SOLUTION
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RFFE Validation Reference Architecture

Determine RFFE Design Performance Faster–from Interactive Bring-Up to Automated Validation

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A More Streamlined Validation Workflow for RF Front Ends

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Trends in RFFE Validation

The number of supported frequency bands and test cases for new wideband wireless standards, such as 5G New Radio (NR) and Wi-Fi 7 (802.11be), continues to grow. Simultaneously, the need for power amplifier design tradeoffs between greater power efficiency and higher linearity keeps driving exploration of innovative linearization and envelope tracking (ET) techniques.

NI's RF Front-End Validation Reference Architecture simplifies the workflow of engineers responsible for validating wideband RF power amplifiers (PAs) for demanding applications like 5G NR and Wi-Fi 7. On the hardware side, NI's portfolio of modular, lab-grade instrumentation and Focus Microwave's wideband tuners deliver scalable, tailored, and tightly integrated validation test benches.

With NI RFIC Test Software, specifically optimized for wideband wireless standards, engineers benefit from interactive control of validation benches and detailed results visualized in a streamlined workflow. The RFIC Test Software makes it easy to bring-up new DUTs, interact manually to validate DUT performance, and automate extensive device characterization routines.

RFFE Validation Reference Architecture Overview

Determine RFFE Design Performance Faster–from Interactive Bring-Up to Automated Validation

NI's RFFE Validation Reference Architecture can help:

- Quickly bring up new designs of the latest 5G NR and Wi-Fi RF front ends
- Determine key RF performance metrics in 50-ohm and non-50-**ohm** environments
- Explore best-in-class PA linearization with standard or custom digital pre-distortion (DPD) algorithms
- Configure extensive parameter sweeps with industry-leading speed
- Achieve accurate measurements with S-parameter calibration/de-embedding
- Lower the cost of test with integrated, modular, and scalable validation benches

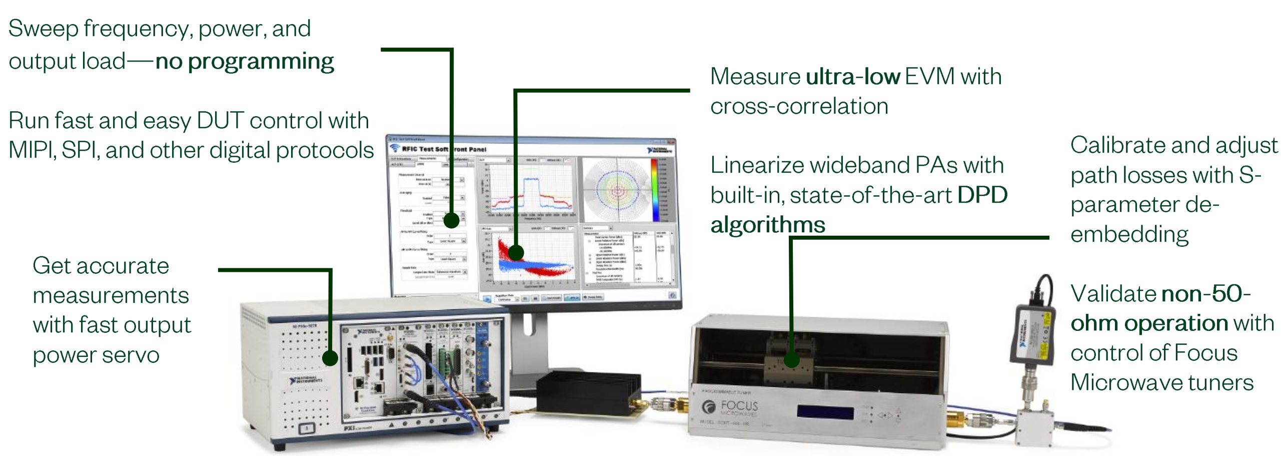


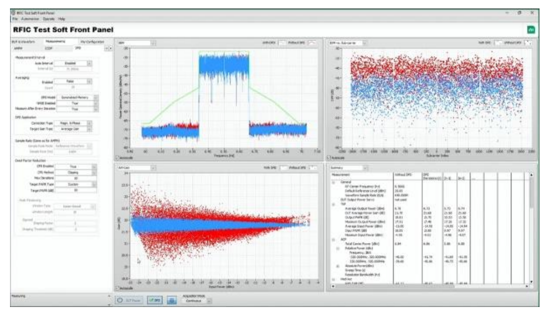
FIGURE 01 Overview of RFFE Validation System Components

Solution Details

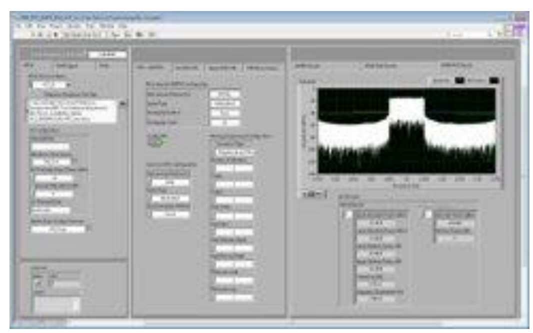
RFFE Validation Reference Architecture: A More Streamlined Validation Workflow

1. Configure a cost-optimized, modular bench with a combination of DC, AWGs, analog, digital, and RF instruments. Expand your bench later or upgrade your VST for more bandwidth and frequency if needed.

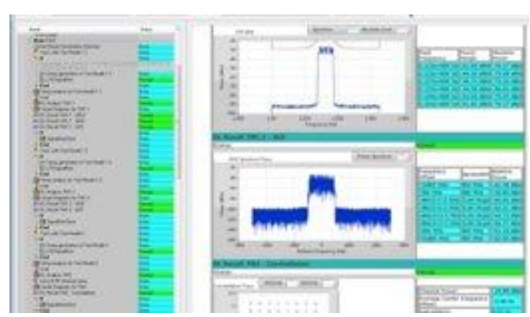
2. Control your bench from the intuitive graphical user interface (GUI) in the RFIC Test Software for fast and interactive bring-up of RF front ends. Configure frequency and power sweeps with no coding necessary.



3. Launch the Test Automation Wizard and instantly create easy-to-use code modules with NI's RF Reference Design Libraries in LabVIEW and .NET



4. Transition to extensive automated characterization with TestStand sample sequences, looping over multiple parameters, and producing valuable results reports.



System Architecture

NI's RFFE Validation Reference Architecture gives engineers control of modular PXI test bench hardware through powerful and integrated software. At the top level, the RFIC Test Software serves as a visualization tool and intuitive graphical user interface (GUI) for fast bring-up and manual interaction with the RF DUT.

Working in conjunction with the soft front panel, the RFFE Validation Reference Architecture includes an Automation Wizard with easy-to-use reference design libraries (RDLs)—and an array of code examples in LabVIEW and .NET—to empower engineers to run quick, automated tests on their DUTs.

In addition, the Automation Wizard creates TestStand example sequences that use these code modules to automate extensive PA testing and results reporting, looping through multiple nested parameters without having to write complicated test software.

