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System-Level Verification of Modern EW and Radar

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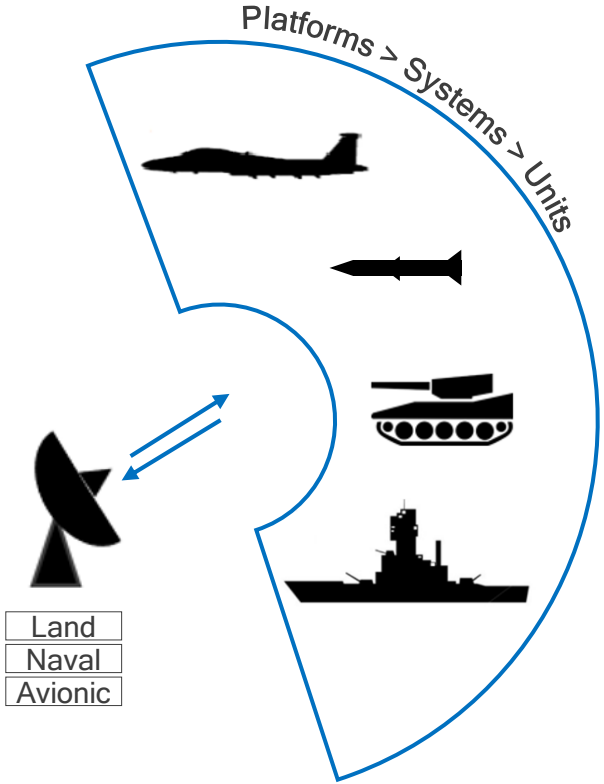
Agenda

- Testing Needs for Radar and EW Systems
- Types of Test and Engineering Challenges
- Software-Defined Systems
- Technology Challenges

Radar and EW Systems - Overview



Type of Applications Installed on the Platforms
Radar • Radar • Seeker EW/SIGINT • Electronic Support • Electronic Protection • Electronic Attack Communications • Radio • Datalink

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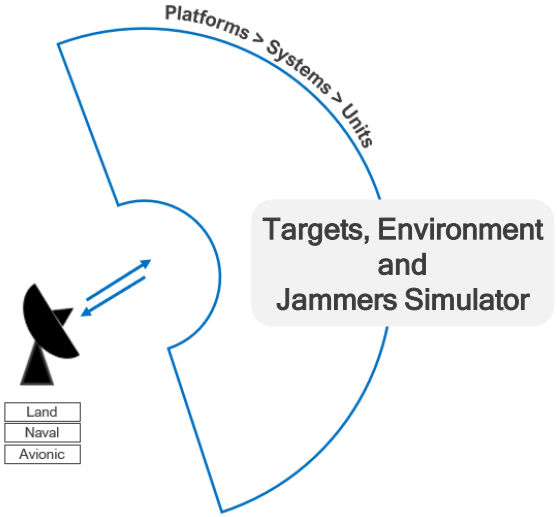
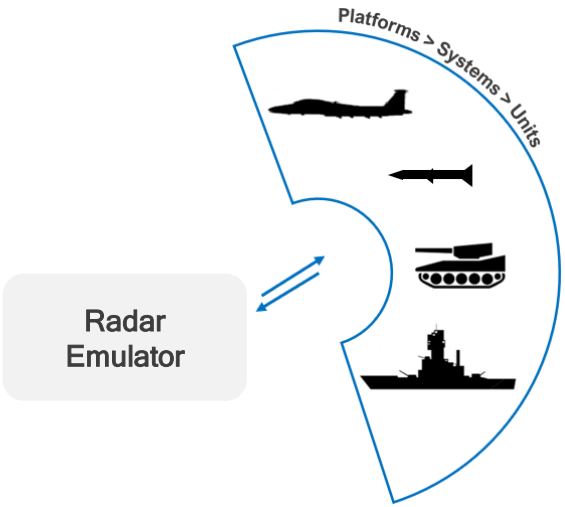
Testing Needs for Radar/EW Systems



