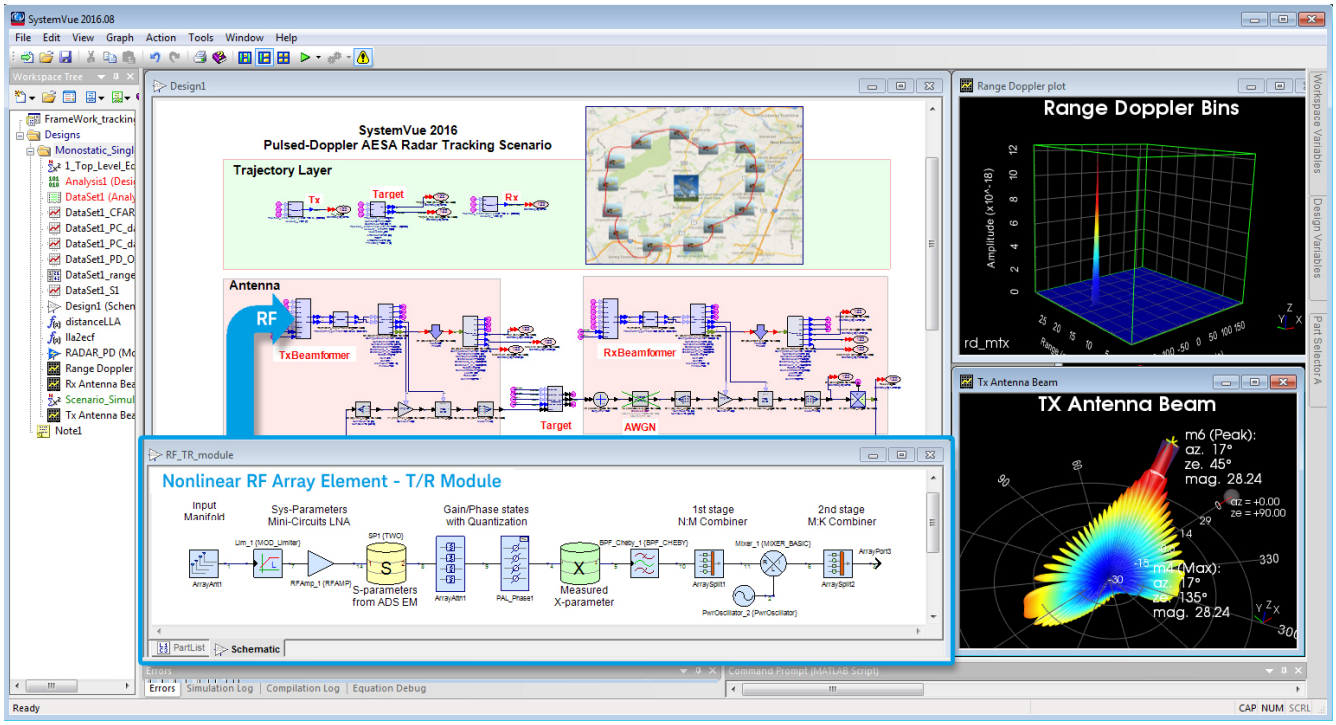
Keysight EEsof EDA

W1720EP Phased Array Beamforming Kit
W1467BP SystemVue Array Architect Bundle

System-level design support for phased array subsystems, enabling beamforming techniques to be applied to 5G, Radar, and Satellite systems

Solution Brochure



KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Introduction

The W1720 Phased Array Beamforming Kit provides system architects in 5G, Radar/EW, and Satellite communications with the essential tools to evaluate phased array and beamforming subsystems, including RF, Digital, and Hybrid beamforming architectures. It allows system designers to consider RF nonlinear and noise effects, Gain/Phase quantization, and Monte Carlo variations effects on total beam quality, sidelobe levels, and effective radiated power. It also supports dynamic system-level scenarios with algorithms for adaptive beamforming.

Because SystemVue includes MATLAB Script and supports baseband algorithm modeling in multiple languages, such as C++, SystemC, and VHDL/Verilog, SystemVue is an ideal platform to cross-validate phased array design information from RF, Baseband, and test & measurement teams. The W1720 beamforming kit is also compatible with SystemVue's many reference libraries for 4G/5G, Radar, satellite, and other modulation formats.