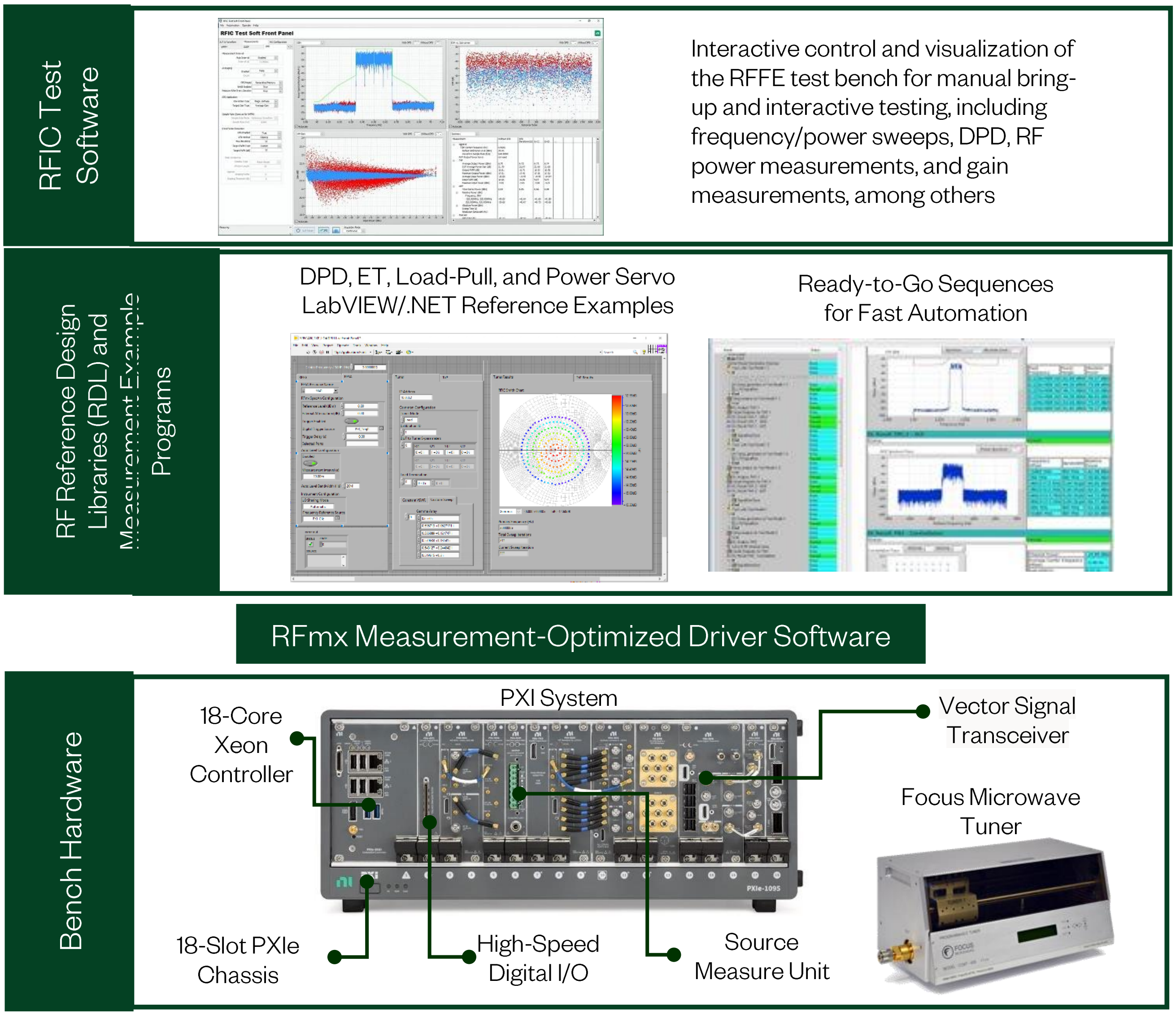


FIGURE 02 RFFE Validation Reference Architecture Software and Hardware Interaction

Linearization and DPD Overview

Linearization of wideband RF power amplifiers with digital pre-distortion (DPD) is a popular technique to correct for higher-order non-linearities, minimizing spectral regrowth and improving EVM. The RFFE Validation Reference Architecture performs all four key DPD operations: characterizing device behavior, model extraction, model inversion, and application of predistortion to baseband IQ samples.

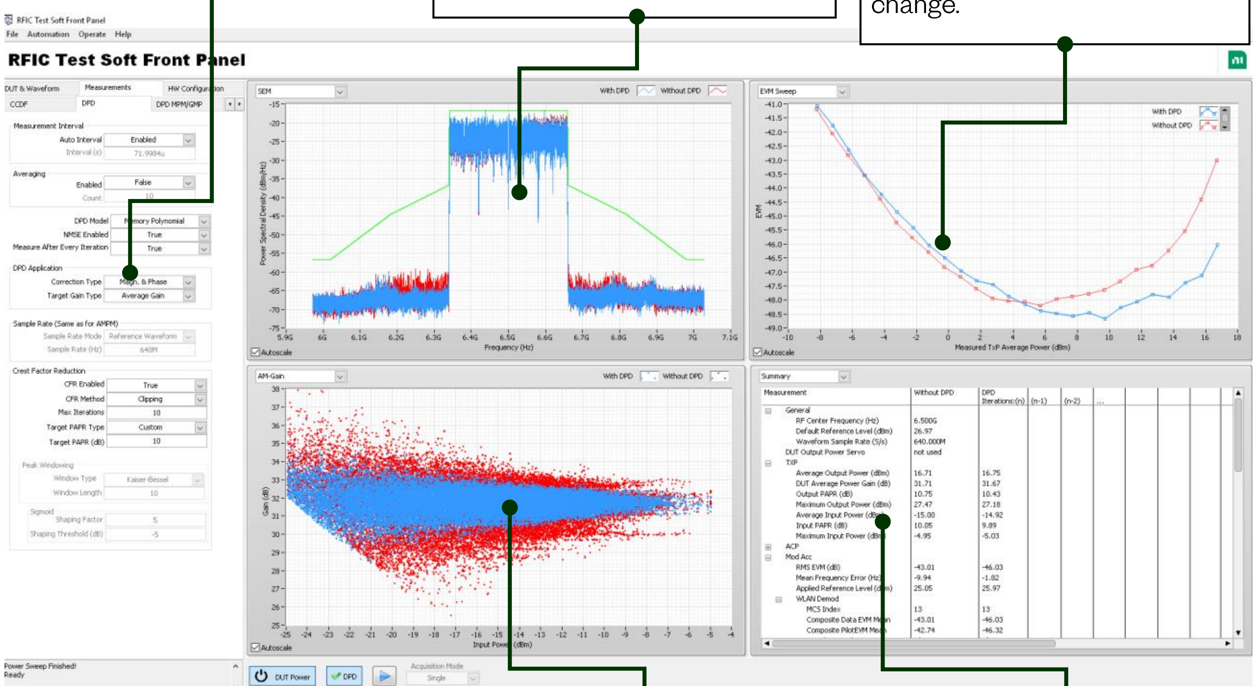
The RFIC Test Software allows you to apply DPD models and observe device behavior quickly and interactively. This solution supports both well-known DPD algorithms—lookup table (LUT), Memory Polynomial Model (MPM), and Generalized Memory Polynomial (GMP)—along with custom-implemented DPD models, such as custom MathWorks® MATLAB® software algorithms, Iterative Learning Control (ILC) DPD, AMD (Xilinx) DPD, or dual-band algorithms from MaxLinear (NanoSemi). With the ability to save DPD coefficients, users can quickly switch between different models for easy comparison and visualization.

Also included is an example code that empowers engineers with more control to automate device validation with DPD. Because these example programs use the same underlying measurement IP as the RFIC Test Software, users can more readily correlate results from the interactive and automated use cases.

Linearization Algorithms
Select from traditional or custom linearization implementations.

Performance Visualization
Observe single-and dual-band DPD improvements in ACP and modulation quality in real time.

Sweep Results
Configure frequency, power, and load sweeps to characterize DPD performance as conditions change.



PA Linearity Measurements
Observe gain, AM-AM, and AM-PM response of the PA, easily visualized both with and without DPD.

PA Performance Metrics
Obtain measurement results such as ACP, EVM, power, and RMS memory to characterize PA performance.

FIGURE 03

RFIC Test Soft Front Panel DPD Screenshot

Hardware Configuration

For DPD testing, the RFFE Validation Reference Architecture combines multiple instruments into a unified measurement experience that controls PXI Vector Signal Transceivers (VSTs), precision Source Measure Units (SMUs), and high-speed digital I/O for DUT control. The VST is a key element of the measurement configuration and combines a wideband RF signal generator and RF signal analyzer into one module. Tight synchronization between RF generator and analyzer enables accurate measurements of gain and AM-AM/PM using modulated waveforms.

