

*38th ILA Convention and Technical Symposium  
October 13-15, 2009  
Portland, Maine USA*

# ***Crime, GNSS Jamming & Enhanced Loran***

**Professor David Last**  
**Consultant Engineer & Expert Witness**



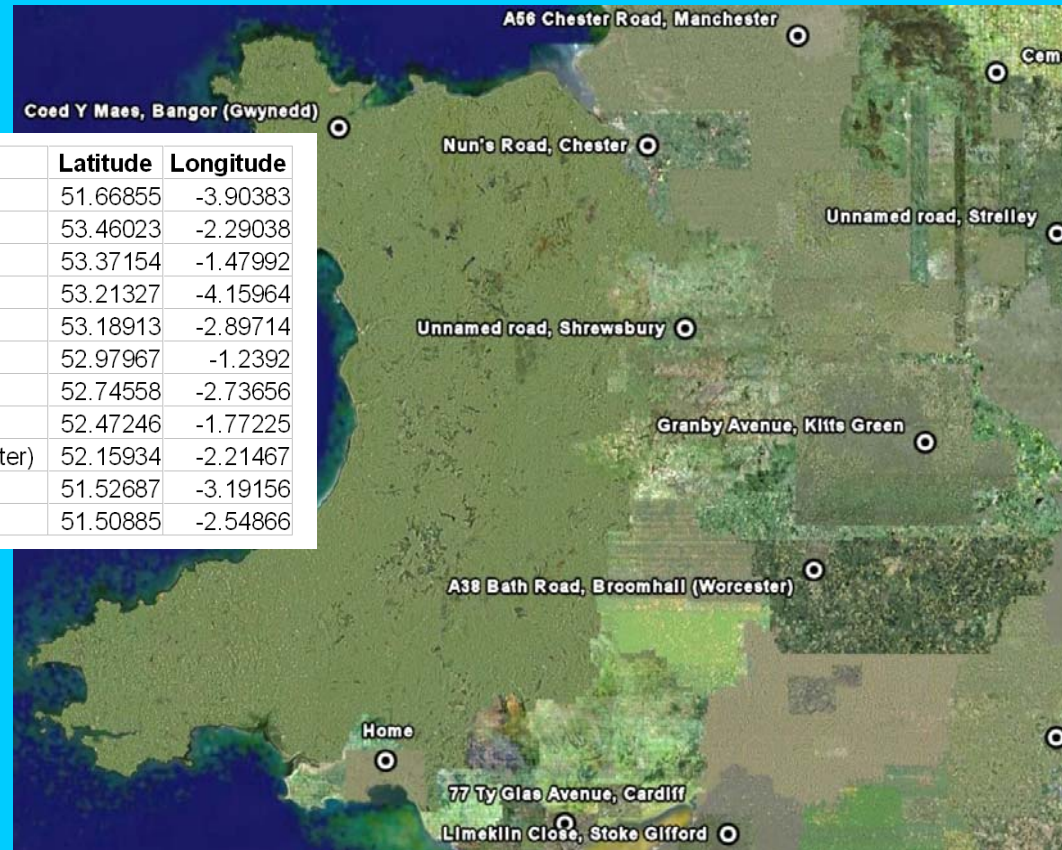


## TomTom Car Navigator GPS receiver + Computer

Picture: [www.tomtom.com](http://www.tomtom.com)

