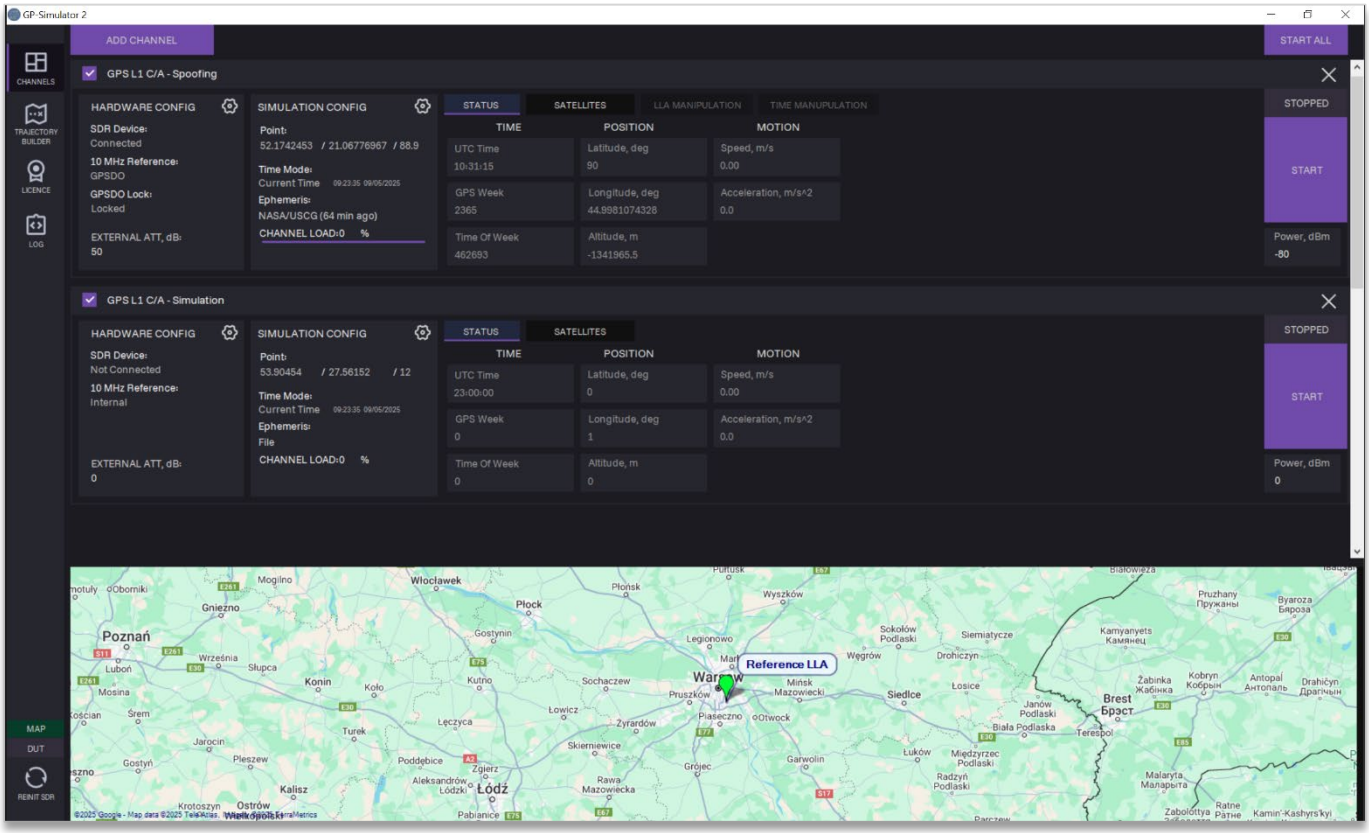
GP-Simulator 2

GPS Signal Simulator for Spoofing Vulnerability Assessment and General Purpose Testing

Supports coherent spoofing, trajectory simulation, and precise time manipulation.
Compatible with a wide range of SDRs for lab, field, and production-line testing

GP-Simulator 2 is a powerful and versatile GNSS signal simulator designed for spoofing vulnerability testing, timing attacks, and functional validation of GPS receivers. It supports coherent and non-coherent spoofing scenarios, trajectory-based motion simulation, real-time manipulation of time and position, and integration with a broad range of SDRs—including Ettus USRPs and GPSPATRON's custom high-performance board. Ideal for lab environments, production lines, and cybersecurity research.