The PXI platform takes advantage of the latest multicore processors to speed up processing of mathematically complex DPD algorithms. With bandwidth requirements often three to five times higher than the signal bandwidth for DPD, this can mean anywhere from 1,600 to 2,000 MHz bandwidth is required for the latest Wi-Fi 7 and 5G NR standards. With up to 2 GHz of instantaneous bandwidth, PXI Vector Signal Transceivers in combination with PXI Controllers can easily handle these high-demand applications.

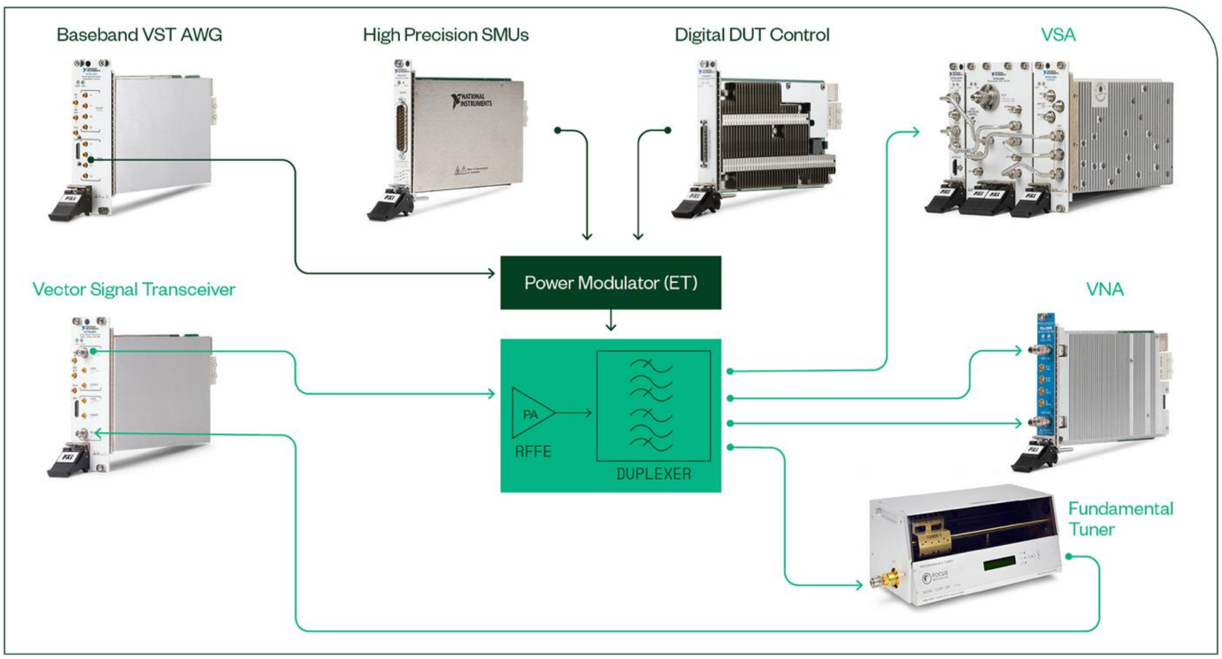


FIGURE 04

RFFE Validation System Diagram

DPD Solution Features and Specification

DPD Models

- NanoSemi single- and dual-band DPD
- Iterative Learning Control (ILC) DPD
- AMD (Xilinx) DPD
- Custom MATLAB algorithms
- Memoryless AM-AM/PM LUT
- Memory Polynomial Model (MPM)
- Generalized Memory Polynomial (GMP)

Supported Signal Types

- 5G NR: single carrier and carrier-aggregated
- 2G to 4G
- Wi-Fi (802.11a/b/g/n/ac/ax/be)

Measurements

- AM-AM/PM
- RF power and gain
- EVM per symbol/subcarrier
- ACP
- SEM
- RMS memory (phase)
- Harmonics
- Power-added efficiency

Iterative Learning Control (ILC) DPD Overview

ILC DPD is used to find the best possible performance of a given power amplifier (PA) under certain operating conditions. It can be used as benchmark performance to effectively validate the new DPD architectures. This method functions by refining the optimal PA input signal, driving the PA to the desired linear output response on a sample-by-sample basis. It also estimates DPD parameters using standard modeling approaches.

The benefits of this method include allowing for comparative measurements across devices, saving PA designers from having to sort out the influences of different DPD algorithms. It can also be used to generate labeled training data sets for modern (AI/ML based) DPD models.

Key Features

- Delivers best possible PA performance under given operating conditions
- Benchmarks performance to validate the new DPD architectures effectively
- Saves time and effort in comparing/evaluating influences of different DPD algorithms
- Can be used to generate labeled training data sets to train modern (AI/ML based) DPD models

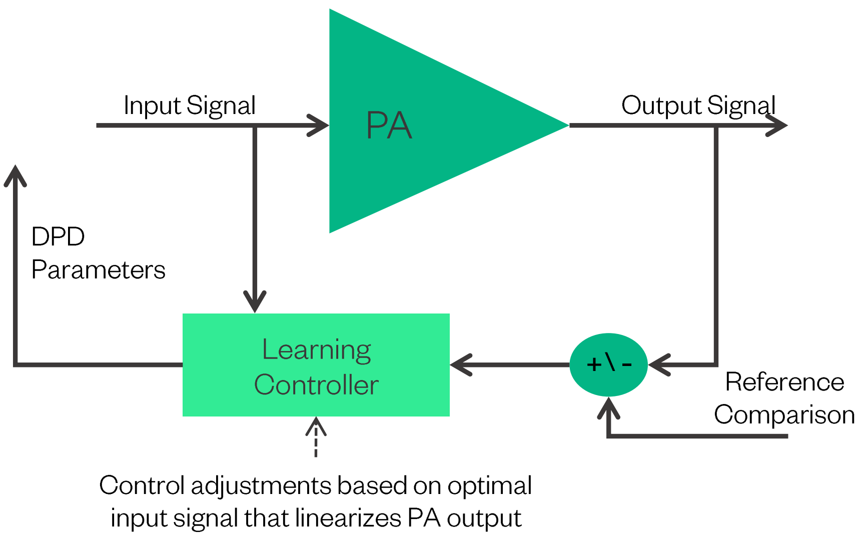


FIGURE 05

Iterative Learning Control (ILC) DPD Block Diagram

Load-Pull Overview

NI has partnered with Focus Microwaves to integrate control of their passive load tuners as part of the RFFE Validation Reference Architecture. All Focus Microwaves' tuners use extremely efficient calibration and tuning algorithms to produce consistent measurement results sweep after sweep.

Users can interactively adjust and sweep their tuner's reflection factor (complex gamma) directly from the RFIC Test Software as they visualize the amplifier's performance with the changing impedance. Additionally, users can automate their impedance sweeps and measurements from the code and test sequence examples included with the Automation Wizard.

