



**Signal Sentry GPS Interference  
Detection & Geolocation Technology**  
September 2015

**Joe Rolli**

Business Development

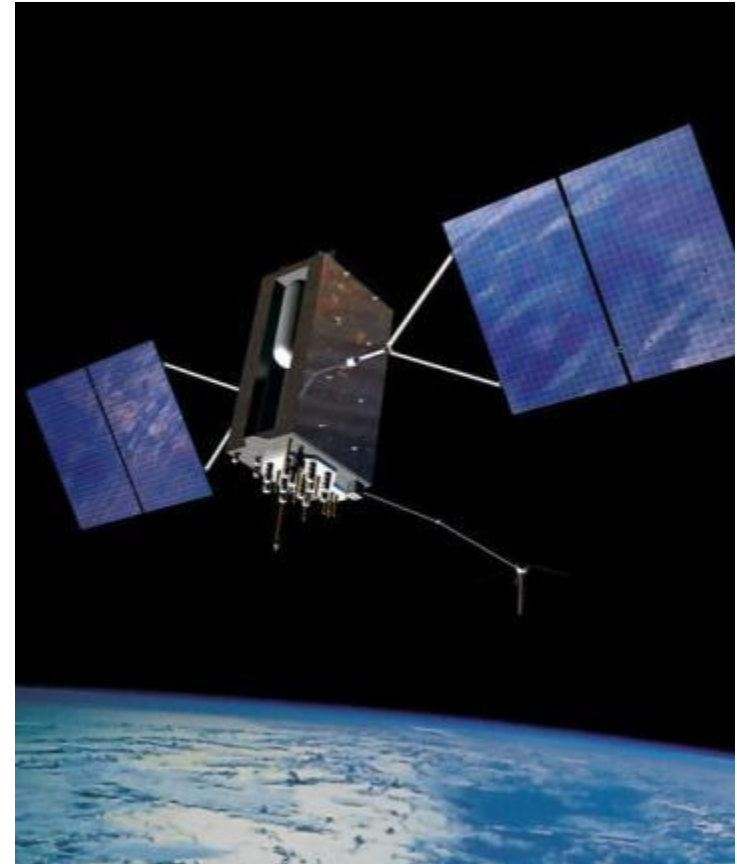
**HARRIS®**

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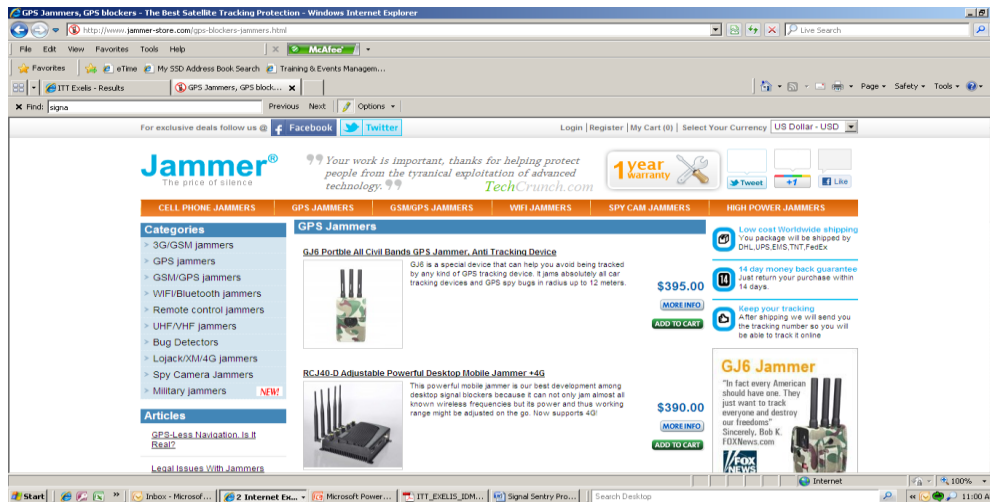
[harris.com](http://harris.com)

**assuredcommunications®** |

- **Harris is the GPS Signal Expert**
  - Developed Over 50 GPS satellite payloads
  - Payloads & Transmitters have been on every GPS satellite ever launched
  - Our payloads transmit the GPS signal from space
  - We have accumulated over 500 years of on-orbit life
  - No mission-related failure due to our equipment
  - Currently developing the next generation navigation payloads



**GPS jamming does not allow receivers to lock onto the GPS signal**  
**GPS susceptible to outages due to intentional & unintentional jamming**  
**A small jammer can disrupt the GPS signal for a mile or more**  
**People jam because they are smuggling, stealing or trying to escape tracking**  
**Availability of low-cost GPS jamming devices has increased the risk**

