



GNSS Vulnerability to Jamming & Spoofing

Professor David Last
Past-President, Royal Institute of Navigation

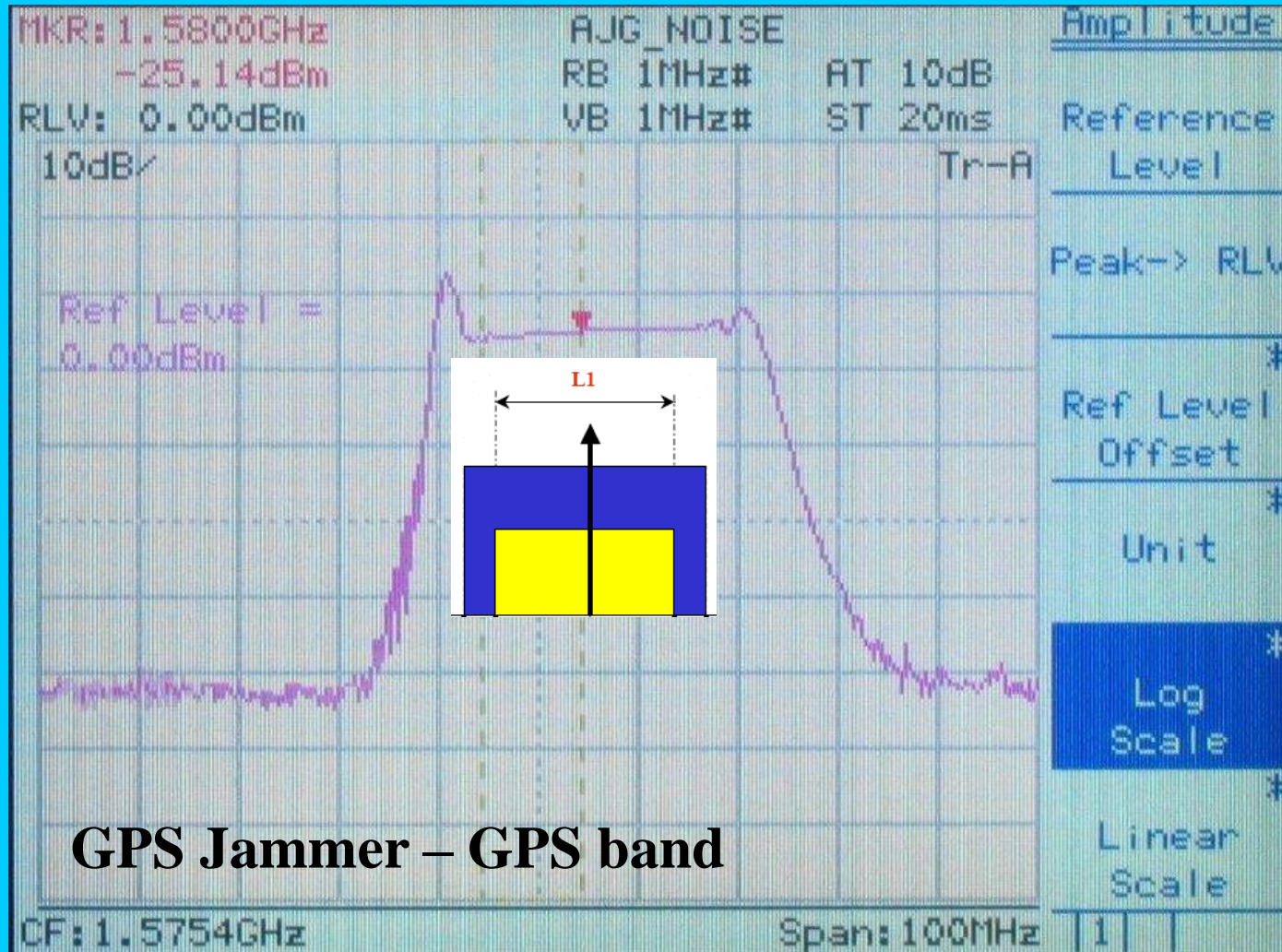
NNF Workshop
Navigation, Technology & Safety in Navigation
Bodo, Norway
2 February 2016

Picture: earthobservatory.nasa.gov/newsroom/BlueMarble/

Organised Crime: High-value vehicles & construction equipment are stolen and exported in containers – protected by plug-in GPS jammers