- Radar Performances
- Radar Protection (EP)



- ELINT Receiver (ES)
- Radar Warning Receiver (ES)
- Jammer (EA)
- RF Active Decoy (EP)

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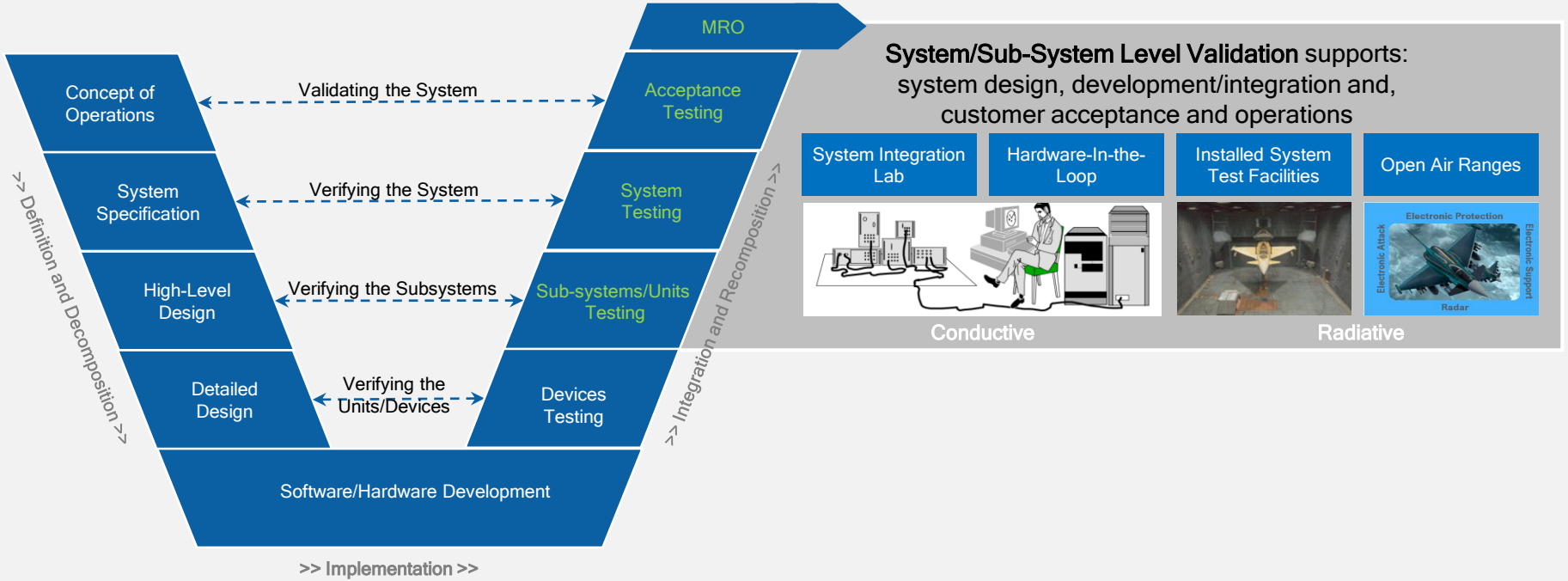
Type of Testing and Test Resources