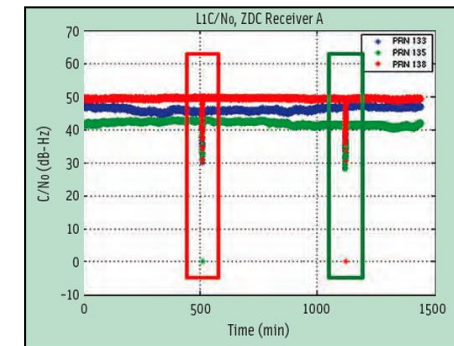
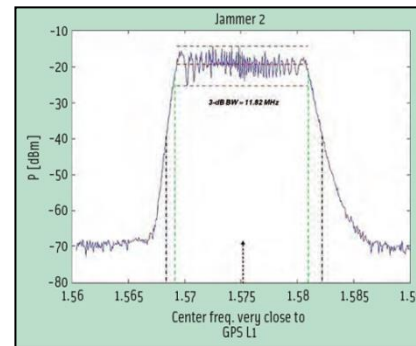
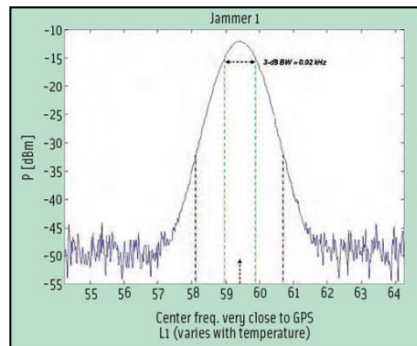
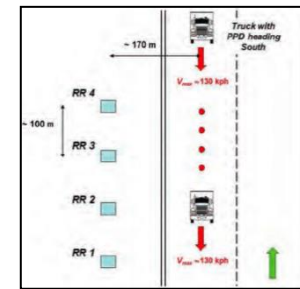


# Real Risk of GPS Disruption



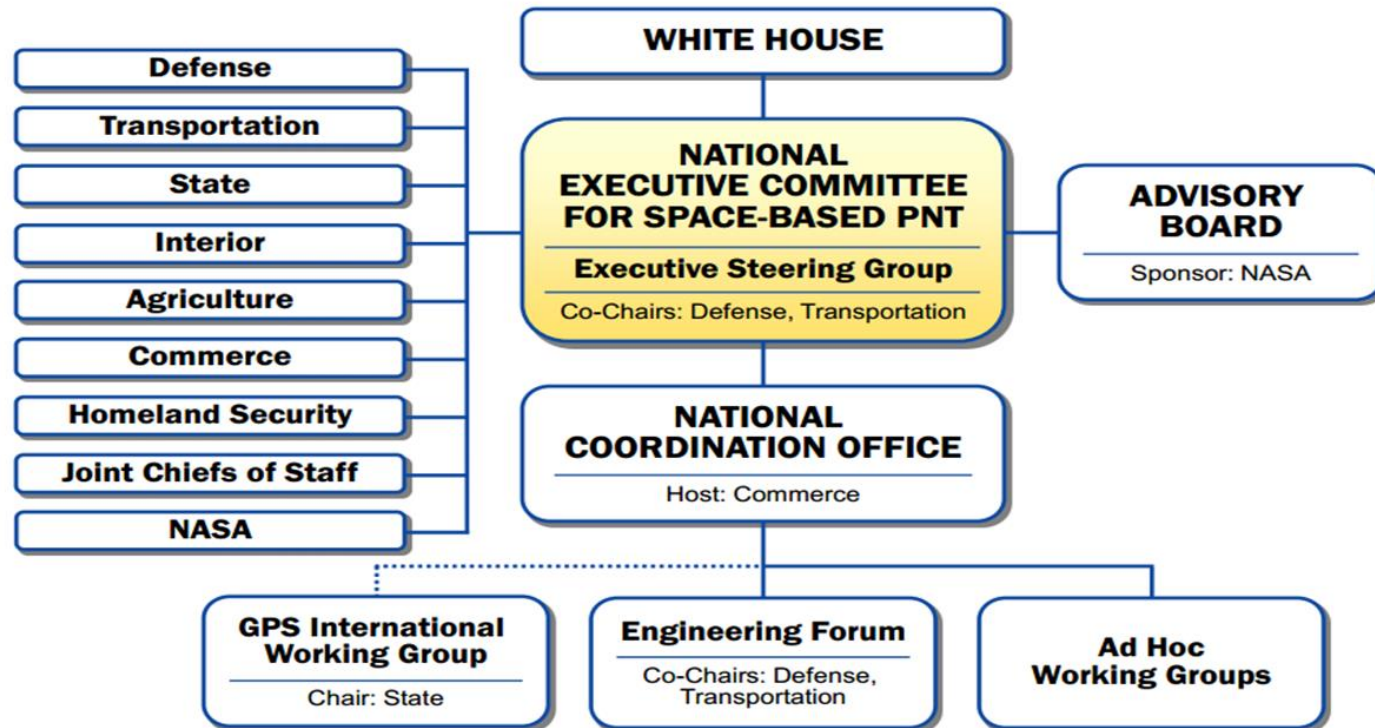
November 2009

## Ground-based Augmentation Systems (GBAS) Jammed Took 8 months to find the source



PNT Advisory BD "We must quickly develop and field systems that will rapidly locate, mitigate and shutdown the interference"

