

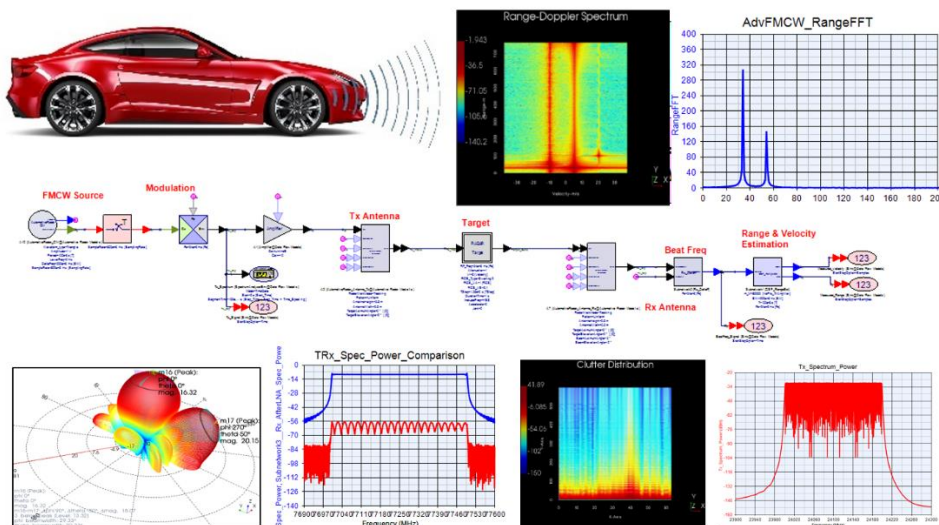
TECHNICAL OVERVIEW

Keysight W1908EP/ET

SystemVue Automotive Radar Library

A complete set of highly-parameterized simulation models and reference designs for automotive radar scenario simulation

The Keysight EEs of EDA SystemVue W1908 Automotive Radar Library has comprehensive tools for radar waveform generation, signal modulation, antenna modeling, channel simulation and signal processing. Users can simply connect different models to establish the unique automotive radar simulation scenarios.



Meanwhile, the reference designs, such as multi-targets range and speed measurement and 3D scanning radar using antenna array, could offer users much easier starting points to implement their own design ideas into early simulations and prototyping.

Bring your design ideas into real-world automotive radar scenarios

The Automotive Radar Library is used with the Keysight SystemVue electronic system level simulation platform to integrate critical, safety-conscious and complicated scenarios into reliable, leading-edge design of automotive radar. It provides solutions under cost and time constraint projects to design and develop algorithm such as direction of angle (DOA) and phase comparison.

Multi-scatter target parameterized simulation models are available in the Automotive Radar Library to coordinate file import to realize and visualize the micro-Doppler effects on the target. This library can import antenna pattern files for ground clutter simulation as well.

To accelerate the product development cycle from simulation to pilot and prototyping, the connectivity to test and measurement instruments with SystemVue platform enables upload and download the data files by adding input and/or output in the schematic workspace.



Try a 30-day free trial now

Start evaluating your automotive radar simulation scenarios.