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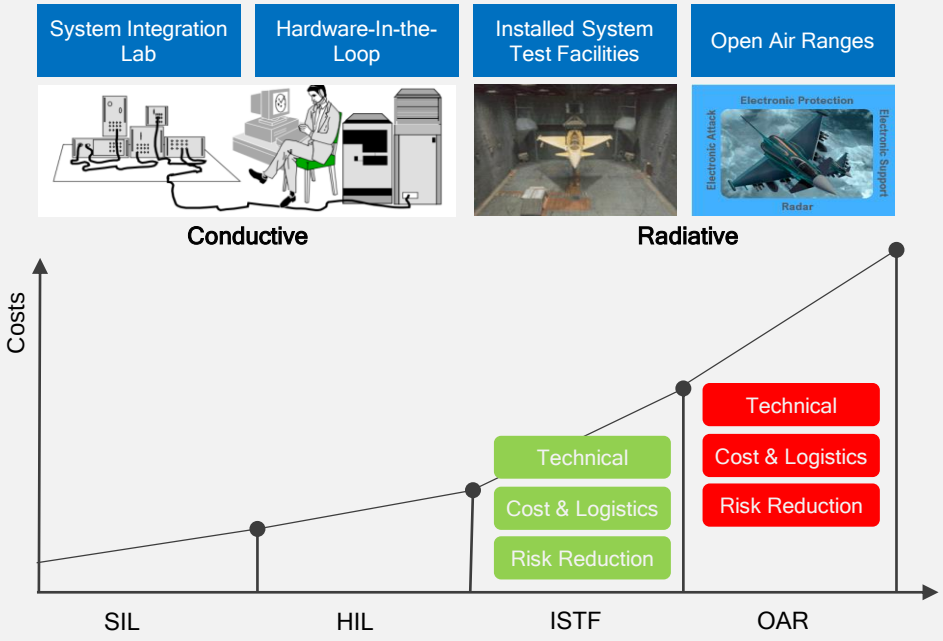
Test Resources versus Engineering Challenges



- Concurrent Engineering is a key approach for discovering failures in early stage of the system life cycle and it requires the simulation of the sub-systems for HIL testing.
- OAR requires complex and expensive simulation facilities for customer acceptance procedure and operations. That requires different conductive/radiative approach to ISTF.
- Standards and regulations require a different approach for seamless integration of 3rd party IP for lowering risk and cost, and reducing disruption of emerging requirements integration.

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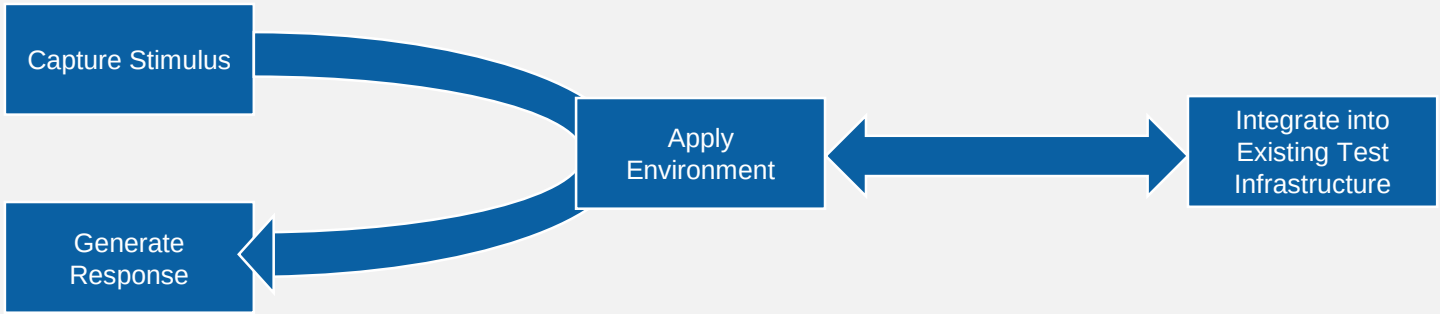
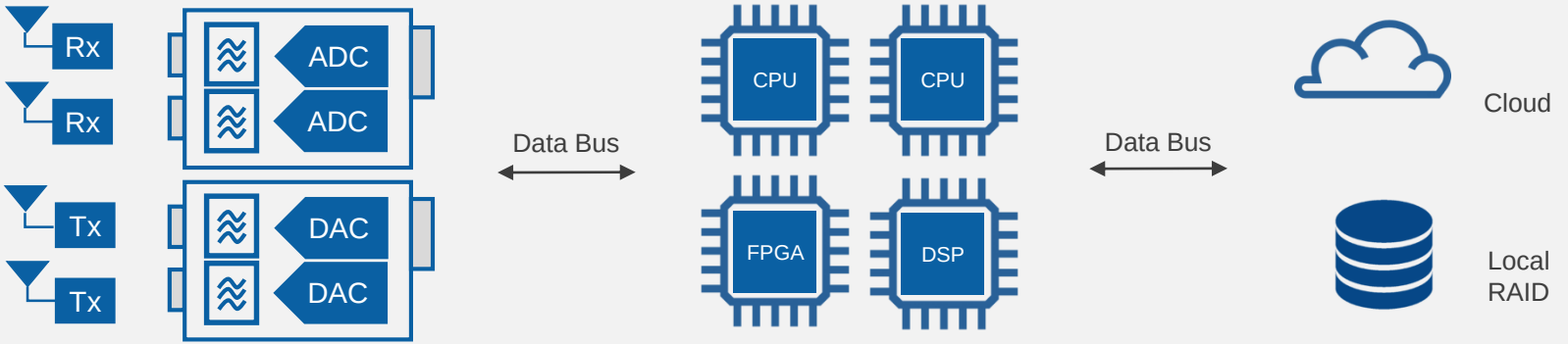
Software-Defined Systems Approach



