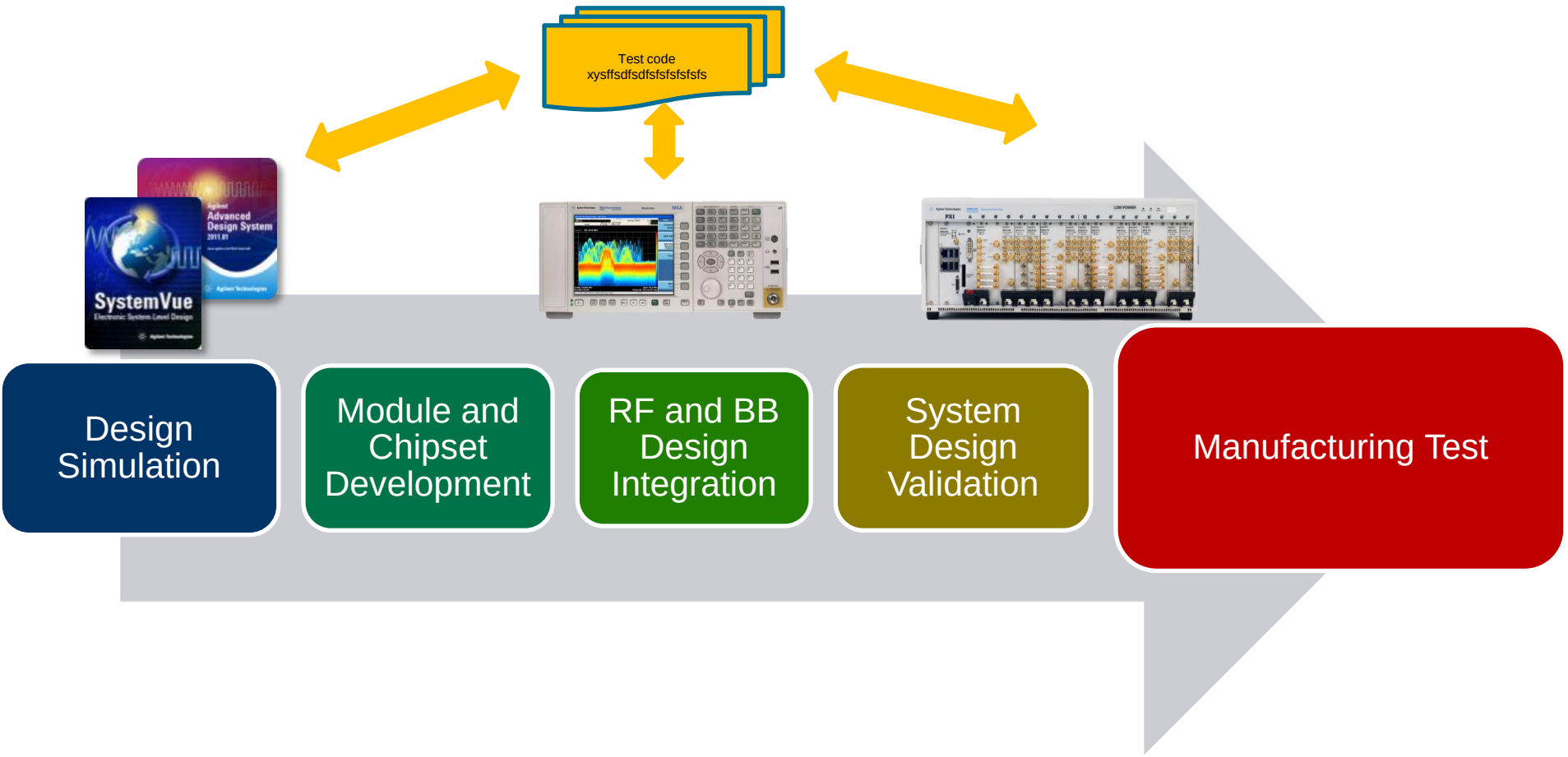
Manufacturing test platforms



RDX for DigRF v4

RF Handheld Analyzers

Code re-use: from R&D to Manufacturing



One RF Measurement Science for Multiple Instrument Form Factors

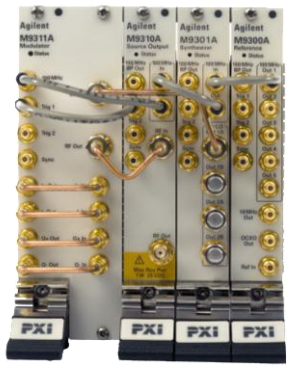
M9381A PXIe Vector Signal Generator

Agilent Performance MXG Vector Signal Generator in PXI

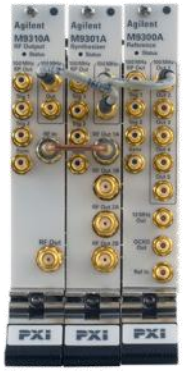
M9381A PXIe Vector Signal Generator

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**