Photos courtesy of AVCIS & Chronos Technology

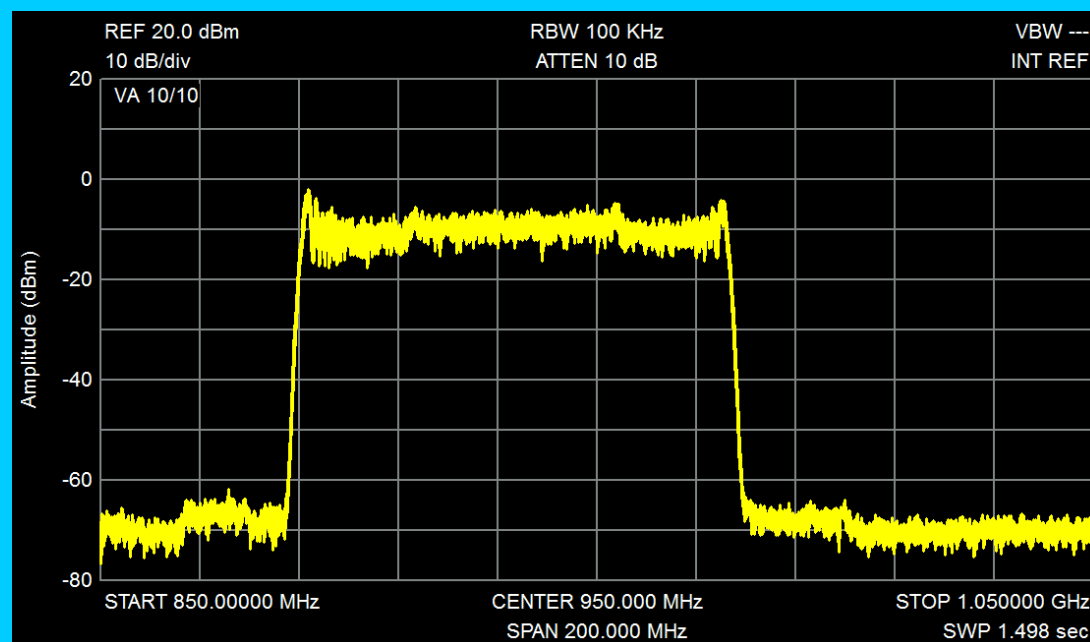
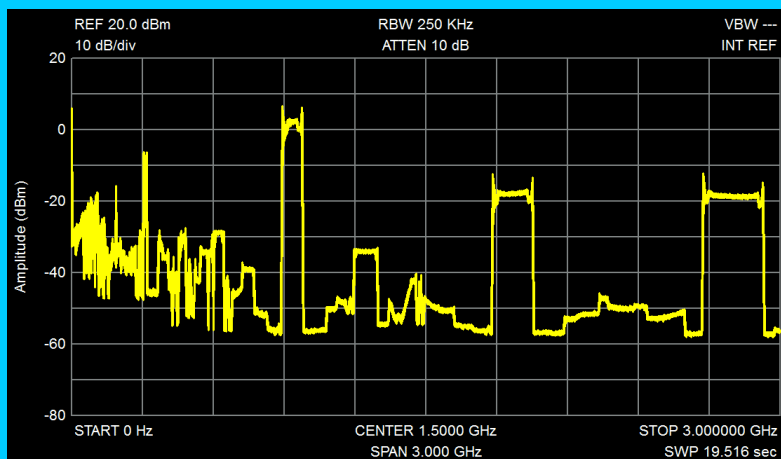


Picture: http://galileo.khem.gov.hu/documents/angol/technikai_dokumentumok/status_of_galileo_frequency_and_signal_design.pdf

GPS and GSM Jammer



Picture: <http://www.tayx.co.uk>







Free shipping by



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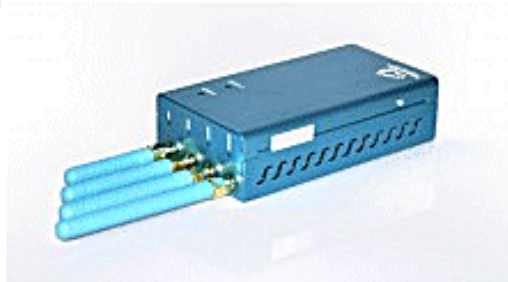
* Only for Legal Use

Product Description

Are you sick of being tracked like a criminal? This certain device is a gorgeous GPS jammer which can totally solve your troubles. The can prohibit signals from tracking your current location; pay a private space for you. All of this owes to the **high power portable GPS (GPS L1/L2/L3/L4/L5) jammer**.

