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Radar Target Generation Software

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Trends in Radar Design and Test

Radar technology has been a critical capability for flight safety, precision navigation, space applications, and more. To meet future electromagnetic spectral operation requirements, modern radars are being increasingly designed to be frequency agile with cognitive modes while utilizing ultra-broadband active electronically scanned arrays to dynamically adapt to electronic warfare and the ever-changing electromagnetic spectrum. Additionally, modern radars are increasingly designed with the goal of improved EW resilience and low probability of intercept (LPI) with multifunction and cognitive capability, radar, EW, and comms. Due to the increased complexity of designs, finding issues before an open-air range test has never been more important. Today, radar engineers are leveraging powerful modeling and simulation tools to digitally test systems prior to integration. Most leading radar manufacturers leverage hardware-in-the-loop (HIL) integration testing to mitigate risk and find issues in the early stages of the design cycle. Radar target generation technology is a powerful tool to inject realistic targets into radar systems in the lab or during production test to validate system performance or provide that final functional check before deployment.

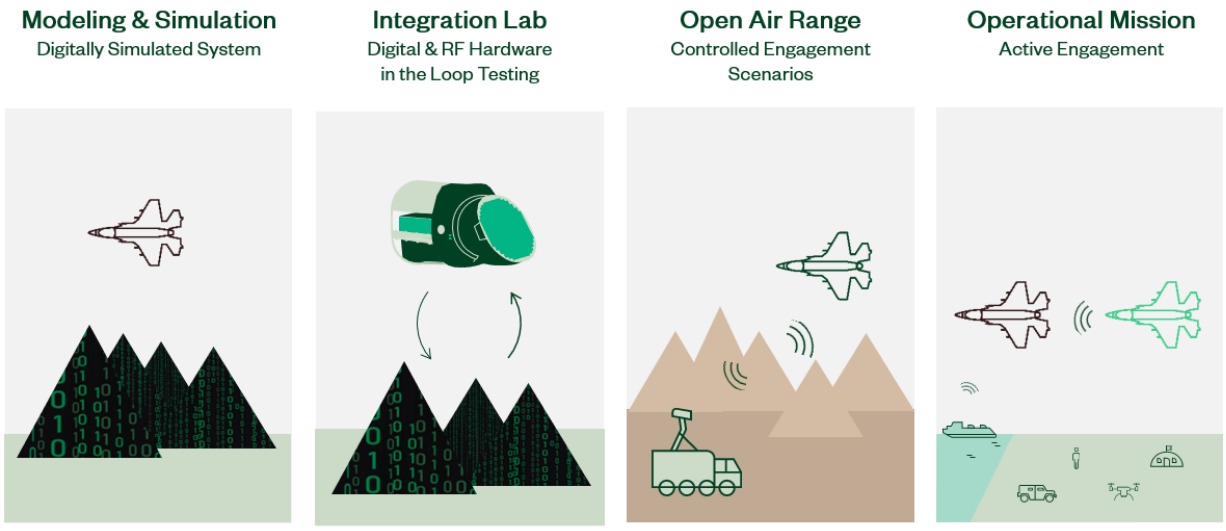


FIGURE 01

Phases of Radar Design Test and Evaluation

Radar Target Generation Software Overview

The Radar Target Generation (RTG) Software includes applications and APIs to help you operate certain models of the PXI Vector Signal Transceiver (VST) as a closed-loop real-time radar target generator. The RTG software works with scenarios calculated in real-time, provided from a file, or generated from a linear motion calculation. With this software, engineers can inject up to four independent targets with configurable range (time delay), velocity (doppler frequency offset), and path loss (attenuation) into a radar for test. In its default personality, the VST is a calibrated RF generator and analyzer. Beyond the standard VST calibration, the RTG software includes a loopback calibration that enables users to apply accurate time delay and attenuation by de-embedding residual and external cabling and fixtures effects. The RTG Software is well suited to basic functional validation of radars, production test, or MRO (maintenance, repair, and overhaul).