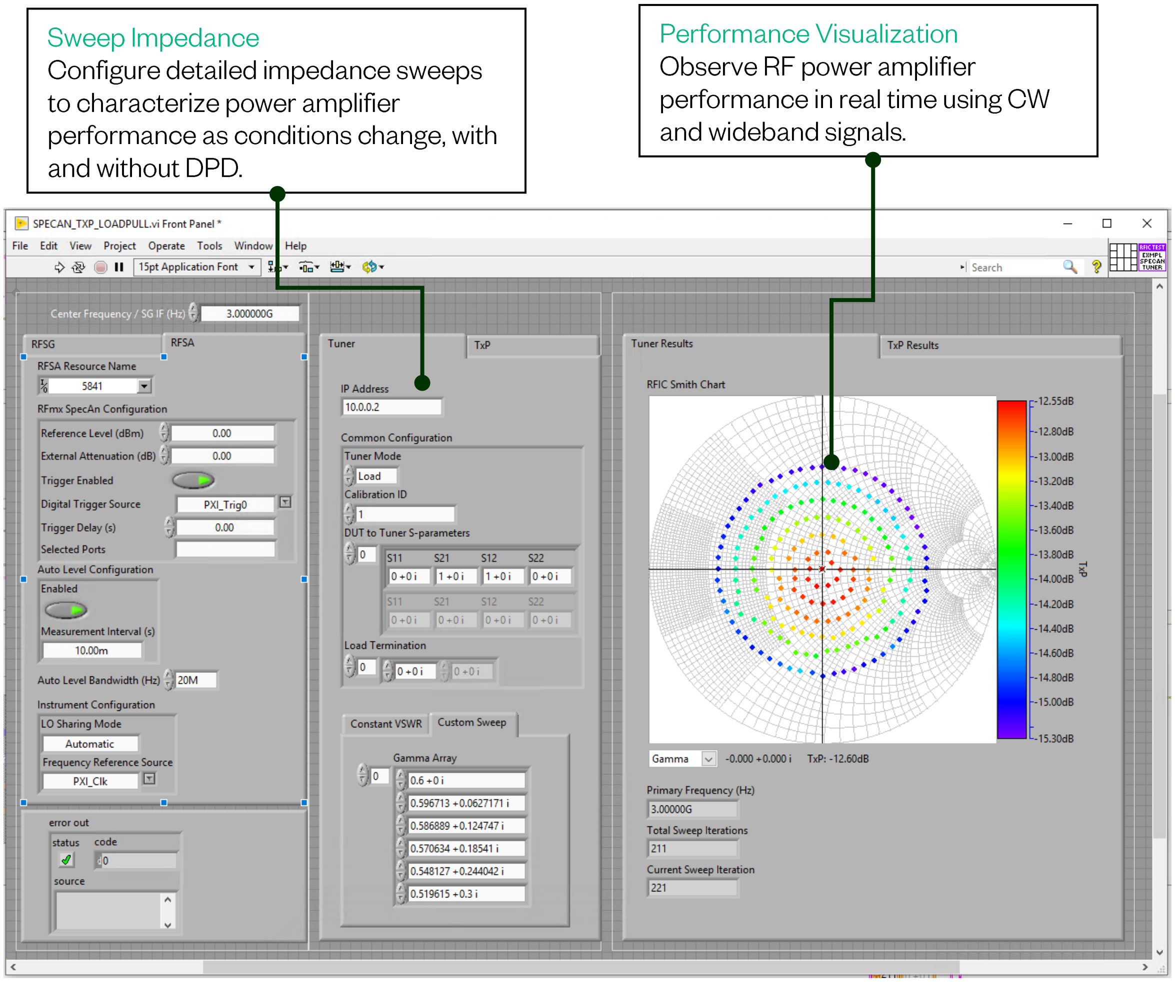


FIGURE 06

Load-Pull Example Code Screenshot

Load-Pull Solution Features and Specifications

- Scalar, pre-calibrated load pulling for highly repeatable generation of complex reflection factors
- Integrated control of various Focus Microwaves wideband, fundamental, passive tuners via Ethernet (TCP/IP) connection
- Multiple tuner impedance setting modes: motor position, gamma, and VSWR
- Smith chart, numerical visualization, and results logging
- Integration of bench calibration S-parameters

Envelope Tracking Overview

Envelope tracking (ET) for wideband power amplifiers relies on an ET Power Supply (ETPS) to vary the DC power supply dynamically in conjunction with the amplitude of a modulated wireless signal. ET keeps a PA near compression as often as possible, thus improving overall efficiency.

For ET testing, the NI RFFE Validation Reference Architecture transforms multiple instruments into an easy-to-configure, unified measurement experience that simplifies control and synchronization of the VST, a high-bandwidth arbitrary waveform generator (AWG), and high-speed digitizer. Used in conjunction with InstrumentStudio™ software, all instruments work together cohesively in an integrated ET test system.

The RFFE Validation Reference Architecture also features LabVIEW and .NET example code and ready-to-run automated test sequences that can be customized for extensive automated validation applications.

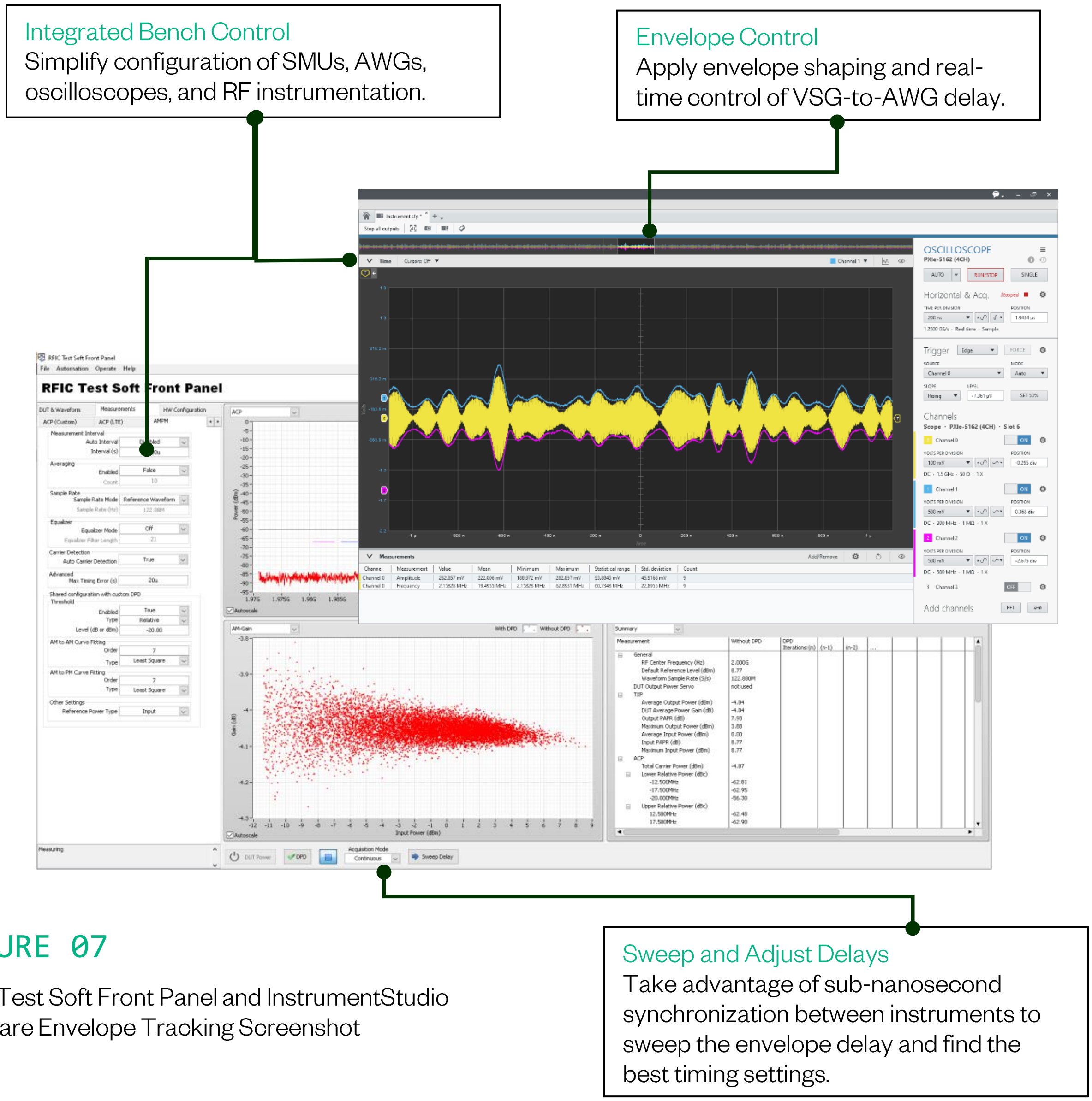


FIGURE 07

RFIC Test Soft Front Panel and InstrumentStudio Software Envelope Tracking Screenshot

Envelope Tracking Hardware Configuration

A critical challenge for ET PA testing is synchronization and stable alignment of RF and Vcc signals supplied by a vector signal generator (VSG) and arbitrary waveform generator (AWG). The RFFE Validation Reference Architecture is based on NI PXI instrumentation and features shared trigger and timing bus resources. This implementation minimizes synchronization jitter between RF and Vcc signals to less than 20 ps. In addition, by routing timing signals on the PXI backplane, these results are stable and repeatable. The software includes the NI Fast ET Align measurement, which rapidly estimates RF and Vcc alignment. Finally, the envelope tracking software can simultaneously apply DPD to the stimulus signal.