Software:

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

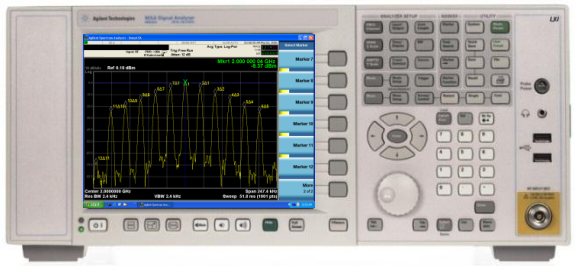
Signal Studio Connectivity

- LTE FDD
- LTE TDD
- GSM/EDGE
- cdma2000
- Bluetooth
- Digital Video
- TD-SCDMA
- W-CDMA
- WiMAX
- WLAN
- Broadcast Radio

M9391A PXI Spectrum Analyzer: Benchtop in PXI format

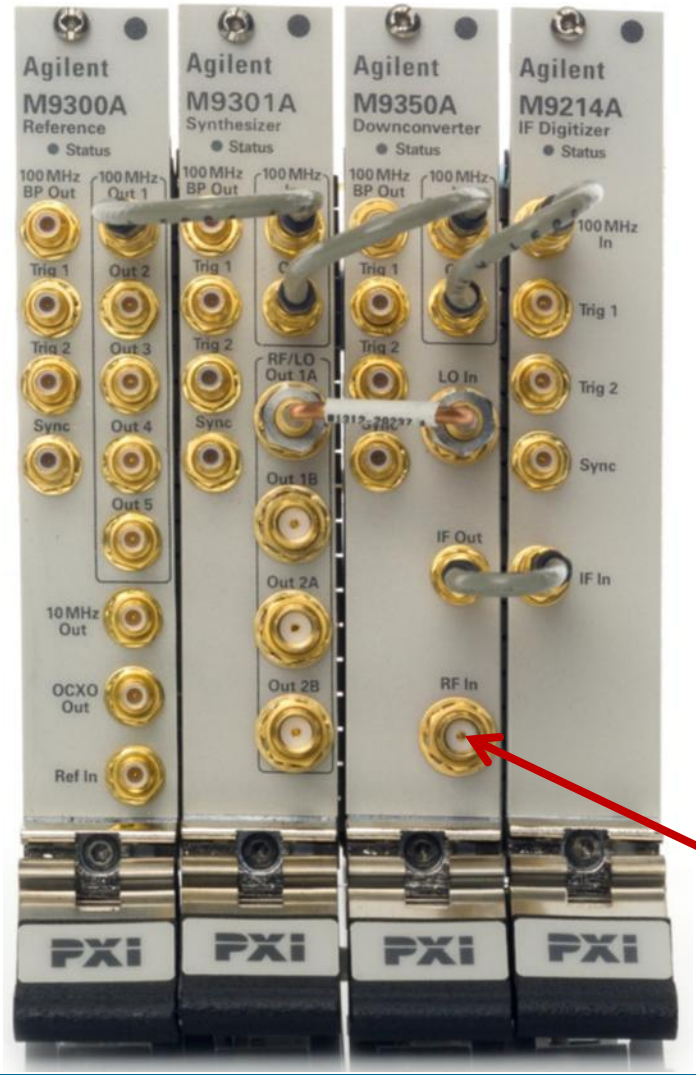
Combination of high performance modules create uncompromising VSA performance in PXI