High Power Portable GPS (GPS L1/L2/L3/L4/L5) Jammer

Free Shipping



RRP: ~~GBP £110.26~~

Your Price: **GBP £101.43**
(You save GBP £8.83)

SKU: JM110838

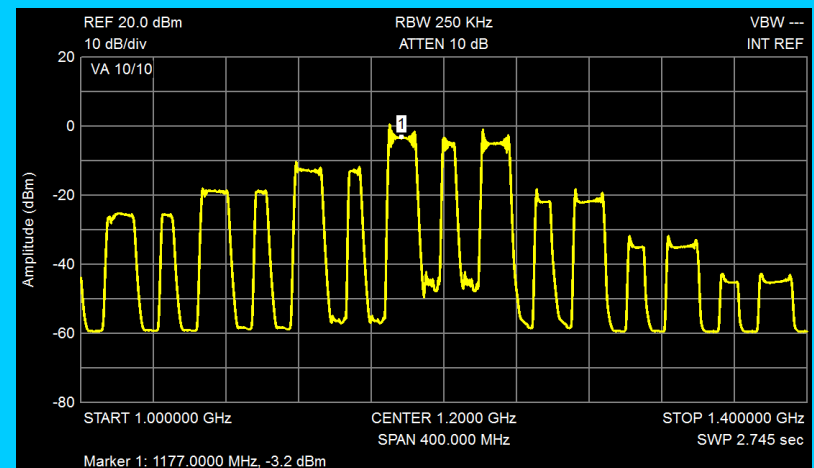
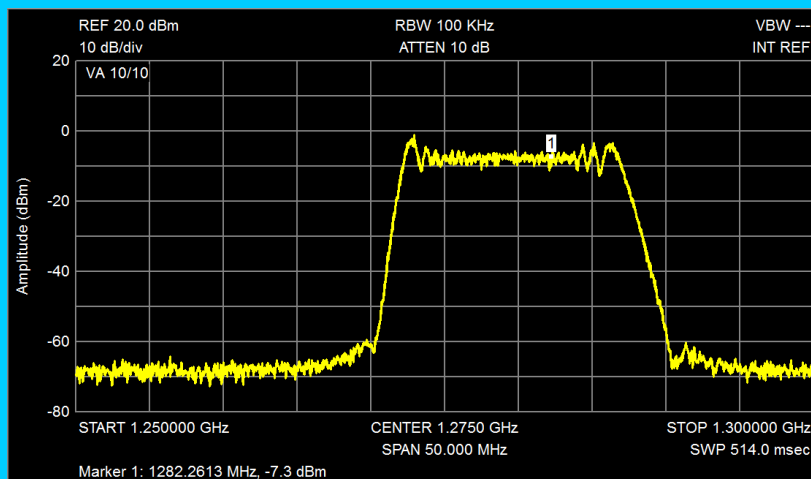
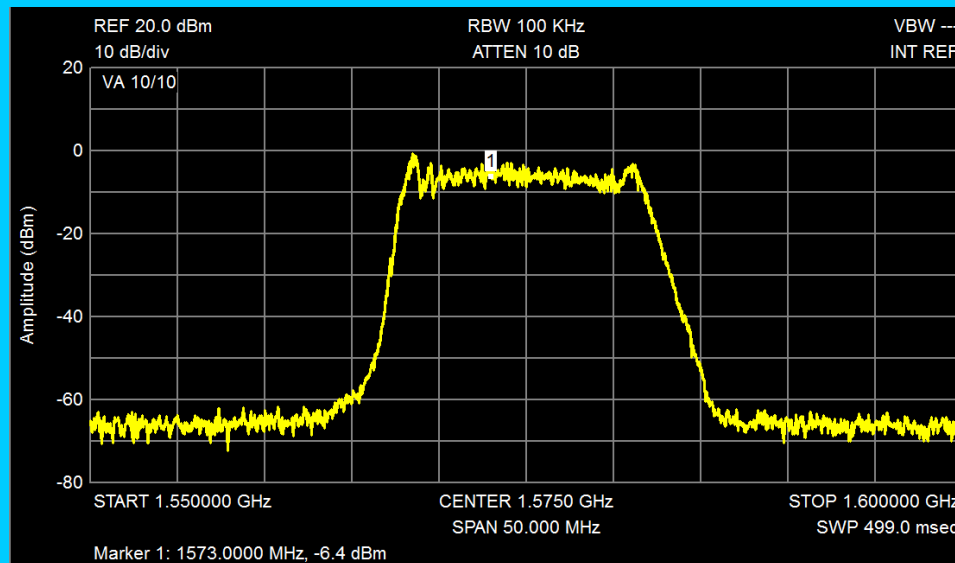
Rating: ★★★★★ ([6 product reviews](#))

Shipping: Calculated at checkout

Quantity:

1 ▼

Add to cart



Systems - or simply GNSS?