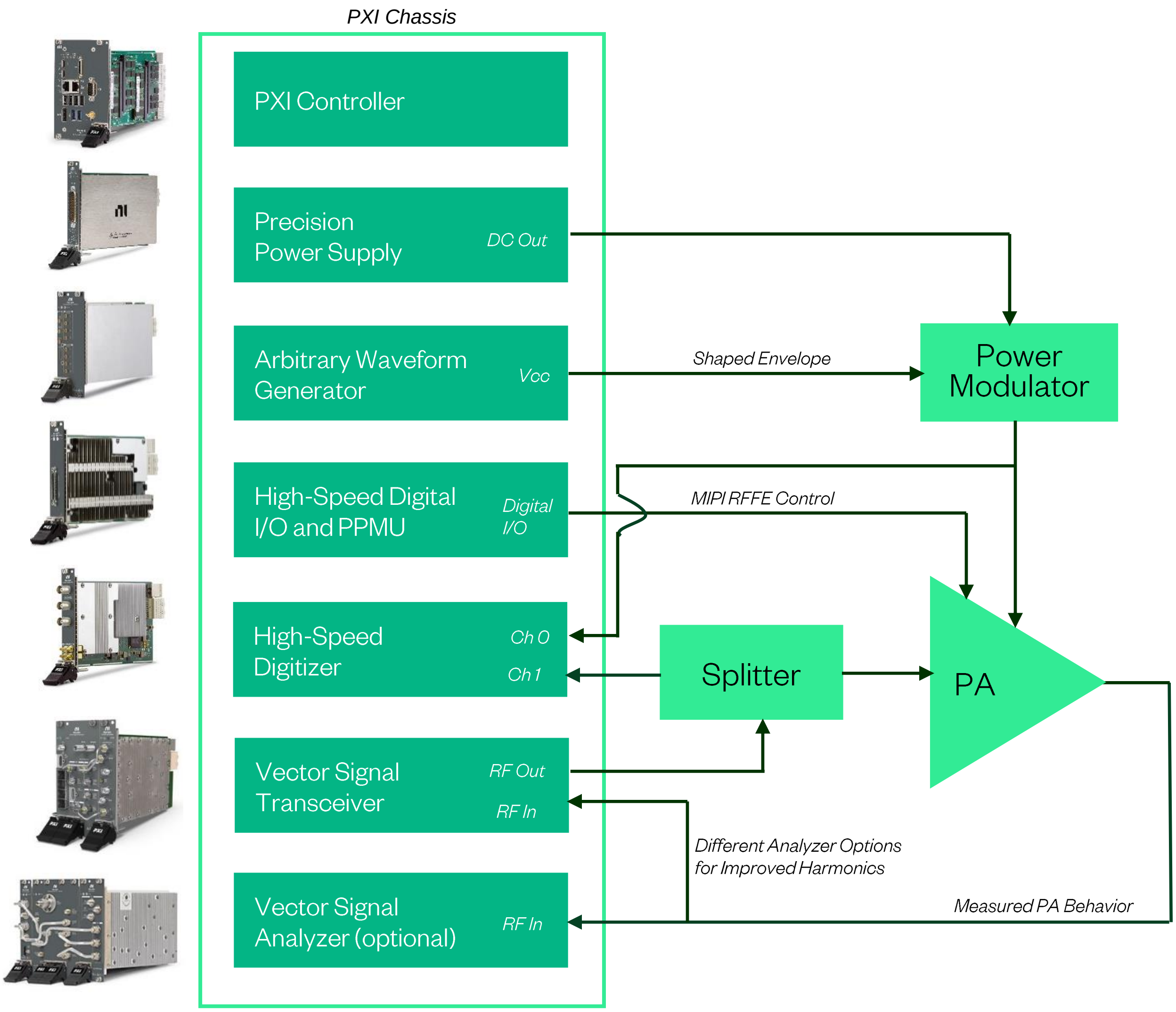


FIGURE 08 Envelope Tracking Diagram

Envelope Tracking Solution Features and Specifications

Synchronization

- AWG-to-VSG jitter: < 20 ps
- AWG-to-VSG skew resolution: 1 ns

Supported Signal Types

- 5G NR
- 2G to 4G
- Wi-Fi (802.11a/b/g/n/ac/ax/be)

Accelerated Test Times

The evolution of wideband wireless technologies and multimode power amplifiers is increasing the demands on automated validation and characterization of power amplifiers. Combining high-performance modular instruments with fast and reliable measurement software, the RFFE Validation Reference Architecture delivers accurate RF results with test times that are typically 5 to 10 times faster than traditional instruments.

Cross-Correlation for EVM Measurements

Cross-correlation for EVM measurements involves the use of two separate VSTs in parallel to compare the same signal through two distinct receiver paths. By removing the uncorrelated noise introduced by the receivers, cross-correlation allows for up to a 3 dB EVM measurement improvement over single channel configurations.

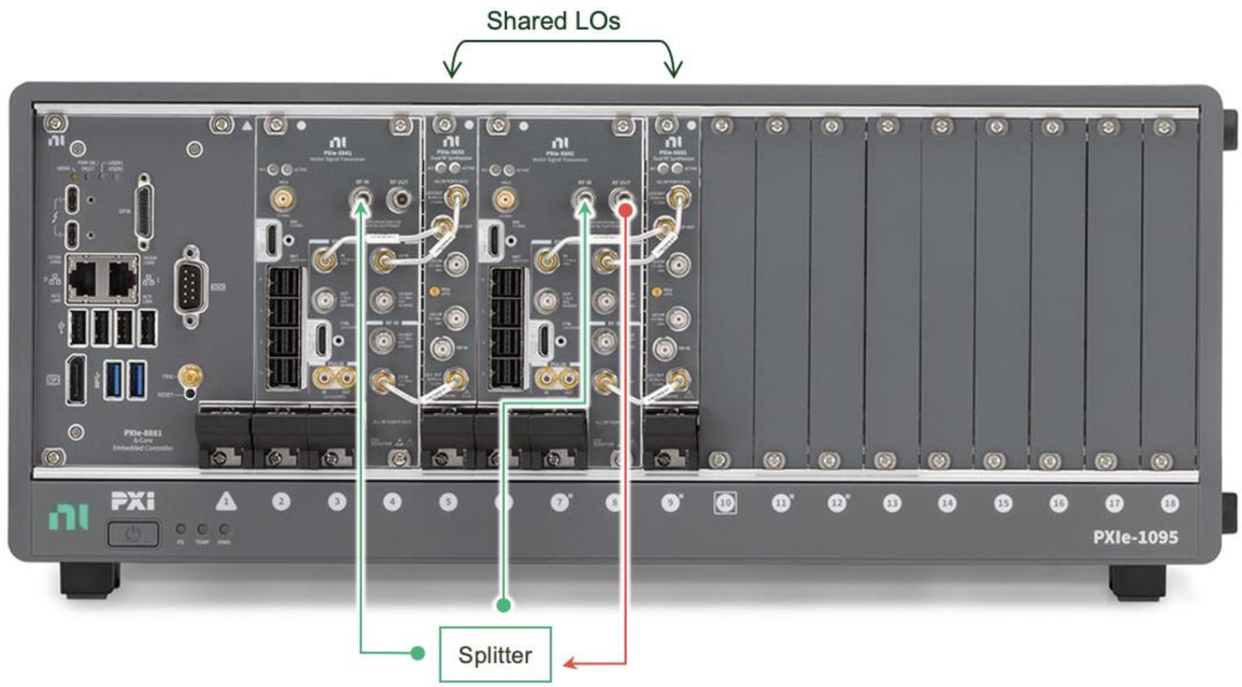


FIGURE 09 Cross-Correlation Connection Diagram with Two PXIe-5842 VSTs

Cross-Correlation for EVM measurement software IP is included with the professional version of RFIC Test Software. This measurement technique, combined with the PXIe-5842, allows for industry-best EVM measurement performance, allowing for ultra-precise validation of even the most technical challenging standards, such as Wi-Fi 7 and 5G NR.

