

SMART DEVICES REQUIRE

SMARTER

AUTOMATED TEST SYSTEMS

VST Reduces Test Cost & Accelerates Productivity

"The NI VST gives us incredible flexibility...The reprogrammable FPGA allows us the ability to **quickly tailor** the system to meet specific test objectives."

Don Miller, Senior Staff Engineer, Lockheed Martin Space Systems

"Based on NI VST and PXI platform, we developed the multi-DUTs WLAN production testing solution...resulting in the **efficiency improvement of up to 80%.**"

Xuesong Zou, Director, T&W, China

"The VST helped us to **significantly reduce production test times.** Where RF tests used to take seven minutes, they can now be reduced to just one minute."

Markus Solbach, Managing Partner, NOFFZ

"Using the VST for manufacturing test, we have been able to **double test coverage while** reducing test time by 20%."

Sanjay Noronha, Product Manager, Ruckus Wireless

"With the VST's help we have created software suites that **cut measurement times by up to 99%.**"

Niklas Nolemo, Sales and Marketing Manager, GTT

"Within a single PXI rack, we could integrate five VSTs and test 5 UUTs in parallel, guaranteeing **maximum system production capability.**"

Paolo Bertoldo, Business Development, SEICA

"With NI VST's excellent RF performance and RATs (multi-protocol) capabilities such as LTE-A, we protected our investment and enhanced our FDR P2P Transceiver in **three months.**"

李永台 / Li Yung-Tai, Deputy Director, Institute for Information Industry, Taiwan

"We were able to **reduce manufacturing test time** of Power Amp (PA) by five times compared to our existing test system by using NI VST to implement power servoing on the FPGA."

Roy Yoon, Product & Test Engineer of NPI, Broadcom, Korea

"The excellent software support in LabVIEW and the various tool boxes helped integrate the instrument into our processes and led to **increased productivity.**"

Matthias Vogel, Sales Engineer, Konrad Technologies

"We chose the NI PXI platform as the core of our new test architecture, especially VST. It surprised us for the **excellent test performance** and the ability to test multiple protocols."

林文生 / Lin Wun-Sheng, Technical Support Dept. Manager, Castlenet, Taiwan

"With the VST and FPGA programmable by LabVIEW, we were able to **rapidly emulate** a wide range of diverse scenarios."

Niels Koch, Component Owner Radar Systems, Audi AG

"The VST has **saved us weeks** of development and spared our customer additional hardware costs."

Ronald Kaempf, CEO, WKS Informatik

"NI VST provides **accurate, fast measurements**, is more compact, and is offered at a reasonably low cost. It greatly enhances the competitiveness of our RF measurement."

盧豐裕 / Lu Feng-Yu, Executive Vice President, Arcadyan, Taiwan

"The availability of one channel for receiver and one channel for transmitter on the same VST module **reduced the physical size** of our DRFM solution enormously."

Mahesh Kumar & Vijay Raj, RF Application Engineers, Digilogic

"Using NI PXI vector signal transceiver, we **improved test speeds** by more than 200 times compared to traditional rack-and-stack instruments."

Director, Qualcomm Atheros

By adopting the VST-based 5G wireless rapid prototyping test system, we expect to demonstrate the performance and capabilities of NOMA and higher frequencies **early.**"

Takehiro Nakamura, VP and Managing Director, 5G Laboratory, NTT DOCOMO, Inc., Japan

NI's 2nd Generation VST is better in EVERY Aspect

Only 2 PXI Slots!!

6.5 GHz VSG with
1 GHz Instantaneous BW

10dB Higher Output Power

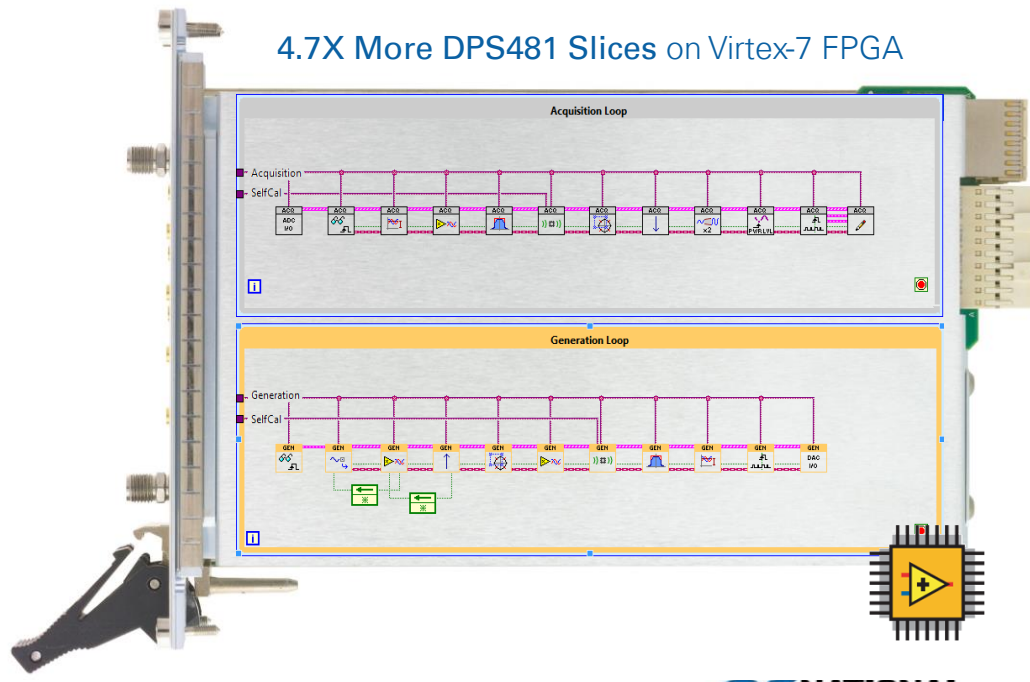
60 MHz, 8 port high-speed
parallel digital interface

NEW high speed serial interface
(12 Gbps, 4 Tx & 4 Rx Lanes)

6.5 GHz VSA with
1 GHz Instantaneous BW

Better EVM Performance

4.7X More DPS481 Slices on Virtex-7 FPGA



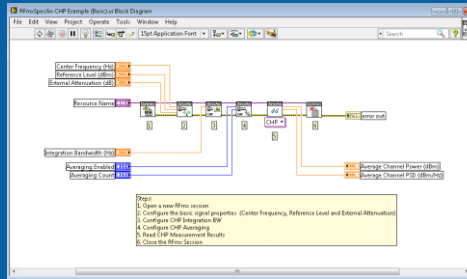
Same Powerful Software Experience

INTERACT



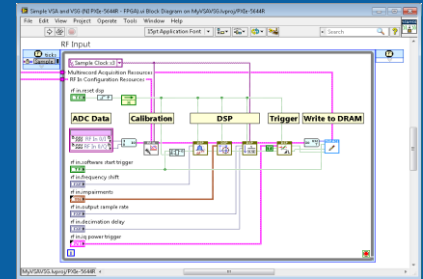
Soft Front Panel

AUTOMATE



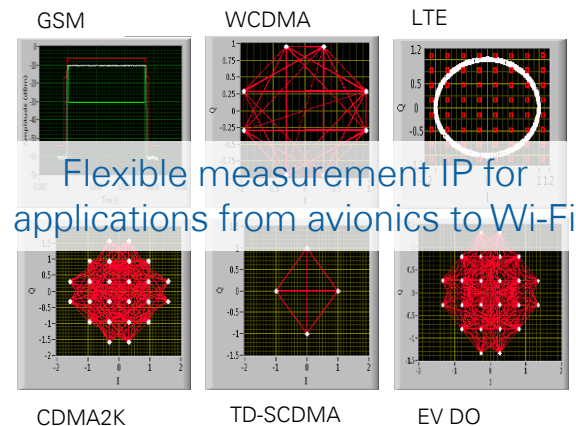
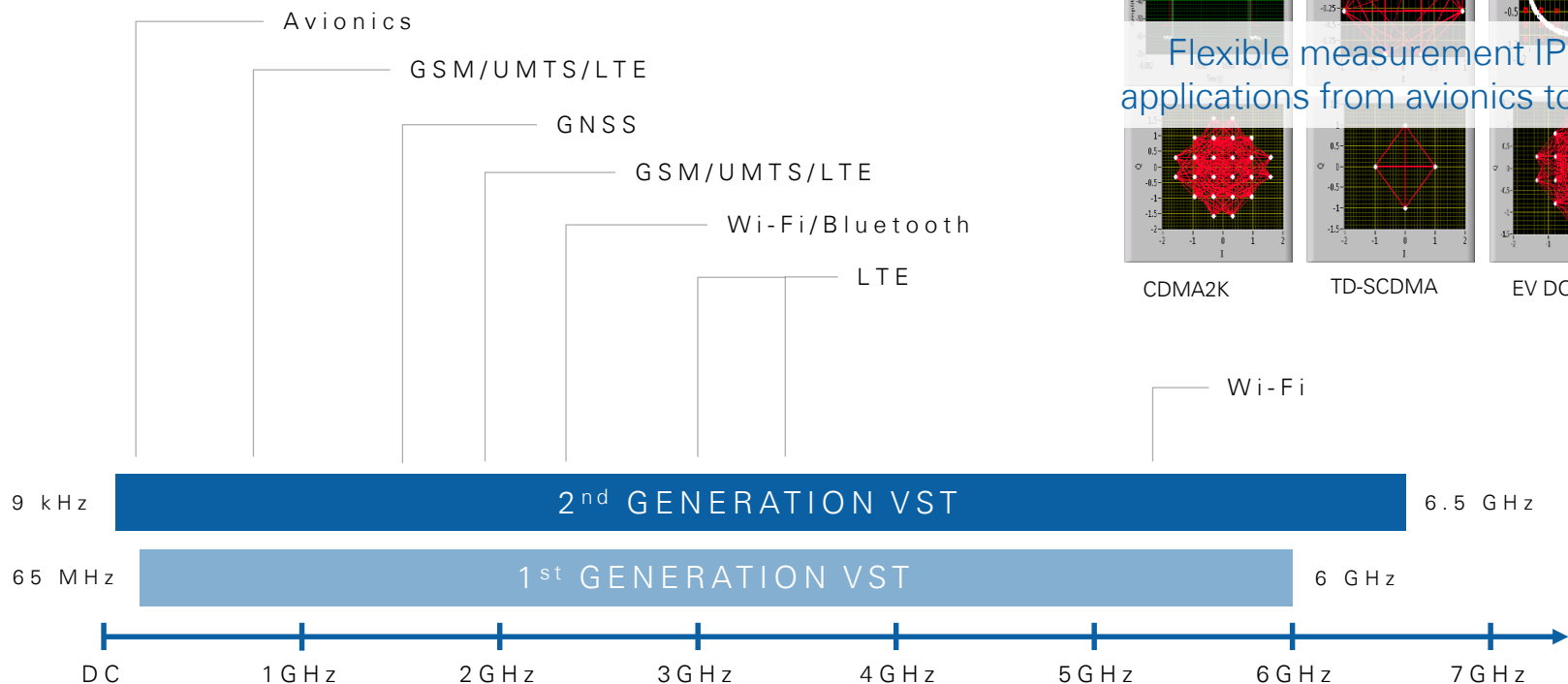
RFmx