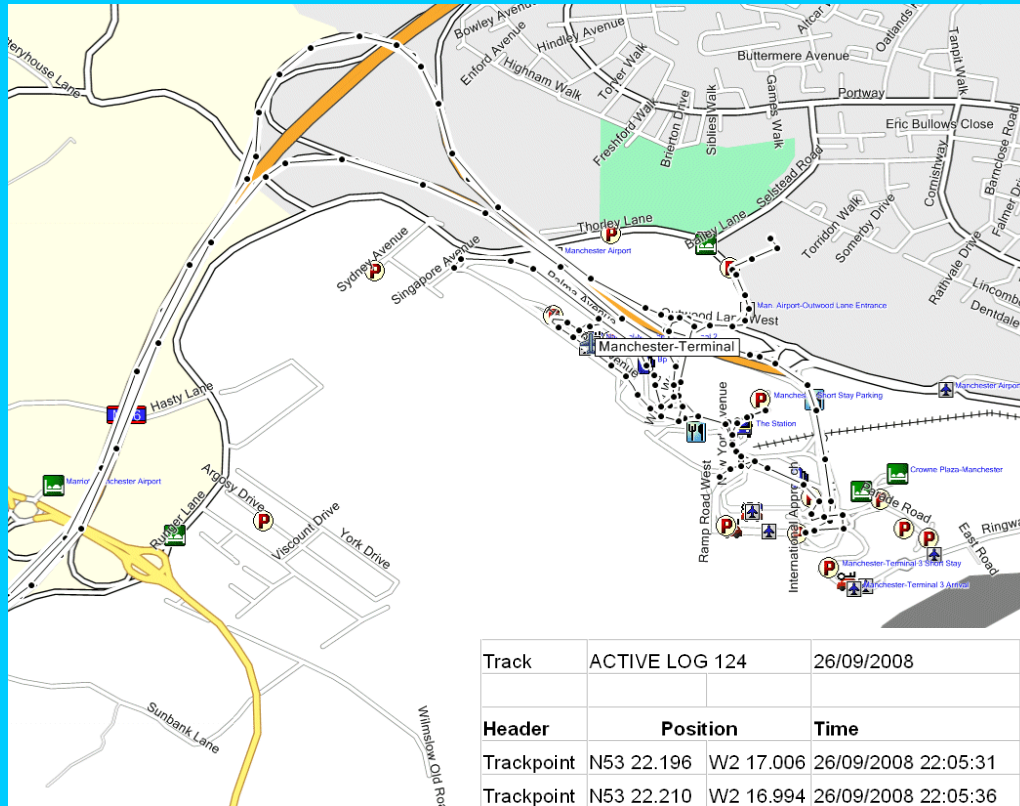
© David Last

Location	Latitude	Longitude
Home	51.66855	-3.90383
A56 Chester Road, Manchester	53.46023	-2.29038
Cemetery Road, Sheffield	53.37154	-1.47992
Coed Y Maes, Bangor (Gwynedd)	53.21327	-4.15964
Nun's Road, Chester	53.18913	-2.89714
Unnamed road, Strelley	52.97967	-1.2392
Unnamed road, Shrewsbury	52.74558	-2.73656
Granby Avenue, Kitts Green	52.47246	-1.77225
A38 Bath Road, Broomhall (Worcester)	52.15934	-2.21467
77 Ty Glas Avenue, Cardiff	51.52687	-3.19156
Limekiln Close, Stoke Gifford	51.50885	-2.54866



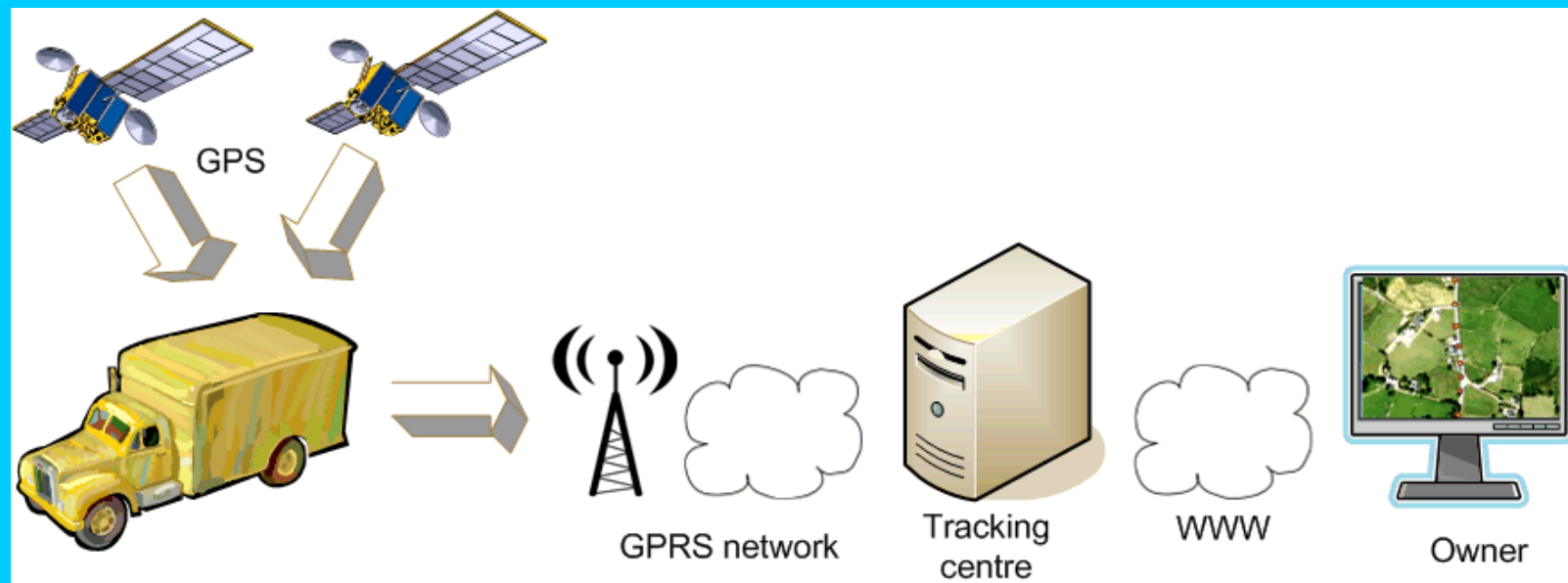
**Plot of addresses extracted from TomTom car navigator**