Reliable Path Loss and Fixture Calibration with S-Parameters

The RFIC Test Software includes support for S-parameter calibration files, extracting magnitude and phase information to correct for path losses through every cable, fixture, and other signal paths.

From Mobile to Infrastructure RF Front Ends

The versatility of the RFIC Test Software means that base station infrastructure PAs, which often require external amplifiers and attenuators, are easily configurable. The RFIC Test Soft Front Panel comes with a built-in System Compensation Panel that intuitively lays out the gain/attenuation at each stage in the signal chain. This ensures no component is subject to higher power levels than it can handle, and that every component is tested under the correct conditions.

Fast Power Level Servo Technology

A unique benefit of the NI RFFE approach is the super-fast FPGA-based power level servo using NI VSTs. By performing the control loop entirely on the instrument FPGA, engineers can achieve very fast power level convergence. By decoupling the power level servo algorithm from the embedded controller and performing it on an FPGA, engineers can achieve significant reductions in validation time and cost. The RFIC Test Software also supports output power servo routines using USB power sensors coupled to the output load. The software automatically reads the power sensor and adjusts the level of the generated waveform to achieve the desired output power set point.

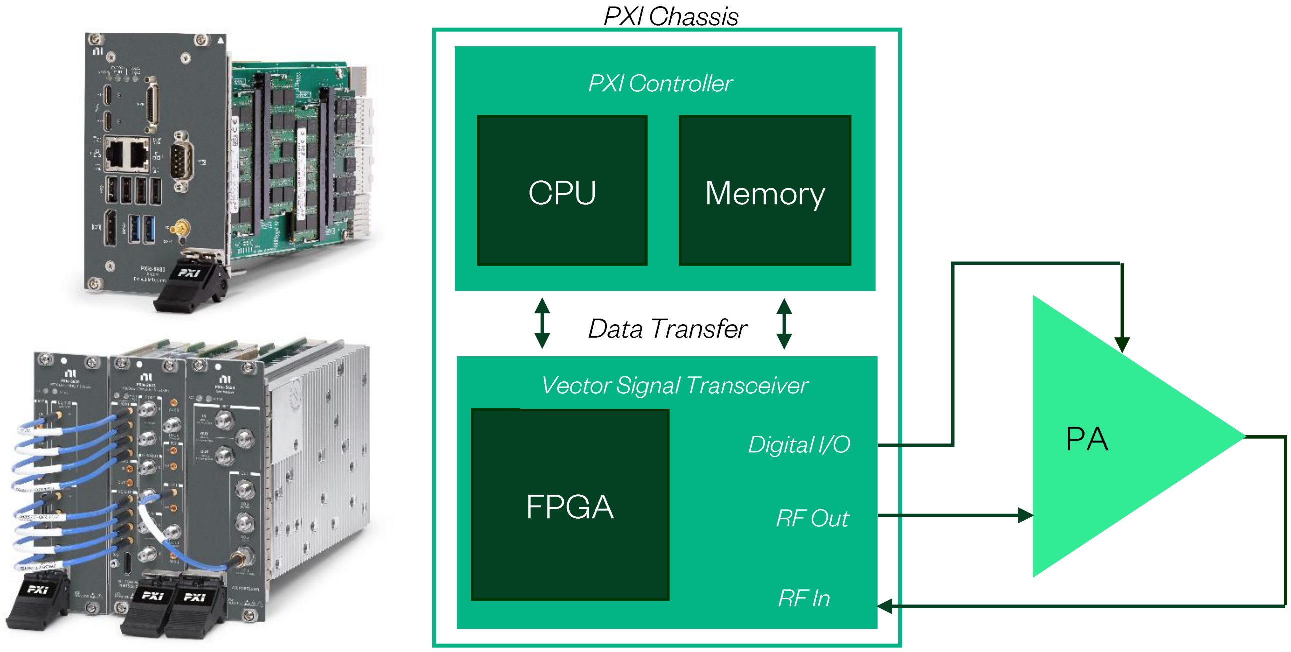


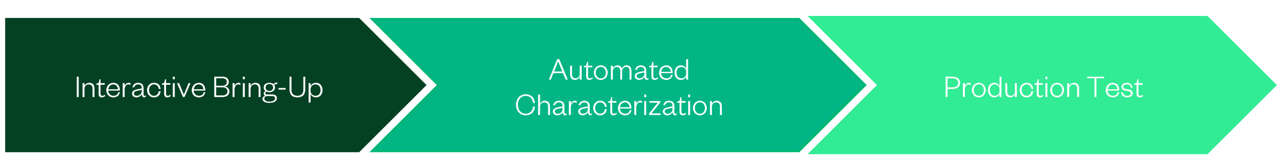
FIGURE 10

PXIe Power Level Servo Loop Diagram

From Characterization to Production Test

The openness and flexibility of the NI RFFE Validation Reference Architecture empowers engineering teams to transition test systems from the R&D lab to the manufacturing floor. This can be done by leveraging the initial engineering investment early in development, using the same type of instrumentation and measurement science for production test, and reducing the correlation efforts between the two. NI's combination of fast measurement speed and small physical footprint make it an ideal test solution for high-volume, high-throughput environments.

Additionally, NI PXI instruments use similar software tools to ensure a quick transition whenever a change needs to be made. The PXIe-5842 is integrated into the RFIC Test Software in a similar way as the PXIe-5841 and PXIe-5830/1—requiring no change to software and ensuring users with familiarity have a seamless experience using any vector signal transceiver.



Quickly validate PA behavior using instrument soft front panels or reference examples.

Automate PA/FEM characterization through easy-to-use example code and sequences.

Reuse test equipment and characterization software in manufacturing test.

Deploying PXI in Manufacturing Test

You can deploy PXI for manufacturing test either as a stand-alone system or as part of the NI Semiconductor Test System (STS). The STS combines the NI PXI platform with NI's speed-optimized test software for high test throughput inside a fully enclosed test head suited for production environments.

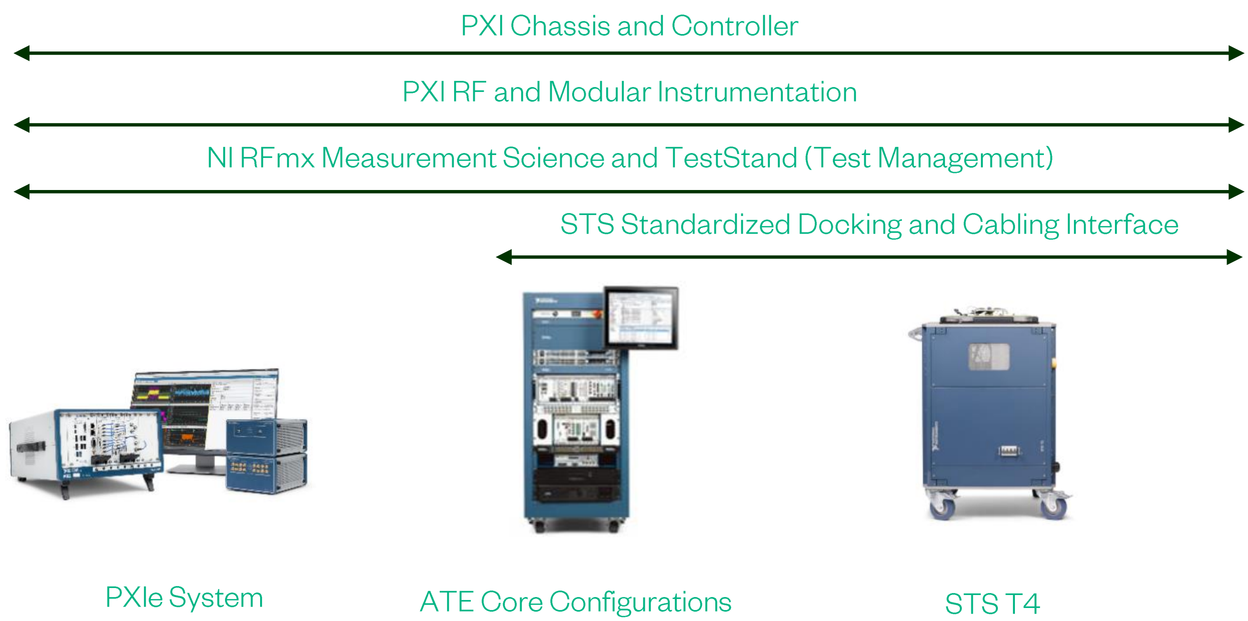


FIGURE 11 PXIe Platform across the Product Development Lifecycle

The STS enclosure houses all the key components of a production tester including test instruments, device under test (DUT) interfacing, and device handler/prober docking mechanics. With the open, modular STS design, you can take advantage of the latest industry standard PXI modules for more instrumentation and computing power to lower the overall cost of RFFE production test.