Who should use the W1720 Phased Array Beamforming Kit?

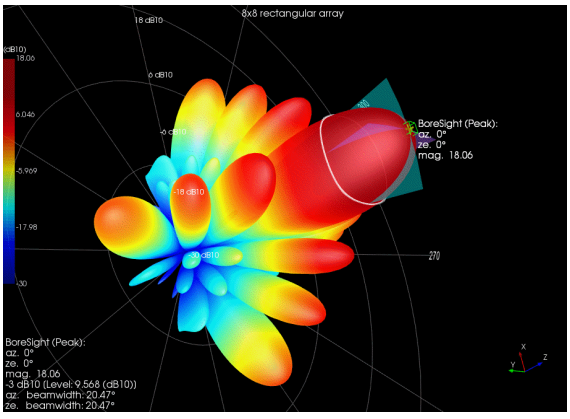
In typical R&D organizations, many engineering disciplines are required in phased array subsystem design. The SystemVue Phased Array Beamforming Kit allows RF and baseband teams to use a model-based engineering approach across disciplines. This enables them to perform early R&D validation of phased array system architectures, components and beamforming algorithms, and then continue into hardware test.

- **System architects** can integrate design information from multiple diverse teams, along with test waveforms, to produce winning architectures and proposals
- **Algorithm and beamforming designers** can include RF design information, for more realistic accuracy
- **RF system architects** can directly observe the effects of their RF arrays on high-level beam-level measurements, such as beamwidth, sidelobe levels & nulls, effective radiated power (ERP), and Gain/Temperature (G/T)
- **System Verifiers** can validate scenario-level performance under a range of conditions, as well as automate regression suites, and link to high performance test and measurement equipment

SystemVue also provides a variety of links to RF design tools such as Keysight Advanced Design System (ADS), providing both flexibility and consistency across a full R&D workflow.

Key applications

- 5G beamforming and high order MIMO
- Radar/EW systems
- Automotive beamforming
- Satellite/NewSpace communications terminals and payloads



What's Included in the W1720?

The W1720 adds onto any SystemVue environment. It enables users to work with phased arrays as either individual signals, or as a single "beam". The W1720 includes

- RF array analysis – enhances W1719 Spectrasys to work with arrays. Replaces ad hoc spreadsheets with nonlinear RF analysis for N-element arrays used in RF beamforming, with multiple levels of splitters/combiners, gain/phase states, and impairments from nonlinear, mismatch, and noise effects. (requires W1719).
- Dataflow array analysis – Models dynamic RF, Digital, and Hybrid beamforming topologies, and provides a convenient "Timed Envelope Matrix" datatype that makes working with 1000 parallel signal paths as easy as 1 signal path.
- RF Link – allows the RF array to be re-used at the system dataflow level. Directly validate nonlinear Transmit/Receiver architectures on actual 5G, Radar/EW, or Satellite system performance using realistic signals with active modulation, coding, and adaptive equalization and filtering.
- Beam measurements and visualization – Direct measurements of beamwidth, boresight direction, sidelobe levels, nulls, and aggregate quantities such as directivity, G/T, and effective radiated power.
- Radiated direction and power of spurious intermods analysis - predicts spatial and spectral interference with nearby antennas, multimode AESA radar-communications and compliance with FCC emission rules.
- Using S-, X- and sys-parameters of phase-shifters, attenuators, amplifiers and mixers for fast hardware implementation.
- Antenna element failure analysis - Monte Carlo or user-specified element failures enables robust mission critical design.
- System-level scenarios – Apply beamforming subsystems in active, system-simulation scenarios in 5G, Radar/EW, and Satellite communications.