# Multiple timed and dated tracks

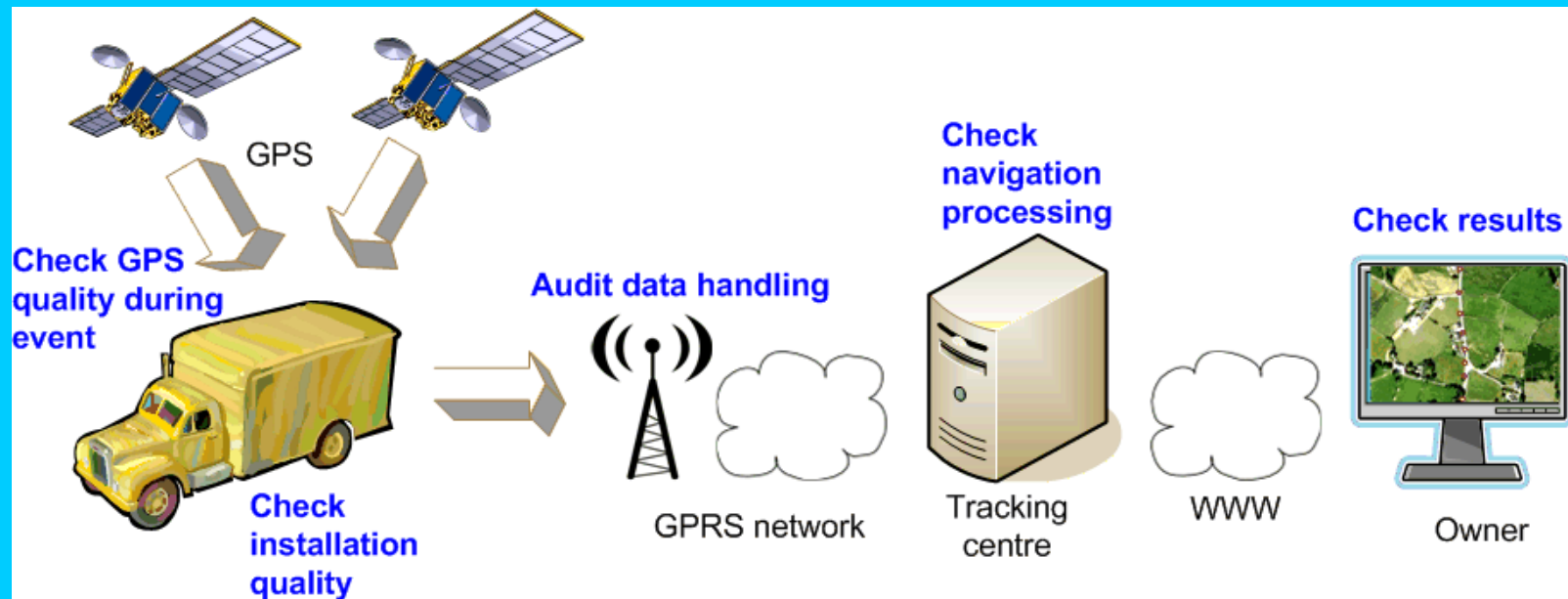


Track	ACTIVE LOG 124		26/09/2008	22:05:31	0:00:46	595 m	47 kph	
Header	Position		Time	Altitude	Leg Length	Leg Time	Leg Speed	Leg Course
Trackpoint	N53 22.196	W2 17.006	26/09/2008 22:05:31	79 m				
Trackpoint	N53 22.210	W2 16.994	26/09/2008 22:05:36	78 m	30 m	0:00:05	22 kph	28° true
Trackpoint	N53 22.210	W2 16.994	26/09/2008 22:05:38	78 m	0 m	0:00'02	0 kph	0° true
Trackpoint	N53 22.207	W2 16.893	26/09/2008 22:05:43	78 m	111 m	0:00:05	80 kph	92° true
Trackpoint	N53 22.194	W2 16.847	26/09/2008 22:05:47	78 m	57 m	0:00:04	51 kph	115° true
Trackpoint	N53 22.112	W2 16.714	26/09/2008 22:06:01	78 m	212 m	0:00:14	54 kph	136° true
Trackpoint	N53 22.063	W2 16.663	26/09/2008 22:06:10	76 m	128 m	0:00'09	51 kph	135° true
Trackpoint	N53 22.034	W2 16.619	26/09/2008 22:06:17	76 m	57 m	0:00:07	29 kph	164° true





## Vehicle tracking system



## Vehicle tracking system

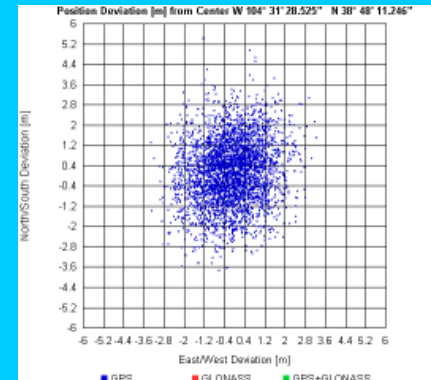
*Checks to establish quality of evidence*

# How accurate is it, then?

*“95% of GPS position measurements will lie within 5 metres of the true position”*

*provided ...*

- *GPS receiver operating OK*
- *Installation OK*
- *Has acquired satellites*
- *Aerial can see sky*
- *No blockages*
- *No reflections*
- *No interference*



Scatter plot: <http://www.gral-gju.org/examples.php>



**GPS Jammer**



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**HANDHELD JAMMERS**

- RX9000 Handheld
- SH066 Handheld
- Y050 Handheld
- Y050G GPS Handheld
- Y050TG GPS/GSM in car
- BLJM-R 2.4Ghz Handheld

**DESKTOP JAMMERS**

- Y100 Dual
- Y300 Dual
- Y300 Triple World
- Y300 Triple (3G)
- Y400 Quad (3G)

**HIGH POWER JAMMERS**

- Y2000 Dual
- Y2000 Triple (3G)
- Y2000 QUAD (3G)

**VERY HIGH POWER JAMMERS**

- Y3000
- XX1000