Hardware Specifications

Engineers can specify a modular combination of PXI instruments to complete their NI RFFE Validation Reference Architecture, going from the most basic, to more comprehensive setups with multiple, synchronized instruments. Simpler measurements of the most basic RF parameters might require only a PXI chassis, controller, and VST, while other configurations for envelope tracking call for additional instruments like arbitrary waveform generators, scopes, and SMUs.

The RFFE Validation Reference Architecture is scalable to meet the exact needs of your application.

PXI Vector Signal Transceivers

NI's VSTs combine an RF vector signal generator (VSG) and RF vector signal analyzer (VSA) with a powerful FPGA into a single PXI instrument. The combination of wide bandwidth and high-quality RF measurement performance makes the NI VSTs an ideal solution for RF power amplifier testing of sub-8 GHz and mmWave front-end modules.

The third generation VST, the PXIe-5842, brings much improved measurement capabilities and new features applicable in a wide range of RF applications. Among the new capabilities are best-in-class EVM performance (802.11be, <-50 dB), enhanced LO Offset mode with improved average noise density, continuous frequency coverage up to 23 GHz, and up to 2 GHz of instantaneous RF bandwidth.

PXIe-5842 Vector Signal Transceiver	
Frequency Range	30 MHz–26.5 GHz
Instantaneous Bandwidth	Up to 2 GHz
Channels	RF In RF Out
EVM (Wi-Fi 6 80 MHz, Loopback @ 6 GHz)	-56 dB
EVM (5G NR 100 MHz, Loopback @ 5.5 GHz)	-58 dB
EVM (5G NR 100 MHz, Loopback @ 28 GHz)	-44 dB
VSG Maximum Output Power (CW @ 5 GHz)	+20 dBm
Tuning Time	230 µs
Slots	4–6

PXIe-5831 mmWave VST	
Frequency Range	5 GHz–21 GHz
Bandwidth	1 GHz
Channels	Up to 32 In/Out (Switched)
EVM (Wi-Fi 6 80 MHz, Loopback @ 6 GHz)	-50 dB
EVM (5G NR 100 MHz, Loopback @ 5.5 GHz)	-51 dB
EVM (5G NR 100 MHz, Loopback @ 28 GHz)	-44 dB
VSG Maximum Output Power (CW @ 5 GHz)	+12 dBm
Tuning Time	See Specifications
Slots	4–6
Frequency Extension	Yes, up to 44 GHz

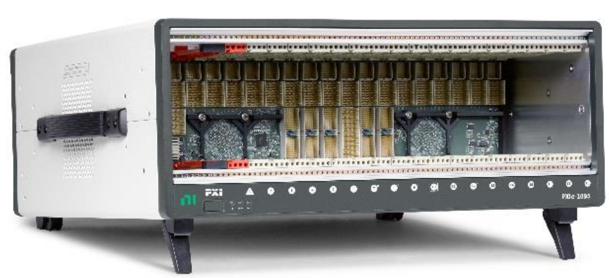
PXI-5842 with 54 GHz Frequency Extension	
RMM-5585 RF In/Out Frequency Range	22.5 GHz–54 GHz
PXIe-5543 RF In/Out Frequency Range	200 MHz–23 GHz
Bandwidth	2 GHz
RF In/Out Amplitude Accuracy (23.5–50 GHz)	±1.3 dB/±1.5 dB typ
RF In/Out Frequency Response (23.5–50 GHz)	±1.4 dB/±1.2 dB typ
EVM (5G NR FR-2) 1CC, 100 MHz Loopback, Measured @ 28 GHz	-44 dB
Maximum Leveled Output Power (28 GHz)	+10 dBm typ

PXIe-5820 Baseband VST	
Frequency Range	0–500 MHz
I/Q Bandwidth	1 GHz
Max Sample Rate	1.25 GS/s
Common-Mode Accuracy	±2 mV

PXIe-6570/1 High-Speed Digital	
Data Rate	200 Mb/s
Pattern Timing	39.0625 ps Placement
Voltage Range	-2 V–7 V

PXIe-4147 Precision SMU	
Channels	4
Maximum Continuous Power	±8 V, 3 A, 24 W
Transient Response	< 50 µs

PXIe-8881 Embedded Controller	
Processor Core	Xeon 18-Core
Controller Bandwidth	24 GB/s
Hard Drive Memory	512 GB



PXIe-1095 Chassis	
PXI Express Slots	18
Total System Bandwidth	24 GB/s
Total Power Rating	1,644 W (Dual Supply)

RFFE Validation Configuration Options

Connectivity Test Reference Solutions

Reference Solution Base Configurations

Solution Name	Part Number	Description
Wi-Fi and Bluetooth Test Reference Solution[1]	866573-01B	Wi-Fi and BT, 30 MHz–8 GHz, 1 GHz BW, 9-Slot Chassis, Controller, 4 Additional PXI Slots
	866573-02B	Wi-Fi and BT, 30 MHz–26.5 GHz, 2 GHz BW, 9-Slot Chassis, Controller, 4 Additional PXI Slots
	866573-10B	Wi-Fi and BT, 30 MHz–8 GHz, 1 GHz BW, 18-Slot Chassis, Controller, 13 Additional PXI Slots
	866573-12B	Wi-Fi and BT, 30 MHz–26.5 GHz, 2 GHz BW, 18-Slot Chassis, Controller, 13 Additional PXI Slots
Wi-Fi, Bluetooth, and UWB Test Reference Solution[1]	866573-03B	UWB, 5–12 GHz, 1 GHz BW, 9-Slot Chassis, Controller, 4 Additional PXI Slots[2]
	866573-04B	Wi-Fi, BT, and UWB; 9 kHz–12 GHz; 1 GHz BW; 9-Slot Chassis Controller[2]
	866573-17B	WLAN, BT, and UWB; 30 MHz–12 GHz VST; 2 GHz BW; 18-Slot Chassis; Controller[2]
	866573-19B	WLAN, BT, and UWB; 30 MHz–26.5 GHz VST; 2 GHz BW; 18-Slot Chassis; Controller[2]
	866573-20B	UWB, 5–12 GHz, 1 GHz BW, 18-Slot Chassis, Controller, 13 Additional PXI Slots[2]
	866573-21B	Wi-Fi, BT, and UWB; 9 kHz–12 GHz; 1 GHz BW; 18-Slot Chassis; Controller; 9 Additional PXI Slots[2]

[1] Wi-Fi/Bluetooth/UWB reference solutions use the PXIe-5841, PXIe-5842, and PXIe-583x VSTs. Refer to specifications for more information.
[2] Ultra-wideband (UWB) test applications require separate software independent from RFIC Test Software. Please include the UWB Test Toolkit for UWB test applications.

Base configurations provide everything you need to build a test system from scratch for a given wireless standard. Whether for Wi-Fi, Bluetooth, Ultra-wideband, or a combination of all three, all options listed include the PXI instrumentation needed to set up a fully functioning test bench.

The PXI chassis included in the bundles are either the PXIe-1095 (timing and synchronization option, 18 slots) or the PXIe-1092 (timing and synchronization option, 9 slots). The controllers included are the PXIe-8881 (8-core, Windows 10). For further assistance choosing configurations, please reach out to your account manager, distributor, or contact NI.