## U.S. Organizational Structure for GPS Governance



**Summary: The United States is now critically dependent on GPS. For example, cell phone towers, power grid synchronization, new aircraft landing systems, and the future FAA Air Traffic Control System (NEXGEN) cannot function without it. Yet we find increasing incidents of deliberate or inadvertent interference that render GPS inoperable for critical infrastructure operations.**

**Most alarming, the very recent web availability of small GPS-Jammers suggests the problem will get worse. These so-called personal protection devices (PPDs) as well as other, readily available, more powerful devices can deliberately jam the Global Positioning System (GPS) signal over tens of square miles. They also can be devastating to the other, new foreign satellite navigation systems being deployed worldwide.**

**PPDs are illegal to operate, but many versions are available (for as little as \$30) from foreign manufacturers over the Internet. The simplest models plug in to a cigarette lighter and prevent all GPS reception within a line of sight range of 5 to 10 miles. Current penalty for operation is simply that the device is confiscated.**

**We currently lack sufficient capabilities to locate and mitigate GPS jamming. It literally took months to locate such a device that was interfering with a new GPS based landing system being installed at Newark Airport, NJ.**

**We must quickly develop and field systems that will rapidly locate, mitigate and shutdown the interference.**

# Real Risk of GPS Disruption

**Pharma cargo thieves start to deploy jamming technology**

Companies often deploy covert GPS-tracking technology in the fight against cargo theft, but thieves are now entering the arms race.

A series of attempted cargo thefts of pharmaceuticals being shipped by road have featured the use of jamming devices, deployed in an attempt to block the tracking signals and prevent security firms and the police recovering stolen shipments, according to the Pharmaceutical Cargo Security Coalition (PCSC).

Just last week, a tractor and trailer hauling \$2m-worth of pharmaceutical products was stolen from a truck stop in Cartersville, Georgia, with the thieves displaying two separate GSM jammers (pictured), but were unsuccessful. Law enforcement was able to track the shipment and recover the product intact, although those behind the theft evaded capture.

There was at least one portable tracking device, supplied by HIDEONTEC USA and monitored by GlobalTRIS, concealed within that shipment which ultimately assisted in guiding police officials to make the recovery, according to the PCSC. The vehicle's components



The FCC said an aircraft tracking system at Newark Liberty International Airport experienced interference from a GPS jammer device used by a Readington man who claimed he was simply trying to hide his whereabouts from his employer. The FCC fined the driver \$31,875 Aug 2012

## Pharmaceutical Cargo Security Coalition Symposium \* Novartis Pharmaceutical East Hanover February 10-11 2015

**Forty-Six Stolen Luxury Cars Returned to Port of Los Angeles**

Published on Jun 19, 2013  
Law enforcement officials at the Port of Los Angeles have uncovered a major organized criminal ring responsible for the theft and attempted exportation of over two million dollars worth of high-end vehicles.

46 Stolen Cars and exported from LA Port Using GPS PPD



**IN HOMELAND SECURITY**  
News & Analysis of Critical Issues in Terrorism & Homeland Defense

**GPS Jammers, Other Maritime Cyber Security Threats Discussed At Seminar**

March 3, 2015

Vice Adm. Chuck Michel, USCG, addressing the Seminar and Symposium on Maritime Cyber Security

By Glyn Cosker  
Managing Editor, In Homeland Security

The Learning Seminar and Symposium on Maritime Cyber Security, co-sponsored by Rutgers University and American Military University (AMU) enters its second day today on the campus of Rutgers University, New Brunswick, N.J.

Command, Control, and Interoperability Center for Advanced Data Analysis (CCICADA) and AMU are hosting the event that covers a wide range of maritime cyber security issues, national security and data breaches. The seminar features several keynote speakers from the U.S. military, homeland security coverage: control/defense/2015/maritime-security/seminar/2015support.aspx#agenda

Coast Guard Vice-Admiral Chuck Michel saw it happen in one Eastern Seaboard port.