GPS plus ...

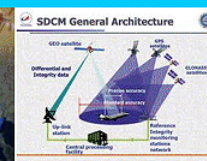


GLONASS (Russia) Compass-Beidou (China)



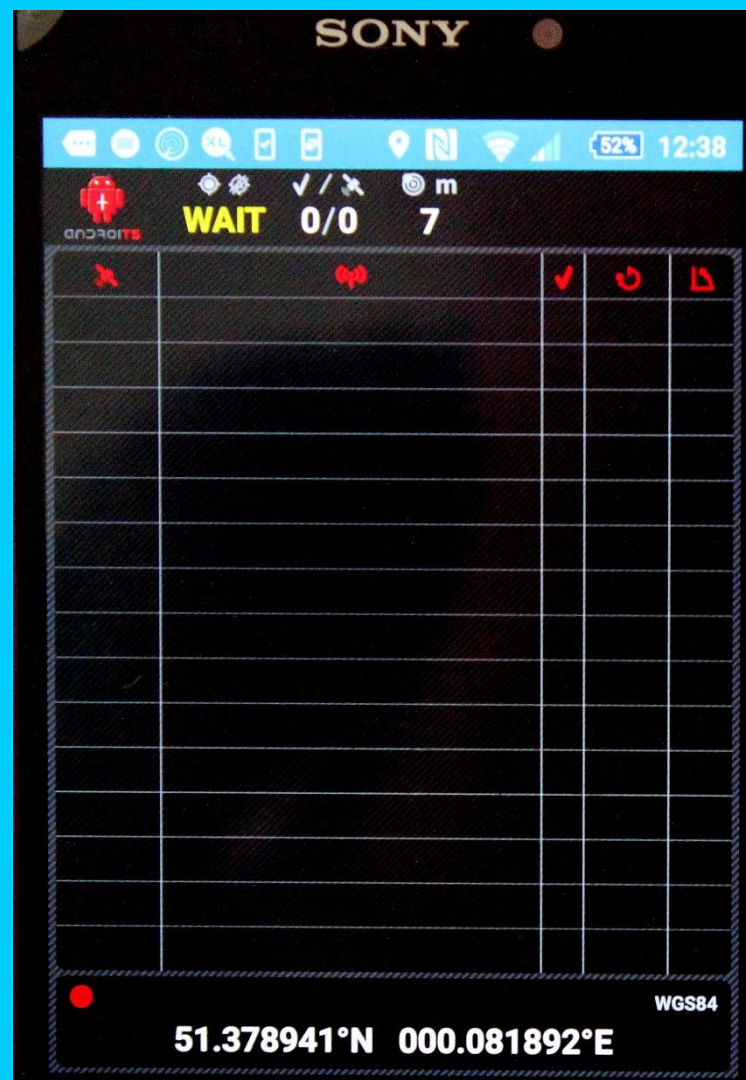
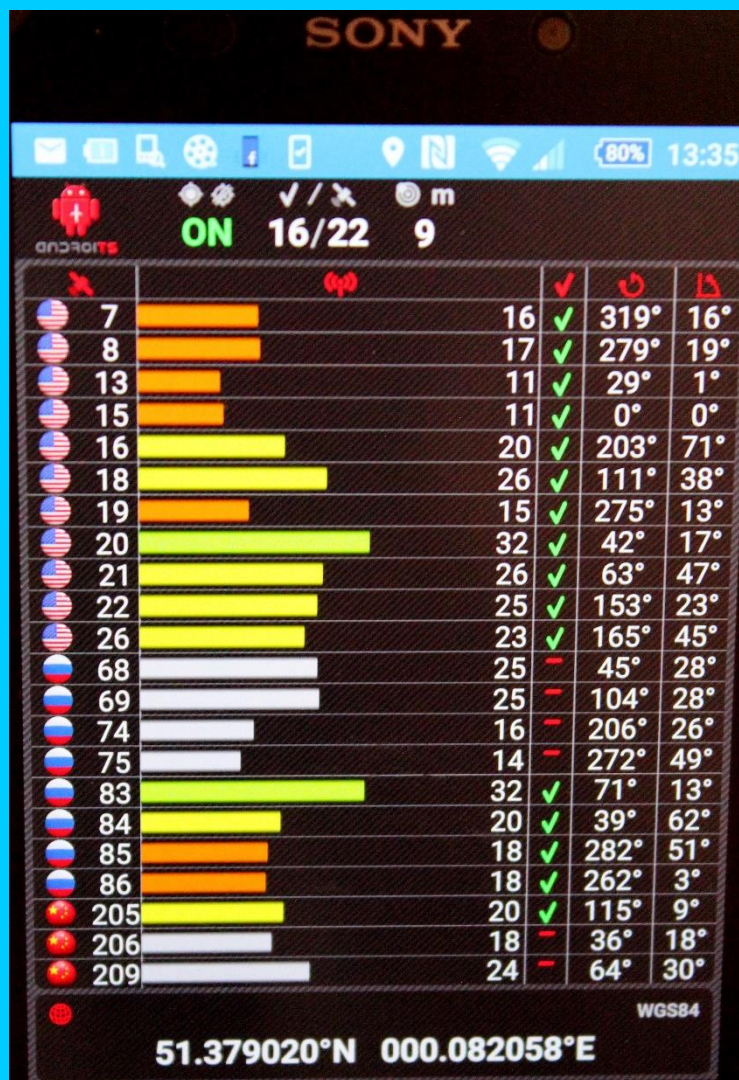
QZSS (Japan) GALILEO (Europe) IRNSS (India)

