W1919

GNSS Baseband Verification Library

SystemVue Algorithm Reference Library for Global Navigation Satellite Systems (GNSS), Intended for System Architecture, Baseband Algorithms and Verification

Data Sheet

The W1919 Global Navigation Satellite System (GNSS) Baseband Verification Library is an optional add-on library for SystemVue. It provides end-to-end simulation modeling for GPS satellite navigation systems, with additional modulation-only sources for Galileo, GLONASS and Beidou (Compass) systems. The library provides reference designs for GPS transmitters and receivers, and a satellite channel model with troposphere, ionosphere and multi-path effects, enabling users to simulate receiver performance with baseband and RF impairments. Full multi-satellite scenarios are also provided to simulate system performance in realistic satellite environments given the receiver location, trajectory, date, and time.

Anticipate ___*Accelerate* ___*Achieve*

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Who should use the W1919?

System-level architects, baseband algorithm designers and RF component designers can use the W1919 GNSS library to perform early system validation, with or without working baseband or RF hardware. SystemVue is also scriptable, linkable to other platforms and connects to high-performance test equipment, providing both flexibility and consistency across the full product lifecycle.

The W1919 GNSS library is intended for use in early R&D, academic research and aerospace/defense systems to explore algorithm and system robustness in deep margin and interference situations. It also provides a convenient modeling platform for customer applications and emerging worldwide GNSS standards.

What can you do with the SystemVue GNSS Library?

With the SystemVue GNSS library, users can simulate satellite navigation system performance (including baseband TX/RX algorithms and RF impairments) in single-satellite and multi-satellite scenarios.

- **Baseband Modeling**
  Replace algorithms in the Agilent W1919 GNSS reference design with your own custom algorithms in C++, MATLAB, or HDL formats, or use graphically-defined schematics. SystemVue also integrates directly with your existing MATLAB, for Intellectual Property (IP) compatibility and portability.

- **System Modeling**
  Evaluate algorithms under user-defined fading, noisy, interference, jamming, and deep-margin conditions, and include RF impairments.**

- **Research & Emerging Standards**
  Add military, emerging standards or custom encoding/decoding to extend beyond the commercially-available "GPS L1" signal formats and standards. Precisely probe inside the open block diagrams or simply self-educate on the latest GNSS standards.

- **Custom Testing**
  Download custom wideband waveforms, multi-standard signals, interference, and impairments to test and measurement equipment. (SystemVue for static waveform generation is limited mainly by the AWG memory depth of the signal source.)

- **RF Component Evaluation**
  SystemVue's GNSS library fills the gaps for RFIC/RF module designers who want to assess system-level performance based on simulated or tested analog designs. SystemVue can interact with the Agilent ADS and GoldenGate RF EDA simulators, with X-parameters*, and more.