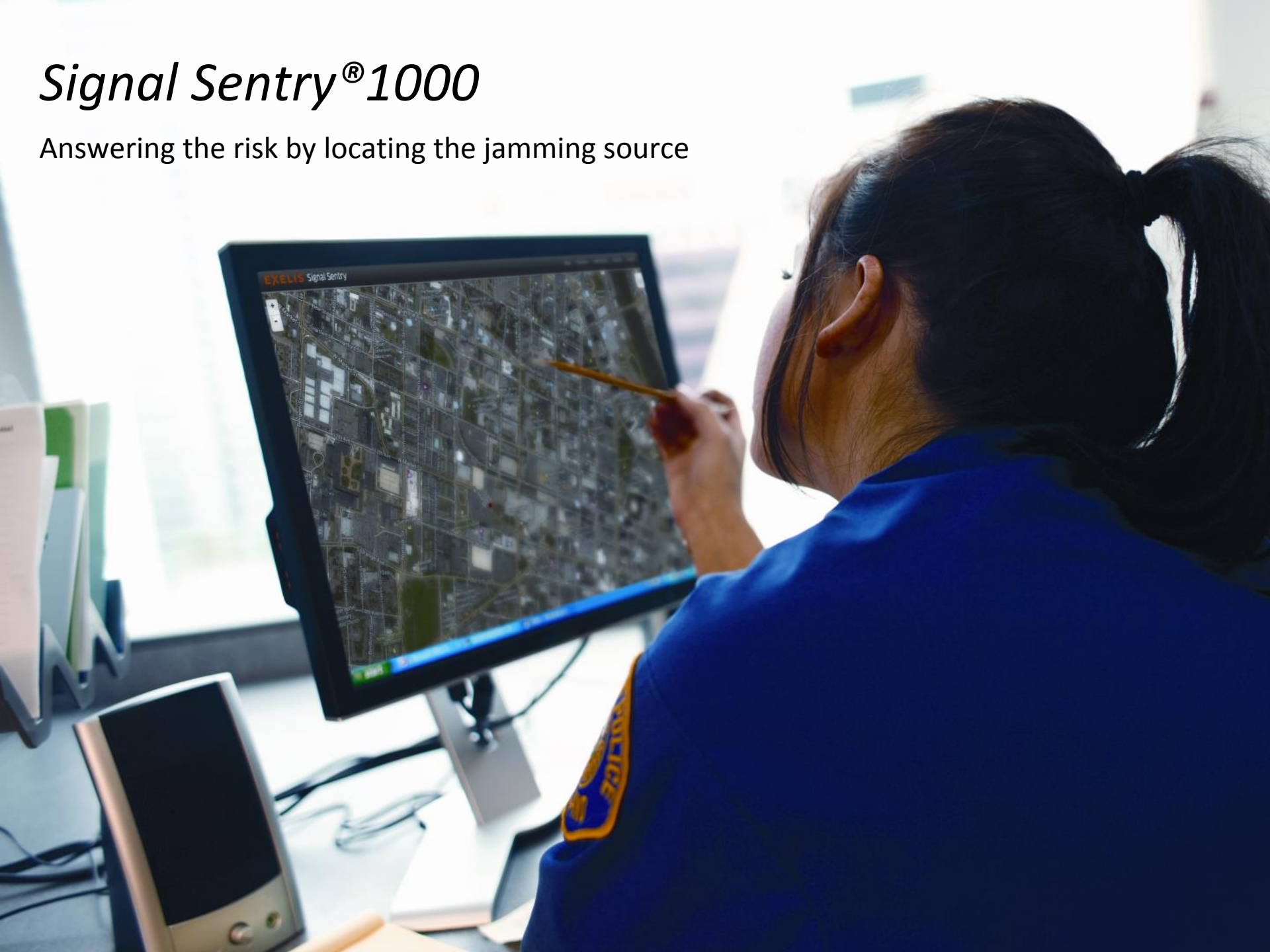
"It was believed to be sort of a vandal or a person messing around, actually blocked that GPS signal from that computer's ability to do that, and the port came to a halt," he said.

\*Maritime Cyber Security Symposium  
March 2-3 2015

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# *Signal Sentry<sup>®</sup> 1000*

