

# Scalable EW Stimulus Solutions

Compact VPX (CCVPX)

Easily scale from single chassis to rack-mounted 8-channel or 16-port solutions

CEESIM and mini-RFGEN (mRFGEN) configurations available

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### Overview

- CCVPX provides cost-effective EW threat stimulus with quick delivery
- High fidelity RF stimulus based on digital technology
- Full scenario/emitter compatibility with trusted and market tested CEESIM product line
  - Enables lower-level testing to share common scenarios and emitter modes with higher-level System Integration Laboratory (SIL) testing
  - Significantly increases probability of early issue detection, providing considerable cost and schedule savings to the EW program
- Provides compatibility with full-size CEESIM systems
  - Proven and tested CEESIM capability
  - Common scenarios/emitters validated by Government-witnessed Threat Representation Validations (TRVALs)
  - Common user interface and maintenance (no need to retrain staff)
  - Common tools (automated calibration and diagnostic test, PDW capture/filter)
  - Common hardware building blocks
- 20 MHz to 40 GHz frequency coverage
- Transport case or rack packaging available

### Benefits

#### Low Cost/Quick Delivery

Cost is comparable to other commercial small simulators, but with all the power and capabilities of our full-sized CEESIM. Quick turn delivery is available.

#### Small Footprint

CCVPX provides the greatest flexibility and expandability of any small EW simulator available. What takes racks full of other suppliers' hardware can be done with a few desktop CCVPX chassis.

#### High Fidelity Performance

CCVPX is a DDS source capable of generating complex intrapulse modulations that can vary on a pulse-to-pulse basis, with proven accuracy to validate the parameter extremes in threat intelligence databases. CCVPX can also generate high emitter density (up to one MPPS/channel).

#### Compatibility

CCVPX maintains full scenario/emitter compatibility with all CEESIM systems and uses the same user interface, hardware modules and tools employed in full-sized CEESIMs and RFGENs.

#### Confidence

CEESIM is the established threat source used to validate all state-of-the-art EW platforms. CEESIM emitter modes have gone through multiple TRVALs on U.S. programs to validate they are true representations of the threat radar waveform. CCVPX has demonstrated support of all test environments, including: Sub-assembly Test Stations, SILs, Anechoic Chambers, and Open-Air Test Ranges. We can support your test mission.

#### Core Building Blocks

The Local Oscillator (LO) and Up-converter Direction Finding (UCDF) RF slice pair provides 0.5 to 18 GHz signal generation, and the core building blocks of the Compact CEESIM-VPX. Frequency extension RF slices are available to expand this base frequency coverage. The Ultra-Low Band (ULB) RF slice extends frequency range down to include 20 to 500 MHz and the Millimeter Wave (MMW) slice extends frequency range to include 18 to 40 GHz.

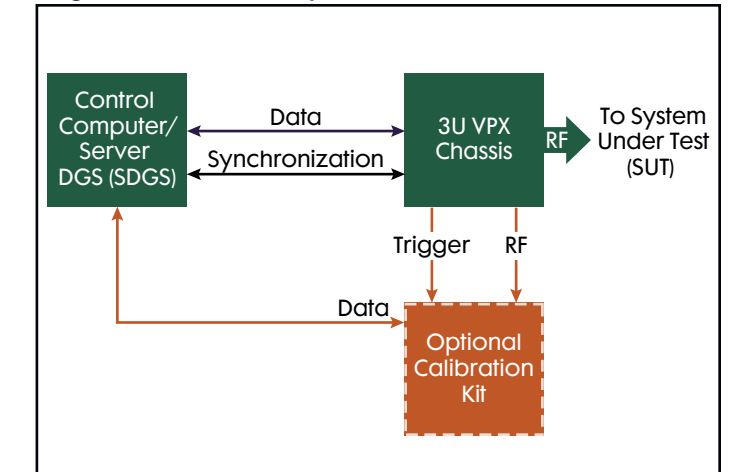
### Benchtop Solutions

Benchtop solutions consisting of a single 3U VPX chassis are ideal for lower level test stations, anechoic chambers, and open air test ranges. CEESIM and mRFGEN configurations available.