Start free trial

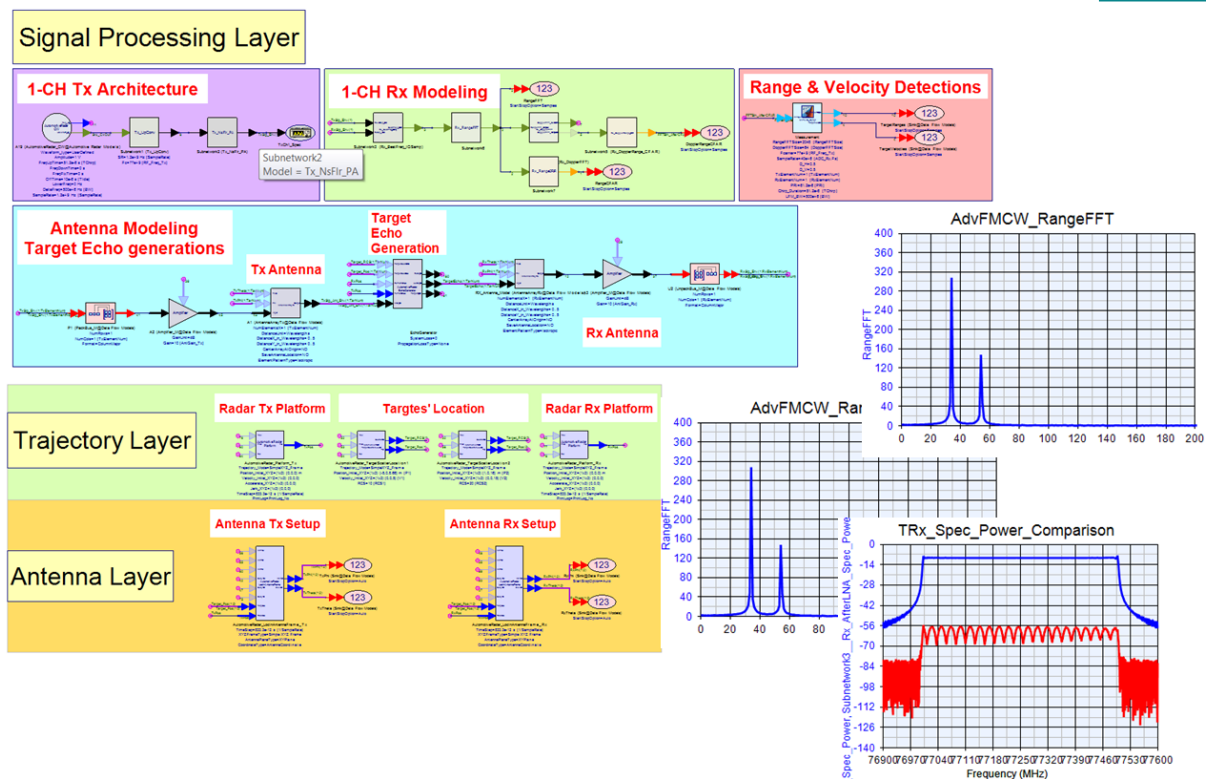


Figure 1: The Automotive Radar Library provides dozens of highly-parameterized simulation models and reference designs for automotive radar scenario simulation. This library has the capacity of radar waveform generation, signal modulation, antenna modeling, channel simulation and signal processing.

Avoid overdesign - use synergistic system simulation tools for RF and baseband

Today's designs require more sophisticated RF and baseband system simulation, to manage technical risk earlier in the design process. System simulation of RF / baseband interactions within and between channels is an increasing challenge. Larger array sizes, bandwidth, frequency, distortion and modulation complexity multiplies risk.

Focus on product design, not simulator design

Maintaining a combination of tools such as MATLAB and fragmented spreadsheets to do domain-specific system simulations takes time. Next generation automotive radar systems require simulation tools that can accurately model the increasing complex RF and baseband interactions.

Frequency & time domain simulation for RF & baseband system design

Co-simulate with DataFlow Time domain and Spectrasys RF system simulators. Easily simulate system metrics with RF impairments.

An Integrated Workflow

Integrate your workflow with complementary tools for co-simulation with ADS, SS, VSA, MATLAB & STK. Achieve a greater simulation capability with synergy to your workflow.

Efficient and accurate simulation tools for multi-channel OTA applications

Perform both frequency and time domain simulations for phased array analysis, beamforming and over-the-air (OTA). Evaluate the effects of complex channel-channel RF interactions and impairments, including yield & failure.

Easily deploy your simulation & environment scenarios into proven RF test solutions

Deploy scenarios to Keysight Instrumentation and validate your design with the same scenarios from system simulation.

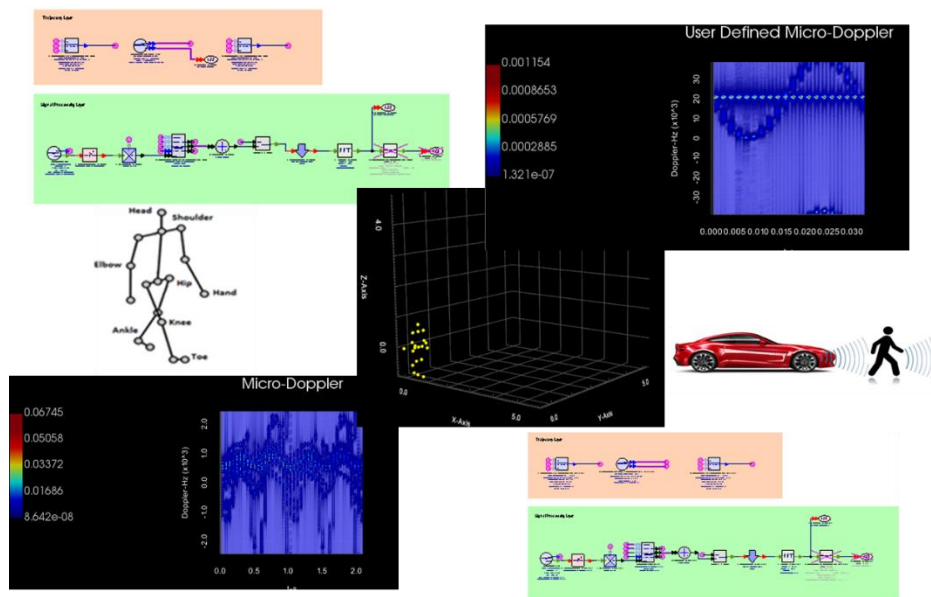


Figure 2: Automotive radar developers can simulate and test micro-Doppler to validate their radar's ability to detect slow-moving pedestrians.