**CELL PHONE DETECTORS**

- SH055S Handheld
- Detector 610

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**Y050G GPS Handheld Jammer**

Total Output Power: 300 Milliwatts  
Effective distance: 0 to 15 metres (in optimum conditions)

**New low price on this product for a limited period only**

0.3 Watt total power, range up to 15 metres (in optimum conditions)

**THIS IS NOT A CELL PHONE JAMMER, IT IS ONLY FOR GPS L1.**

RF total power : 0.3 watt

- Block range : GPS L1 & GLONASS within 1 ~ 15m radius
- Handheld (Portable) Size and Aluminium Case
- Jammer battery life: Up to 5 hours
- Jammer uses internal rechargeable battery and a/c power or cigajack in car.
- Quick Charging : 3 - 4 hours
- Battery type: internal rechargeable 3.6V 2000mA Ni-MH battery pack
- Supplied with a/c adapter and cigajack type adapter for car
- Size : 60 x 100 x 30 mm (weight : 270g (including battery)).

**GPS Jammer**

Was £139.00 GBP

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**SALE CONDITIONS FOR JAMMING PRODUCTS**

Note - The use of jamming equipment is prohibited in some countries. It is the responsibility of the customer to ensure that they have the legal right to import these products before purchasing from us. Upon purchasing, the customer becomes wholly liable for any legal issues that may occur as a result of the importation and/or use of these products in the destination country.

Note for UK customers: jamming equipment is illegal to use in the UK as it violates section 8 of the 2006 Wireless Telegraphy Act, we are therefore unable to supply jammers to any UK customer with the exception of certain military and government departments who have the necessary authorisation from the UK Office of Communications (Ofcom). Please note that no exceptions can be made on this policy.