CUSTOMIZE

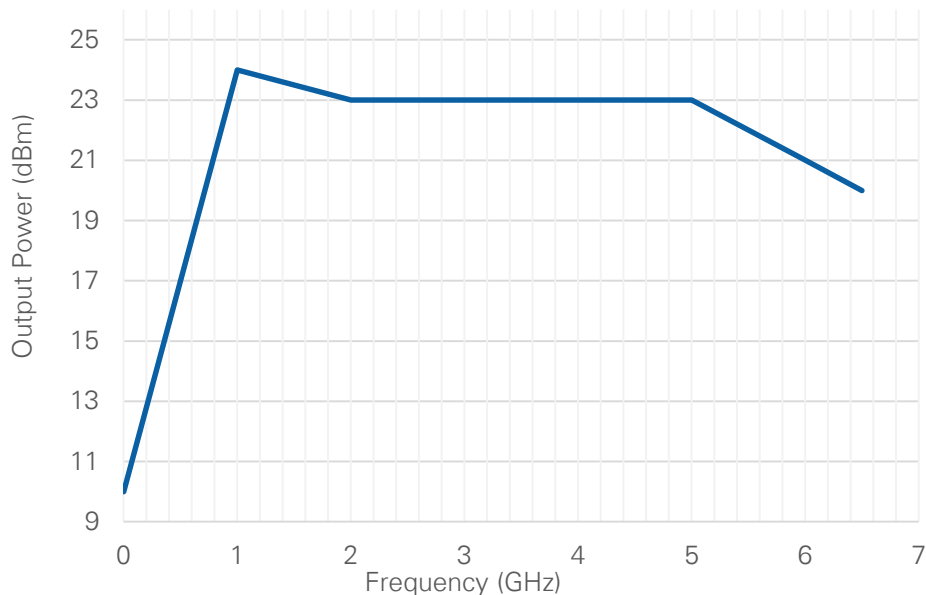


LabVIEW FPGA

Wider Frequency Coverage



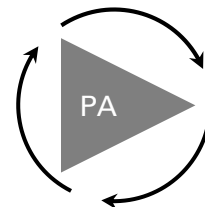
Higher Output Power with Real-Time Control



**Preliminary specifications (6/13/16)*

Benefits

- Mitigate Loss Through Fixturing
- Test DUTs at Higher Power Levels
- Remove the Need for Driver Amps
- Better Linearity at High Output Powers
- Higher Power RADAR Signals