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



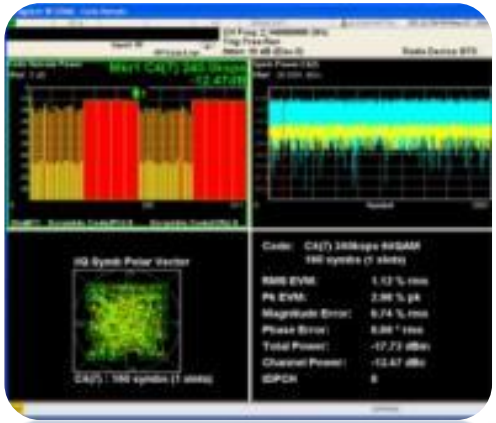
MXA Spectrum Analyzer
MXA apps run also on PXI

=



RF INPUT

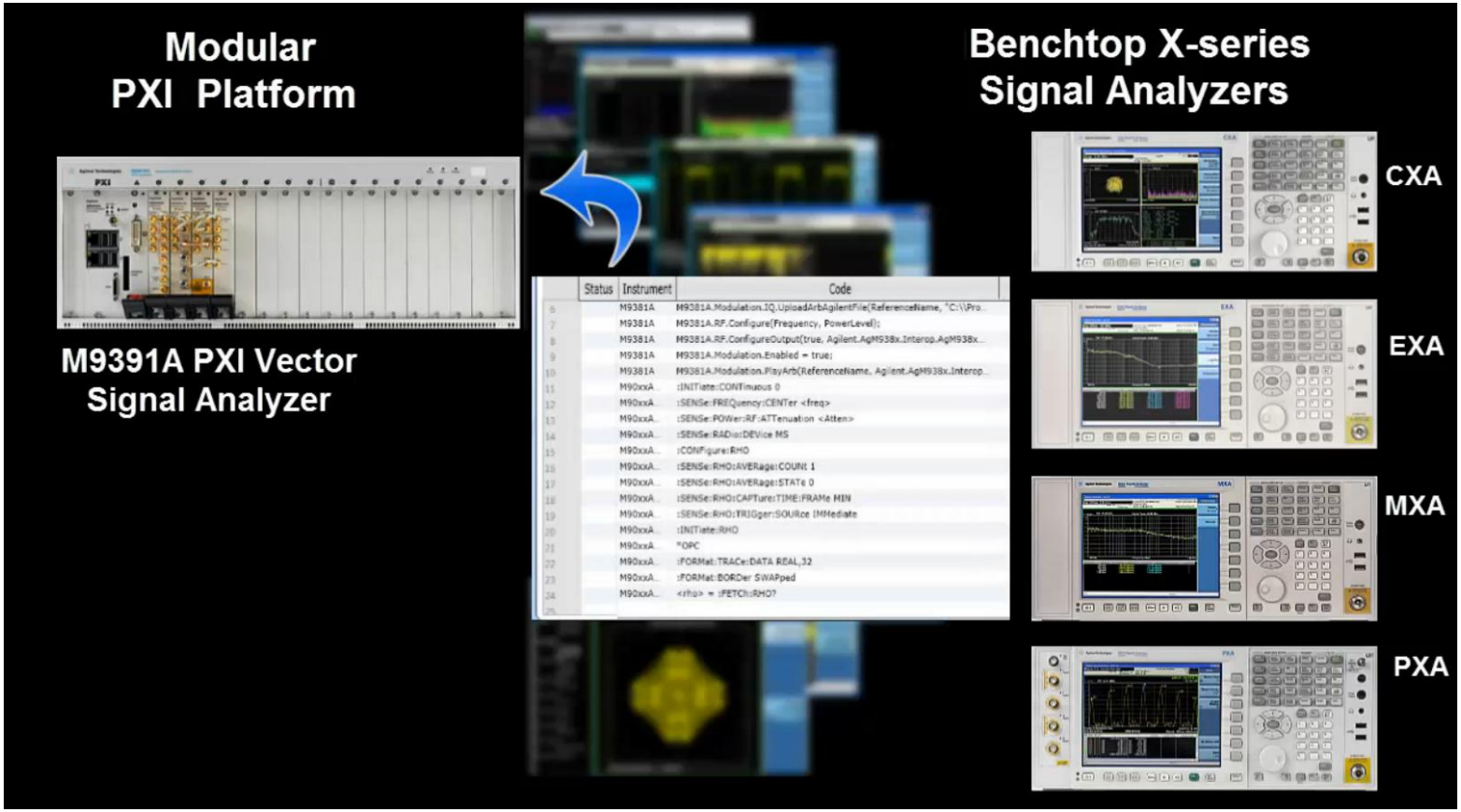