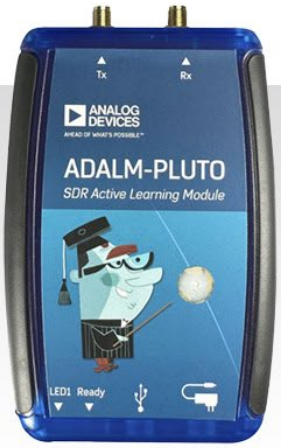
Key Features

- **Coherent and Non-Coherent Spoofing**
  Simulate both synchronous (coherent) and asynchronous spoofing attacks. Coherent spoofing allows seamless signal takeovers without tracking loss, while non-coherent spoofing is useful for testing basic detection and recovery mechanisms.
- **Live Sky Signal Synchronization**
  Use real GNSS signals from an external antenna to synchronize spoofing signals. This enables realistic testing in a lab.
- **Advanced Time Manipulation**
  Modify critical GNSS timing parameters in real time, including PPS phase shift, Time of Week (ToW), and satellite clock drift. Ideal for evaluating the impact of timing attacks on receivers and time servers.

- **Position Spoofing and Trajectory Simulation**
  Override the receiver's position manually or simulate dynamic movement by defining waypoints, altitude changes, speed, and acceleration. Perfect for testing drones, autonomous vehicles, and mobile equipment.
- **True Almanac and Ephemeris Integration**
  Automatically downloads real almanac and ephemeris data from trusted NASA sources, ensuring spoofing success against receivers with built-in protection mechanisms.
- **Multi-Channel Operation**
  Run multiple simulation or spoofing channels simultaneously. Each channel can be configured independently, enabling complex test setups such as multi-device scenarios.
- **Broad SDR Compatibility**
  Works with Ettus USRP SDRs via UHD drivers. Support for Adalm Pluto and HackRF One is coming soon. Also supports GPSPATRON's custom SDR with enhanced signal quality and low phase noise.
- **Over-the-Air Testing Tools**
  Easily configure over-the-air tests by specifying antenna gain, cable losses, amplifier parameters, and distance to the device under test. Enables accurate power planning in real environments.
- **Real-Time Scenario Adjustment**
  Change spoofing parameters on the fly without restarting the simulation. Supports agile testing and debugging of receiver behavior under evolving conditions.
- **Receiver Testing for Security and Performance**
  Suitable for both spoofing vulnerability assessments (e.g., time servers, drones, RTK bases) and basic functional testing of GNSS receivers during production or lab validation.
- **User-Centered Design**
  Intuitive graphical interface, minimal setup requirements, and full video training library make the tool accessible even to users without GNSS expertise.