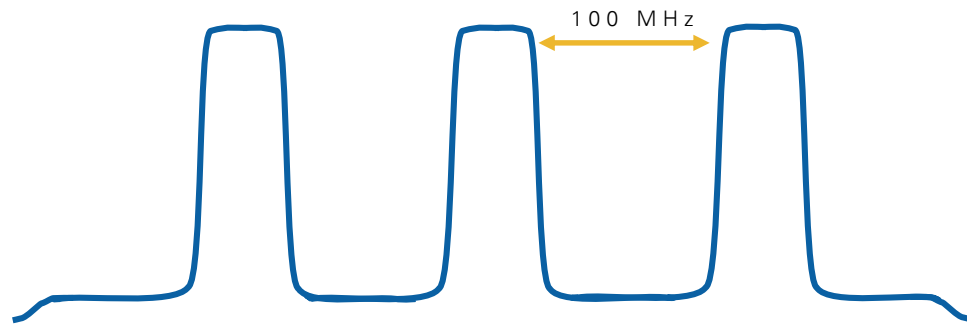


Control output power in real-time using LabVIEW-programmable FPGA

Wide Instantaneous Bandwidth

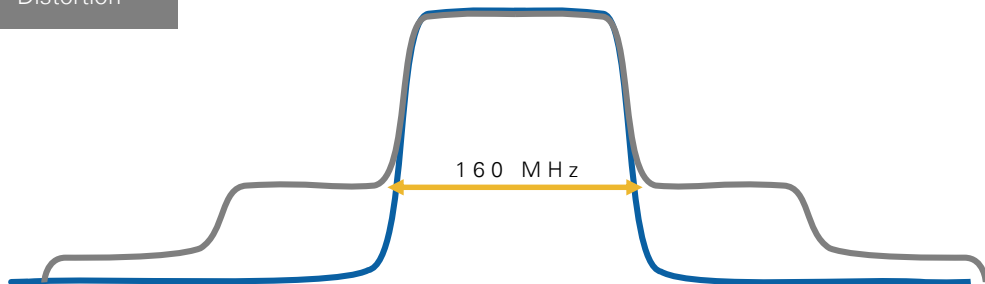
LTE Carrier Aggregation

Carrier Aggregation of Widely Spaced Carriers



Digital Pre-Distortion

DPD Requires 3x to 5x the Signal Bandwidth



APPLICATION IP

Digital Pre-Distortion

Automotive RADAR

LTE Carrier Aggregation

5G Communication

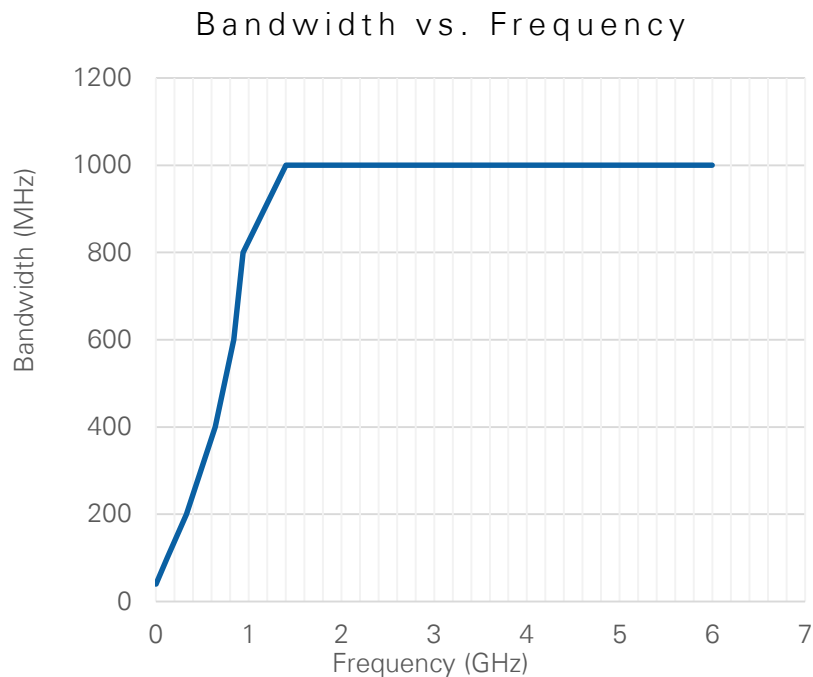
WLAN Testing

RADAR Target Simulation

Channelizer

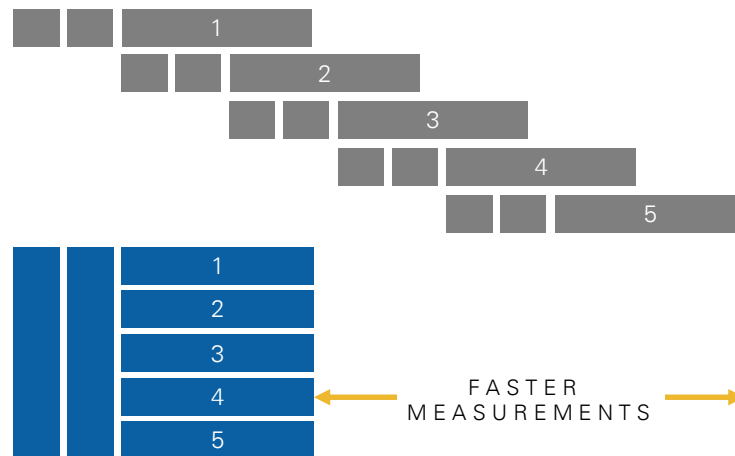
Custom IP

Wide Measurement Bandwidth



**Preliminary specifications (6/13/16)*

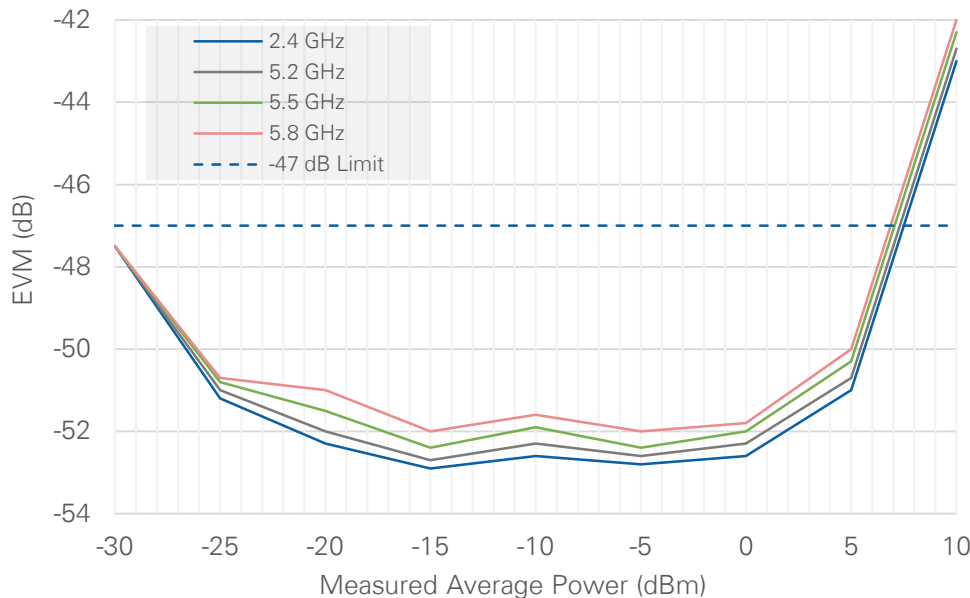
Application: Channelizer



Wide bandwidth eliminates the need to re-tune through LabVIEW FPGA-based channelizer (multi-channel DDC) IP

Excellent EVM Measurement Performance

802.11ax 80 MHz EVM Performance (Loopback)



**Preliminary specifications (6/13/16)*

ENABLING TECHNOLOGIES

- Patented Wideband Equalization Optimized Dynamic Range
- Excellent Phase Noise
- Sophisticated Self-calibration Algorithms

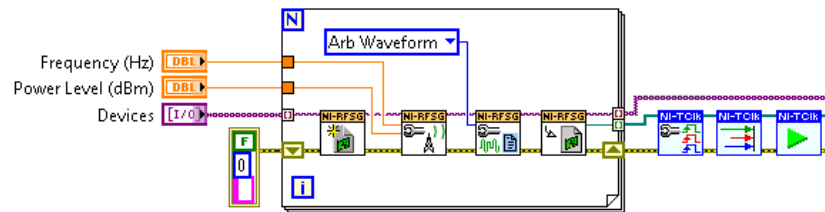


LabVIEW Example for 802.11ax

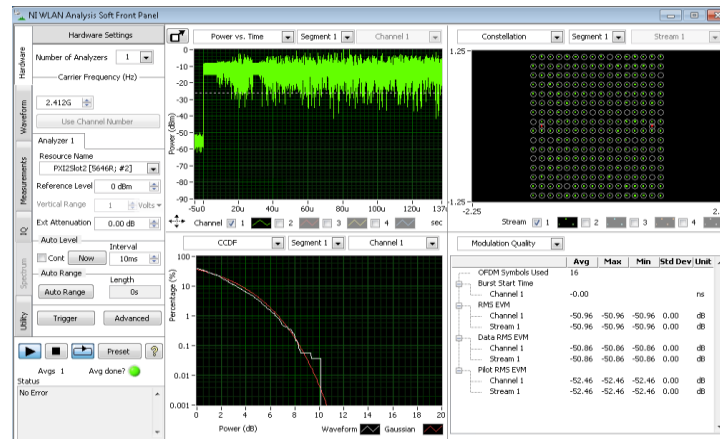
Small 2-Slot PXI Footprint

Externally Share TX and RX LOs
for MIMO Configurations

Synchronize up to 8 VST's in
a Single 18-slot chassis

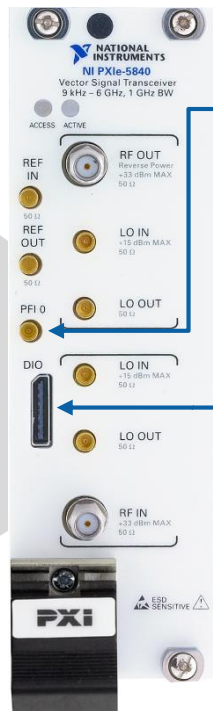
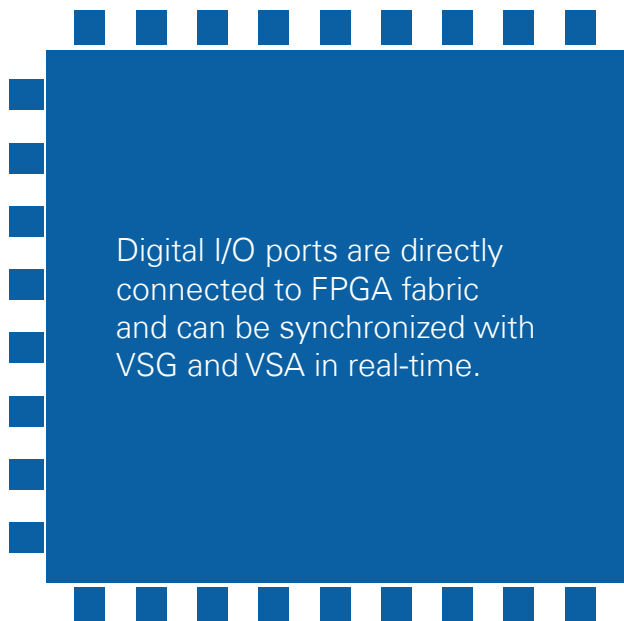