RF Benchtop and PXI with X-Series Apps



- Performance you need
- Future – ready
- Common UI
- Common Application Software
- Code compatible

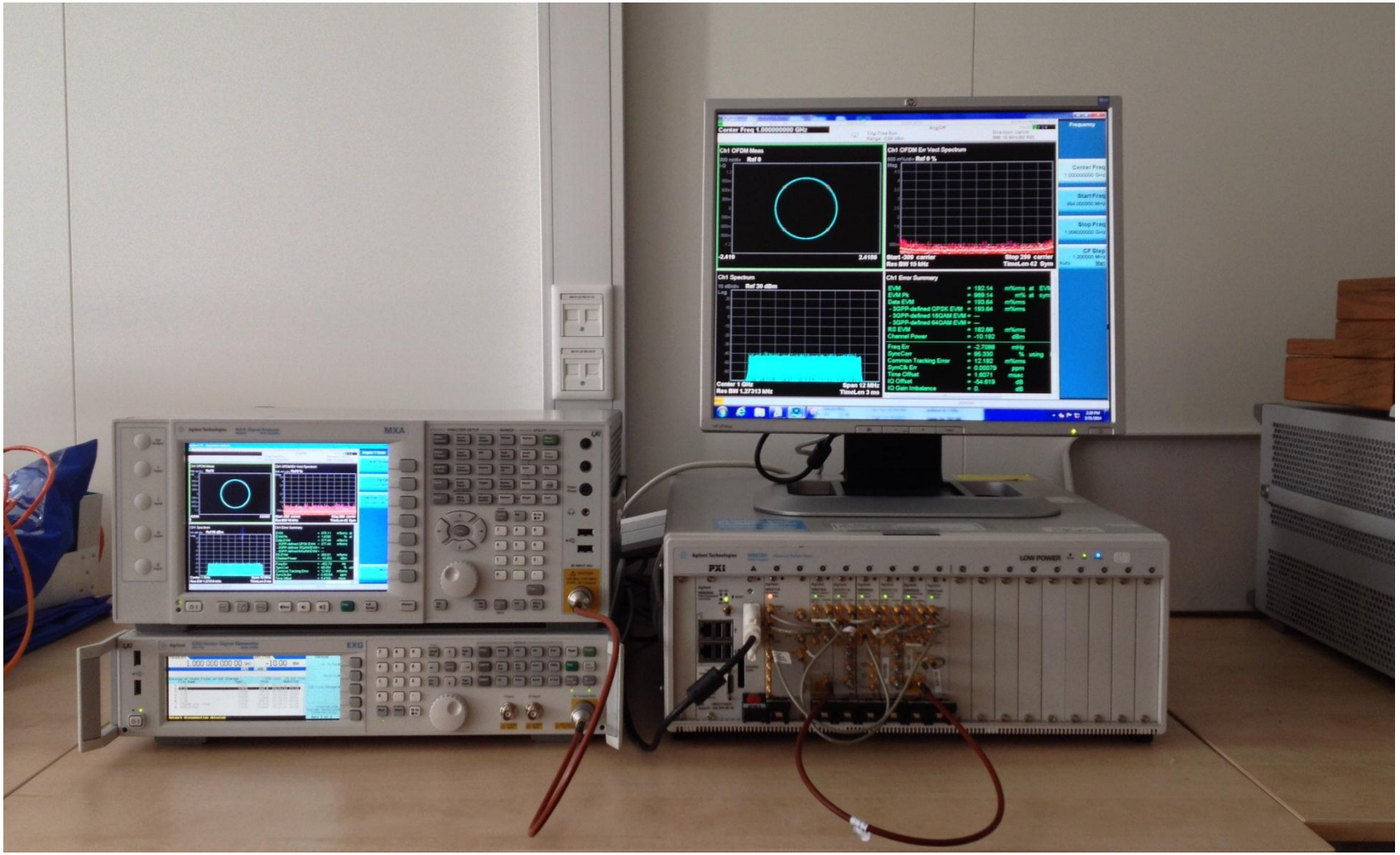
One Measurement Framework between the Platforms