** SystemVue can also be customized to integrate with the STK 10 inertial and terrain modeling software from Analytical Graphics, Inc. (AGI). Please contact your local Agilent EEsof EDA Consulting Services representative about integrating SystemVue with STK (depending on local availability and export restrictions).
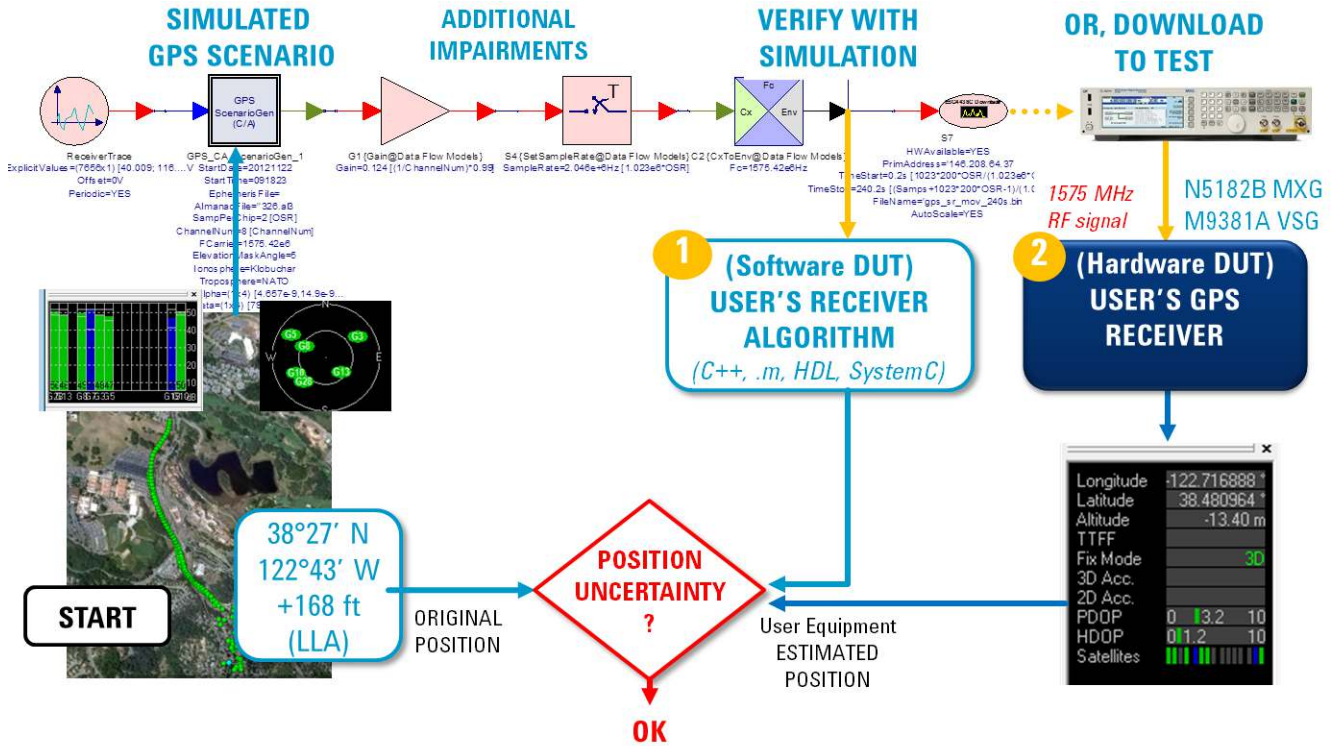
Figure 1. The W1919 GNSS library can be used to create GPS or Beidou2 signals with full multi-satellite constellation and fading, ground receiver trajectories and a reference receiver. Substitute your MATLAB/C++ algorithms, RF impairments and interference, or download to test equipment to validate GNSS satellites or receivers.
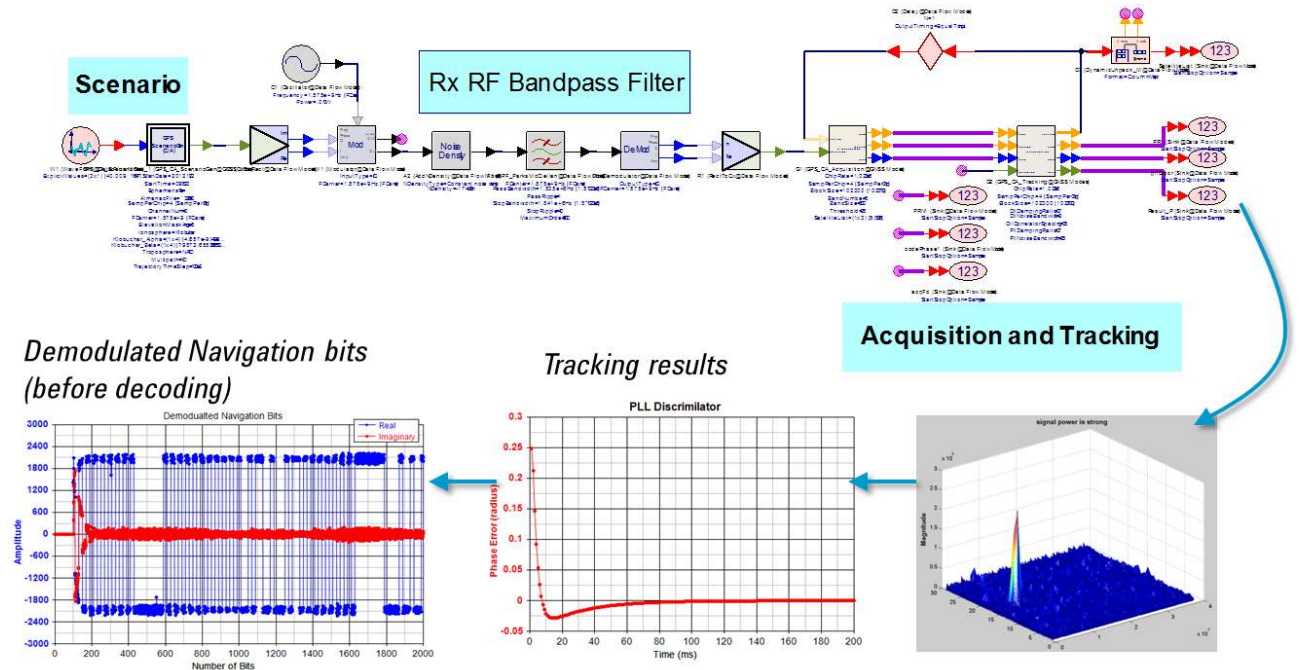