Radar Target Generation

Software-Defined Systems Approach

A platform of modular hardware and flexible software solves all aspects of system design



FLEXIBLE & MODULAR I/O

- RF, uWave and mmWave
- Wideband ADC/DAC
- Phase coherence across Tx & Rx
- Phase coherence across multiple channels

REAL-TIME SIGNAL PROCESSING AND DETECTION

- Target Generation
- Jamming / Interference
- Clutter / Multipath / Atmosphere
- Signal Identification and Decoding

SYSTEM COMMUNICATIONS

- Pulse Description Words
- Waveform Description Words
- Result Recording

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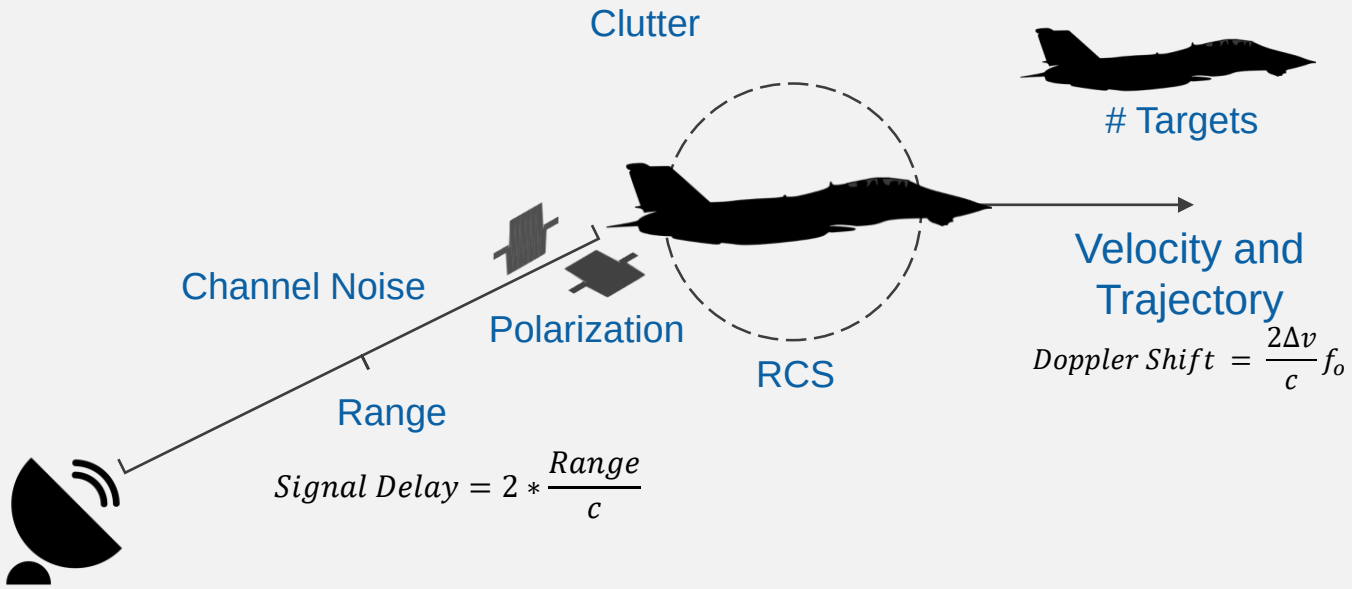
Typical Parameters for Real-time Target Generation