Applications

- Closed-loop real-time target generation
- Open-loop spectral and datalink systems test
- Programmable signal generation and analysis

Key Characteristics

- Frequency Range: 10 MHz to 21 GHz (22.5 GHz to 44 GHz with frequency extender)
- Signal IBW: 1 GHz
- Number of Targets: 4 per channel
- Channels Per Chassis: up to 4
- Signal Parameters: Delay, Doppler, Attenuation
- Maximum Range: 64,000 km
- Minimum Range: >1 m in low-latency mode 125 m otherwise
- Update Rate: 15 kHz (List Mode) 1 kHz (Live Mode)
- Range Step: 0.8 ns (0.12 m)
- Doppler Offset: +/- 2 MHz
- Doppler Resolution: <5 Hz
- Pulse Width: Unrestricted
- Typical Rx to Tx SFDR: 68 dBc
- Overlapping Targets: Yes

The NI Advantage

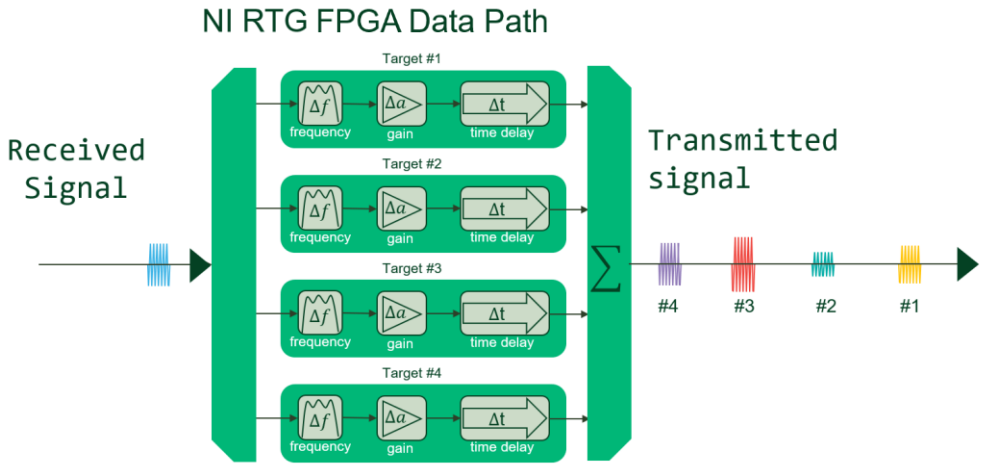
Built on off-the-shelf RF test hardware

Reduce cost with a single instrument for multiple test requirements

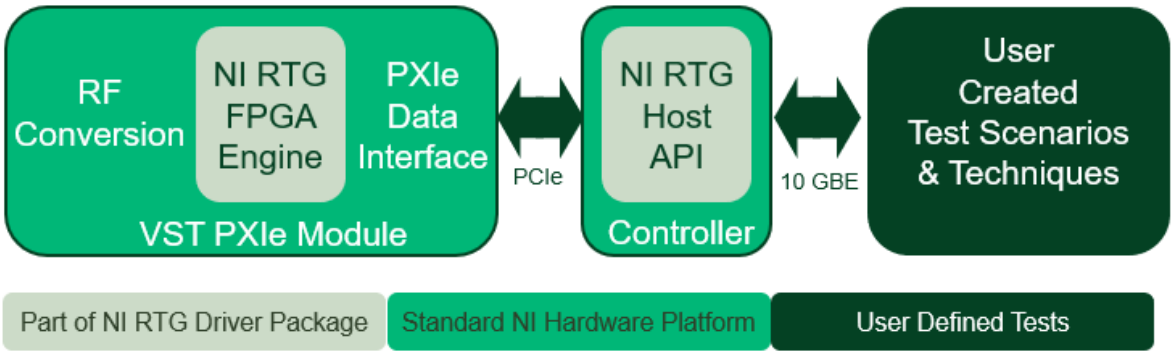
Identify issues before costly open-air range tests