NI-TCLK Ensures Scalable Synchronization



NI WLAN SFPs Support up to 8x8 MIMO

Flexible Digital Interfacing Options



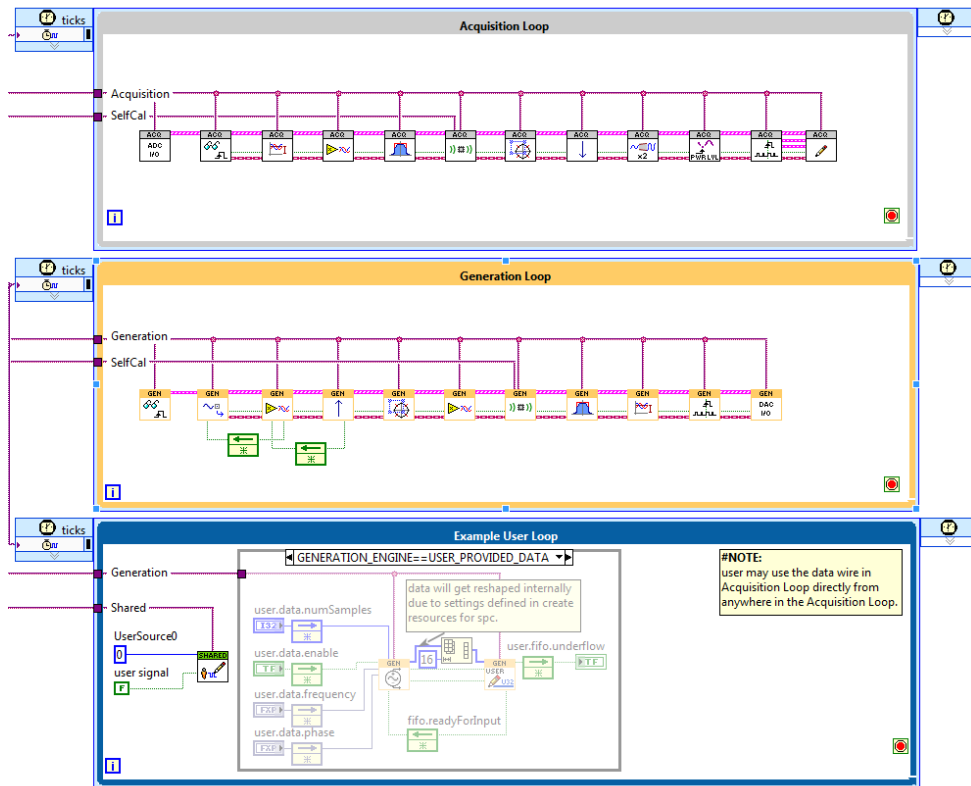
Stand-Alone MCX
PFI Trigger Line

42-Pin Nano-
Pitch Digital
Connector

50 MHz, 8 port high-
speed parallel digital
interface

12.5 Gbps, 8 port
high-speed serial
multi-gigabit
transceiver (MGT)

Customized your VST with a User-Programmable FPGA



APPLICATION IP

Channelizer

Digital Pre-Distortion

RADAR Target Emulator

Power Servoing

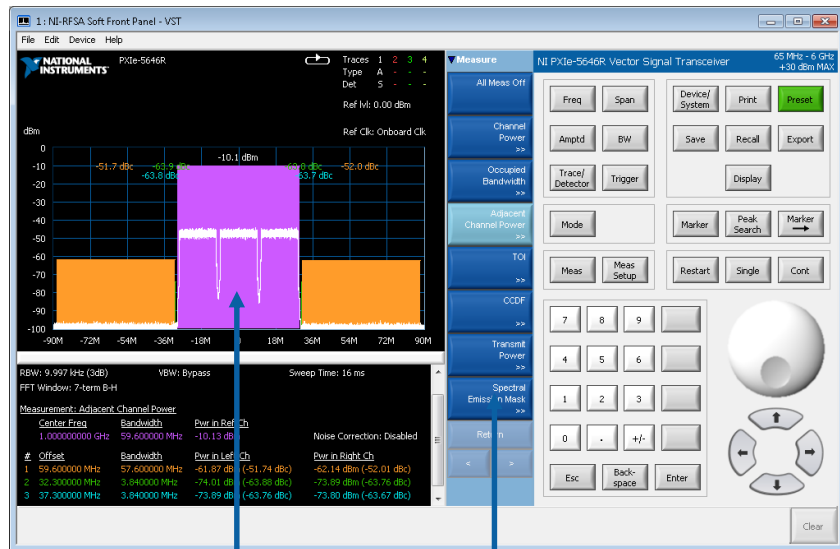
LTE Carrier Aggregation

Custom IP

- Use LabVIEW FPGA Extensions IP for measurement acceleration or DUT control
- Customize instrument firmware for advanced measurement applications

Interact with Soft Front Panels

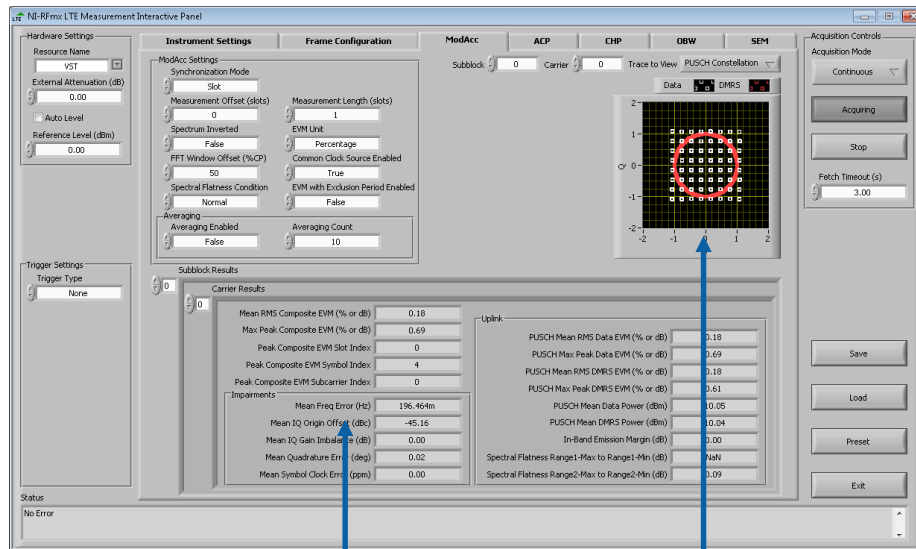
NI-RFSA Soft Front Panel *Virtual Spectrum Analyzer*



Measurements and
Spectrum Display

Configure
Measurement Settings

NI-RFmx Interactive Examples *For 2G to LTE Advanced*



LTE Measurement Results

LTE Constellation

Automate with RFmx

ACCURATE

High-performance measurements for LTE-A, WCDMA, GSM/EDGE, and more

Optimized measurement performance tailored to specific instrument capability

FAST

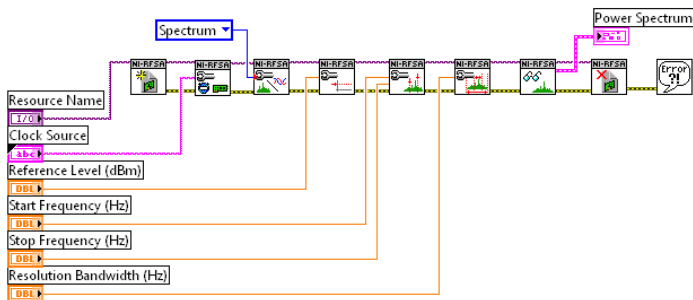
Industry-leading measurement speeds using the latest processor technologies

Easy-to-program multi-threaded measurements for test time reduction

SIMPLE

Measurement-centric API with single-session interoperability

Hundreds of automation examples in LabVIEW, C, and .NET

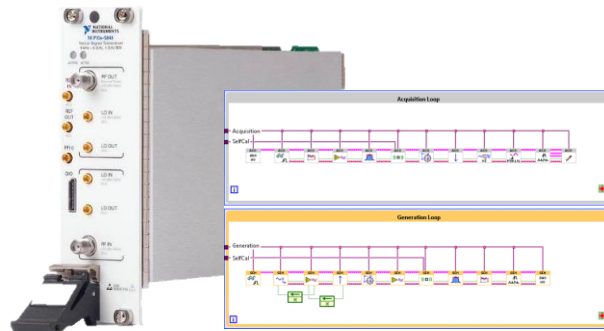
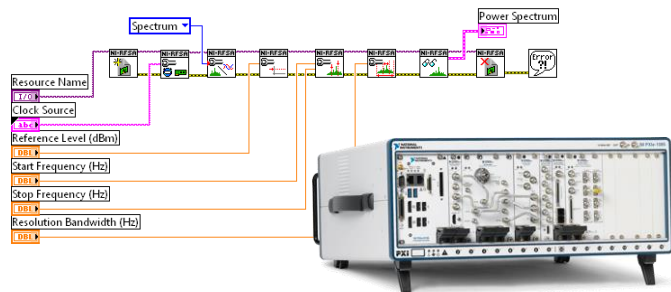


C/C++



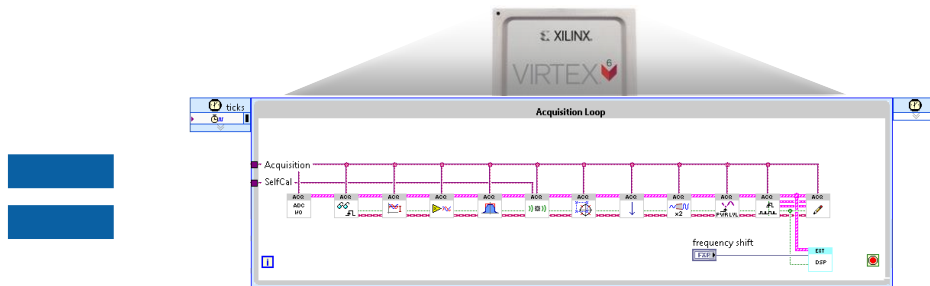
```
/* Create a new RFmx Session */  
instrSession = new RFmxInstrMX(resourceName, "");  
  
/* Get SpecAn signal */  
specAn = instrSession.GetSpecAnSignalConfiguration();  
  
/* Configure measurement */  
specAn.ConfigureRF("", centerFrequency, referenceLevel, externalAttenuation)  
specAn.Spectrum.Configuration.ConfigureSpan("", span);  
specAn.Spectrum.Configuration.ConfigureRbwFilter("", rbwAuto, rbw, rbwFilter)  
specAn.Spectrum.Configuration.ConfigureAveraging("", averagingEnabled, avera  
  
/* Retrieve results */  
specAn.Spectrum.Results.Read("", timeout, ref spectrum);
```

