SOLUTION
BROCHURE

Ultra-Wideband Test Solution

Enabling Faster Ultra-Wideband Signal Generation and Analysis

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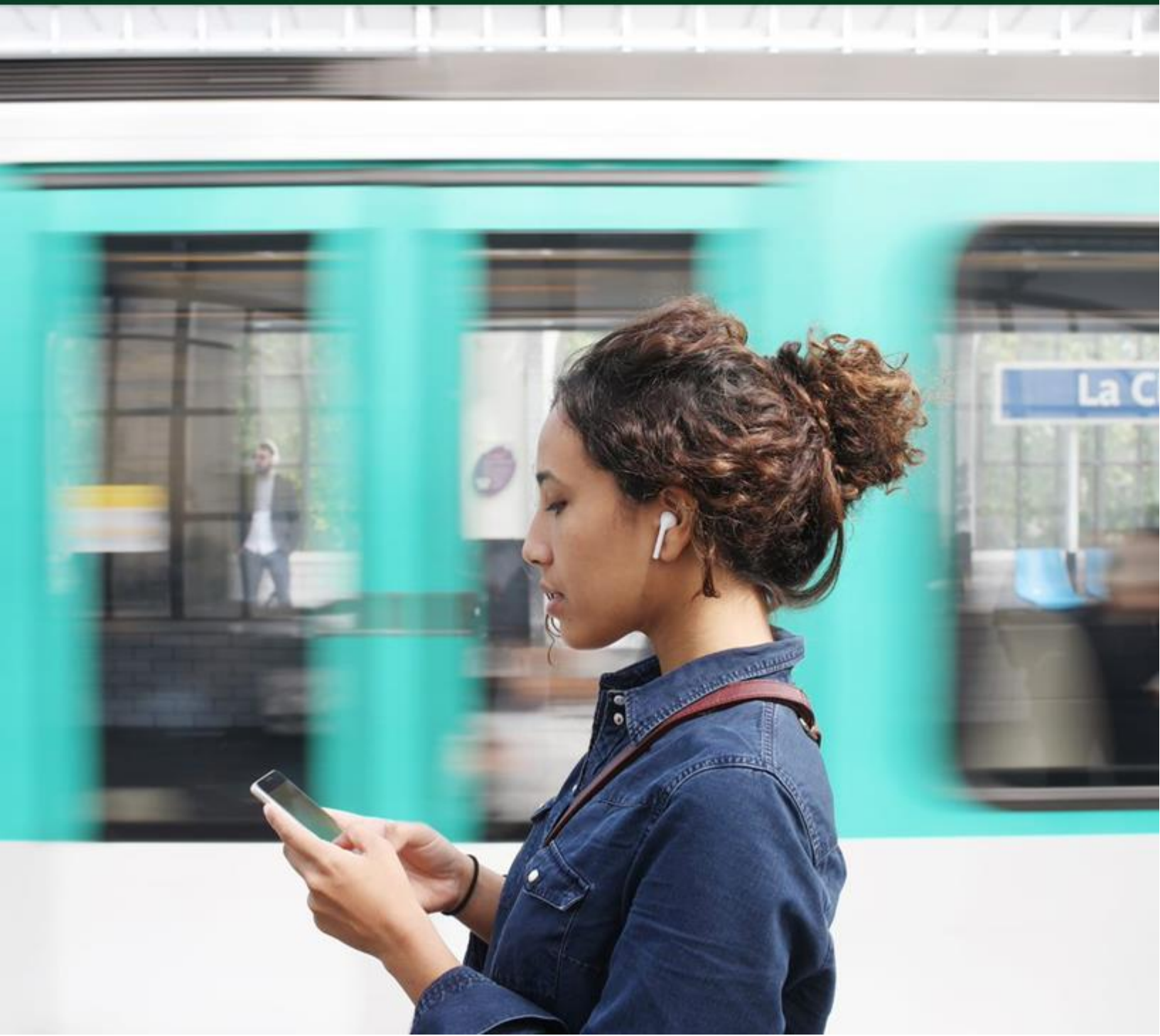


Ultra-Wideband Test Solution

Streamline Test of Ultra-Wideband Wireless Devices

Trends in UWB Development

Ultra-Wideband (UWB) is useful for devices requiring low power operating over a short range, that can coexist with other RF signals for the purpose of providing real-time location information. The UWB standard has bandwidths greater than 500 MHz with frequencies ranging from 3.6 GHz to 10.6 GHz—which requires wideband capabilities and low noise for precise ranging. These requirements, along with its use in wireless applications such as access control, asset localization, wireless payment, and digital keys, means it is both difficult to accurately test and will be increasing in use in the coming years.