... and all the augmentations:

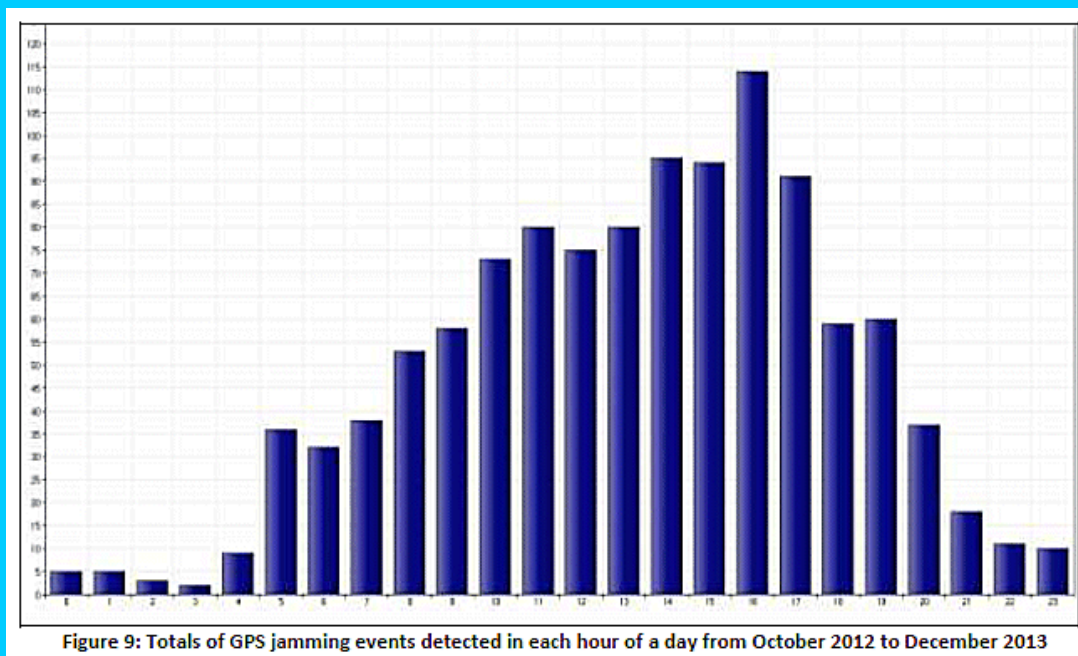




Pictures: Bob Cockshott – UK KTN, www.bidhaabora.com



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Some European Union Activities on GNSS Spectrum Protection