Supported NI Modules: PXIe-5830, PXIe-5831, PXIe-5832, PXIe-5841

System Components



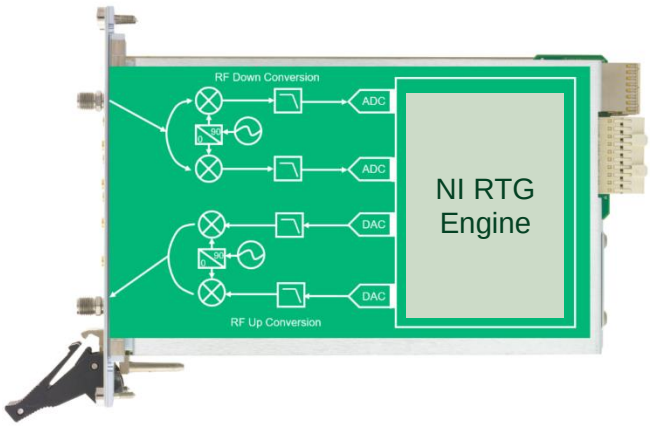
- Four independent, overlapping targets
- NIST-traceable calibration
- Automate test scenarios with Ethernet API or partner IP
- FPGA Coprocessor Harness for custom IP integration
- Low Latency Mode for close-in targets



NI RTG System Components

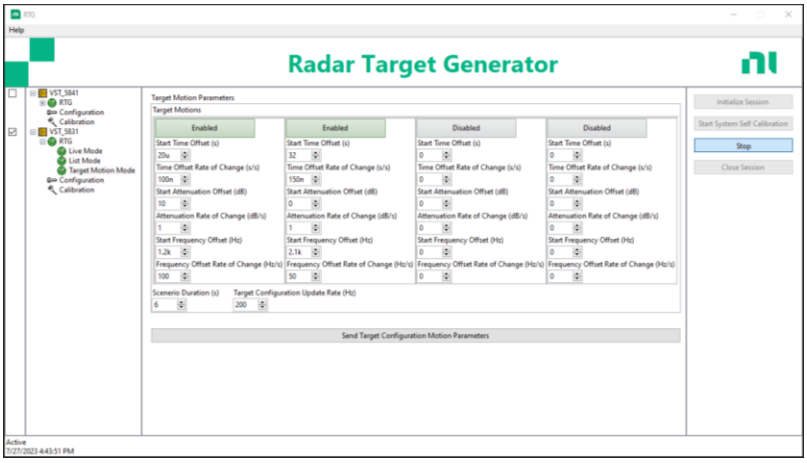
Vector Signal Transceiver Hardware Capability

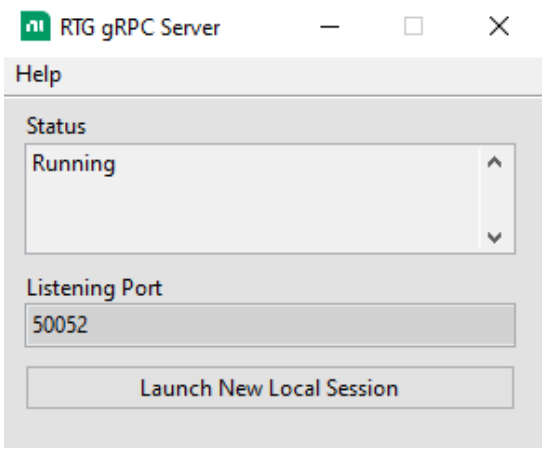
1. 10 MHz to 21 GHz Fc
2. 1 GHz IBW
3. Coherent receive to transmit
4. PXIe-5831, PXIe-5830, PXIe-5841, PXIe-5832



Control API

- Manual parameter control panel
- Remote API over Ethernet
- Scenario generation not included
- License-controlled distribution

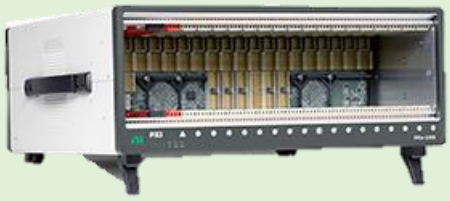




PXIe System Components

PXIe System Infrastructure

- 3U modular instrumentation chassis
- Expandable to 18 slots
- Data transfer up to 24 GB/s
- Integrated clocking / triggers



Integrated Embedded Controller

- Intel Xeon 8-core x86 processor
- Removable hard drive
- Windows 10 support
- 64 GB DDR4

Have high fidelity test requirements?
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