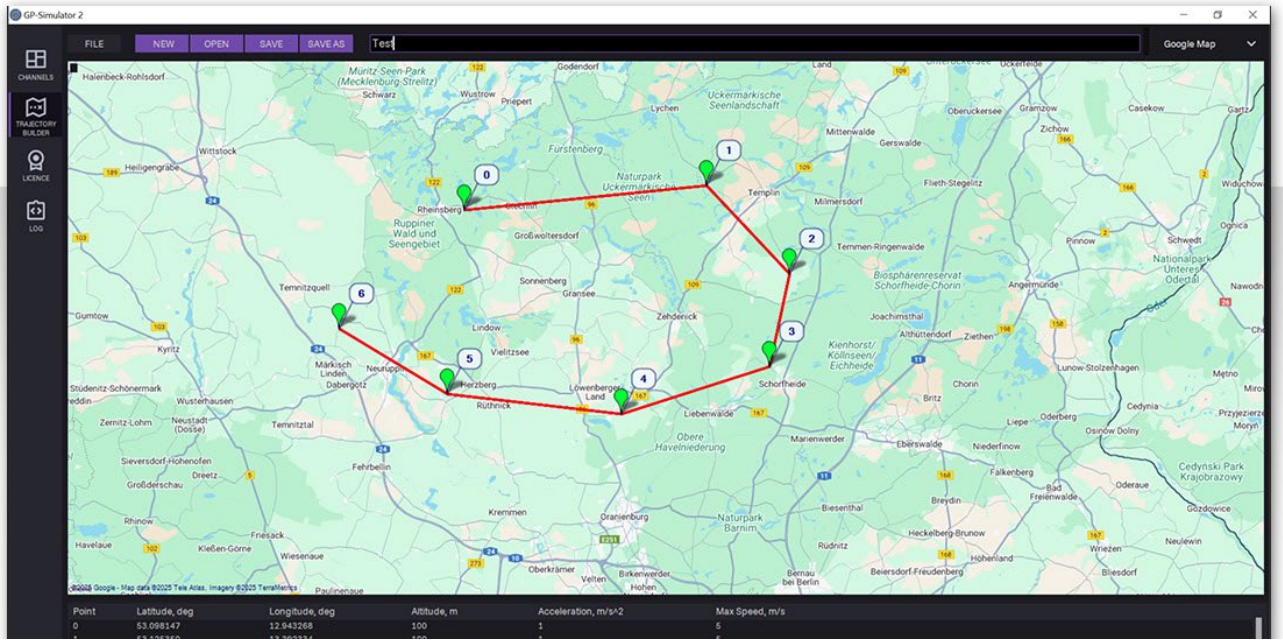
Broad SDR Compatibility

Supports a wide range of SDRs including USRP, Pluto, HackRF, and more—flexible integration with your existing test hardware