Operating Frequency
Bandwidth
PRF
Beam Azimuth and Shape
Antenna and Scan Pattern

An ideal target generator is fully decoupled from the radar under test.
In reality, certain parameters (f_c, BW, Directionality, etc.) are required.

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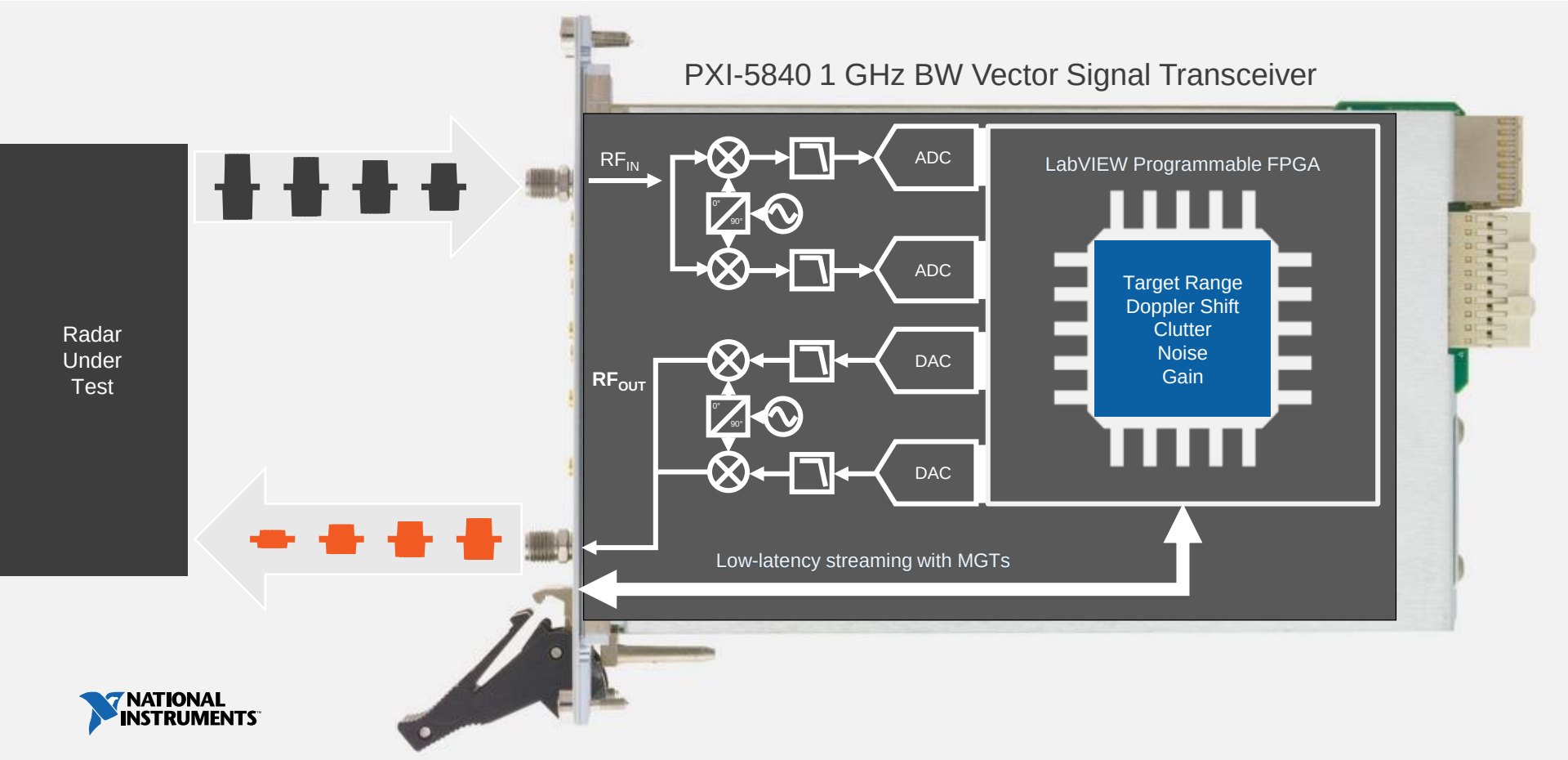
Simple Example for Radar Target Generation