Answering the risk by locating the jamming source

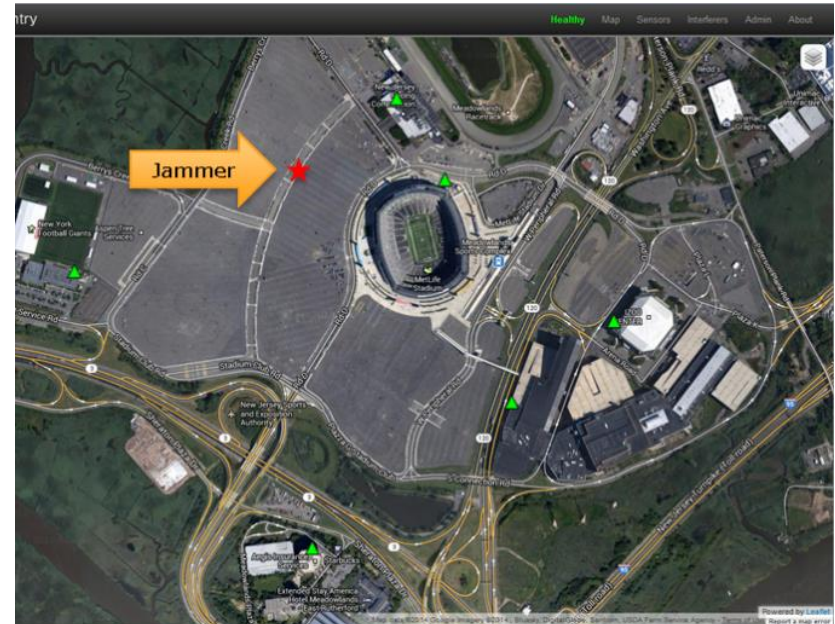




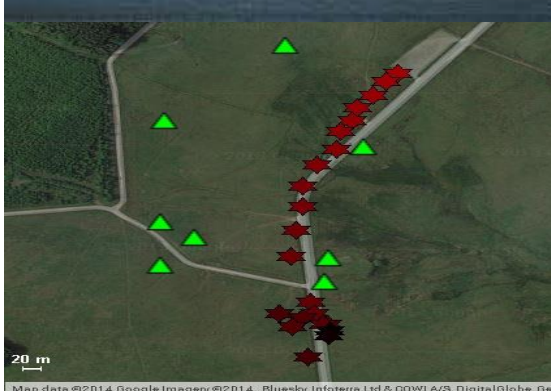
# Signal Sentry® 1000 Overview



- Designed to protect critical infrastructure from GPS Disruption
- Detects and locates sources of GPS signal interference
- Provides location of interference
- Presented in the form of geographical pin mapping
- Provides actionable intelligence to the user
- Leverages Exelis signal domain knowledge of GNSS
- Patented Exelis Technology
- Signal Sentry 1000 data aids Intelligence Led Policing



*Assures safety, efficiency, and revenue*



## Signal Sentry

- Designed to protect critical infrastructure from GPS disruption jamming & spoofing
- Situational Awareness of GPS Interference
- Real time geolocation of GPS interference
- Actionable Intelligence for quick mitigation of GPS disruption

## Deployed Systems

- 2014 Super Bowl at Met Life Stadium
- Southampton Port United Kingdom
- Newark N.J DHS & Essex County Sherriff

## Field Tested

- Sennybridge Test Range UK
- Vidsele test range in Sweden

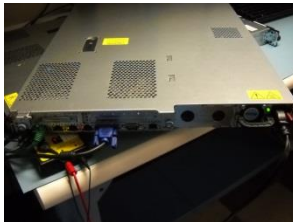
## Includes antennas, sensors and a server

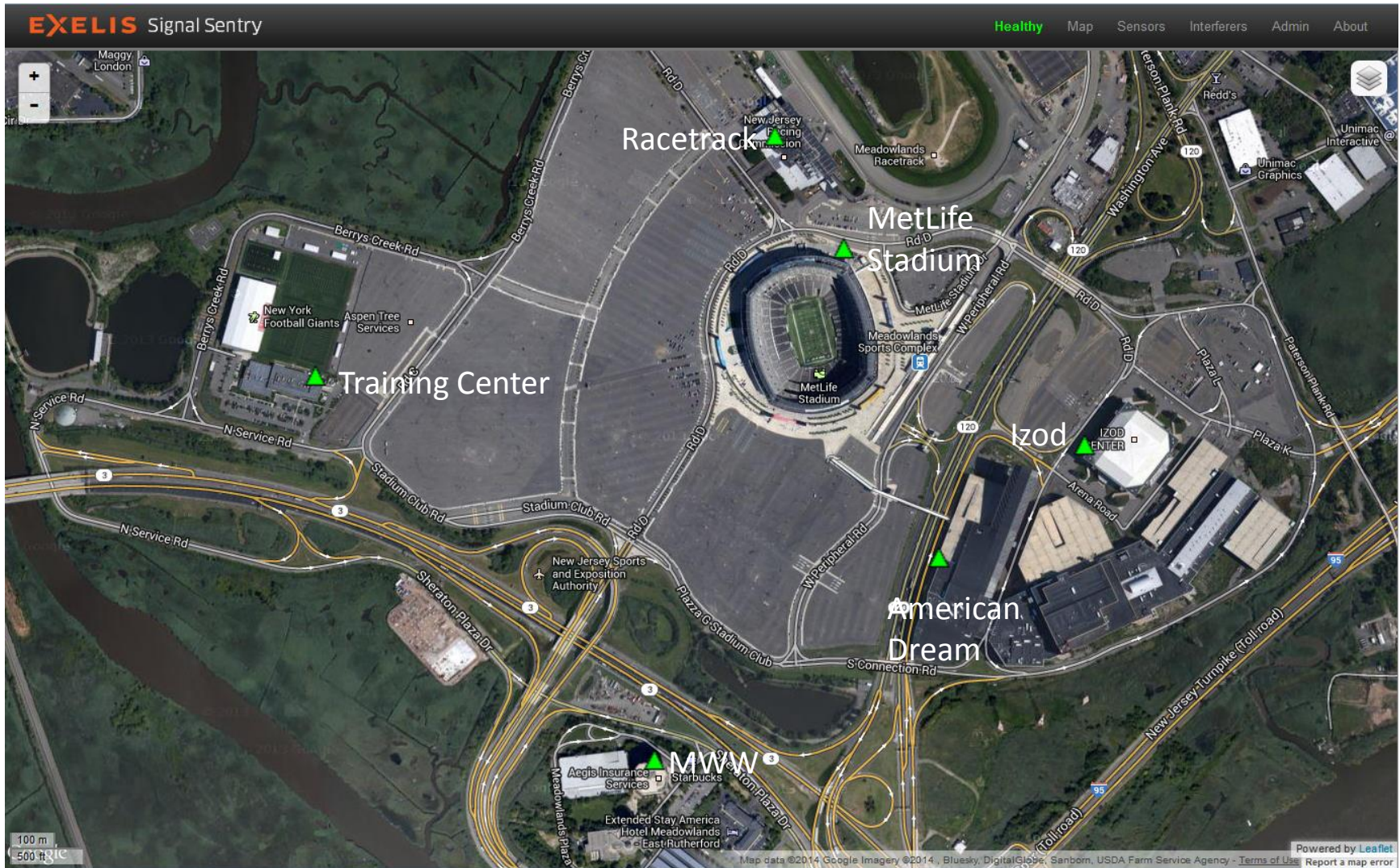
- Antennas connected to the sensor
- Sensors connected to the server