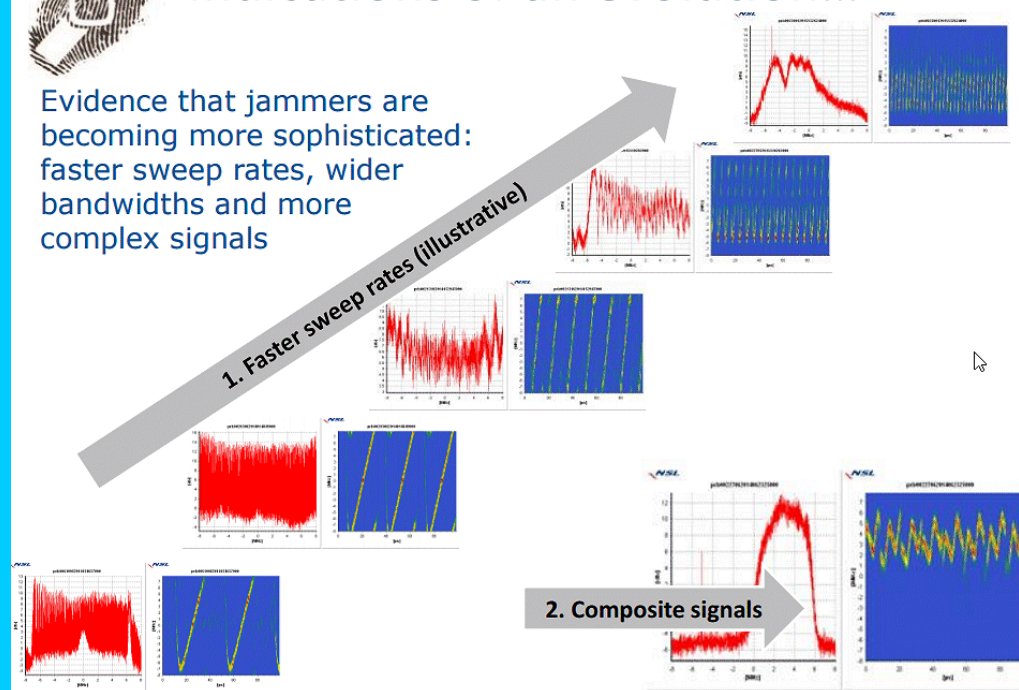
Pieter De Smet
European Commission
Galileo Programme
31 October 2015



Indications of an evolution...

Evidence that jammers are becoming more sophisticated:
faster sweep rates, wider
bandwidths and more
complex signals

1. Faster sweep rates (illustrative)



2. Composite signals



Successful demonstration of a GPS Jammer triggered camera system

GPS Jamming Trials at Sennybridge, Brecon Beacons, Wales



Photograph released by kind permission of
Commandant Sennybridge Training Area

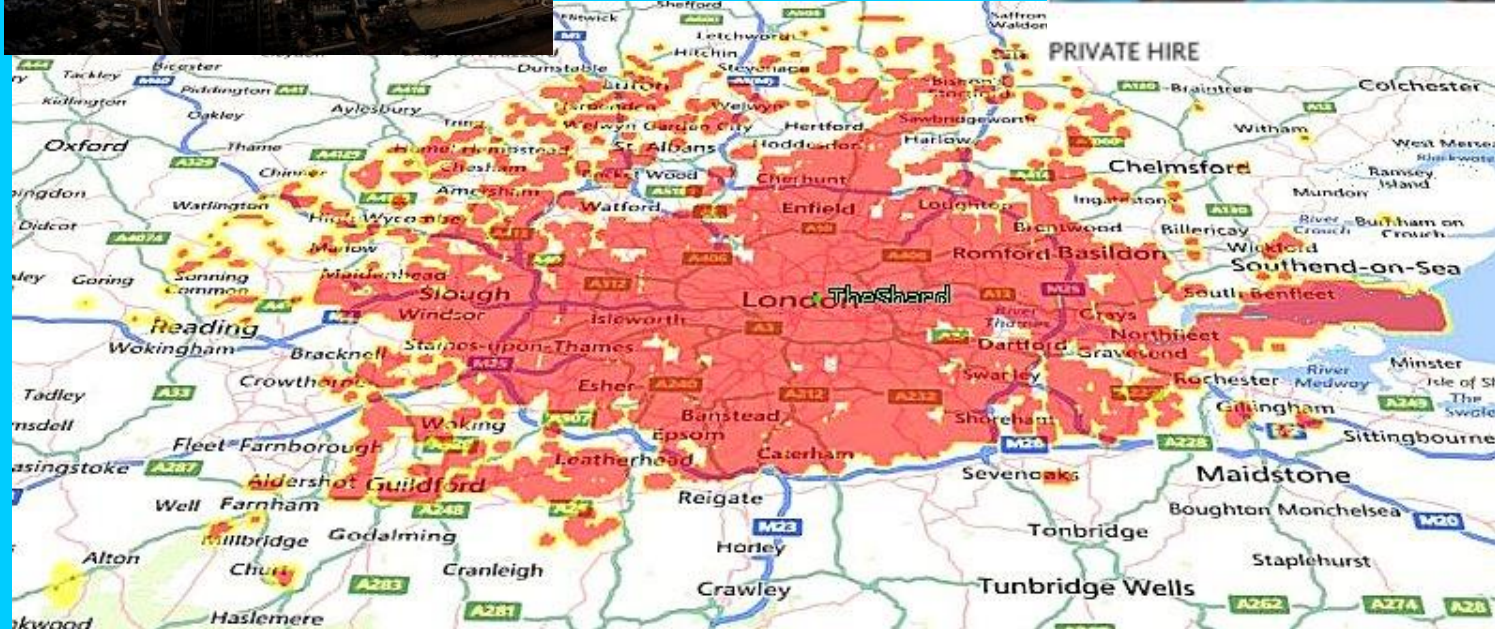
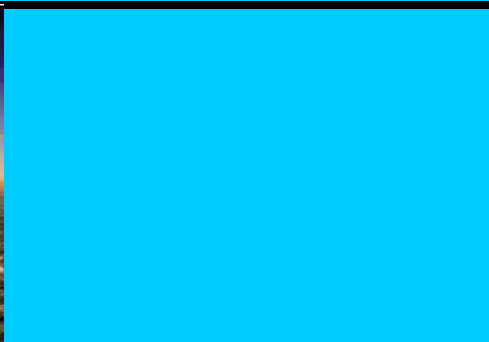
Material: Chronos Technology Ltd.