Figure 2. The W1919 GNSS library is used here to simulate receiver tracking performance as it acquires a satellite signal, overcomes its Doppler shift and outputs raw navigation data.

Uncoded GNSS Modulation Formats Supported as Sources

System	Carrier (MHz)	Signal	Type	Modulation	Chipping Rate	Code Length
GPS	L1 1575.42	C/A	Data	BPSK	1.023 Mcps	1023
		P	Military	BPSK	10.23 Mcps	For 7 days
	L2 1227.6	C/A	Data	BPSK	1.023 Mcps	1023
	L5 1176.45	I	Data	QPSK	10.23 Mcps	10230
		Q	Pilot		10.23 Mcps	10230
	L1C 1575.42	L1CD	Data	BOC(1,1) TMBOC	1.023 Mcps	10230
		L1CP	Pilot		10.23 Mcps	10230
	L2C 1227.6	L2CM	Data	TM and BPSK	0.5115 Mcps	10230
		L2CL	Pilot		0.5115 Mcps	767250
		P	Military	BPSK	10.23 Mcps	For 7 days
Galileo	E1 1575.42	B	Data	CBOC	1.023 Mcps	4092
		C	Pilot		1.023 Mcps	4092*25
	E5 1191.795 a: 1176.450 b: 1207.140	a-I	Data	AltBOC (15,10)	10.23 Mcps	10230*20
		a-Q	Pilot		10.23 Mcps	10230*100
		b-I	Data		10.23 Mcps	10230*4
		b-Q	Pilot		10.23 Mcps	10230*100
GLONASS	L1 1602.0+k*Δf, k=-7,...,6	C/A	Data	BPSK (not CDMA)	0.511 Mcps	10220
Beidou	B1 1561.098	C/A	Data	BPSK	2.046 Mcps	2046

Figure 3. The SystemVue W1919 GNSS library supports a variety of uncoded modulation formats as signal sources for the major worldwide satellite navigation standards.

GNSS Transmit-Receive Scenarios Supported

GNSS Standard	TX Modulated Signal	TX Scenario					RX Demod Uncoded BER	RX Decode, Pseudo-range/ Positioning
		Constellation	Doppler	Ionosphere/ troposphere	Multi-path	Navigation message		
GPS	L1 C/A; L1C,L2,L2C, L5 examples	Yes	Yes	Yes	Yes (user-defined)	Yes	L1 MBOC	Yes
Beidou2	B1I	Yes: GEO / IGSO / MEO	Yes	Yes	Yes (user-defined)	Yes	B1I	Yes

Figure 4. For GPS L1 C/A and Beidou2 B1I systems, the W1919 provides a working reference design with a coded source, multi-satellite scenarios, propagation, and a reference receiver. This enables end-to-end system-level simulations of Latitude/Longitude/ Altitude (LLA) position uncertainty. The open block diagram allows user IP, RF models, and impairments to be added, or used simply for parameterized test vector generation.

Configuration

The W1919 GNSS Baseband Verification Library can be added as an option to any W146x-series SystemVue environment or bundle.

The W1919 can be combined with other libraries such as the W1917 WLAN, W1918 LTE-Advanced or W1905 Radar libraries, which can provide additional sources of interference and signal complexity.

The W1719 RF System Design Kit is recommended for including analog/RF effects in the RF receiver design, including X-parameters, phase noise and other factors that affect receiver performance. The W1464 RF System Architect environment includes the W1719 and can be used as the base platform, instead of the W1461 SystemVue Comms Architect.

For more information

For more detailed application information, refer to:
www.agilent.com/find/eesof-systemvue-gnss-library
www.agilent.com/find/eesof-systemvue-videos
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