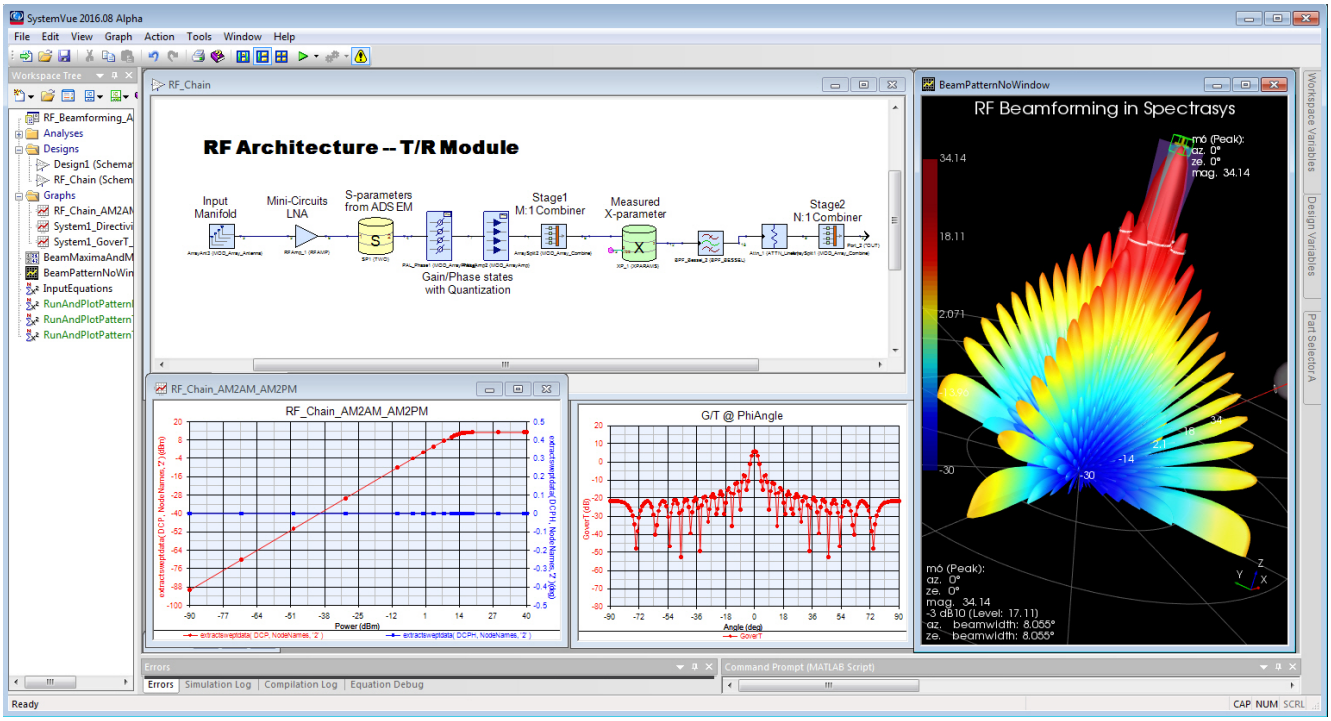


Figure 1. Among its many funcitons, the W1720 Phased Array Beamforming Kit adds an array analysis controller and special components and mesaurements to the W1719 RF System Deisgn Kit (Spectrasys). If you already own the W1719, the W1720 adds on top, and enables the full dynamic dataflow capability as well.