Customize with FPGA Extensions



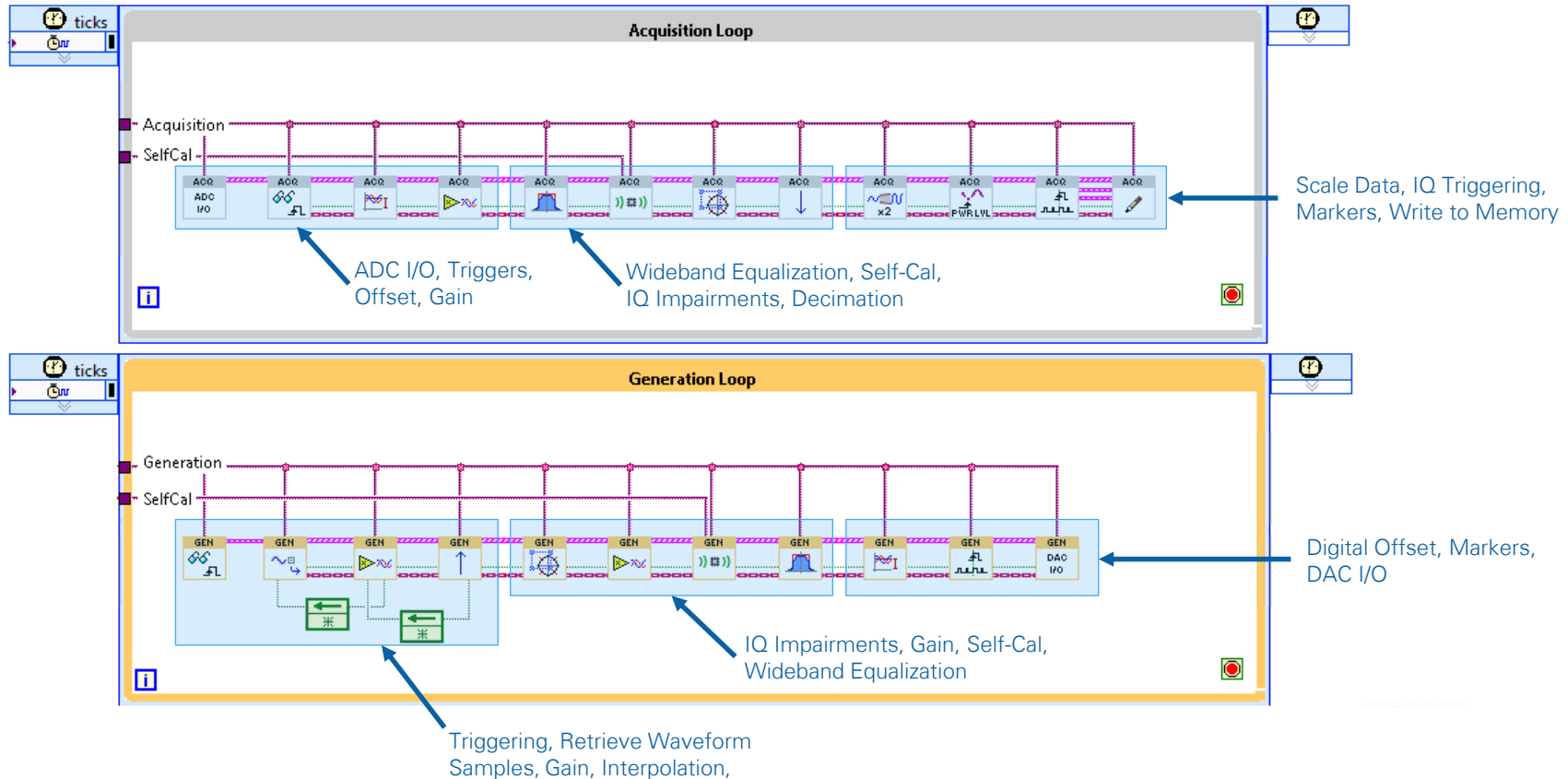
The **FUNCTIONALITY** of
industry-standard measurement software

The **FLEXIBILITY** of
LabVIEW programmable FPGA



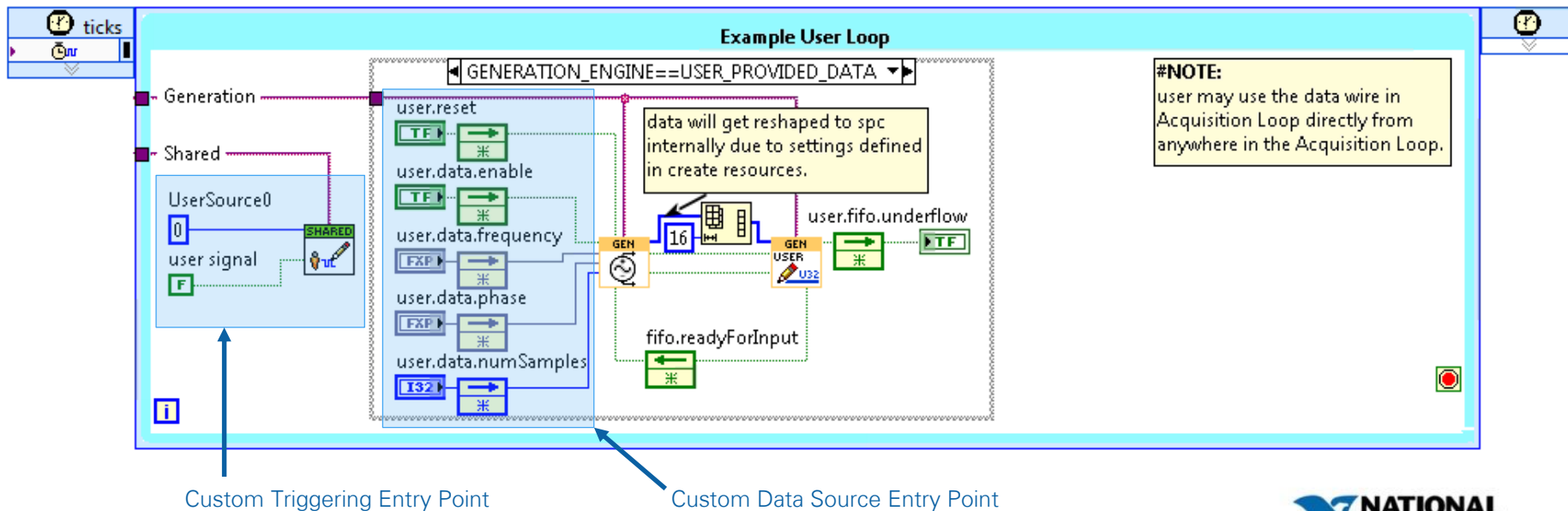
Instrumentation **TAILORED** for your application

Default Reference FPGA – RX and TX Data Loops



Default Reference FPGA – Example User Loop

- Example User Loop allows users to specify custom triggers and user provided data



Subtractive FPGA Extensions

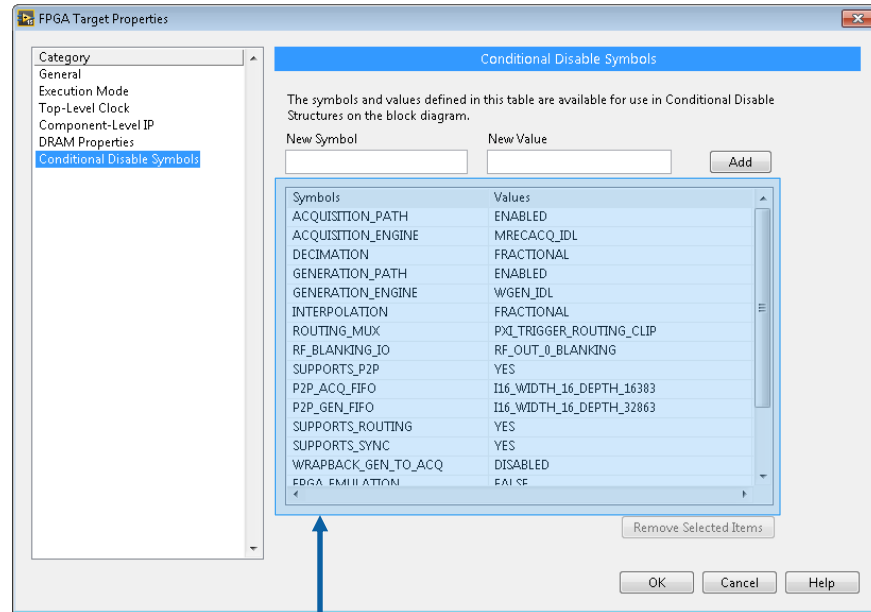
Subtractive FPGA extensions enable users to increase #available FPGA slices

Reports

Final device utilization (placement) ▼

Device Utilization	Percent
Total Slices	82.3
Slice Registers	35.5
Slice LUTs	46.8
Block RAMs	39.3
DSP48s	76.9

Default FPGA
Utilization: 82%



Disable specific functionality on
the Reference FPGA Image

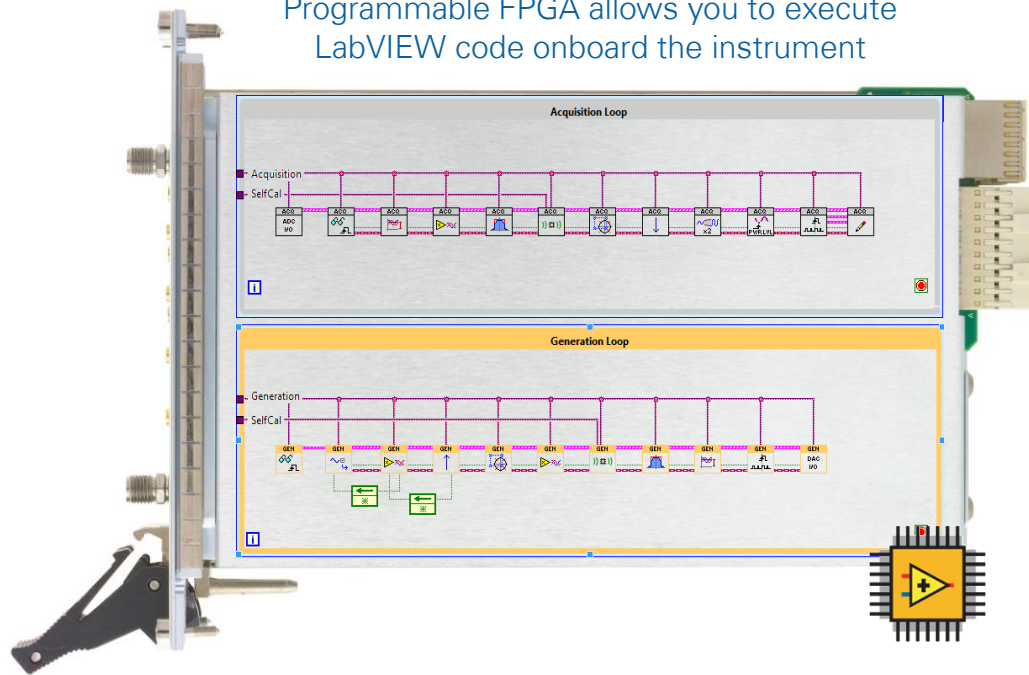
2nd Generation VST: PXIe-5840

Spec	PXIe-5840 Performance*
Frequency Range	9 kHz to 6.5 GHz
Max. Output Power	+23 dBm
Bandwidth	1 GHz
EVM	-50 dB (Loopback, external LO)
Tx/Rx Amp. Accuracy	± 0.35 dB / ± 0.3 dB
Tuning Time	10 us
Slots	2
FPGA	VIRTEX 7 690T
Digital I/O	50 MHz, 8 port high-speed parallel 12.5 Gbps, 8 port high-speed serial