**System detects, locates and maps the jamming source**

**Data is available through an easy-to-use web enabled GUI**

**Information used for action – change navigation methods, alert authorities...**





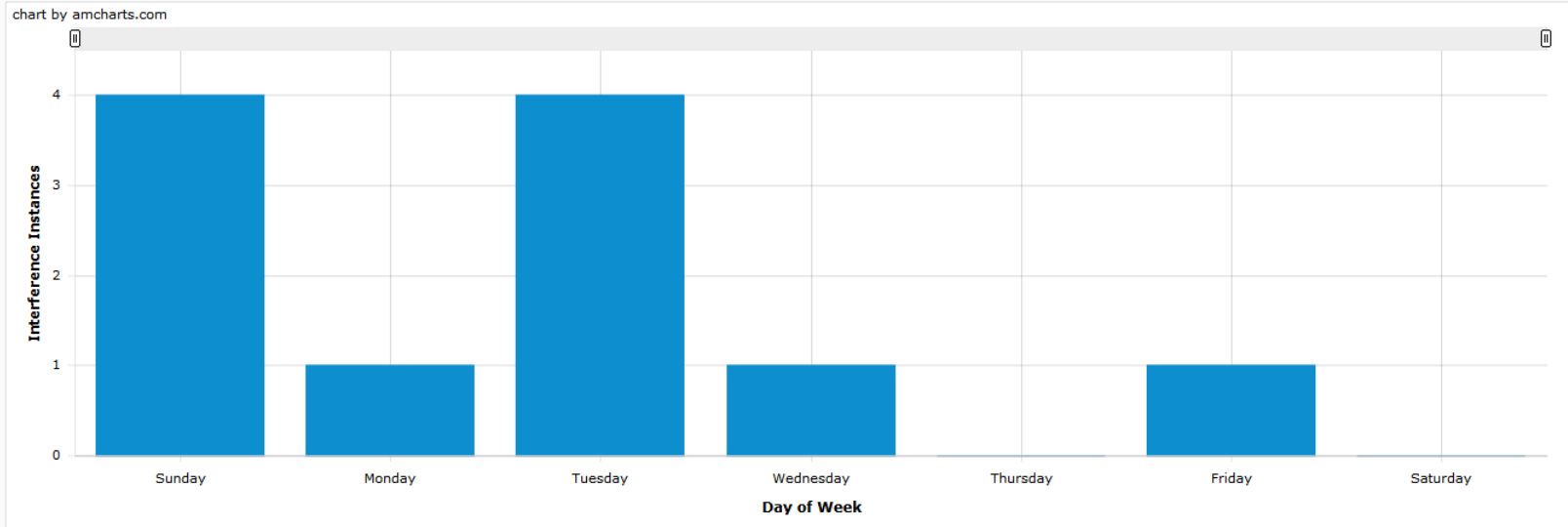
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# Interferer Frequency Chart Example – When?



## Interferer Frequency

Geolocated Instances of Interference Lasting at Least 1 Minute by Day of Week From Friday, January 03, 2014 2:30:28 PM To Monday, February 03, 2014 2:30:28 PM



If the option *Count only Geolocated Interferers* is enabled, clicking chart items causes a map to be displayed in this area that shows the geo-located interferers pertaining to the selected chart items. Selected chart items are shown in red, and non-selected chart items are shown in blue.