Due to non CE approval of these products we cannot sell these products into any European Union country.

Customers in North America are advised to contact the FCC to ensure that they are legally allowed to import jammer products into the USA before purchasing from us.

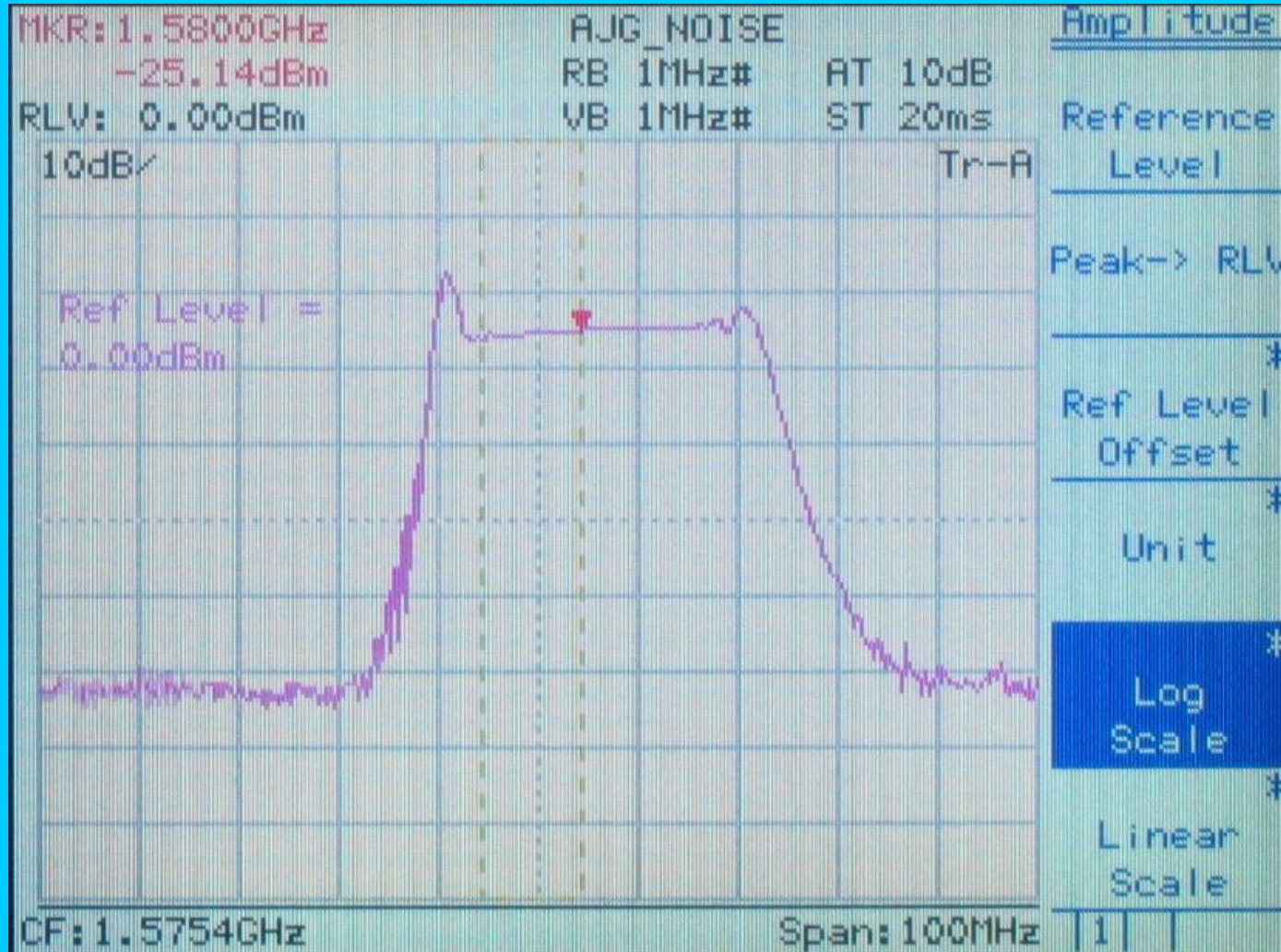
Copyright © 2001 - 2008 - Global Gadget UK Ltd - All Rights Reserved