Example: Code re-use from Benchtop to PXI



One RF Measurement Science for Multiple Instrument Form Factors

Actual Demo: Unlocking on both Benchtop and PXI



One Measurement Science for 3GPP LTE applied for 10 MHz 50rb QPSK Uplink signal
Unlocked on both Benchtop Instruments (left) and also PXI Instrumentation (right)

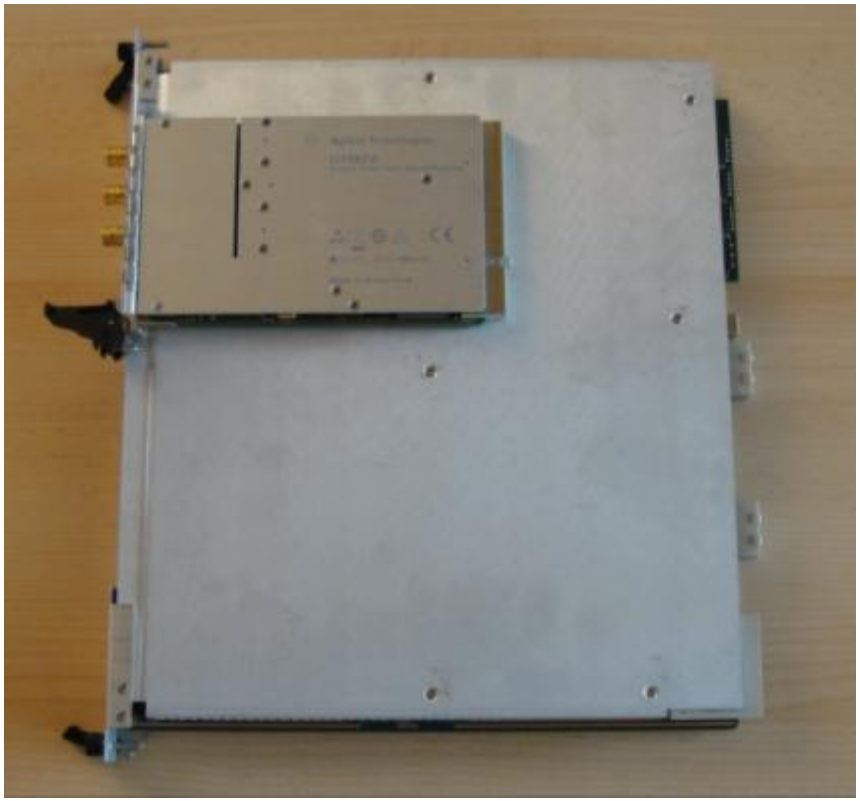
AGENDA

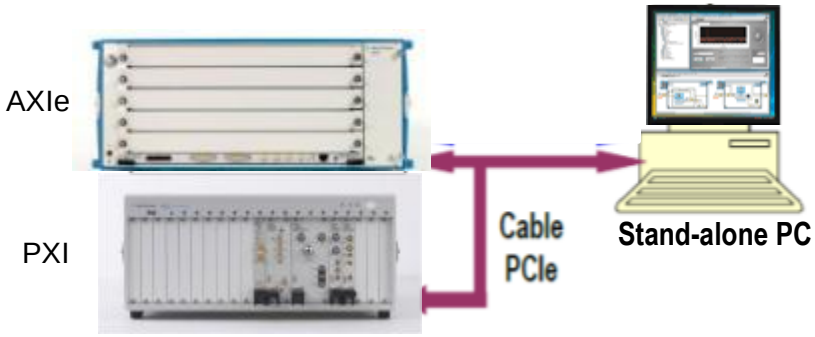
1. Introduction
2. Name Change: Agilent => Keysight
3. Same Measurement Science, Different Form Factors.
   a) Why both PXI and BenchTop
   b) Short demonstration
4. **AXEi: AXEi vs PXI**
5. Morph-able aspects of our Benchtop Instruments
6. Conclusion

One RF Measurement Science for Multiple Instrument Form Factors

AXIe versus PXI

Scalability *and* Compatibility





Common control via

- **Rack mounted controller, or**
- **Embedded controller in chassis, or**
- **Desktop controller**

One RF Measurement Science for Multiple Instrument Form Factors

AXIe and PXIe Comparison

Feature	AXIe	PXIe
Chassis base	AdvancedTCA	cPCI/cPCIe
PCIe maximum data bandwidth (Maximum Gen 2.0): Single peripheral slot to backplane All peripheral slots to system slot/embedded controller	 2 GB/s 10 GB/s	 4 GB/s 8 GB/s
PCIe fabric	Yes	Yes
LAN backplane	Yes	No
Local bus	18 pairs req 62 pairs opt	1 line (13 PXI)
Triggers	Bidirectional Star Trigger 13 signal MLVDS bus	Star Trigger(1xTTL, 3x Diff per slot) 8 Signal TTL bus
Frequency Reference & Sync	100MHz, yes	10MHz, 100MHz, yes
Power per slot	200 W	30 – 48 W
Board space per slot (higher density, flexibility)	900 cm^2	160 cm^2