*Preliminary specifications (6/13/16)

ni.com

Programmable FPGA allows you to execute LabVIEW code onboard the instrument



Applications For the 2nd Generation NI VST

ELECTRONIC WARFARE & RADAR



WIRELESS DEVICE TEST

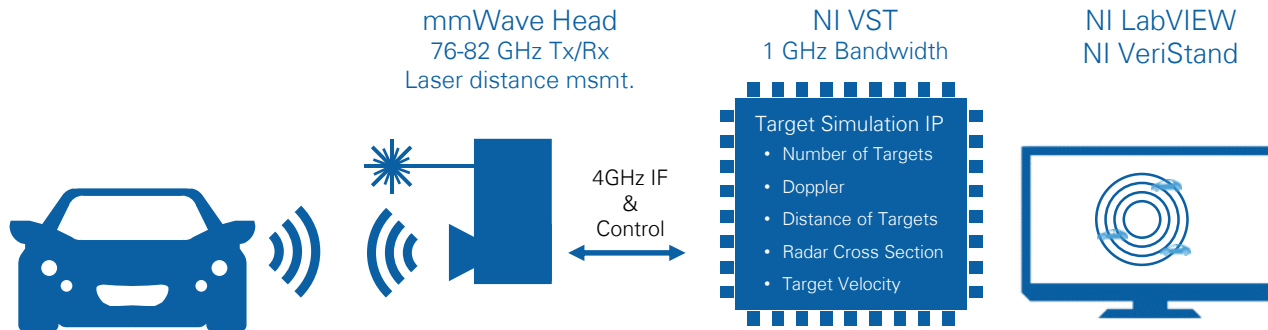


SEMICONDUCTOR TEST



Spectrum Monitoring
Record & Playback
Channel Emulator
Radio Production
5G Test
8x8 MIMO WLAN
Electronic Warfare
Software Defined Radio
Target Simulator
IoT Device Test
RADAR Prototyping
DPD Prototyping
Real-time DUT control
Power Servoing
Measurement Acceleration
Channel Sounding
Real-time Spectral Analysis
Channelizing
...

Automotive Radar Testing at 77 GHz



“The combination of the industry’s widest bandwidth and low latency software-designed instrument allowed us to discover our automotive radar sensors as never before, and even allowed us to identify problems very early in the design phase that were previously impossible to catch,” said Neils Koch, component owner radar systems, Audi AG. “With the VST and FPGA programmable by LabVIEW, we were able to rapidly emulate a wide range of diverse scenarios, thus influencing safety and reliability aspects in autonomous driving.”

Wireless Device Testing

Flexible PXI configurations enable up to 8x8 true MIMO in the same system



WTS supports up to 16 ruggedized ports in a single system based on 1st Gen VST



Same measurement IP for wireless standards ranging from GNSS to LTE to 802.11

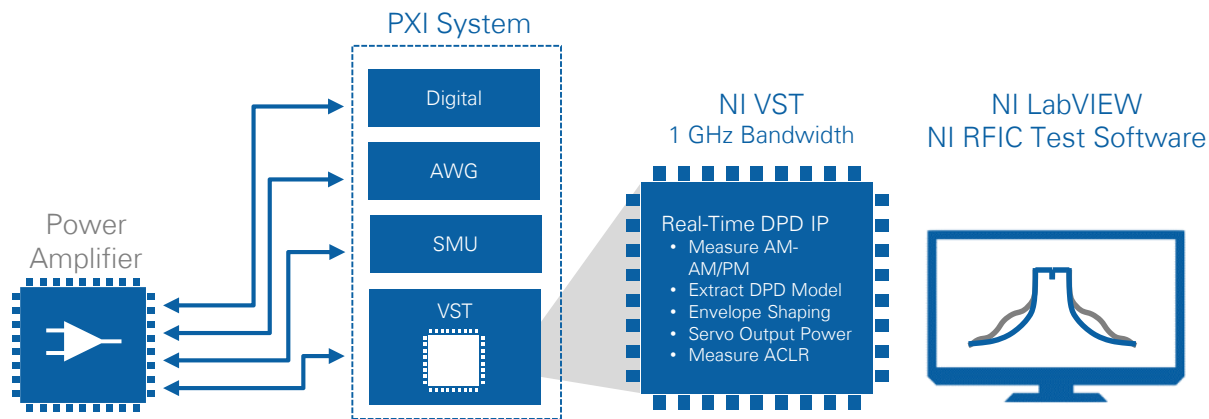
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林文生 / Lin Wun-Sheng, Technical Support Dept. Manager, Castlenet, Taiwan

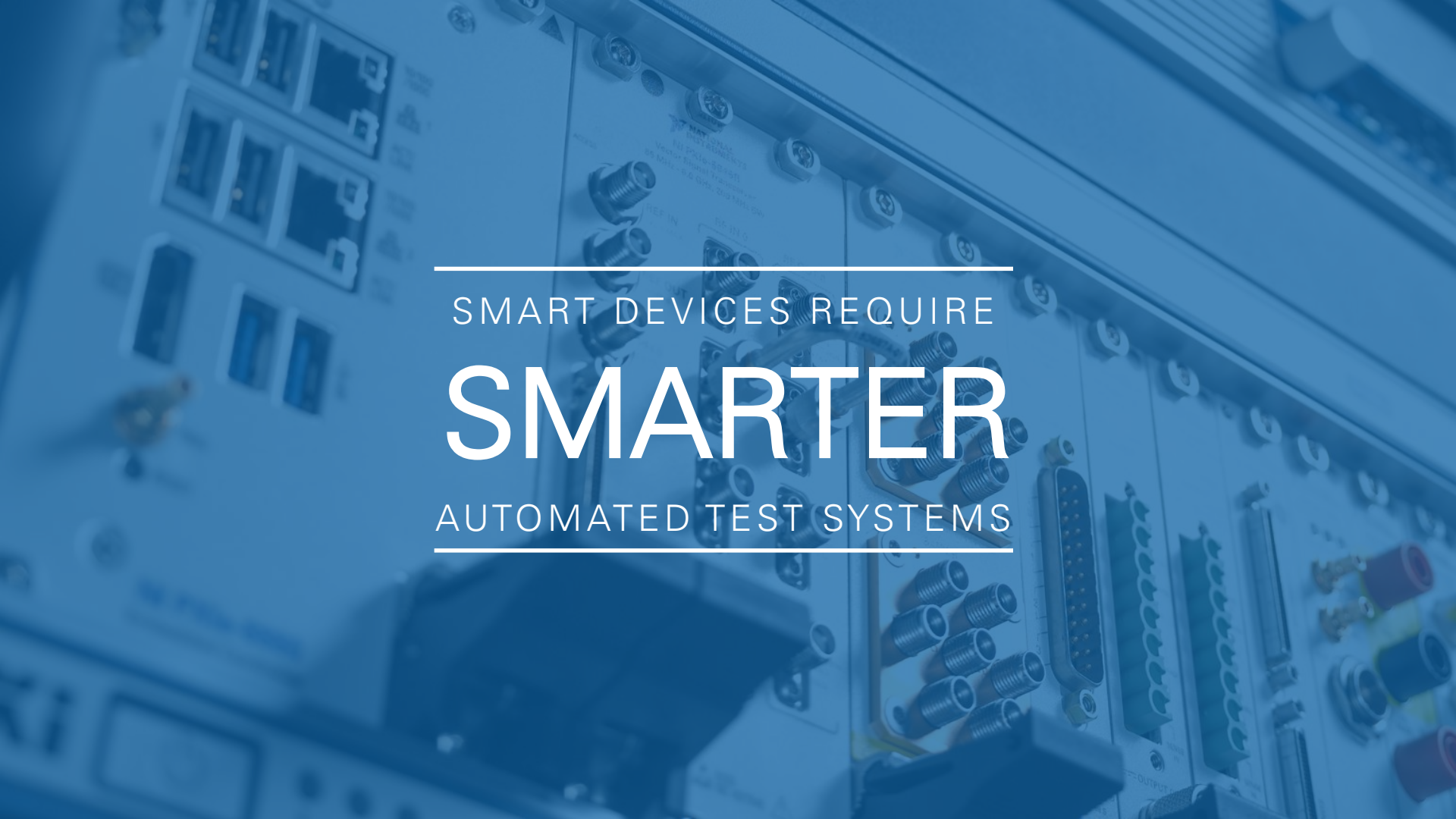
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盧豐裕 / Lu Feng-Yu, Executive Vice President, Arcadyan, Taiwan

Power Amplifier (PA) Testing with Real-Time DPD



“We were able to reduce manufacturing test time of Power Amp (PA) by 5 times compared to existing test system by using NI VST to implement power servoing on FPGA level.”