Resolution

Min. Interference Duration (hh:mm:ss)  :  :

Count only Geolocated Interferers  
 Count only Non-geolocated Interferers  
 Count all Interferers

From Date (MM/dd/yyyy hh:mm:ss)  To Date

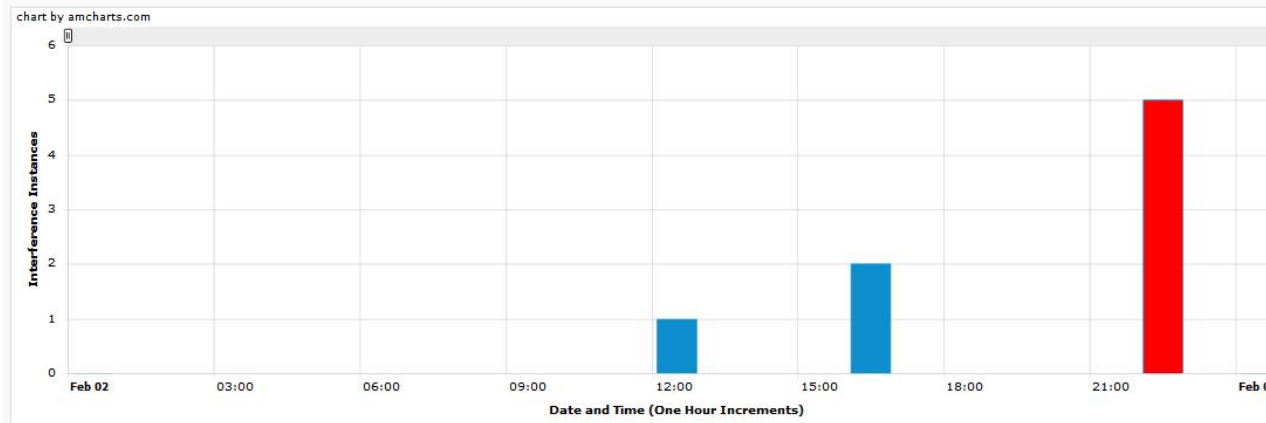
From Time of Day (hh:mm:ss)  :  :  AM

To Time of Day (hh:mm:ss)  :  :  PM

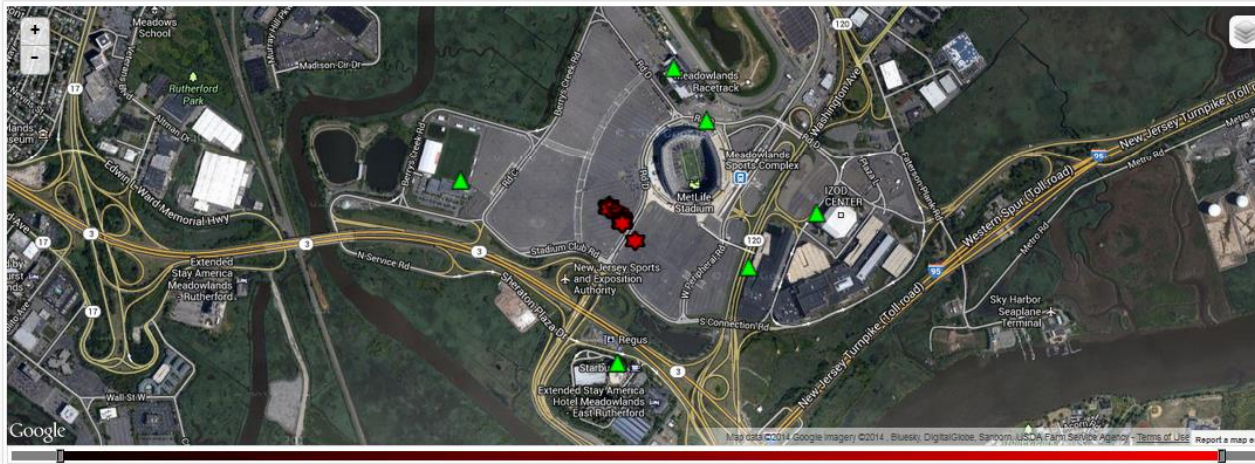
# Interference Frequency – When & Where?

## Interferer Frequency

Geolocated Instances of Interference Timeline (One Hour Increments) From Sunday, February 02, 2014 12:00:00 AM To Monday, February 03, 2014 12:00:00 AM



If the option *Count only Geolocated Interferers* is enabled, clicking chart items causes a map to be displayed in this area that shows the geo-located interferers pertaining to the selected chart items. Selected chart items are shown in red, and non-selected chart items are shown in blue.



- Selecting histogram bar displays location of events on map below
- Can select more than one bar at a time

# Signal Sentry 1000 Test Results



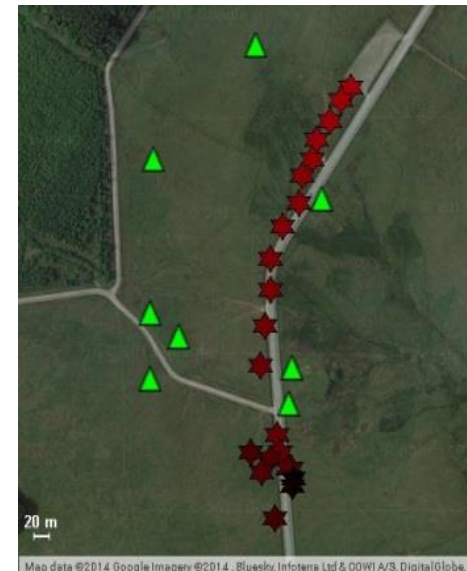
**Tested during GPS jamming trials in Sennybridge, UK in September 2014**