Minimize design risk and drive test with SystemVue's Automotive Radar Library:

- Chip designers can prove their devices in a reference system simulation scenario
- Radar designers may evaluate vendor chips in a variety of system scenarios
- Linear FMCW, MFSK & Fast Chirp signal generation
- Evaluating different MIMO radar architectures
- Simulate multiple target detection range and accuracy
- mmWave propagation, multi-GHz bandwidths & interference, RF impairments
- Capturing complex moving targets in the presence of a variety of clutter
- Phased array simulation with EMPro, HFSS, & and CST antenna file importing
- Antenna 3D scan simulation
- Pedestrian micro-Doppler simulation
- Phase compare & DOA estimate with fewer channels
- Multi scatter target simulation
- Connectivity with Keysight instrumentation

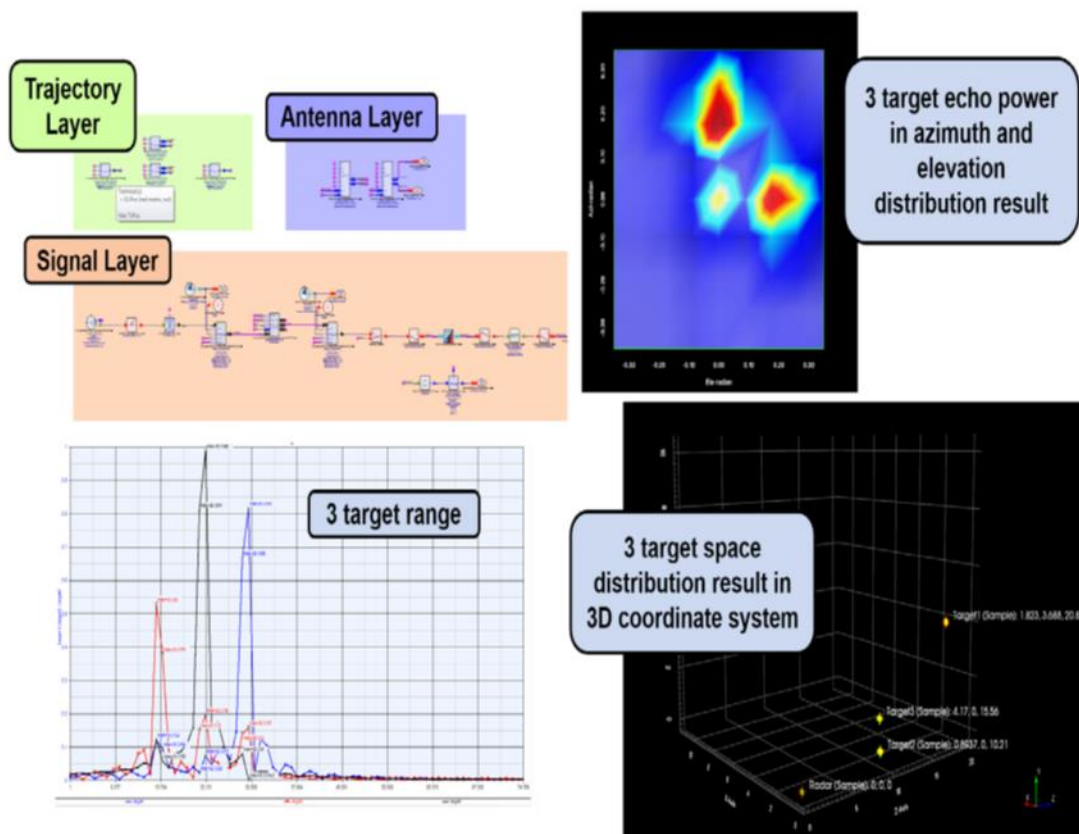


Figure 3: Create 3D scan scenarios with platform and target position, velocity, target RCS, and more. Designers can visualize the results in various traces and distribution plots.

SystemVue Automotive Radar Models

The Automotive Radar Library has many models today with reference designs and additional automotive radar examples. The walking pedestrian scenario model is uniquely available in the automotive radar library. Using reference models from the W1908 library as well as the user's own Intellectual Property (IP), SystemVue users can design their automotive radar components and systems quickly and easily.