#### Single 3U VPX Chassis Configurations

Model Number	Configuration
APG0518V-OMNI	1-channel 0.5 to 18 GHz, Omni Output
APG0518V-MP	1-channel 0.5 to 18 GHz, 4 ports Amplitude/Phase/TDOA
APG0518V-DC	2-channel 0.5 to 18 GHz, Omni Outputs
APG0518V-WB	1-channel 0.02 to 40 GHz, Omni Outputs

#### Single 3U VPX Chassis System



#### Single 3U VPX Chassis Capabilities

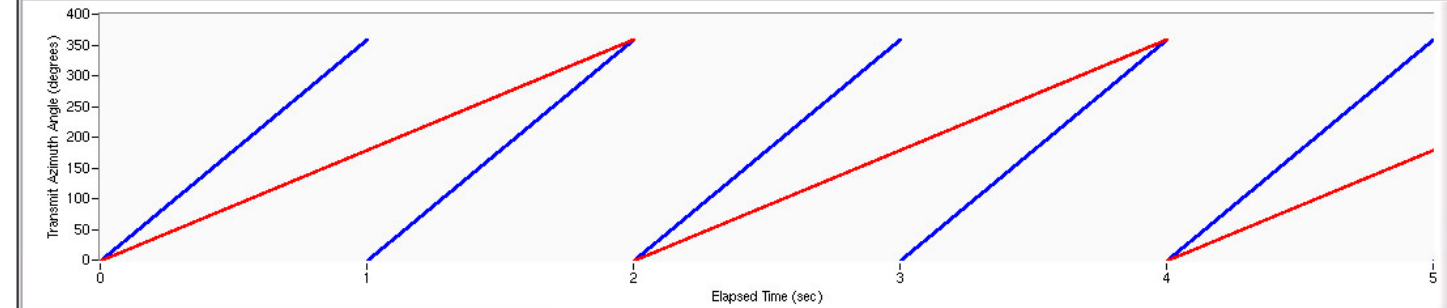
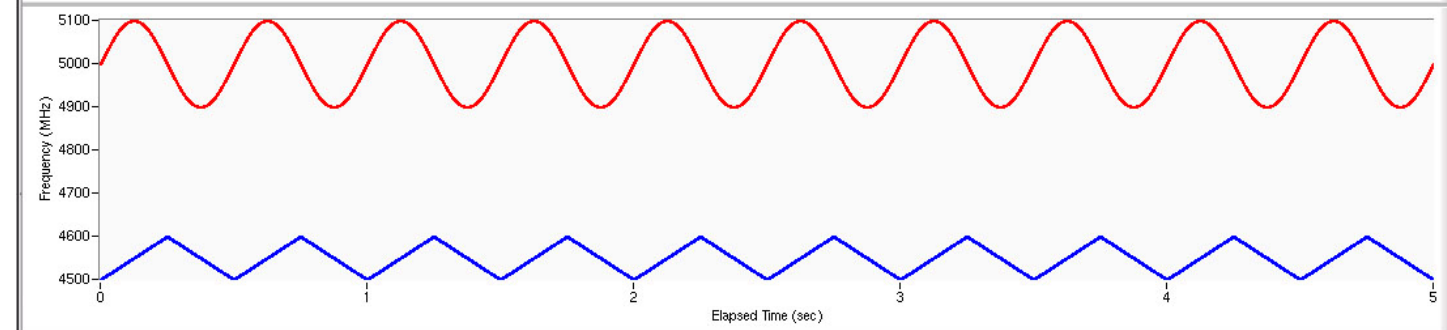
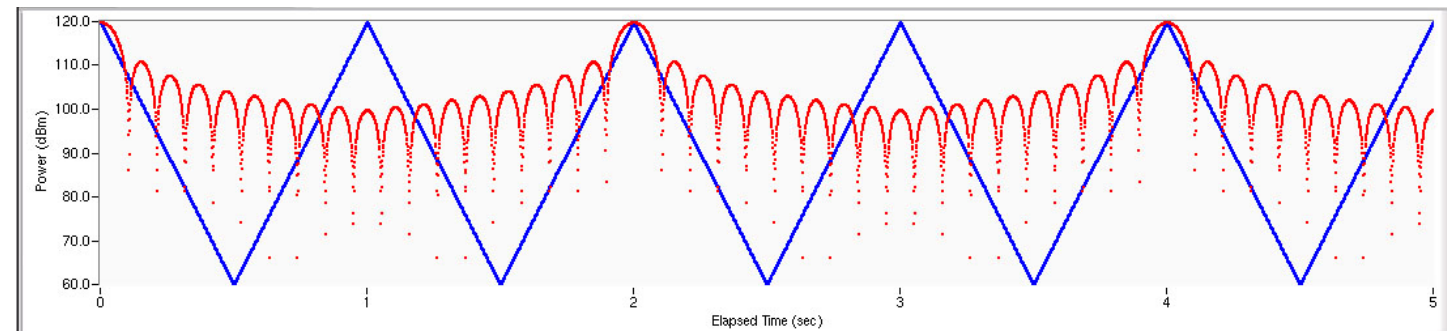
Parameter	Capability		
Pulse Density	1 MPPS per channel		
Frequency	<ul style="list-style-type: none"> <li>• 20 MHz to 40 GHz with 1 Hz resolution (Omni configurations)</li> <li>• 0.5 to 18 GHz with 1 Hz resolution (AoA configurations)</li> </ul>		
Pulse Width	15.625 ns to 131.071 ms with 3.90625 ns resolution		
Intrapulse Modulation	<ul style="list-style-type: none"> <li>• Amplitude Modulation (e.g., AM, ASK, Pulse Shaping)</li> <li>• Frequency Modulation (e.g., FM, Chirp, Discrete FMOP)</li> <li>• Phase Modulation (e.g., BPSK, QPSK, poly-phase)</li> <li>• Quadrature Amplitude Modulation (QAM)</li> <li>• User Defined</li> </ul>		
PRI	1 μs to 999.999 ms with 0.122 ns resolution		
Scan Types	Steady Conical Sector Circular	Raster Palmer Helical Spiral	Multibeam Electronic Synchronized
AoA Modeling	<ul style="list-style-type: none"> <li>• Amplitude Angle of Arrival (AOA)</li> <li>• Phase Interferometry AoA</li> <li>• Time Difference of Arrival (TDOA)</li> <li>• Calculated and Measured Data Models</li> <li>• Up to 4 ports (single chassis)</li> </ul>		
External Control	Ethernet		
External Synchronization	IRIG-B		