Picture:  
<http://www.globalgadgetuk.com/yo50G.htm>

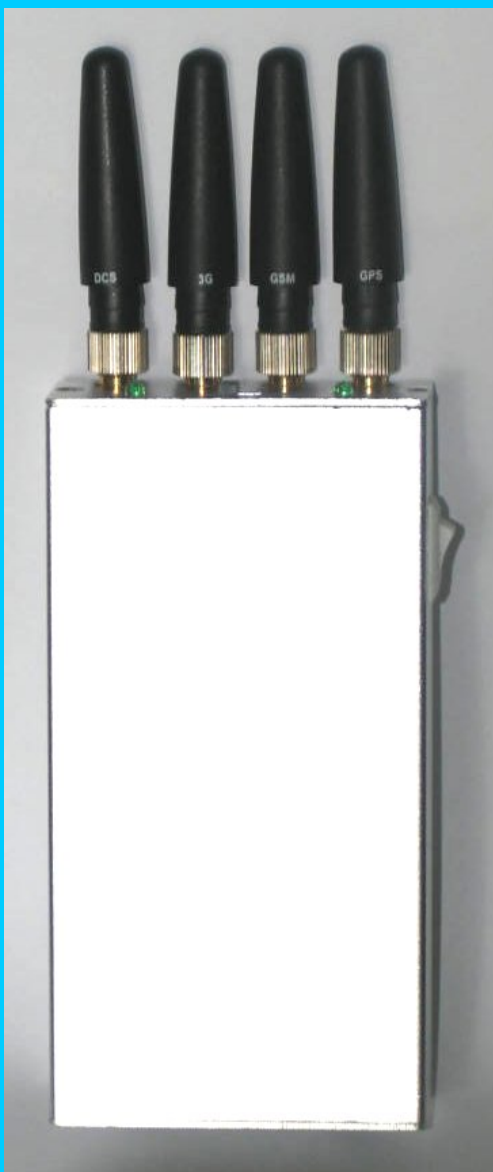


- **GPS satellite radiates 100W**
- **From 20,000km range**
- **Illuminates 38% of Earth**
- **eg Europe + Africa + Atlantic**