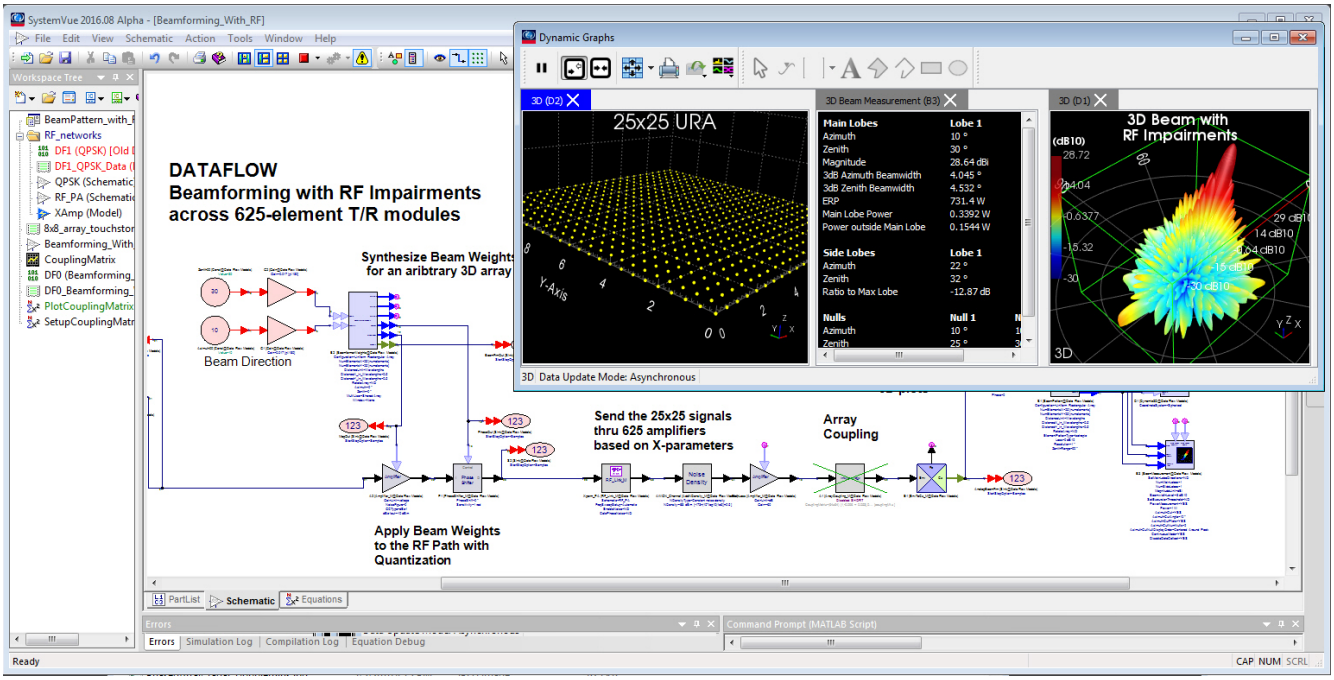


Figure 2. The W1720 also enables a dynamic, system-level beamforming analysis using a new “timed envelope matrix” datatype in the datflow simulation. Observe dynamic measurements of beamwidth, direction, sidelobe levels, and nulls, while taking into account quantization effects, noise, nonlinearities, statistical variations, and farfield patterns from popular 3DEM software.