The NI Advantage

- High reusability of hardware for additional RF test applications
- Improved time-to-market with automation APIs
- FiRa Consortium PHY conformance certification
- Full support of complex UWB test cases and measurements

A robust UWB test solution needs to:

- Account for wideband capabilities greater than 500 MHz
- Ensure full frequency coverage from 3 GHz to 10 GHz
- Allow for coexistence of UWB, WLAN, and Bluetooth standards on a single test bench
- Incorporate precision ranging measurements with time-of-flight (ToF) and angle-of-arrival (AoA) calculations
- Include Deterministic HRP Frame Generation for thorough characterization

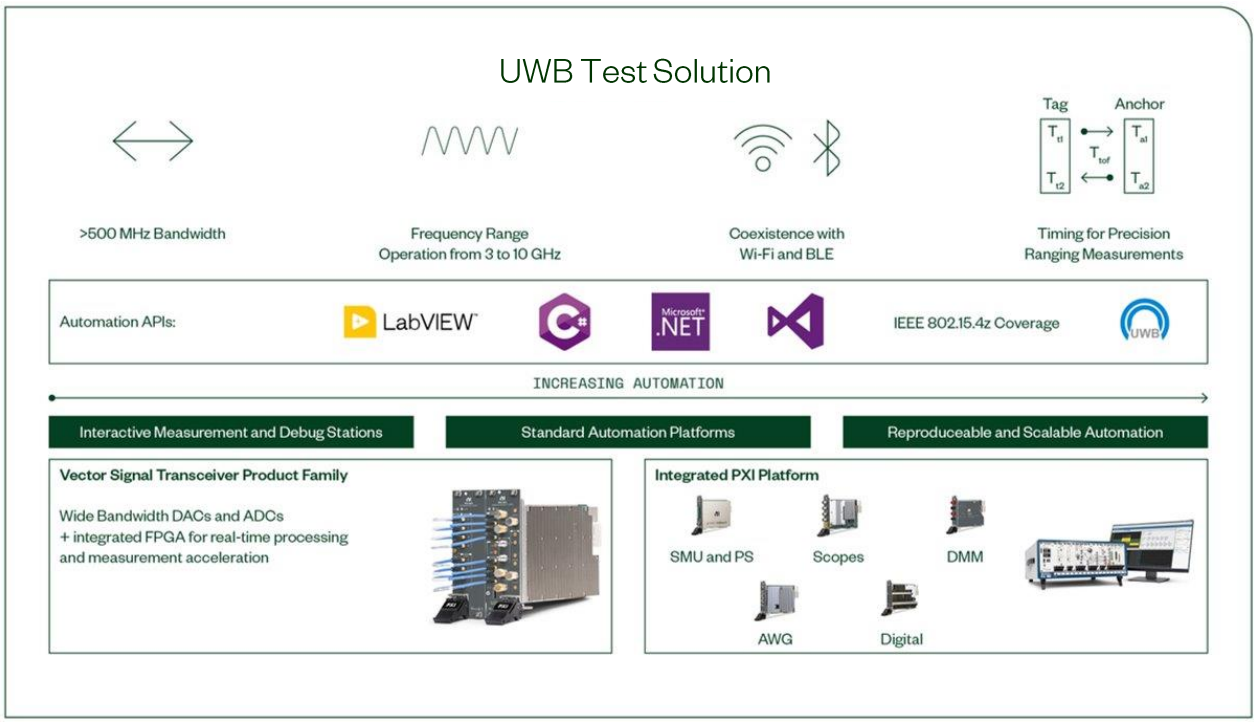


FIGURE 01
UWB Test Solution Diagram

Benefits of NI Wireless Connectivity Test Solutions

- Enables higher reusability of hardware through a consolidated test bench with RFmx for WLAN, Bluetooth, cellular, and MaxEye UWB Test Toolkit for ultra-wideband test
- Improve time-to-market with intuitive APIs that incorporate robust automation from interactive bring-up to characterization
- Ensures test quality and completeness with the implementation of FiRa Consortium PHY test cases and FiRa PHY certification
- Incorporates complex UWB test cases such as angle-of-arrival and time-of-flight measurements

