GP-Probe NANO L1

Wearable GPS Jamming Detector/Logger

Portable GNSS jamming detector designed to identify and log interference in the GPS L1 band. Can function independently or in combination with an Android phone via a USB Type-C connection

GP-Probe Nano L1 is a highly compact and portable GNSS jamming detector engineered for identification and logging of interference within the GPS L1 band. Utilizing advanced power measurement techniques with huge dynamic range, the device continuously monitors interference power, and alerts users to potential jamming threats. Designed for versatility, it can operate autonomously using its built-in battery and alert system (speaker, vibration, and LED scale) or be connected to an Android smartphone via USB Type-C for enhanced real-time data visualization, analysis and streaming to GP-Cloud. The small form factor, roughly the size of a flash drives, makes it ideal for field use, security applications, and interference investigations.

Key Features

- **Dual Operation Modes**:
  - **Detector Mode**: Monitors signal power 10 times per second and instantly alerts users to potential jamming events.
  - **Logger Mode**: Runs fully autonomously for up to **3 months**, recording power levels every second. All measurements are stored and can be later transferred to an Android app for detailed analysis.
- **High Sensitivity**: Detects GNSS jamming up to 200 meters in line-of-sight conditions from a 5 dBm USB-powered jammer. Detection range is 50-70 meters when the jammer is installed inside a vehicle, depending on shielding and propagation conditions.
- **Wide Dynamic Range**: Covers **+5 dBm to -80 dBm**, ensuring detection of both low-power and high-power jammers. Enables reliable identification of interference sources across short and long distances, adapting to varying signal environments.

- **Notification System**: Utilizes a **built-in speaker, vibration, and a 36-LED scale** to alert users about detected interference in real-time and it's power.
- **Compact & Lightweight Design**: Its form factor is comparable to a flash drive, making it easily portable for field operations.
- **Android App Integration**:
  - Displays real-time power measurements and SNR.
  - Allows users to retrieve and analyze logged data.
  - Provides seamless device control through a USB Type-C connection.
  - Integration with GP-Cloud as an option.
- **Extended Battery Life**:
  - Up to **1 month** in Detector mode (10 measurements per second).
  - Up to **3 months** in Logger mode (1 measurement per second).
- **One-Button Simplicity**: A single button on the device controls **power, notification muting, and battery status check**, ensuring intuitive operation in any environment.
- **Angle-of-Arrival Estimation**: By leveraging natural body attenuation effects, users can determine the approximate direction of interference sources without requiring a directional antenna.

Technical Specifications

Monitored Bands GNSS:	1575.42 MHz; 2 MHz bandwidth • GPS L1 C/A • Galileo E1B/C
Modes:	• Real-time Detector • Logger • Detector/Logger with GP-Cloud connection via Android app
Power Measurement Dynamic Range:	+5 dBm to -80 dBm
Jammer Detection Range:	For usb-style low-power (5 dBm) jammer • Up to 200m in line-of-sight conditions • 50-70m when jammer is inside a vehicle
GNSS Measurement:	**Android app:** • Power • SNR **GP-Cloud:** • Signal quality • Anomaly detection caused by spoofing or jamming • Interference detection • SNR • Numbers of visible satellites • DOP • Position accuracy • + much more
Angle-of-Arrival Estivation:	Passive localization using body attenuation
Notification:	Configurable in app: • Speaker • Vibration • 36 LEDs
Power	
Battery:	3.7V LiPo, 450mAh
Charging:	USB Type-C 90 minutes for a full charge
Operating time:	• Up to 1 month in Detector mode (10 measurements per second). • Up to 3 months in Logger mode (1 measurement per second).
Mechanical	
Enclosure:	Ruggedized, IP5x-rated for dust and water resistance (TBD)
Size:	113 × 31 × 15 mm
Weight:	~50 g
Environmental	
Operational Temperature:	-20°C to +60°C
Storage Temperature:	-20°C ~ +70°C
Humidity:	0% – 90% RH non-condensing @ 40°C

Regulatory Compliance	
Complies with the requirements:	TBD
EMC:	TBD
RF:	TBD
Safety:	TBD
Warranty & Support	
Warranty:	1 year Extended warranty is available
Support:	1 year of complimentary technical support
Package Content	
GP-Probe Nano L1:	1 pc.
Manuals:	Quick start guide

Detector Mode

The detector mode is designed for real-time GNSS jamming detection by continuously measuring the power level in the GPS L1 band. The device operates autonomously, scanning for signal anomalies and notifying the user when interference is detected.