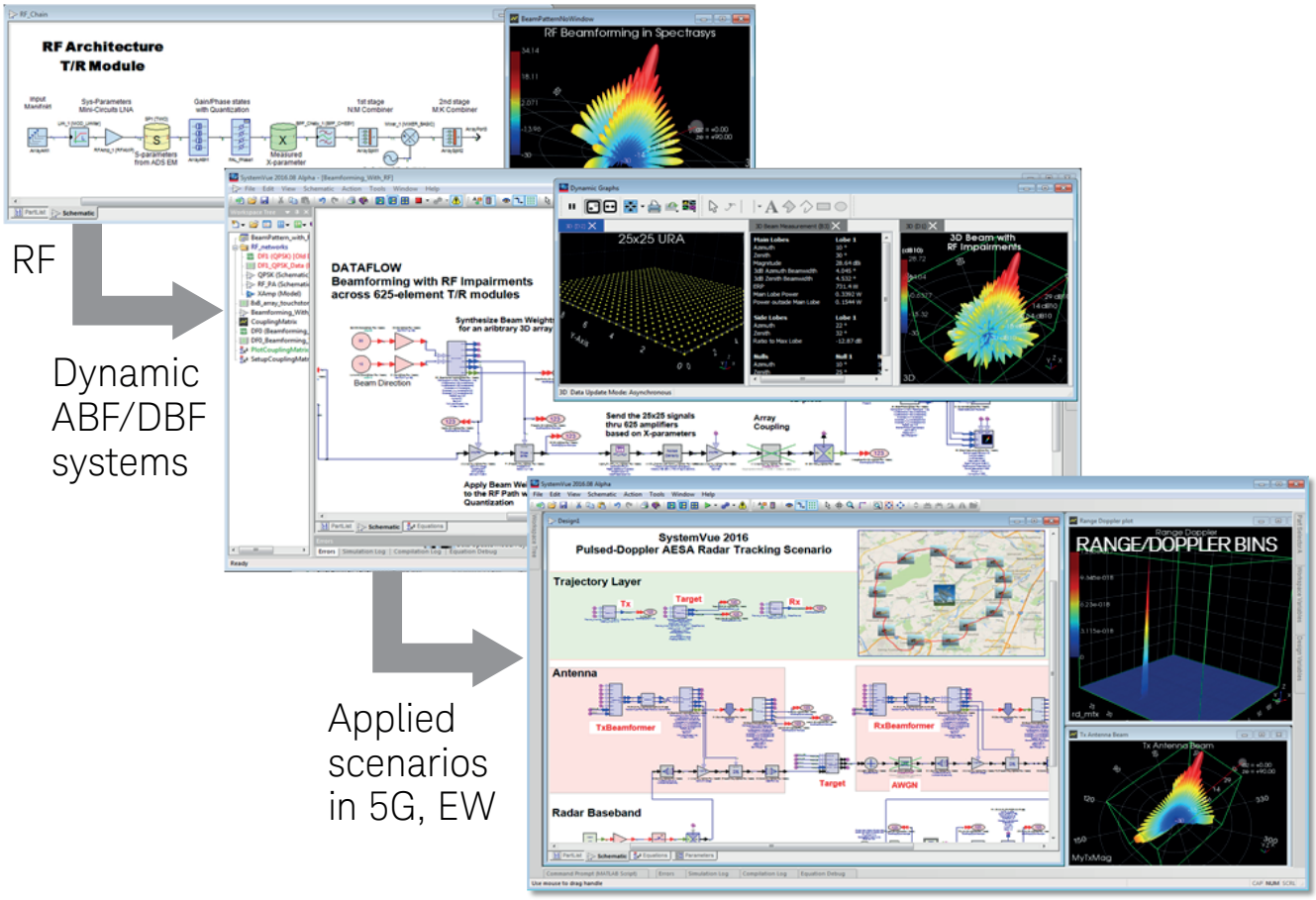


Figure 3. The W1720 allows RF array performance to be leverage at the dataflow (system-level), and then applied to dynamic, multi-user scenarios with active signaling using the SystemVue 5G, Radar, and other reference libraries. Shown above is a monostatic radar tracking application using the W1905 Radar model library.

Configuration

The W1720 Phased Array Beamforming Kit can be added to any SystemVue Environment. It does not require the W1719 RF System Design Kit, but the W1719 is highly recommended for analysis of RF array architectures. Without the W1719, the W1720 still provides system-level dataflow simulations and beam measurements.

If you are working in Radar or 5G applications, it is recommended that you purchase the full W1905 or W1906 libraries (respectively), not the W1720 by itself.

The W1720 is already included in these bundles and libraries:

- W1905 Radar Model library
- W1906 5G baseband verification library
- W1907 5G Forward baseband verification library bundle
- W1467 SystemVue Array Architect bundle

The W1467 SystemVue Array Architect is a convenient bundle that adds the W1720 Phased Array Beamforming Kit to the popular W1464 SystemVue RF System Architect bundle, to take full advantage of the W1720. This bundle is recommended for system architects working in satellite and New Space communications systems. Existing SystemVue users may wish to upgrade to this bundle.

The W1467 includes:

- W1461 SystemVue Comms Architect
- W1719 RF System Design Kit
- W1720 Phased Array Beamforming Kit

Additional Keysight software applications (such as I/O libraries, Command Expert, and the 89600 VSA software) are often used to connect SystemVue to families of Keysight test equipment. These families include baseband AWGs, digitizers, RF sources, RF analyzers, and oscilloscopes.

For More Information

For more detailed application information, refer to:

- **www.keysight.com/find/eesof-systemvue-phased-array**
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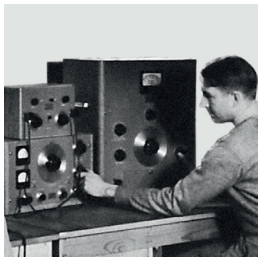
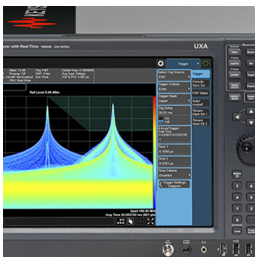


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