

# **Anti-Jam and Spoof Detection GPS with Single Antenna**

Researchers in Prof. Per Enge's laboratory have developed a simple, back-compatible, single antenna system to protect GPS flight navigation systems from jamming, interference and spoofers. This technology exploits the fact that GPS antennas are dual polarized in order to steer a null along the azimuthal plane. A single antenna is able to provide deep nulls for anti-jamming capability when placed on the body of the airplane fuselage, by exploiting surface currents. Furthermore, with the flip of a switch, the device can use the “nuisance” back lobe radiation to determine if a signal is originating from above the antenna or below and thus if it is genuine or spoofed. The antenna is backward compatible with existing aircraft – it uses a standard GPS receiver with an antenna that fits into aviation standard surface area with no additional signal processing or cable runs. This invention could reduce inherent GPS vulnerabilities to enable more reliance on GPS in a variety of end user applications, such as navigation, location-based authentication, vehicle tracking or commercial aviation functions such as landing and takeoff.

## **Stage of Research**

The inventors have built a prototype antenna device with off-the-shelf components and a standard GPS receiver. In field tests, this prototype in the “anti-jam” mode generally provided greater than 10 decibels of signal suppression when threatening signals originated below the horizon. They have also have performed a variety of simulation experiments to demonstrate the viability of this technology for spoof detection.

## **Applications**

- **GPS/GNSS** - mitigate jamming and protect from spoofing attacks with end user applications such as:
  - commercial and recreational aviation

- navigation of remote and manned vehicles
- location-based authentication
- vehicle and asset tracking

## Advantages

- **Back compatible** with existing hardware:
  - simple design that is consistent with current size constraints of GPS receivers
  - standard GPS receiver with no additional equipment or algorithms to implement
- **Simple, static single antenna**
- **Compact and lightweight** - very low profile optimal for aerial applications, with form-factor and payload constraints
- **Instantaneous** - anti-jam mode provides about 10 dB of broadband signal suppression from the antenna horizon to about 45 degrees below the horizon for a single azimuthal cut

## Publications

- McMilin, Emily, De Lorenzo, David S., Walter, Todd, Lee, Thomas H., and Enge, Per ["Single Antenna GPS Spoof Detection that is Simple, Static, Instantaneous and Backwards Compatible for Aerial Applications"](#) Presented September 2014 at the Institute of Navigation (ION) Global Navigation Satellite Systems (GNSS+) Conference, Tampa, Florida.

## Patents

- Published Application: [WO2016085554](#)
- Published Application: [20180224557](#)

## Innovators

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