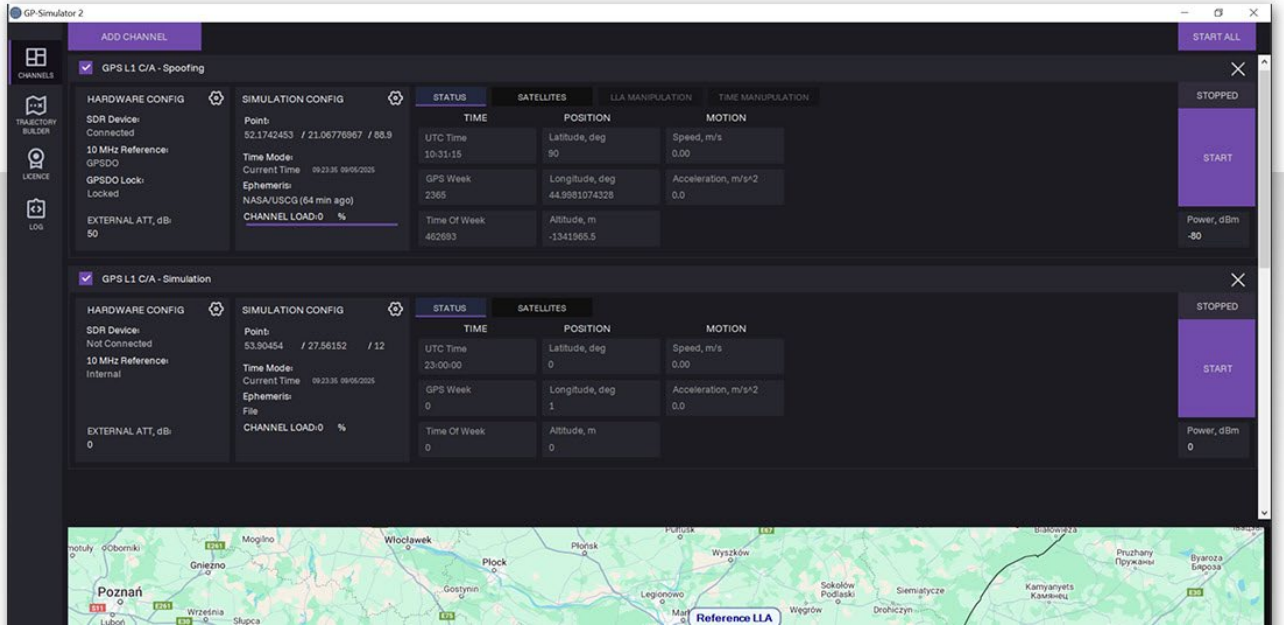
Trajectory Builder

Create complex movement paths by setting waypoints, speeds, and accelaration—ideal for testing spoofing scenarios with dynamic receiver motion



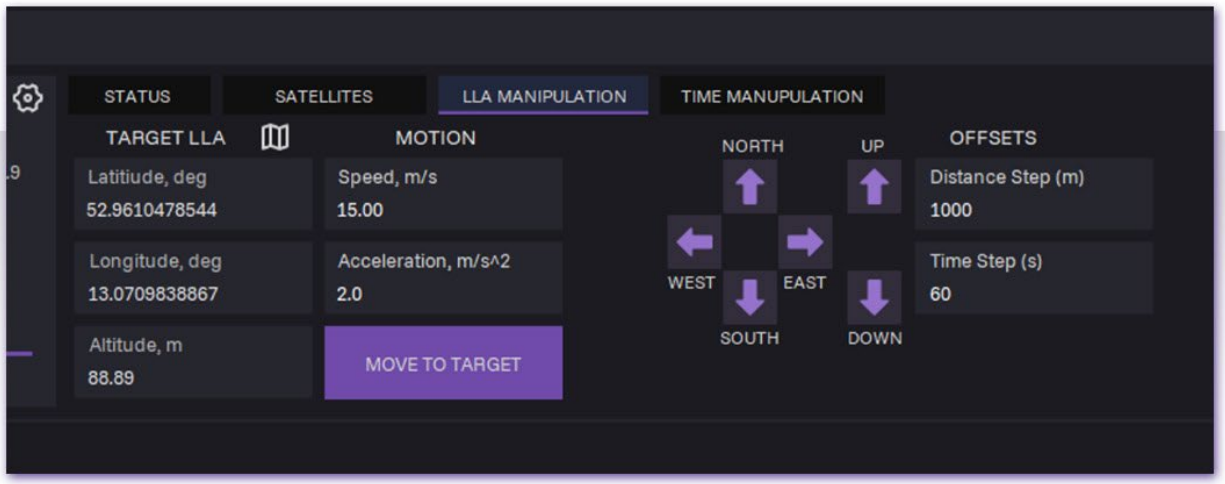
Multi-Channel Operation

Simulate multiple GPS signal channels simultaneously—configure and run spoofing and simulation scenarios in parallel