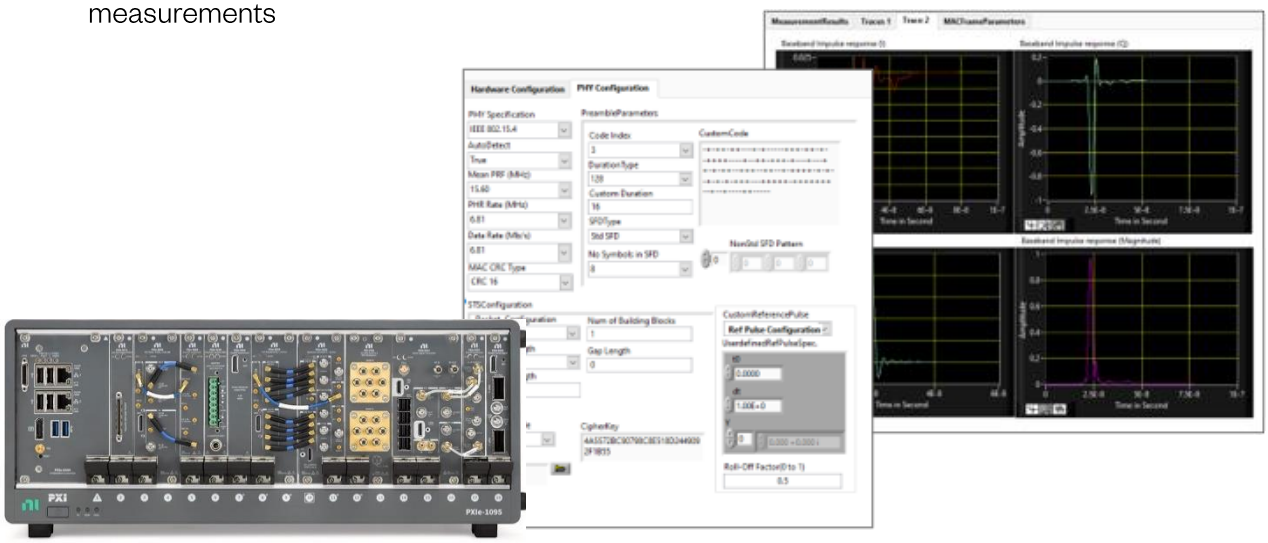


FIGURE 02

UWB Test Solution: Reusable Test Bench for WLAN, Bluetooth, Cellular Applications

UWB Test Toolkit from MaxEye Technologies

The NI UWB Validation Solution, comprised of PXIe instrumentation and the Ultra-Wideband (UWB) Test Toolkit, is the only test solution on the market to comprehensively test UWB front end devices, transceivers, and electronic devices with superior frequency coverage as well as baseband signal generation and analysis capabilities. The UWB Test Toolkit is developed in conjunction with MaxEye Technologies, leveraging their expertise in wireless communications for a one-to-one, tailored test solution for UWB test cases enabling fast, accurate, and easily configurable test of UWB front ends and transceivers.

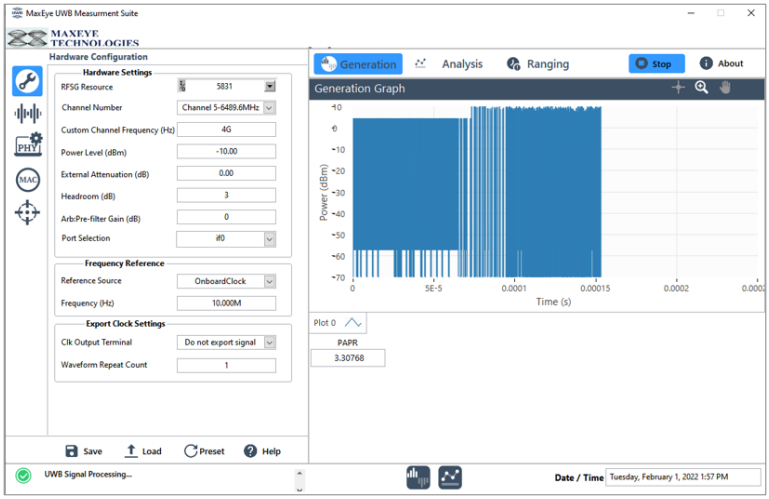
- Easy-to-use graphical user interface (GUI) through intuitive and interactive Soft Front Panels and a wide range of APIs enabling automation of UWB test cases
- Full coverage of IEEE 802.15.4z specifications including spectrum mask transmit, symbol modulation Accuracy, carrier frequency offset, and many others
- All-in-one tester that combines WLAN, Bluetooth, cellular, and UWB Transceiver and Power Amplifier validation
- Scalable test bench with RF measurements along with DC, digital, and analog measurements
- Flexible choice of frequency coverage and bandwidth as well as baseband signal generation and analysis capabilities with NI's versatile PXI Vector Signal Transceivers (VST)
- Scalable and synchronized RF channels for MIMO applications

UWB Signal Generation & Analysis

Generate highly customized UWB signals supporting various frame formats including data frame, beacon frame, and multi-frame generation with user-defined interframe spacing.