—New Product Introduction (NPI) Team, Broadcom



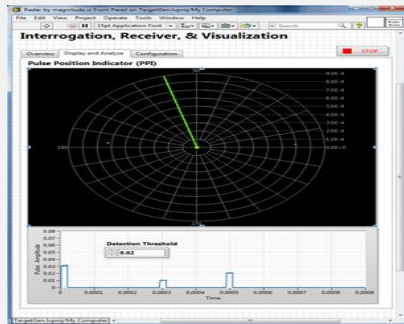
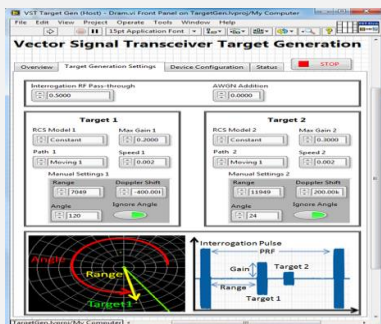
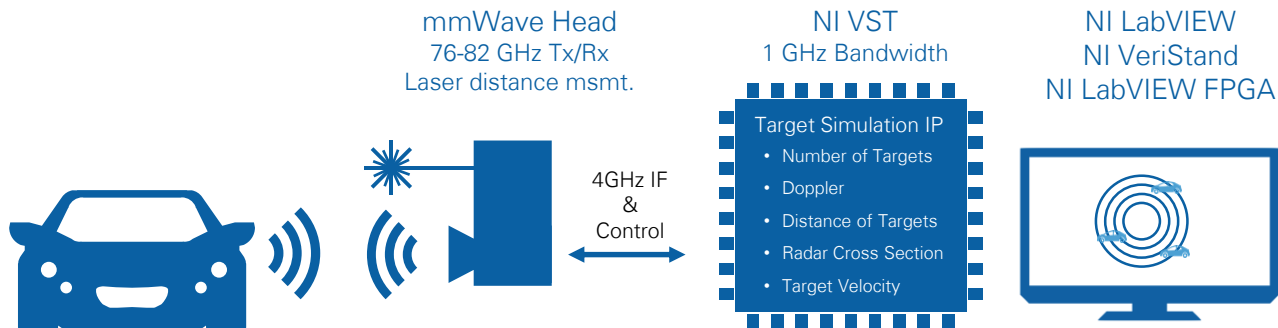
SMART DEVICES REQUIRE

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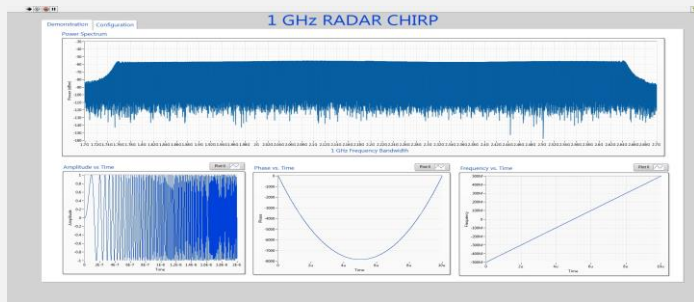
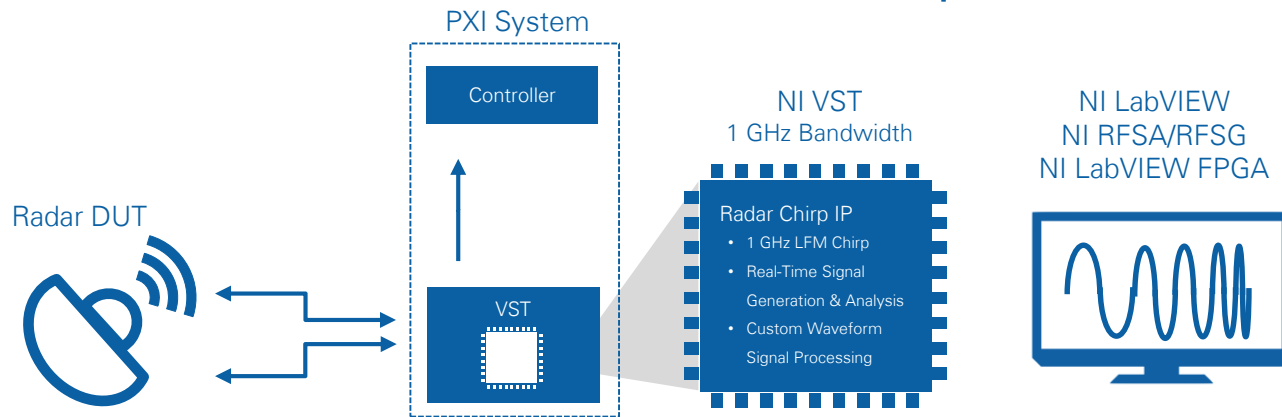
DEMOS

Radar Design and Test



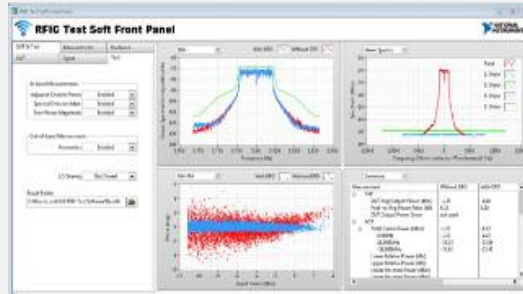
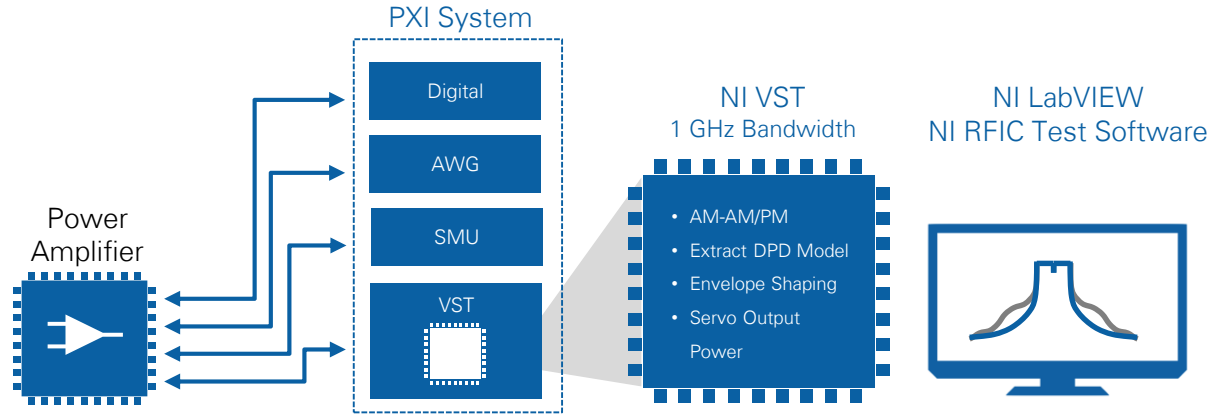
- FPGA-based emulation and host-based generation & analysis API
- Phase Coherent Radar Tx and Rx
- User configurable radar parameters such as # of targets, RCS, doppler-shift & range
- Resolve small changes in distance with wider bandwidth

Wideband Radar Chirp



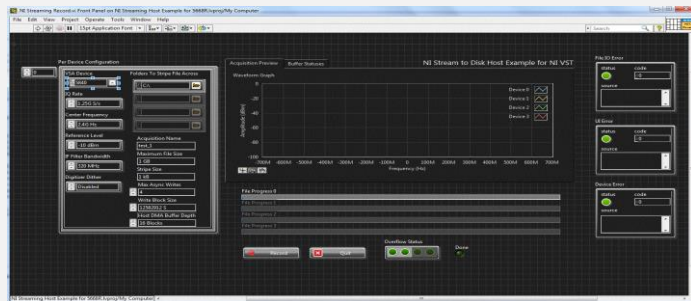
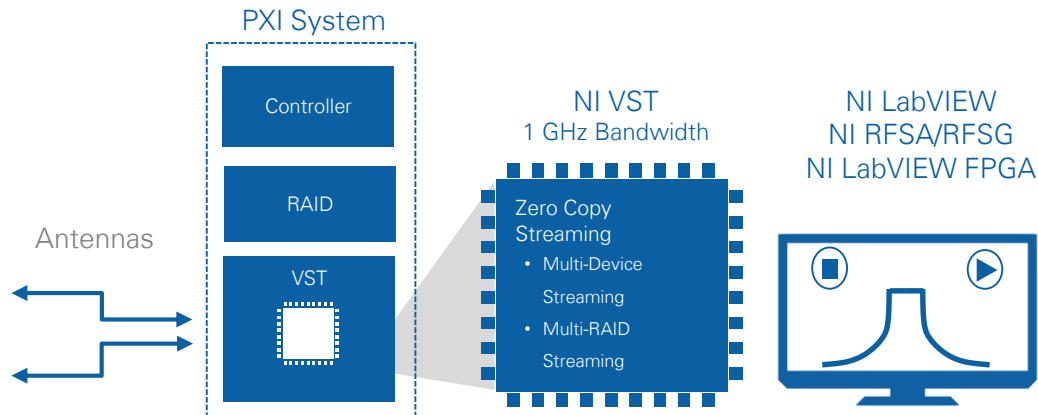
- 1 GHz wide bandwidth LFM chirp generation and analysis
- FPGA based signal processing
- Wideband equalization for amplitude and phase linearity
- This demo will scale to support FMCW library on VST 2