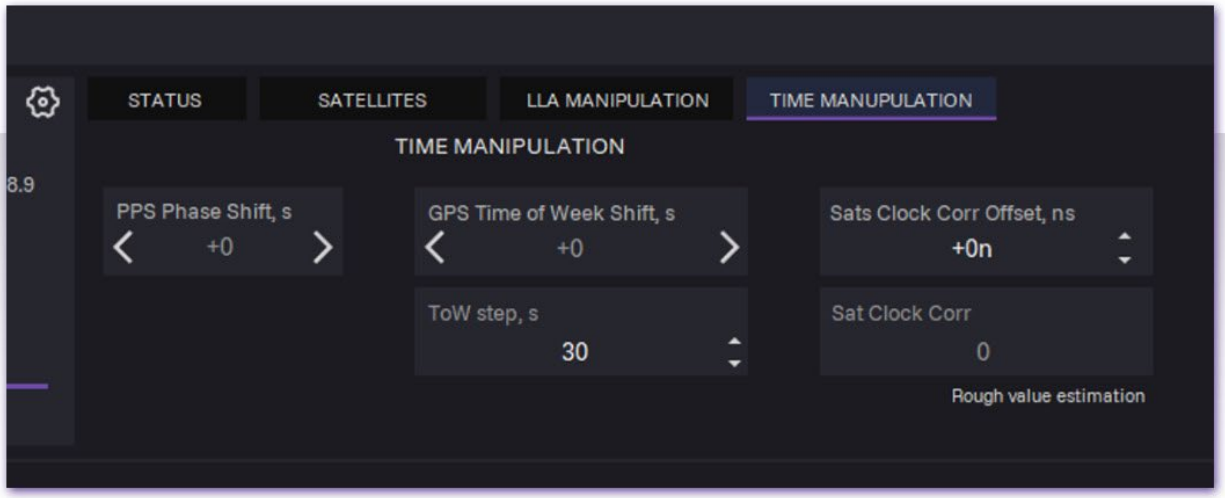
Position Spoofing

Spoof the receiver's location by setting exact LLA coordinates or simulating dynamic movement to mislead GNSS-based systems.



Time Spoofing

Shift PPS phase, Time of Week, and satellite clock values to emulate GNSS timing errors and synchronization attacks



Technical Specifications of GP-Simulator Application

Supported Signals:	• GPS L1 C/A • GPS L2, L5, and Galileo E1B/C is coming soon
Supported SDR Devices:	• **Ettus USRP** – Full support via UHD drivers. Compatible with B200, B210, X310, and other models. Synchronization via GPSDO. Supports coherent spoofing simulation scenarios. • **GP-Simulator SDR** – Proprietary high-performance SDR with low phase noise, enhanced frequency stability, and precise timing synchronization. Offers improved spoofing fidelity and signal clarity. Supports coherent spoofing simulation scenarios. • **Adalm Pluto** (coming soon) – Supports basic signal generation. Doesn't support coherent spoofing. • **HackRF One** (coming soon) – Supports basic signal generation. Doesn't support coherent spoofing.
Supported Operating Systems:	• Windows 11 (64-bit) • Windows 10 (64-bit) • Windows 8 (64-bit)
Minimum System Requirements:	• Intel® Core™ i3 Processors; • RAM 8 GB; • Free hard drive space 1-GB; • One port USB 3.0; • Internet (optional).
Simulation Modes:	• **Signal Simulation** Standard GPS signal simulation for receiver testing. Set a static point, time, or dynamic trajectory, control output power, and adjust per-satellite signal strength during runtime. • **Spoofing Simulation** Enables coherent and non-coherent spoofing. During signal generation, allows real-time manipulation of time and position to test spoofing resilience.
Multi-Channel Signal Generation:	Simulate multiple GPS channels simultaneously. Enables complex scenarios such as dual spoofing attacks or combining a reference (legitimate) signal on one channel with a spoofed signal on another.
Position Simulation Modes:	• **Fixed Location** Manually specify static latitude, longitude, and altitude. • **Trajectory Simulation** Move the simulated receiver dynamically along a user-defined path
Trajectory Builder:	Built-in graphical editor for creating and editing movement paths. Supports: • Waypoint-based vector format • Speed and Acceleration assignment per segment
Time Simulation Modes:	• **Current Time** Simulate GNSS signals based on real-time system clock. • **Past Time** Reproduce historical satellite configurations and timing conditions. • **Future Time** Predict and simulate GNSS signals for a future date with synthetic ephemeris.
Almanac and Ephemeris Sources:	• **Local Files** Load RINEX almanac and ephemeris files from disk.

