

BROADSIM

WAVEFRONT

Software-Defined CRPA Simulation System



A Powerful and Proven Platform

Protecting your GNSS systems from jamming and spoofing is more critical now than ever before. Leveraging the same proven software-defined architecture as our BroadSim platform, Safran Federal Systems developed BroadSim Wavefront to enable easier and more affordable CRPA receiver testing.

Why Develop a New Wavefront Simulator?

- High-end PNT systems are using AJAS - very few Wavefront simulators exist
- Wavefront simulators are expensive - standard configurations can cost millions
- Jamming/spoofing is often not a part of the solution - the user must integrate additional hardware
- Scenario creation is complicated and limited - requiring trained, expert PNT engineers

Advanced Jamming & Spoofing Simulation

- Unlimited number of in-band and out-of-band jamming signals with no additional hardware
- Spoofing for all licensed GNSS signals
- Configurable transmitters - set signals, location, antenna pattern, and trajectory for each transmitter
- Complete jamming and spoofing control through the Skydel GUI and/or API
- Automatic compensation for distance, power, and time-of-flight based on the scenario configuration
- Custom interference waveforms, incl. Blue Force Electronic Attack (BFEA) and replay of IQ data files

Safran Federal Systems is the trusted Resilient PNT mission partner to U.S. government and defense organizations, from the lab to the field.

Scalability

- 4 to 16 tri frequency antenna elements
- 4 outputs / element (Ex. GNSS L1/L2, Interference L1/L2 - enables higher dynamic range)

Software-Defined System

- IQ generated in GPU not FPGA
- RF generated in SDR (Software-Defined Radio)
- Flexible, affordable, scalable
- Rapid development cycles

Operational Features

- 1,000 Hz iteration rate
- Simulate 600+ signals/element
- Space simulation: Orbital trajectories, mission specific trajectories
- Multipath (3 echo's/PRN/Code)
- PXE (pixie) system architecture - single computer operation

The BroadSim Wavefront system employs a scalable architecture with a dedicated controller, offering a single pane view of all system nodes and their signal simulations

Continuous phase monitoring

- Real-time automated calibration
- Phase Offset: $\pm 1^\circ 1\sigma$



7-Element BroadSim Wavefront System

Automatically Calculate

- Propagation delays
- Power loss
- Doppler shift due to dynamics

GNSS Simulation - 1000 Hz

GPS Open: L1C/A, L1C, L1P, L2P, L2C, L5

GPS Encrypted: L1P(Y), L2P(Y), L1-AES-M, L2-AES-M, L1-MNSA-M, L2-MNSA-M

GLONASS: G1, G2

BeiDou: B1I, B1C, B2I, B2a, B3I

Galileo: E1, E1B-OS-NMA, E5a, E5b, E5-AltBOC, E6HAS

QZSS: L1C/A, L1C, L1S, L2C, L5, L5S

SBAS: L1, L5 - WAAS, EGNOS, MSAS, GAGAN, SDCM

NavIC: L5

Interference

- Integrated into the software (GUI and API)
- Simultaneously simulate multiple threats
- Dynamic transmitters, user-defined waveforms
- Jamming, spoofing, repeating

Choose and Control

- Interference location and trajectory
- Antenna locations, pattern, and orientation



Wavefront Node, generates IQ data per each element

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