Reference Solution Optional Add-Ons

Option Name	Part Number	Description
Additional RF Channels—General Purpose	866573-31P	30 MHz–26.5 GHz, 2 GHz BW (PXIe-5842)
	866573-32P	30 MHz–12 GHz, 2 GHz BW (PXIe-5842)
	866573-33P	30 MHz–8 GHz, 1 GHz BW (PXIe-5842)
Additional RF Channels—UWB[1]	866573-10P	UWB, 5–12 GHz VST (PXIe-5830)
	866573-12P	9 kHz–21 GHz with Switch (PXIe-5831, PXIe-5841, PXI-2599)
	866573-24P	9 kHz–12 GHz, Low-Phase Noise with Switch (PXIe-5831, PXIe-5841, PXIe-5655, PXI-2599)
Switching	866573-05P	Dual SPDT Switch 26 GHz (PXI-2599)
Baseband	866573-06P	Baseband VST, 0–500 MHz, 1 GHz BW (PXIe-5820)
DC Power	866573-07P	8 V 3 A Precision SMU 4 Channels (PXIe-4147)
Digital DUT Control	866573-08P	100 MHz Pattern Digital with PPMU 32 Channels (PXIe-6571)
Accessories	Contact NI	Power Cord (by Region)
	786300-01	Upgrade/Replacement Power Supply for PXIe-1092 or PXIe-1095
	Contact NI	Software: RFmx (Various Personalities), RFIC Test Software, UWB Test Toolkit
	960680-301	Standard Service Program for Systems with Traceable Calibration

[1] Wi-Fi/Bluetooth/UWB reference solutions use the PXIe-5841, PXIe-5842, and PXIe-583x VSTs. Refer to specifications for more information.

To add multiple RF channels or include analog, digital, or DC instrumentation, select from the part numbers above to fully customize test requirements to a given application.

For existing test benches, choose the options above to add functionality to your test bench. Software is not included as part of the bundles and must be added separately.

Cellular Test Reference Solutions

Reference Solution Base Configurations

Solution Name	Part Number	Description
Cellular Test Reference Solution	868108-01B	Cellular, 30 MHz–8 GHz VST, 1 GHz BW, 18-Slot Chassis, Controller
	868108-02B	Cellular, 30 MHz–18 GHz VST, 2 GHz BW, 18-Slot Chassis, Controller
	868108-03B	Cellular, 30 MHz–26.5 GHz VST, 2 GHz BW, 18-Slot Chassis, Controller
	868108-04B	Cellular, 9 kHz–6 GHz VST, 1 GHz BW with Low-Phase Noise LO, 18-Slot Chassis, Controller
	868108-05B	Cellular, 9 kHz–6 GHz VST, 1 GHz BW, 18-Slot Chassis, Controller
Cellular Full Test Solution	868108-06B	Cellular, 30 MHz–26.5 GHz VST, 2 GHz BW, 18 GHz RF Power Sensor (2X), 100 MHz Digital Pattern Instrument, 8 V 3 A SMU, 18-Slot Chassis, Controller
Cellular Test Reference Solution (Remote Control)	868108-07B	Cellular, 30 MHz–8 GHz VST, 1 GHz BW, 18-Slot Chassis, PXI Remote Control Module
	868108-08B	Cellular, 30 MHz–18 GHz VST, 2 GHz BW, 18-Slot Chassis, PXI Remote Control Module
	868108-09B	Cellular, 30–26.5 GHz VST, 2 GHz BW, 18-Slot Chassis, PXI Remote Control Module
	868108-10B	Cellular, 9 kHz–6 GHz VST, 1 GHz BW with Low-Phase Noise LO, 18-Slot Chassis, PXI Remote Control Module
	868108-11B	Cellular, 9 kHz–6 GHz VST, 1 GHz BW, 18-Slot Chassis, PXI Remote Control Module
Cellular Full Test Solution (Remote Control)	868108-12B	Cellular, 30 MHz–26.5 GHz VST, 2 GHZ BW, 18 GHZ RF Power Sensor (2X), 100 MHz Digital Pattern Instrument, 8 V 3 A SMU, 18-Slot Chassis, PXI Remote Control Module

Base configurations offer everything you need to build a test system from scratch for cellular test applications. All options listed include the PXI instrumentation needed to set up a fully functioning test bench.

The PXI chassis included in the bundles is the PXIe-1095 (timing and synchronization), and controllers included are the PXIe-8881 (8-core, Windows 10) or PXIe-8398 MXI Controller (remote control options).

For further assistance choosing configurations, please reach out to your account manager, distributor, or contact NI.

Reference Solution Optional Add-Ons

Option Name	Part Number	Description
Additional RF Channels	868108-01P	30 MHz–8 GHz, 1 GHz BW (PXIe-5842)
	868108-02P	30 MHz–18 GHz, 2 GHz BW (PXIe-5842)
	868108-03P	30 MHz–26.5 GHz, 2 GHz BW (PXIe-5842)
	868108-04P	9 kHz–6 GHZ, 1 GHz BW with Low-Phase Noise LO (PXIe-5841)
	868108-05P	9 kHz–6 GHz, 1 GHz BW (PXIe-5841)
Cross-Correlation	868108-06P	30 MHz–8 GHz, 1 GHz BW RX Only (PXIe-5842)
	868108-07P	30 MHz–18 GHz, 1 GHz BW RX Only (PXIe-5842)
	868108-08P	30 MHz–26.5 GHz, 1 GHz BW RX Only (PXIe-5842)
Power Servo—Path Compensation	868108-09P	18 GHz RX RF Power Sensor (USB-5684)
Envelope Tracking	868108-10P	Baseband, 0–500 MHz, 1 GHz BW VST (PXIe-5820), O-Scope (PXIe-5162)
Baseband	868108-11P	Baseband, 0–500 MHz, 1 GHz BW VST (PXIe-5820)
Harmonics	868108-12P	26.5 GHz, 765 MHz BW VSA (PXIe-5668)
Chassis Expansion	868108-13P	18-Slot Chassis, PXI Remote Control Module, PXI Extension Module, MXI Cable
DUT Control—HSD	868108-14P	100 MHz, Digital Pattern Instrument (PXIe-6571)
External RF Switching	868108-15P	RF Replay (PXI-2599), SMA to SMA RF Cable .3 M (VST) (2X)
PAE for External DUT Power	868108-16P	Digit DMM and 1,000 V Digitizer (PXIe-4081) (2X), DMM Probe Set with 2 Alligator Clips (4X)
DUT Power and PAE	868108-17P	8 V, 3 A, 4-Channel Precision SMU (PXIe-4147)

To add multiple RF channels or to include analog, digital, or DC instrumentation, select from the part numbers above to fully customize test requirements to a given application.

For existing test benches, choose the options above to add functionality to your test bench.

Third-party hardware, such as Focus Microwave tuners, is not included with any options and must be purchased separately.

Software

Part Number	Description
784584-35	LabVIEW Professional
Free	RFmx Spec An
788024-35	RFmx Digital Modulation
788018-35	RFmx Analog Modulation
788033-35	RFmx Cellular Bundle
789804-35	RFmx Connectivity Bundle
788036-35	RFmx NR
788064-35	RFmx WLAN
788082-35	RFmx Bluetooth
Free	Third-Party Licensing and Activation Toolkit
Free	NI Modulation Toolkit
788372-35	TestStand
787917-35	RFIC Test Software Professional (Includes RFmx PA)
788542-35	Ultra-Wideband (UWB) Test Toolkit
960680-301	Standard Service Program for Systems with Traceable Calibration

Software is not included as part of the bundles and must be purchased separately.

System Integration on Your Terms

NI offers a variety of solution integration options customized to your application-specific requirements. You can use your own internal integration teams for full system control or leverage the expertise of our worldwide network of NI Partners to obtain a turnkey system.

To learn how you can streamline validation workflows, increase product quality, and shorten test timelines, contact your account manager or NI at (888) 280-7645 or info@ni.com.

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