N. Korea accused of jamming commercial flight signals

By Julie Yoo, NBC News in Seoul, and msnbc.com news services





Area affected by jammer in the viewing gallery of the London Shard.
 Red: Receivers jammed. Yellow: Reception degraded.

Model: 100W jammer. Commercial-grade receivers.

Picture: Michael Jones, Chemring TS

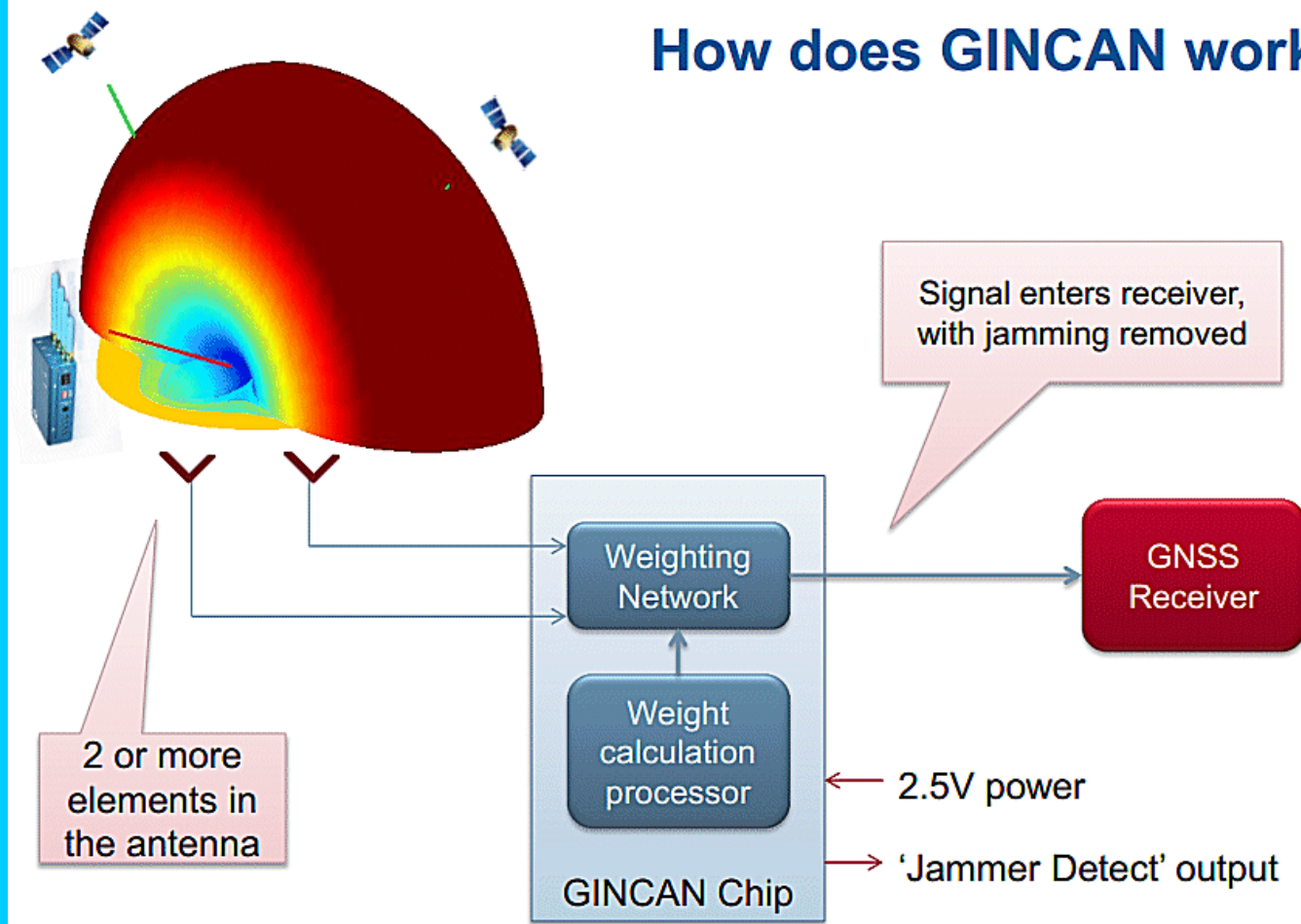
Low-cost spoofer devices can now seize control of GNSS receivers, forcing them to show any location or time a criminal or terrorist chooses.