**Trials administered by the Defence Science and Technology Laboratory**

**Off-the-shelf jamming devices were used during the tests**

**Located stationary & moving jammers in open & obstructed environments**

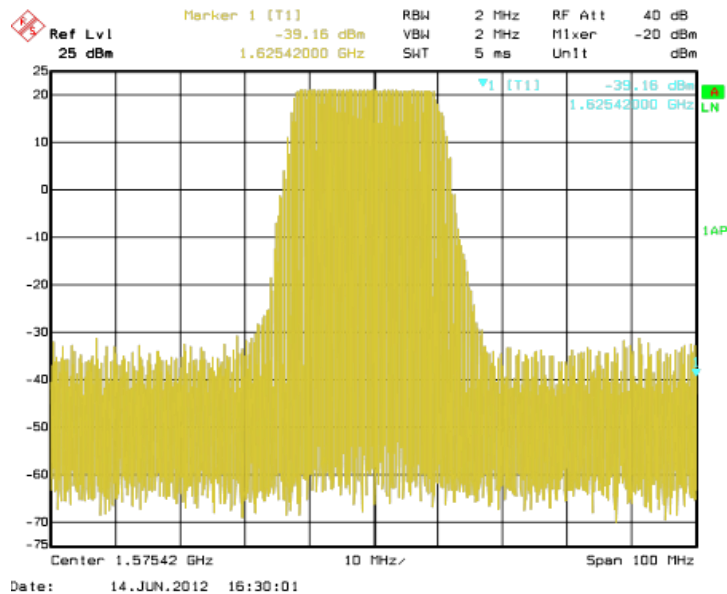
**Identified jammers in moving vehicles within a 10-meter accuracy**



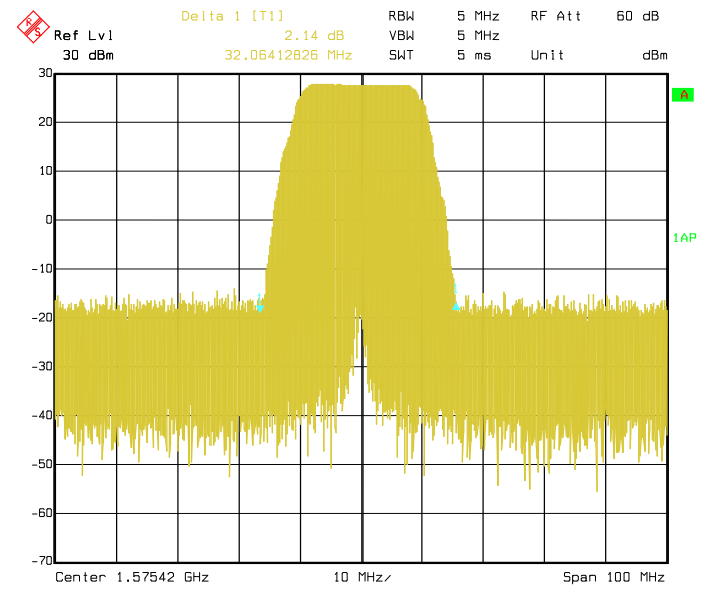
Jammer in car at 40 mph

Two Jammers utilized during the trials  
150mW and .5W

Used to disrupt the GPS L1CA code that operates at 1575.42 MHz



150mW jammer waveform



.5w jammer waveform



**Test was constructed to geolocate jamming in an area with no obstructions**

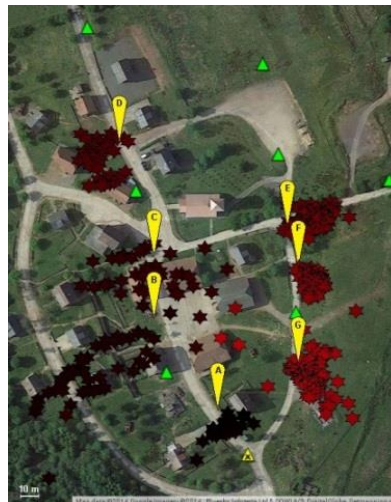
**Test included static jammers and dynamic jammers**

**Six waypoints were surveyed for the purpose of evaluating location accuracy**



Open Field Static Jammer Locations

- An obstructed area test was constructed**
- Test Signal Sentry 1000 in an area with obstructions**
- Simulate an urban environment**
- Took place in Sennybridge area called a FIBUA (Fighting in Built-up Areas)**
- Tested both stationary and dynamic jammers**



Urban Area Jamming



For more information visit:  
[www.exelisinc.com/signalsentry](http://www.exelisinc.com/signalsentry)