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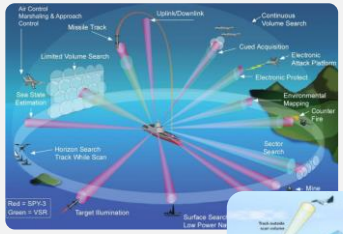
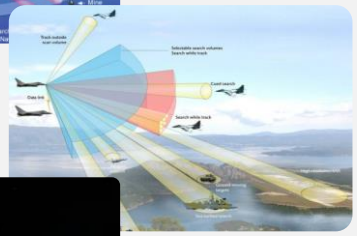
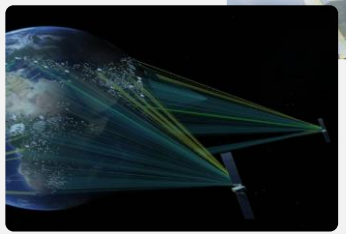
Engineering Challenges Associated to the Technology

Surface Radar and EW Systems



Airborne Radar and EW Systems





Spaceborne Radar and Comm/Nav Systems

*Pictures from web sources

- AESA, which enables Multi-Functional RF Systems (Radar, EW, Comm), requires phase aligned multi-channel RX/TX test systems
- LPI broadband spread spectrum techniques and agile radars require wideband signal analysis and generation
- Cognitive Radar/EW and Artificial Intelligence techniques require real-time signal processing

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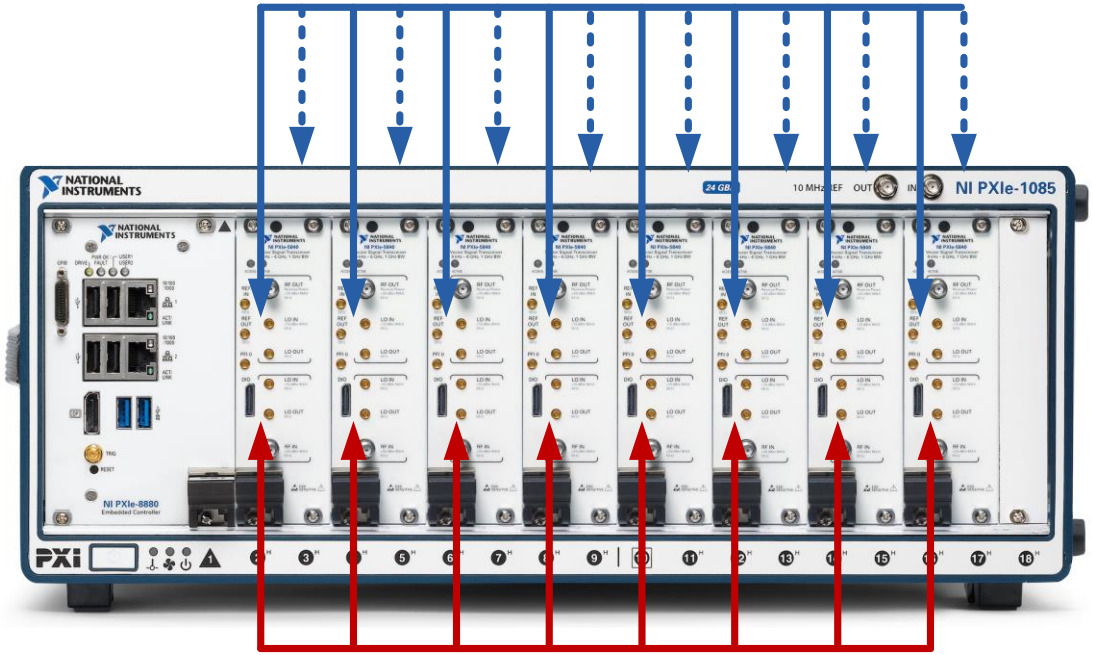
Phase Coherent RF Measurements with PXI