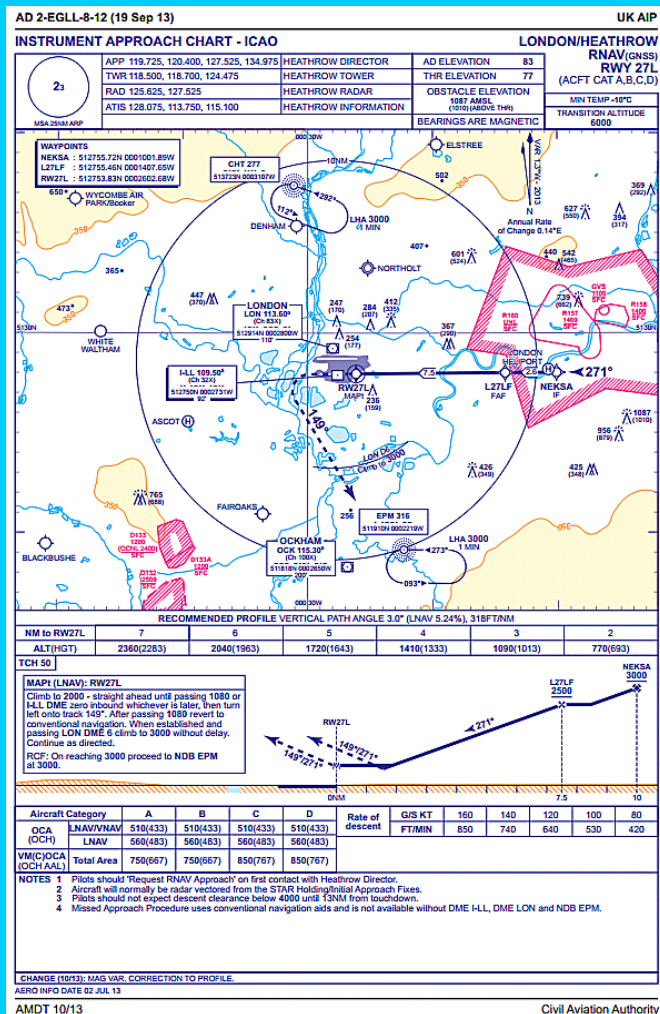


A generator trip in an automatic control scheme could be falsely activated by the GPS spoofing, possibly leading to cascading faults and a large-scale power blackout.

Pictures: dailymail.co.uk, gpsworld.com, Forbes.com

How does GINCAN work?





London Heathrow Runway 27L GNSS Instrument Approach

Supporting cast:

- ILS/DME (I-LL)
- LOC/DME (I-LL)
- MLS/DME

Starring ...

- Instrument Landing System Localiser
- Instrument Landing System Glideslope
- Distance Measuring Equipment
- Microwave Landing System
- Barometric altimeter
- High-Intensity Lighting System

From: http://www.ead.eurocontrol.int/eadbasic/pamslight-23AE573F59E3C0B9AB33BC5B126A385E/7FE5QZZF3FXUS/EN/Charts/AD/AIRAC/EG_AD_2_EGLL_8-12_en_2013-09-19.pdf

Enhanced Loran (eLoran)

- eLoran: Strong LF signals from earth
- GPS: Weak microwaves from space
- Both: timing, ranges, position, time
- No common mode of failure
- Plug-in replacement



Pictures: Mitchell Narins, Federal Aviation Administration; Reelektronika bv



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