## CCVPX Software

The CCVPX, when delivered in the CEESIM configuration, comes with some of the most sophisticated emitter modeling and visualization tools available.

The screenshot shows the CCVPX software interface. On the left, there's a 'Simulation Control' panel with playback buttons and a 'Speed' dropdown set to '1X'. Below it, 'Time Since Startup' is 00:11:32, 'Simulation Time' is 00:00:00.000000, and 'IRIG Time' is 09:13:04. The 'Hardware Status' is 'Offline'. A 'Scenario Status' panel shows 'Platforms' (Total: 3, Active: 3) and 'Emitters' (Total: 1, Active: 0, Radiating: 0, Observable: 0). The main area shows 'Platform 2 - Platform2' and 'Emitter 1 - EMT01 EMITTER01'. A 'Generator #1 Beam 1: Independent' is selected, with a 'View' dropdown. The 'Name' is 'Beam 1' and 'Kind' is 'Independent'. Below, there are four tables for 'Frequency', 'PRI', 'Pulse', and 'Scan' parameters.

Frequency				PRI			Pulse			Scan	
Segment Name	Frequency (MHz)	Ch	Co	Segment Name	PRI (µsec)	Dwell Type	Segment Name	ERP (dBm)	Pulse W (µsec)	Segment Name	
1	Single	1000	Pool	1	Single	1000	-	1	Single	120	
2	Dwell	2000	Pool	2	Dwell	1000	Time	2	Series	-	
3	Series	-	-	3	Stagger	-	-	2.1	-	120	
3.1	-	2000	Pool	3.1	-	1000	Time	2.2	-	110	
3.2	-	2500	Pool	3.2	-	1100	Time	2.3	-	100	
3.3	-	3000	Pool	3.3	-	1200	Time				



	Elapsed Time (sec)	Frequency (MHz)	Power (dBm)	Transmit Azimuth Angle (degrees)
MK 1	1.204000	5054.662118	101.250000	216.710815
MK 2	0.531000	5037.843240	92.000000	95.575562
MK Delta	0.673000	16.818878	9.250000	121.135253

## Emitter Modeling & Visualization

The CCVPX comes with software that allows the user to define even the most complex threat radar waveforms by specifying a sequence of segments that describe the radar's behavior in frequency, PRI, pulse, and scan. Segments of each type can trigger the other segment types to advance in their sequences to produce an accurate progression of the waveform over time. The software includes the ability to graph twelve critical parameters of the simulated radar's waveform to allow the operator to verify correct programming.

The CCVPX software can define platforms for the simulated threat radars and the SUT. The motion of all platforms is modeled with full six degrees of freedom to allow dynamic modeling of terrain following and terrain blockage, as well as the calculation of angle of arrival effects for all signals at the SUT.

The screenshot shows the CEESIM software interface. On the left, there are 'Monitor Emitters' and 'Monitor Platforms' panels. The 'Monitor Emitters' panel shows a table with 3 emitters. The 'Monitor Platforms' panel shows a table with 4 platforms. The main area is a 3D visualization of a terrain with a radar dome and a target (SUT). A 'Polar View' panel on the right shows a radar scan. The SUT is located at 22.124217° N, 159.587930° W, 4572.0 m. The radar dome is centered at 126.82°.

Emitt. ID	GP	Mode	State	Plat.	Range (nm)	Az. AOA	El. AOA	Rad.	Pulses Out	Pulses Inhib.	Pulses Drp.
1	1	Search	Active	2	8.378	78.95	3.71	On	0	0	0
2	2	Track	Active	3	13.726	21.89	4.10	On	0	0	0
3	3	Track	Active	4	17.441	38.96	12.87	On	0	0	0

## 3D Scenario Visualization and Editing

CEESIM offers 3D scenario visualization and editing capability, which displays the extent of threat domes and emitter activation state. The GUI display includes range and bearing from emitter to SUT.

This screenshot shows the CEESIM software interface with a 3D visualization of a terrain. The 'Monitor Emitters' panel shows 3 emitters. The 'Monitor Platforms' panel shows 4 platforms. The main area is a 3D visualization of a terrain with a radar dome and a target (SUT). The SUT is located at 22.032182° N, 159.533188° W, 4568.2 m. The radar dome is centered at 347.9°.

Plat. ID	State	Latitude	Longitude	Alt. (m)	Speed (kt)	Range (nm)	Total Emitters
1	SUT	Active	N 22:01:56 W 159:31:59	14987.502	599.999	SUT	0
2	Grnd Threat	Active	N 22:00:04 W 159:38:48	1000.019	0.000	6.987	1
3	Air Threat	Active	N 21:57:02 W 159:32:36	9996.727	299.999	4.986	1
4	Air Threat2	Active	N 21:51:48 W 159:36:15	14997.846	299.999	10.852	1