Configure payloads with PN sequence, user-defined bits, test pattern, or import payload from a file and develop custom sequences that deviate from standard UWB test cases.

Introduce impairments such as AWGN, IQ gain, phase imbalance, and frequency skew for thorough test and characterization.



Choose from a variety of measurement types including ModAcc, power measurements, carrier frequency offset, UWB pulse time, and many others.

Leverage built-in automation APIs with UWB test cases for an easy transition from interactive to automated measurements and industry leading test speed.

Supports IEEE 802.15.4 and 15.4z HRP standards and FiRa PHY and MAC specifications v1.1

Measurement Capabilities

- Power measurements
- Modulation accuracy
- Frequency and clock offset measurements
- Spectral emission mask (SEM)
- Pulse main lobe width
- MAC CRC, packet error rate and payload bits
- Baseband impulse response
- UWB pulse time domain mask
- Time-of-flight (ToF, Ranging Test)
- Angle-of-arrival (AoA)

The NI UWB Test Solution is FiRa certified and is up to date with the latest IEEE 802.15.4z specifications.

System Components

The UWB Test Solution consists of several hardware and software components working together seamlessly in a cohesive and integrated system. Scalable to meet your needs, choose from a range of RF Vector Signal Transceivers for different frequency and bandwidth options along with DC, analog, and digital instrumentation for a tailored test solution that meets exactly the needs of your application.

Hardware:

- PXI Chassis and Controller
- PXI Vector Signal Transceiver (VST)
- Optional: DC, analog, digital instruments, AWG, and more

Software:

- UWB Test Toolkit including Soft Front Panels and Automation APIs
- Optional: RFmx WLAN, NR, Bluetooth

Integrated PXIe system

Application-specific software

Key Solution Technology

NI Vector Signal Transceivers combine an RF vector signal analyzer and generator with a powerful FPGA and high-speed serial and parallel digital interfaces for real-time signal processing and control from baseband to mmWave.

Baseband VST | 9 kHz - 6 GHz | 5 GHz - 12 GHz | 5 GHz - 21 GHz | 5 GHz - 44 GHz

FIGURE 03

PXIe-5820, PXIe-5841, PXIe-5830, PXIe-5831, PXIe-5831 mmWave (left to right)

Optional Hardware

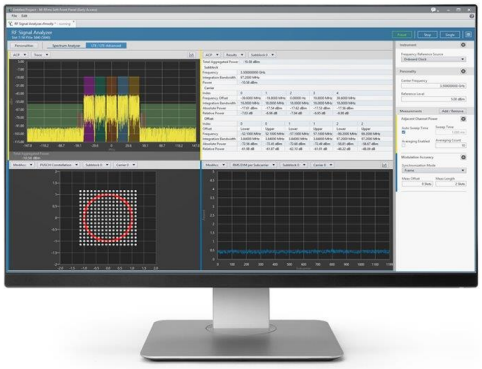
The UWB Test Solution is scalable to meet exactly the needs of your application. Add multiple RF Vector Signal Transceivers to cover a wide frequency range and multi-port DUTs, or add DC, analog, or digital instruments for more thorough test and full device characterization.

Add PXI Source Measure Units for DUT power/stimulus and analog measurement capabilities (PXIe-4138 pictured).

Include digital instruments, such as the PXIe-6571, alongside other instruments for configurable and synchronized DUT control.

Choose from many other DC, analog, and digital instrumentation for additional measurement capabilities (PXIe oscilloscopes pictured).

Optional Software



RFmx is a set of interoperable software applications that optimize NI RF instrumentation for general-purpose, cellular, connectivity, and aerospace/defense test applications.

Include RFmx NR, WLAN, and Bluetooth for a test bench capable of handling multiple cellular and connectivity standards.

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 Alliance Partners to obtain a turnkey system.

Contact your account manager or call or email us to learn more about how NI can help you increase UWB product quality and accelerate validation test timelines at (888) 280-7645 or info@ni.com.

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