- **High-Speed Monitoring**: Measures power **10 times per second**, ensuring rapid detection of sudden interference events.
- **Threshold-Based Detection**: Compares real-time power measurements to a pre-defined threshold to distinguish interference from normal fluctuations.
- **Multi-Level Alerts**: When interference is detected, the device provides feedback via:
  - **LED Scale**: A visual representation of signal strength and interference severity.
  - **Audio Alert**: A beeping sound that increases in intensity as interference strengthens.
  - **Haptic Feedback**: A vibration motor activates when interference exceeds a critical level.
- **One-Button Control**: The single button allows the user to mute alerts temporarily, check battery status, and turn the device on/off.
- **Angle-of-Arrival Estimation**: By rotating the device and using the natural signal attenuation effect of the user's body, it is possible to estimate the interference source direction.
- **Standalone Operation**: Fully functional without an external connection, making it ideal for field use.

Use Case Scenarios

- **Vehicle Jammer Detection:** Identifies unauthorized GPS jammers used by drivers to evade tracking, ensuring compliance with fleet management and law enforcement regulations.
- **Law Enforcement & Military Operations:** Supports police and military teams in detecting GNSS jamming threats, aiding investigations and operational security.
- **Critical Infrastructure Protection:** Monitors interference near airports, seaports, power plants, and other key locations to prevent navigation disruptions.
- **Regulatory Compliance & Spectrum Monitoring:** Enables authorities to detect illegal GNSS interference, ensuring adherence to spectrum regulations.
- **Field Investigations & Anti-Surveillance:** Helps security professionals and researchers locate jamming sources using passive Angle-of-Arrival estimation.

Logger Mode

The logger mode enables long-term GNSS interference monitoring by continuously recording power measurements every second. A high-stability internal clock ensures precise timestamping, allowing accurate correlation of interference events. This enables detailed post-event analysis and trend identification over extended periods without user intervention.

- **Autonomous Data Collection**: Runs independently for up to **3 months** on a single charge, recording power levels once per second.
- **Signal Power Logging**: Captures signal variations over time, allowing retrospective analysis of interference patterns.
- **Data Retrieval & Analysis**: Stored data can be downloaded to an Android phone for detailed post-event evaluation and reporting.
- **Stealth Operation**: No active notifications, making it ideal for passive monitoring in sensitive environments.