### Integrated Solutions

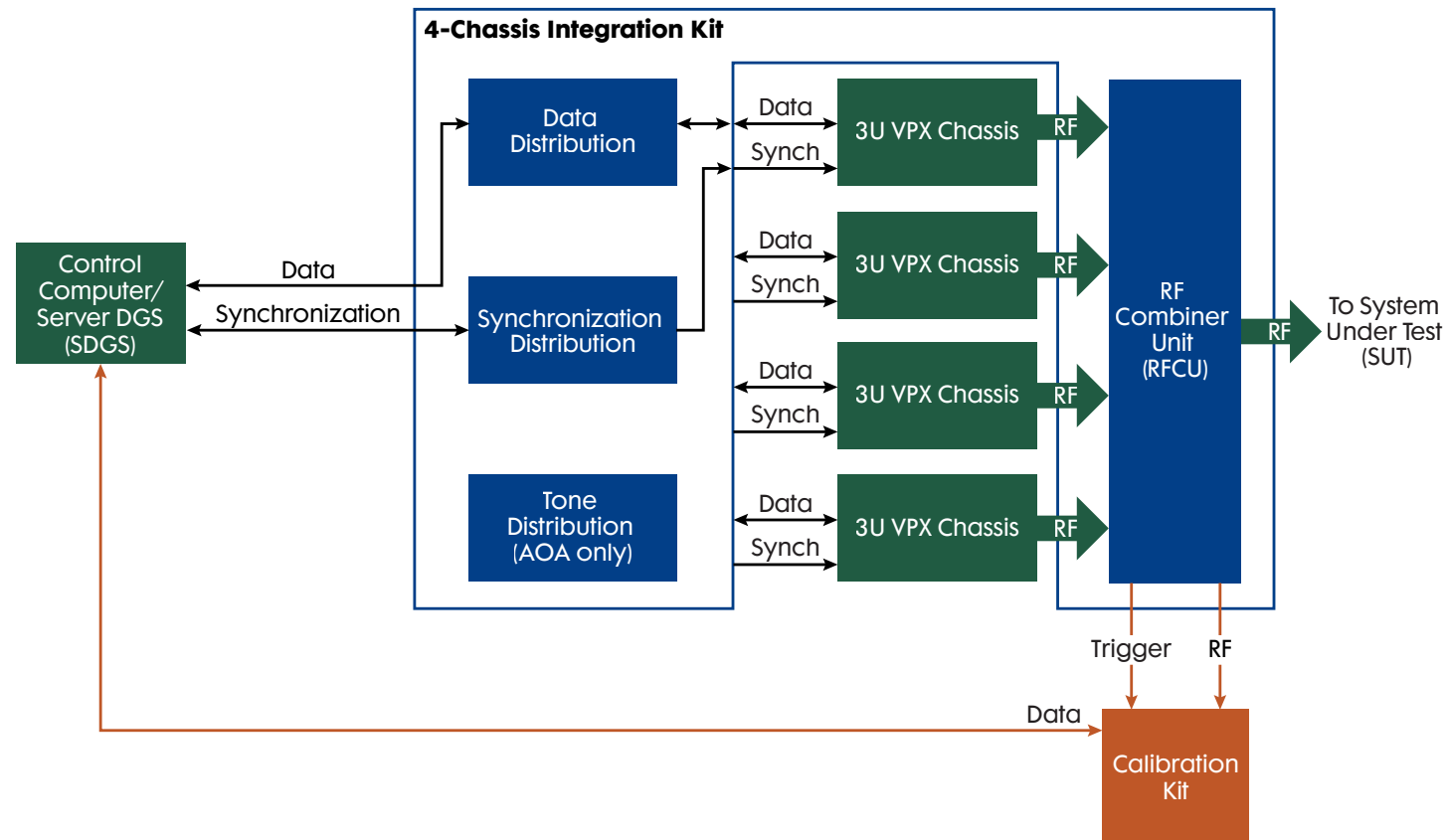
The modularity of the CCVPX design enables the creation of larger systems by combining up to four 3U VPX chassis. This is ideal for higher level test stations and smaller SILs. It provides the capability for up to either eight RF channels for high pulse density applications (8 MPPS), or up to 16 amplitude/phase/TDOA ports to support larger apertures and in some cases full 360-degree coverage.

