

Proliferation of GPS/GNSS Jammer Devices

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Jamming vs. Spoofing

- Jamming is intended to <u>prevent</u> a receiver from acquiring, tracking, or navigating with GNSS signals
- Spoofing is intended to <u>fool</u> a receiver so it provides false position, navigation, and/or time (PNT)
 - Thus allowing the Spoofer to control the victim's PNT
- Smart-Jamming is intended to cause receivers to <u>acquire false signals</u>, which either:
 - Prevents navigation (with less power than for jamming),
 - Or, causes false (but uncontrolled) PNT results



What Are Jammers?

Generally includes devices commonly called signal blockers, GPS jammers, cell phone jammers, text blockers, etc

- Illegal radio frequency transmitters
- Designed to block, jam, or otherwise interfere with authorized radio communications







How do Jammers Work?

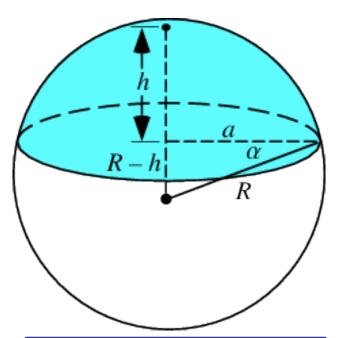
- A jammer can block all radio communications on devices that operates on radio frequencies within its range.
- Emits radio frequency waves that prevent the targeted device from establishing or maintaining a connection.
- Generally does not discriminate between desirable and undesirable communications.
- · Jammers can:

 prevent your cell phone from making or receiving calls, text messages, and emails;

- prevent your Wi-Fi enabled device from connecting to the Internet;
- prevent your GPS unit from receiving correct positioning signals; and
- prevent a first responder from locating you in an emergency.



Received GPS Signals are Weak



GPS defines the minimum C/A "open sky" signal power to be -158.5 dBW, 11 times weaker than calculated here

- Signals from each GPS satellite cover 38% of the earth or 194,244,017 sq km
- A 50 watt GPS transmitter thus provides ~2.6E-13 Watts per square meter on the earth
- A hemispheric L1 antenna "capture area" is ~0.006 m
- Received signal power thus is ~1.5E-15 Watts (-148 dBW)
 or ~1.5E-12 mW (-118 dBm)
- Very weak signals!!!

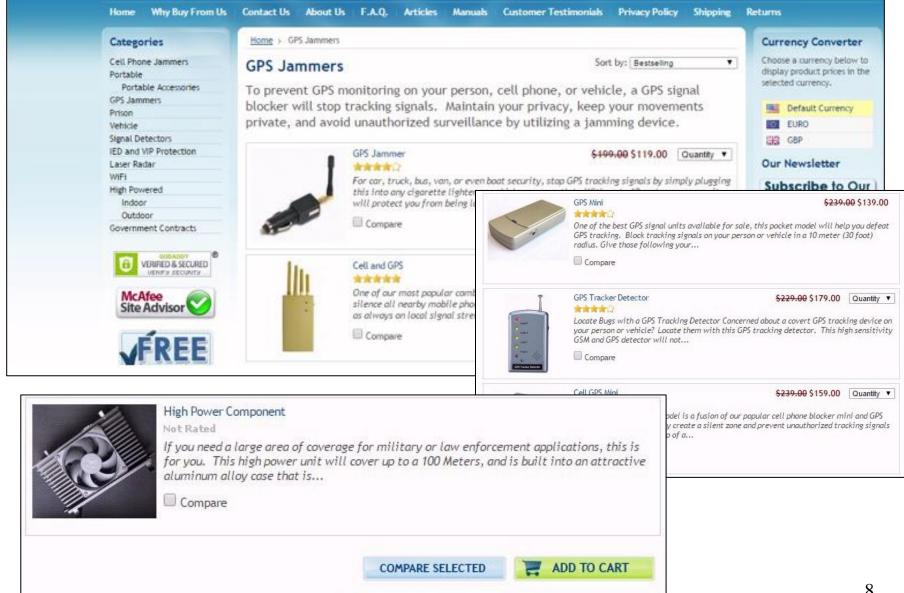
Jamming Sources

- Thrill seekers interrupt GPS "for the fun of it"
- "Privacy" jammers, e.g., cigarette lighter devices
- Criminals
- Terrorists
- Authorized services (not well regulated)
 - Powerful adjacent channel signals causing overload
 - Higher order intermodulation products, e.g., 2f₁ f₂





Jammers for Sale



Thank You

Questions?