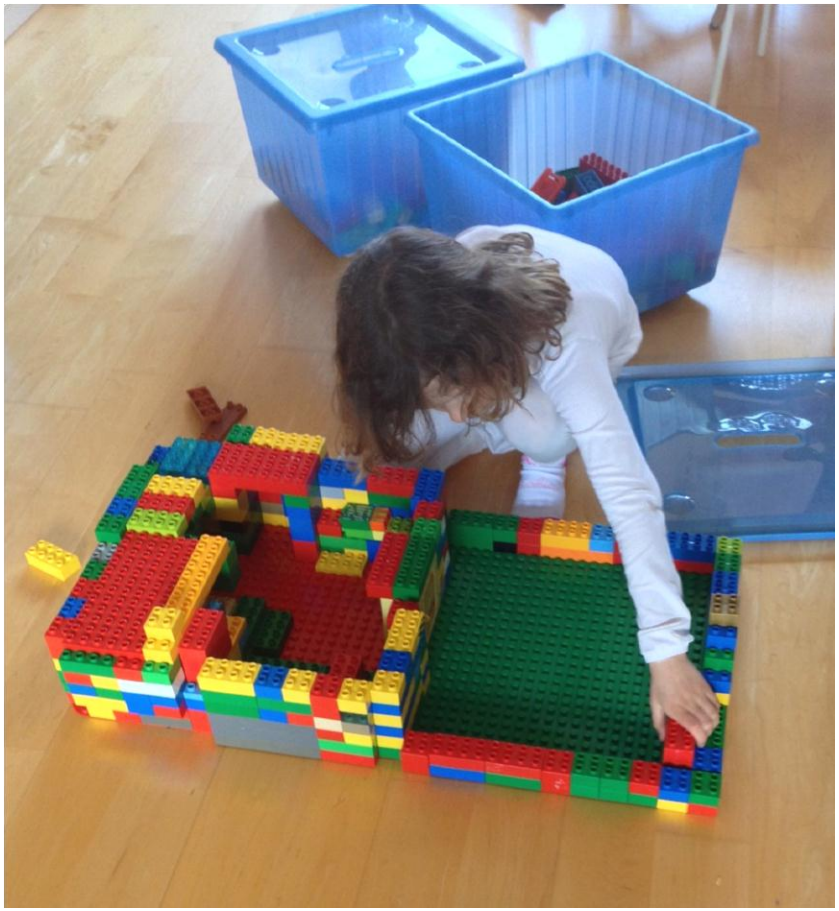
AGENDA

1. Introduction
2. Name Change: Agilent => Keysight
3. Same Measurement Science, Different Form Factors.
   a) Why both PXI and BenchTop
   b) Short demonstration PXI and BenchTop
4. AXEi: AXEi vs PXI
5. **Morphable aspects Benchtop Instruments**
6. Conclusion

One RF Measurement Science for Multiple Instrument Form Factors

So PXI is like Lego?

- Not really
- PXI has however morphable aspects



One RF Measurement Science for Multiple Instrument Form Factors

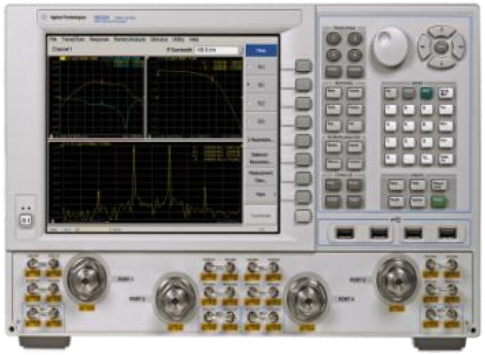
Morphable Example

Robot

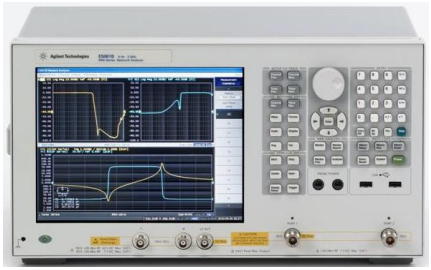
Becomes Locomotive

One RF Measurement Science for Multiple Instrument Form Factors

Morphable: Some Examples originating from VNA



PNA = VNA, SA, NFA, mixer-test, etc.