Power Amplifier (PA) Testing with Real-Time DPD



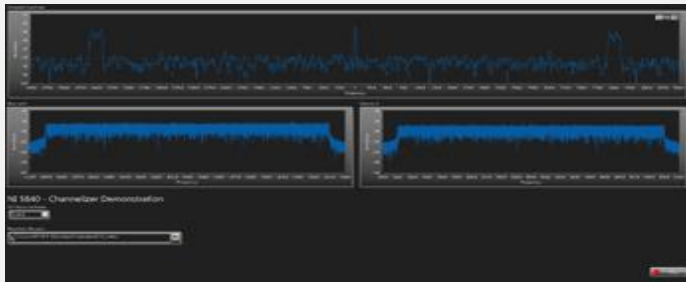
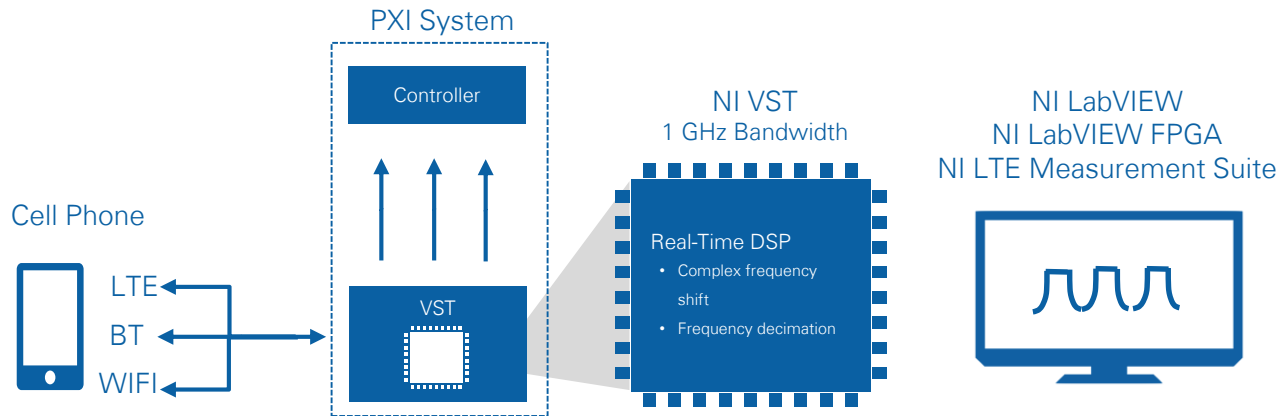
- Based on RFIC test software
- DPD examples for LTE and WLAN
- Faster test times with FPGA based accelerated measurements
- 3rd, 5th or 7th Order pre-distortion on 80MHz or 160 MHz WLAN signal

RF Record and Playback



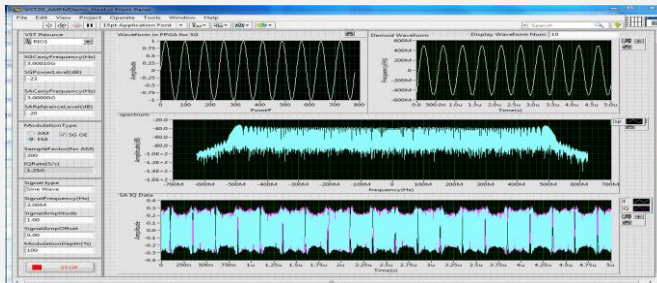
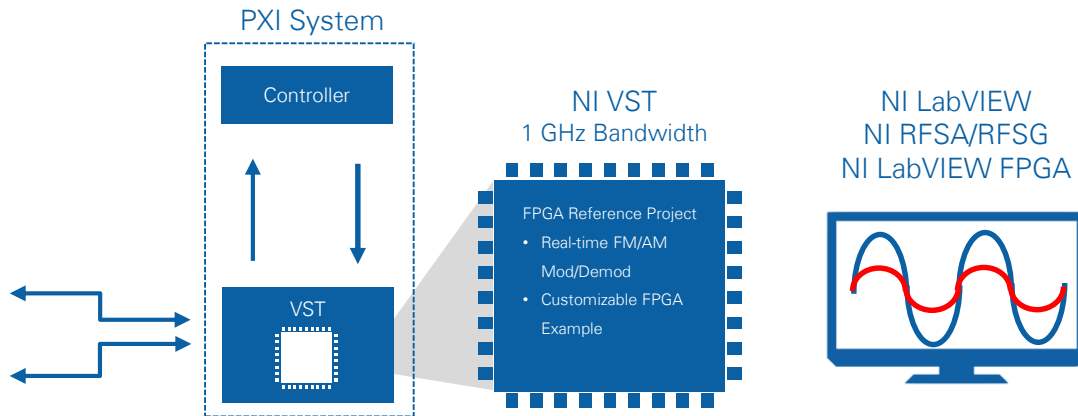
- Record and Playback up to 1 GHz of instantaneous BW with a single instrument
- Examples support streaming to N RAID volume simultaneously
- Analyze waveforms offline
- Stream 1 GHz BW from each of the 2 VSTs in 1085 Chassis @10GB/s to 2 SAS/SSD RAIDs

Multi-DDC Channelizer



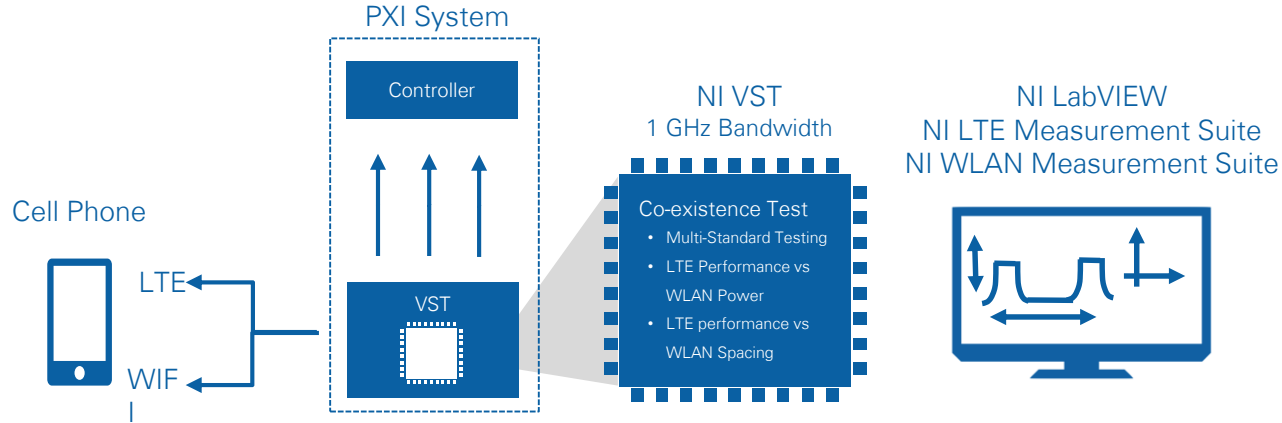
- Wideband signal acquisition of up to 1 GHz instantaneous bandwidth
- Individually configurable narrow channels
- FPGA based Multi-DDC channelization technique
- Future Support for DDC, Polyphase, PFT channelizer on FlexRIO

Customizable FPGA Mod/Demod



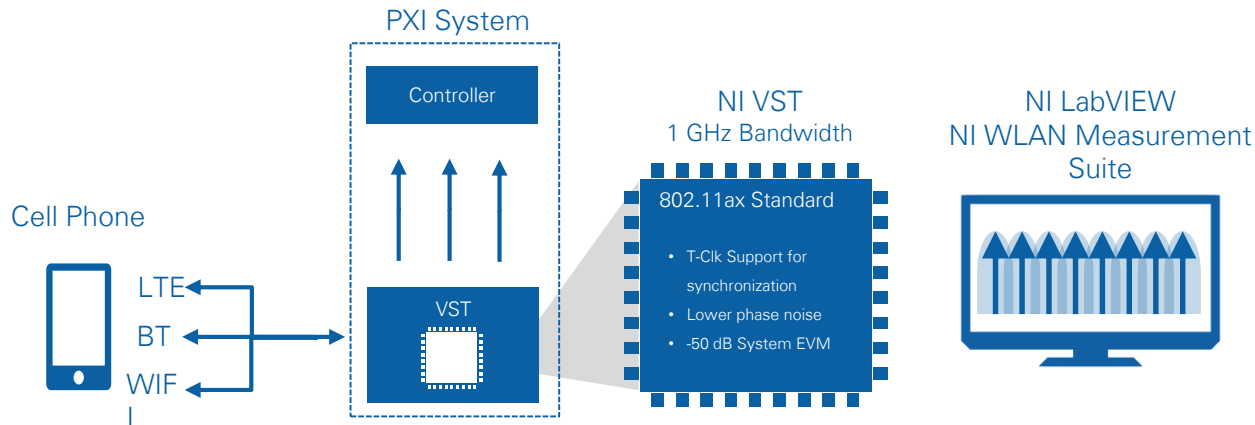
- Example program for FPGA based wideband modulation and demodulation
- Easy to use API with instructions for FPGA development
- Insert your custom code for mod/demo

Simultaneous LTE+WLAN Test



- Whole 2.4 and 5 GHz band coverage
- Multi-Standard Testing with software support
- Measure/Quantify the effects of one standard on the other in co-existence

WLAN 802.11ax Test



- Supports Multi-User OFDMA
- Superior EVM performance on 1024 QAM
- T-Clk Synchronization capabilities enabling 8x8 MIMO in a single chassis*