Use Case Scenarios

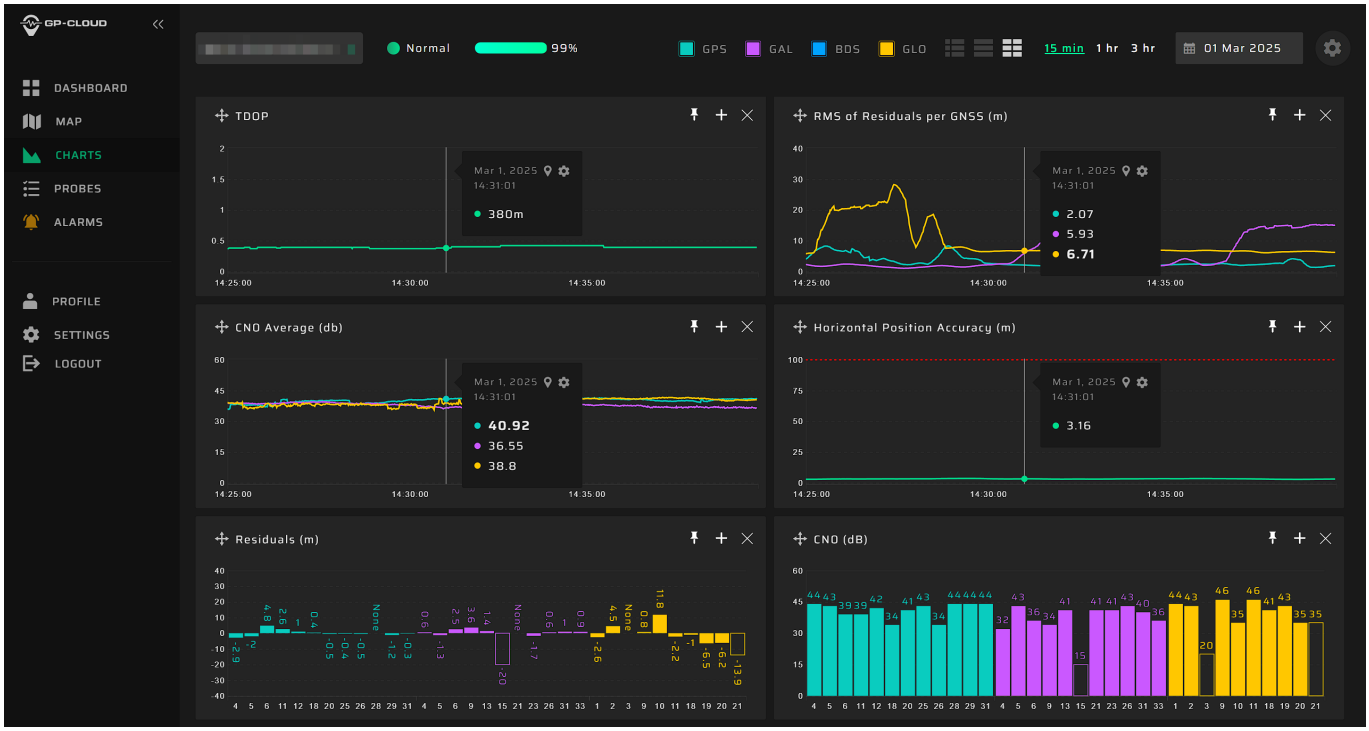
- **Fleet Monitoring**: Detect when drivers use jammers in vehicles to bypass GPS tracking.
- **Urban Interference Studies**: Identify recurring interference hotspots at intersections or high-traffic areas.
- **Security Applications**: Monitor unauthorized GNSS jamming near critical infrastructure.
- **Compliance Audits**: Verify adherence to legal restrictions on GNSS jammer usage.
- **Academic & Research Use**: Gather long-term interference data for scientific analysis.

Integration with GP-Cloud

The GP-Probe Nano L1 seamlessly integrates with **GP-Cloud**, a web application designed for real-time GNSS signal quality analysis, interference detection, and classification. Through the Android application, power measurements from the detector are continuously transmitted to GP-Cloud along with GNSS data from the smartphone's built-in receiver. This integration enhances the device's capabilities, enabling synchronized real-time analysis of interference events, precise localization, and post-event forensic investigations.

Real-Time Interference Detection and Analysis

- **Multi-Layer Monitoring:** Operate in conjunction with other devices such as the GP-Probe TGE2, GP-Probe DIN L1, and a customer RTK reference stations, allowing for a comprehensive terrestrial interference monitoring, classification and localization.
- **Advanced Detection:** Leverage GP-Cloud's capabilities to detect and classify sophisticated GNSS spoofing and jamming attacks.
- **Data Logging and Post-Analysis:** All detected events are logged within GP-Cloud, facilitating detailed post-event analysis and the development of effective countermeasures.



Optional Automated Visual Documentation

- **Event-Triggered Imaging**: Upon detection of a GNSS anomaly, the connected smartphone captures an image of the surrounding environment.
- **Cloud Storage**: Captured images are securely uploaded to GP-Cloud, associating visual context with specific interference events.
- **Source Identification**: Visual documentation aids in identifying potential sources of interference.