### Standard Integration Kits

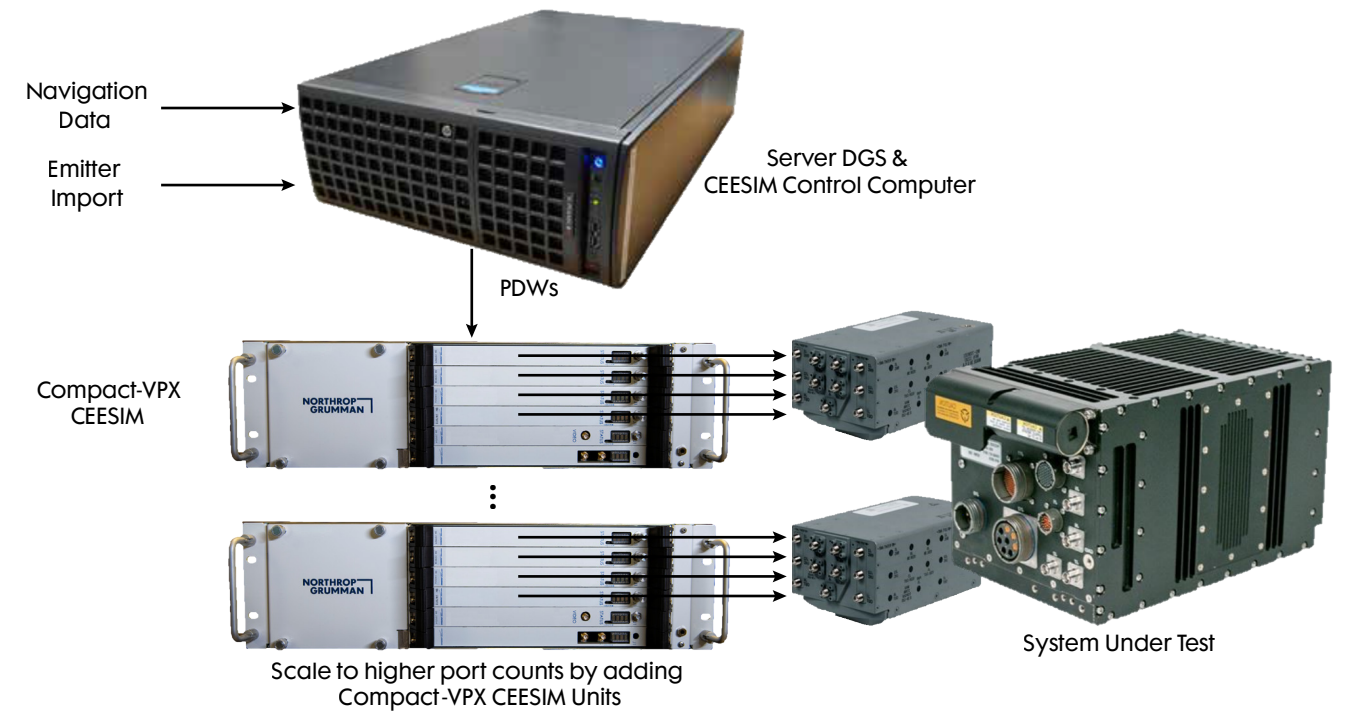
Standard integration kits are available to combine multiple CCVPX and mRFGEN chassis to form larger systems.

Model Number	Standard Integration Kits
APG0518V-CSDGS-R	CEESIM Server DGS and Control Computer, 2U Rack Mount
APG0518V-CSDGS-T	CEESIM Server DGS and Control Computer, Tabletop Briefcase
APG0518V-RMF-C	RMF Security Service—CEESIM Computers
APG0518V-mRFGEN	RFGEN Computer w/RFM
APG0518V-RMF-N	RMF Security Service—RFGEN Computers
APG0518V-CALRK	15U Calibration Rack
APG0518-MULTI-OMNI	Multiple Omni SIG GEN
APG0518-MULTI-PHASE	Multiple Phase SIG GEN

### Integrated Four 3U VPX Chassis System



### Scalable Integrated Solutions



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