

Interference Detection by Crowd Sourcing

ICG Workshop on GNSS Spectrum Protection
and Interference Detection and Mitigation

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GNSS is Vital

- ◆ GPS is vital for many elements of U.S. critical infrastructure, defense, safety of life, science, commerce, construction, environmental protection, agriculture, etc., etc., etc.
- ◆ Being a free global service, GPS is similarly vital for worldwide applications
- ◆ Even so, we are entering a new “golden era” of position, navigation, and time as GNSS adds many more satellites and deploys “modernized” signals
- ◆ Enabled by continued rapid improvement in user equipment technology and applications

The Threat is Jamming

- ◆ Because GNSS signals from space are very weak
- ◆ Jamming, intentional or unintentional, is a threat to the full potential of GNSS to best serve humanity
- ◆ To minimize the threat, jammers must be quickly located, shut down, and their operators punished
 - Legally, appropriate laws are needed
 - Technically, rapid detection and location is needed
 - Logistically, personnel and equipment must be available and deployed

Material from Prior Presentations

- ◆ This presentation is based on prior presentations by Logan Scott, by permission, and by Tom Stansell
- ◆ The first of these was an InsideGNSS webinar on 22 Aug 2012
- ◆ The second, by Logan Scott, was given to the U.S. PNT Advisory Board on 3 June 2014
- ◆ The focus of this presentation is on Crowd Sourcing and Local Enforcement
 - Crowd sourcing – best performance at lowest cost
 - Local enforcement – quickest and most effective

Welcome to GNSS Jamming & Interference Causes, Consequences and Solutions



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Strategies for Limiting Civil Interference Effects Inspired by Field Observations

And Why Civil Receivers Need to Have Jamming Meters

**Special Thanks to Darren McCarthy of R&S for
Sharing Portland International Airport Results**

Challenges In Locating GPS and Cellular Jammers



GPS + Cellular + WiFi Jamming Devices are Fairly Common



What Can/Should Be Done?

- A DHS Federal program?
- ➔ ■ “Crowd Sourcing” (per Phil Ward)?
- ➔ ■ Local regulations and detectors for police?
- Anti-Spoof receiver designs (e.g., dual antennas)?
- Anti-Jam receiver designs?
- Demand GNSS interference mask protection?

Crowd Sourcing



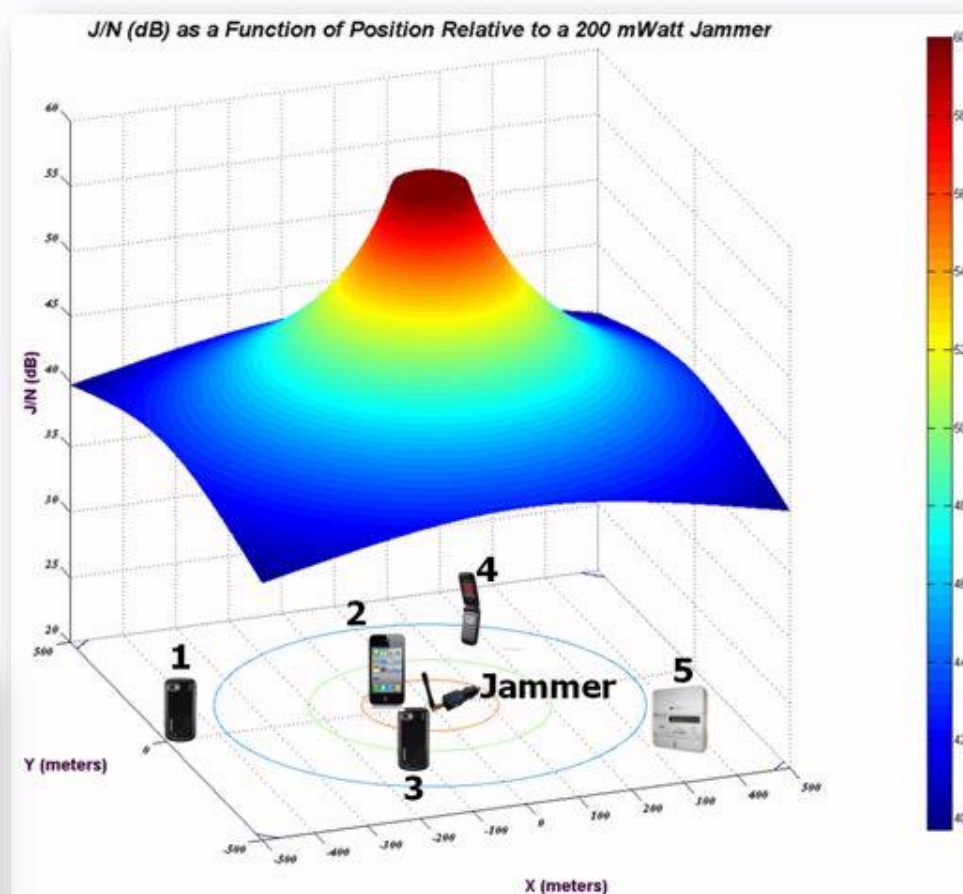
Every cell phone can be a GPS jamming detector.
Requires a Public/Private Partnership.

Crowdsourcing for Jammer Detection & Location (J911)

Geographic Coverage Is the Challenge for IDM Systems; Detectable Range May Only Be a Few Hundred Feet and Multipath Effects Can Be Severe

Collaborative Defense

- Devices Report Jamming Parameters & Own Position to J911
- Using Aggregate of Reports, J911 Can Determine Jammer Position to ~ 40 meters in near real-time
- J911 Can Report Interference Events to Networked Users (Like Traffic Reports)



from Logan Scott: J911: The Case for Fast Jammer Detection and Location Using Crowdsourcing Approaches, ION-GNSS-2011, September 20-23, 2011

Local Regulations and Detectors

- Local authorities probably would be the most effective at discouraging jamming
- Protecting GPS for public safety would be the priority
 - Local airports and aircraft
 - Emergency vehicle use
 - GPS Anklets
 - Vehicle tracking
- Heavy fines would discourage GPS jamming
 - Perhaps pay for enforcement



**No more GPS
Jamming on my
Watch!**



Situational Awareness Creates Herd Immunity

- If Jammers are Detected and Localized
 - Jammers are Less Likely to Be Purchased
 - Jammers Are Less Likely to Turn ON
 - Jammers are Less Likely to Cause Damage

**Civil GNSS Receivers Should Have
Jamming Detection as a Matter of
Good Policy**

Rapid Progress Can Be Made!

- ◆ The FCC is formulating a new e911 requirement for better wireless emergency call indoor positioning
 - Policy is changing, so crowd sourcing could be included
 - Requires cooperation of mobile phone makers, chip suppliers, wireless provider companies, and the FCC
 - Seeking more wideband spectrum while protecting GNSS from interference is a hot topic at the FCC
 - Industry organizations like 3GPP* are ideal for establishing specifications and defining interfaces
 - Interference detection and mitigation benefits all parties

*The 3rd Generation Partnership Project (3GPP) unites [Six] telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TTA, TTC), known as “Organizational Partners” and provides their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies.

How?

- ◆ Interference detection would be built into chipsets
 - Qualcomm, Broadcom, CSR, Intel, MediaTEK, STMicroelectronics, etc.
- ◆ New mobile phones would include the new chips
 - Apple, Samsung, LG, Nokia, Motorola, etc.
- ◆ Wireless providers would collect interference reports from millions of users
 - Anonymous to protect individual privacy
- ◆ Providers forward interference reports to an agency
- ◆ Agency consolidates and forwards to local authority
 - Action taken at the local level

Discussion