Simplify Reference Clock and Trigger Distribution



8X8 MIMO System

Share Common Local Oscillator for Phase Alignment

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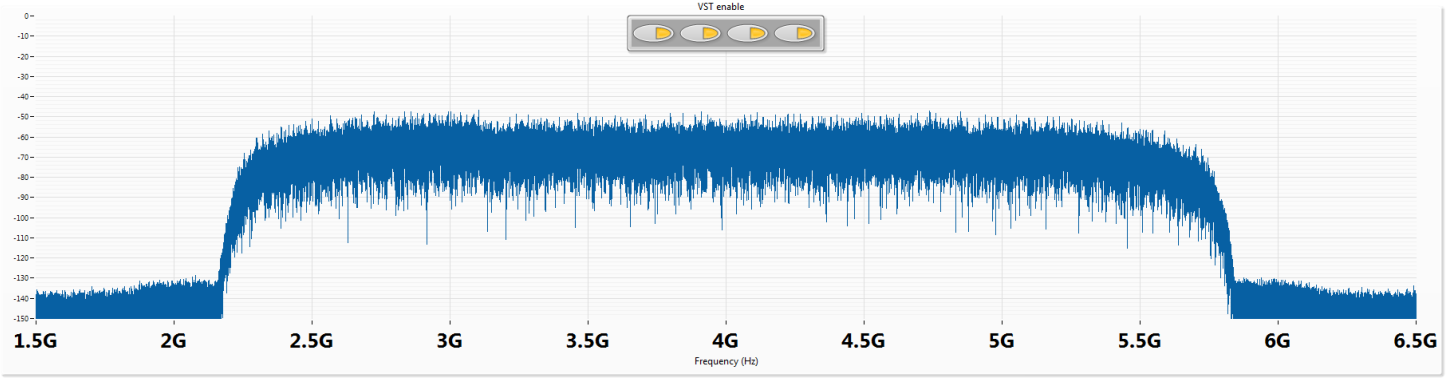
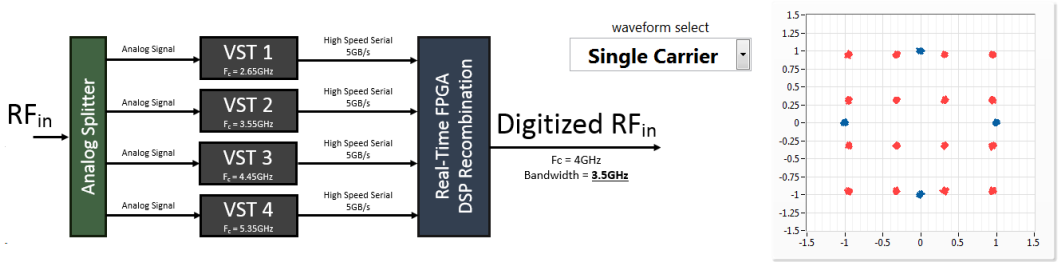
Spectrum Stitching





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Conclusion

- Target Generators and Radar Emulators are needed for testing Radar and EW respectively
- Hardware-in-the-loop approaches / Simulation approaches help to find problems earlier and at lower cost
- Emerging technologies drive the need for real-time signal processing, plus wider bandwidths without losing fidelity

Any Questions?

Please visit us at Stand B3 for a live demonstration