	• **Synthetic Data** Use generated orbital parameters for testing without real data. • Automatic Download Fetch authentic NASA data (via CDDIS or USCG) for the selected simulation time range. Almanac source: www.navcen.uscg.gov Ephemeris source: ftp://cddis.nasa.gov
Timing & Synchronization:	Enables precise alignment of simulated GPS signals through configurable timing sources. Includes the following options: • **10 MHz Reference** – Select clock source: • Internal oscillator • External 10 MHz reference • GPS-disciplined oscillator (GPSDO) • **PPS Source** – Select pulse-per-second synchronization input: • Internal (free-run) • External (trigger) • GPSDO • **Timestamp Reference** – Select timebase for GPS data alignment: • Local system clock (PC) • NTP Server • GPSDO
Power Control:	• Power control during signal generation. • SDR output power calibration. • Compensation for external RF signal path losses.
Spoofing Simulation	
Spoofing Type:	• Coherent (synchronous) • Non-coherent (asynchronous)
Time Manipulation:	• PPS phase shift • Time of Week (ToW) offset • Satellite clock bias simulation
Position Manipulation:	• Manual LLA override (latitude, longitude, altitude) • Instant jumps or gradual movement • Dynamic spoofed motion via trajectory simulation
Support	
Support:	1 year of complimentary technical support
Manuals:	Online quick start guide

Technical Specifications of GP-Simulator SDR

RF Front-End:	AD9363, 2×2 MIMO
Frequency Range:	325 MHz – 3.8 GHz
RF Bandwidth:	up to 20 MHz
ADC / DAC:	12-bit, 61.44 MS/s
Max TX Power:	• Up to 10 dBm CW (frequency dependent) • Up to 0 dBm for GPS signal
Power Control Dynamic Range:	80 dB
Power Regulation Step:	0.5 dB
Baseband Chipset:	Xilinx Artix-7 XC7A100T, 512 MB DDR3 RAM
Connectivity:	USB 3.0 Type-C
Timing & Synchronization:	• Embedded GPSDO • Embedded 50 ppb TCXO • 10 MHz Reference input/ouptut • Trigger/PPS Reference input
GPSDO Performance:	Live sky synchronization time accuracy: ± 250 ns to UTC RMS (2-Sigma) GPSDO 10 MHz Accuracy: 1 ppb
Transmission Bandwidth:	Up to 56 MSPS real-time (USB 3.0 host)
Mechanical	
Enclosure:	Anodized aluminum
Size:	115 × 80 × 35 mm
Weight:	~500 g
Environmental	
Operational Temperature:	0 °C to +50 °C
Storage Temperature:	–20 °C to +80 °C
Humidity:	0% – 90% RH non-condensing @ 40°C
Regulatory Compliance	
Complies with the requirements:	CE | FCC | ROHS
EMC:	EN 55032 FCC Part15B
Safety:	EN 62368-1
Warranty & Support	
Warranty:	1 year Extended warranty is available
Support:	1 year of complimentary technical support

Package Content

GP-Simulator SDR:	1 pc. Main signal generation unit with USB-C interface and GPSDO support.
Rugged Carrying Case:	1 pc. IP-rated protective case for transport and on-site testing
USB Type-C Cable:	1 pc. High-quality shielded cable for SDR connection to host computer. 1 meter.
SMA Attenuators:	3 pcs. Fixed-value attenuators: 10 dB, 20 dB, and 40 dB for signal level control
Directional Coupler:	1 pc. For signal injection into GNSS antenna port of the receiver under test for live spoofing testing.
4-Way RF Combiner:	1 pc. Used with 3-channel GP-Jammer to combine spoofing and jamming signals.
SMA RF Cables:	3 pcs. SMA-Male to SMA-Male 30 cm. RF cables for connecting components.
GP-Divider:	Passive RF splitter for using a single GNSS antenna with two receivers.
Manuals:	Online quick start guide