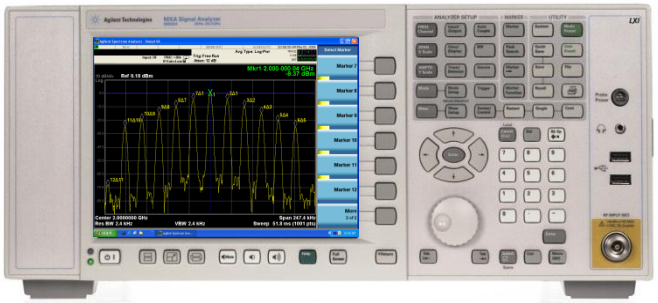


ENA = Gain-Phase, Z-Analyzer, VNA

FieldFox = Sig Gen, SA,VNA,VVM, etc

One RF Measurement Science for Multiple Instrument Form Factors

Morphable: Some Examples originating from SA/SS

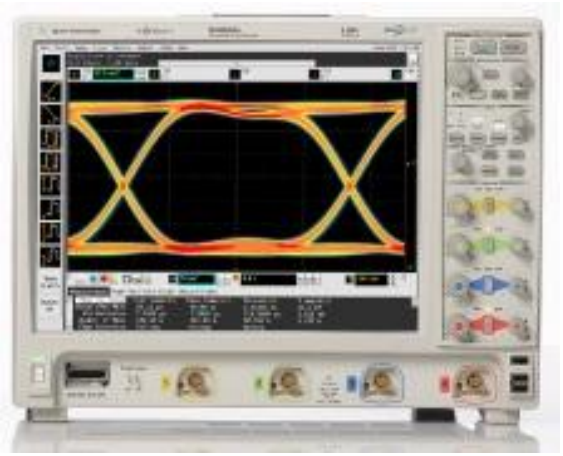


Generic RF source
Morphs into a compliant Transmitter for GSM, LTE, UMTS, GPS, WiFi, DVB, DAB, Pulse, etc.

Generic Spectrum Analyzer
Morphs into an Analyzer for Noise Figure, Phase Noise, GSM, LTE, UMTS, WiFi, DVB, Bluetooth, EMI, Pulse, etc.

One RF Measurement Science for Multiple Instrument Form Factors

Morphable: Example Power Supply, Oscilloscope



Generic DC power supply
Morphs into a Arbitrary Waveform Generator, 4 quadrant SMU, Oscilloscope, Datalogger, etc.

Generic Oscilloscope
Morphs into an Logic Analyzer Analyzer, Protocol Analyzer, USB Compliance Analyzer, PCI Compliance Analyzer, etc.

One RF Measurement Science for Multiple Instrument Form Factors

AGENDA

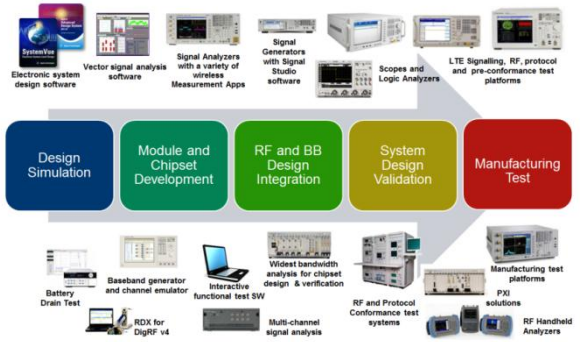
1. Introduction
2. Name Change: Agilent => Keysight
3. Same Measurement Science, Different Form Factors.
   a) Why both PXI and BenchTop
   b) Short demonstration PXI and BenchTop
4. AXEi: AXEi vs PXI
5. Morphable aspects Benchtop Instruments
6. **Conclusion**

One RF Measurement Science for Multiple Instrument Form Factors

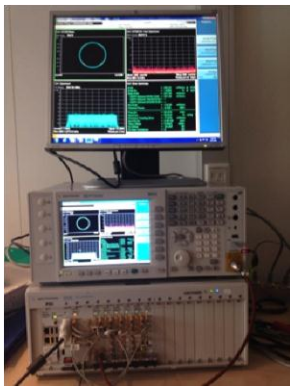
Conclusion

One RF Measurement Science for Multiple Instrument Form Factors

1. Same Measurement Science is applied on different T&M instruments along the Product Life Cycle.



2. Recently PXI has been added. Same algorithms/sw now run on both PXI and Benchtop Instruments.



3. Many Agilent Benchtop Instruments are morphable.