Simulators	Models
Transmit signal generation	CW, FSK, LFM (Linear FM)
Transmit channel and antenna	Tx Antenna, Tx Antenna Polarization, Tx Phased Array, Tx Multi-Channel, Tx DBS 2D
Target and environment	Target, Echo Generator, Target Scatter Location, Target Trajectory, Platform, Clutter 2D, Clutter H, Phase Shift, Propagation Loss, RCS, Clutter Generation, Target Echo
Receiver channel and antenna	Rx Antenna, Rx Antennal Polarization, Rx Phased Array, Rx Multi-Channel, Rx DBS 2D
Signal processing	MTD, MTI, CFAR, DOA, Detector

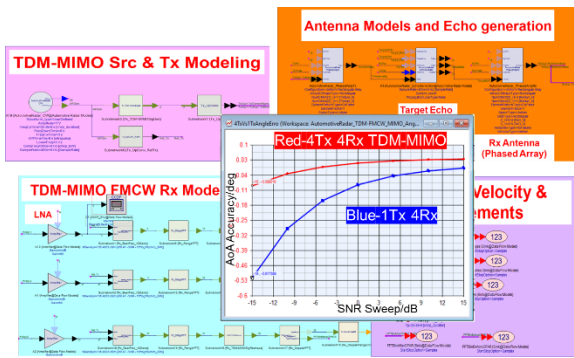


Figure 4: TDM-MIMO with FMCW chirp waveform.

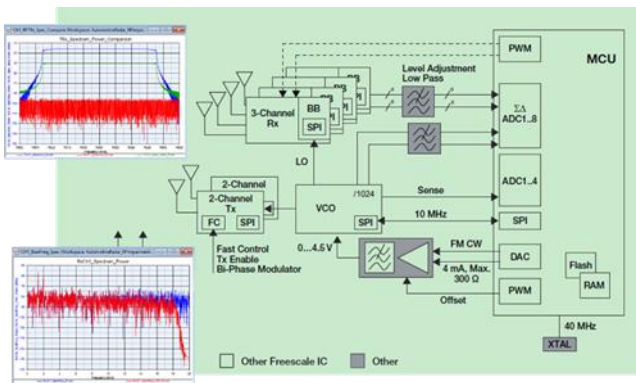


Figure 5: mmWave / RF Impairment Modeling

Bring your design ideas into real-world automotive radar scenarios

SystemVue is a simulation platform for users to model, design and verify a variety of Automotive Radar systems, together with their external environments. Using customers' models and built-in models, different automotive radar systems can be constructed and simulated.

SystemVue Automotive Radar Library Examples:

Example	Description
Basic FMCW Radar Start-up	Simple simulation example illustrating a basic fmcw radar
Advanced FMCW	A more advanced example adding the trajectory and antenna modelling layers to the DSP layer
Micro-Doppler Target Modelling	Pedestrian 3d micro doppler target models with dynamic behavior improved flexibility on user-defined target trajectories
Compressed Sensing	A technique for Recovering signals from far fewer samples than required by the Shannon-Nyquist sampling theorem.
Clutter/Ground Clutter Modelling	Balancing the accuracy of clutter modelling versus simulation time
77 GHz Propagation Loss	Improved propagation loss modelling at MMwave
Signal Generation	Linear FMCW, FSK CW, and MFSK signal generation and instruments connection
Multi-Target Tracking	Four techniques using linear FMCW, MFSK, fast chirp and PRBS
mmWave / RF Impairment Modeling	Modelling IQ impairments, non-linearity and noise in transceiver designs
Phased Array Transmitter	Phased array steering illustration
3D Scan	Phase array 3D scan to perceive automotive Radar scenario information
Phase Difference AoA	Angle of Arrival measurement using three RX antenna elements' phase difference
MUSICAOA	Angle of Arrival measurement using MUSIC
MIMO Architecture Examples	
CDM-FMCW MIMO	Code Division Multiplexing (Hadamard Matrix) with Wide FOV.
CDM-PRBS MIMO	Code Division Multiplexing to mitigate interference effects.
TDM-FMCW MIMO	Time Division Multiplexing with Improved AoA Measurement Accuracy.
TDM-PRBS MIMO	Time Division Multiplexing to mitigate interference effects.
TDM-MIMO AB Profile SigGen	Use distinct FMCW chirp profiles to improve velocity ambiguity.

Ordering Information

Model	Description
W1908EP/ET	Automotive Radar Library

The Automotive Radar Library W1908 can be added as an option to any SystemVue core environment or bundle, such as W1461BP SystemVue Comms Architect.

Available SystemVue core environment:

- W1461 SystemVue Comms Architect
- W1462 SystemVue FPGA Architect
- W1464 SystemVue RF Architect
- W1465 SystemVue System Architect
- W1467 SystemVue Array Architect

More Information

Product information

www.keysight.com/find/eesof-systemvue-automotive-radar

SystemVue information

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