Picture: Professor Durk van Willigen



## GPS Jammer - Spectrum



**GPS & Mobile Phone Jammer**





**GPS 1575MHz**



**GSM  
900MHz**



**DCS  
1800MHz**



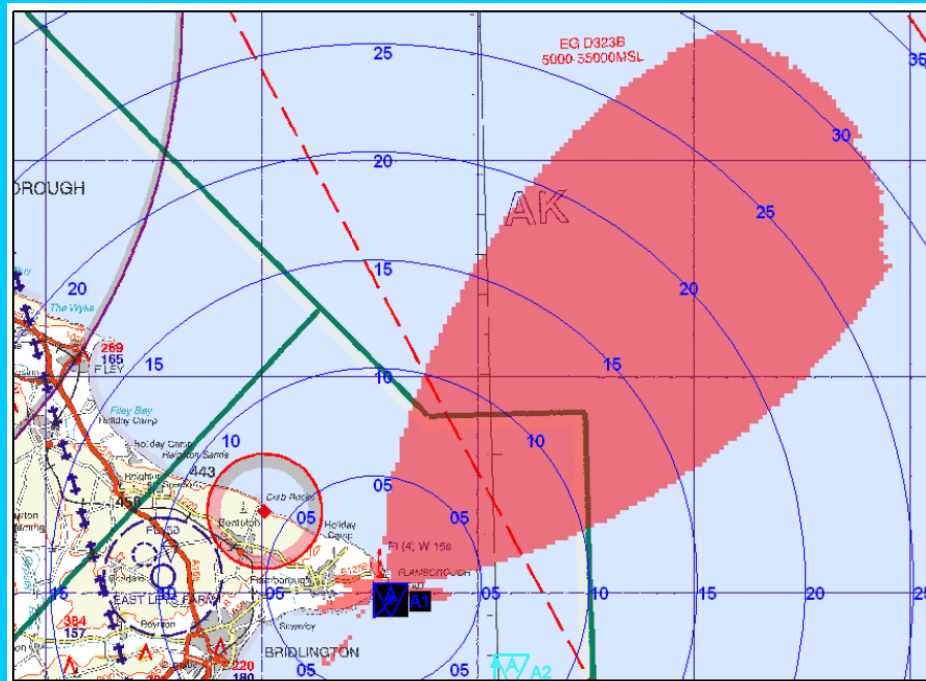
**3G  
2150MHz**





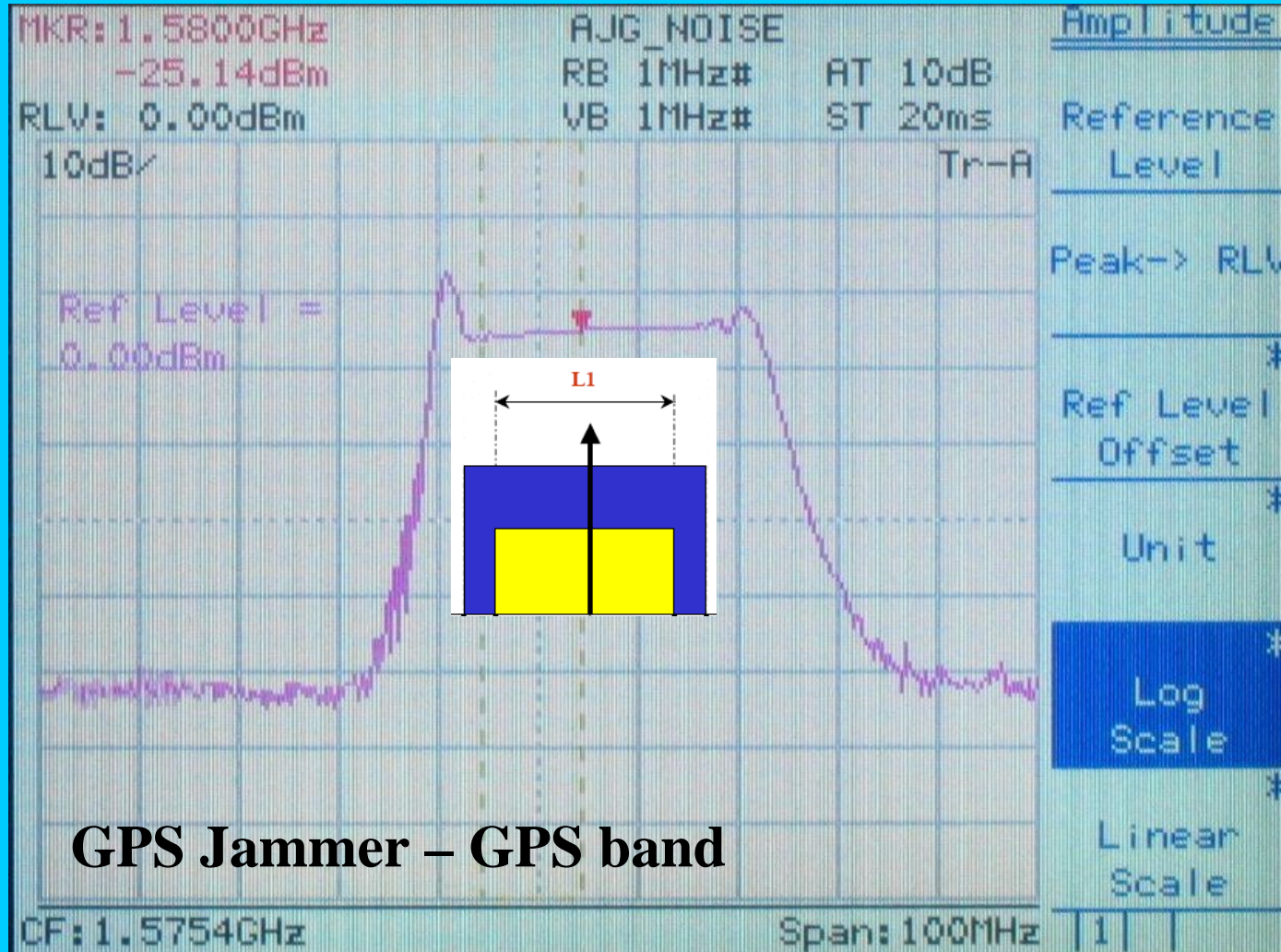
#### Specifications | GMW08

Frequency for Europe: GPS L1 System, CDMA800, GSM900, GSM1800 & UMTS2110 MHz  
 Frequency for America: or GPS L1 System, GSM850, GSM1900 & W-CDMA2110MHz  
 Coverage: 20 ~ 40 Meters Radius  
 Current: 6A  
 Power: GSM/CDMA/GPS 2W, others 1.5W, total 6.5W



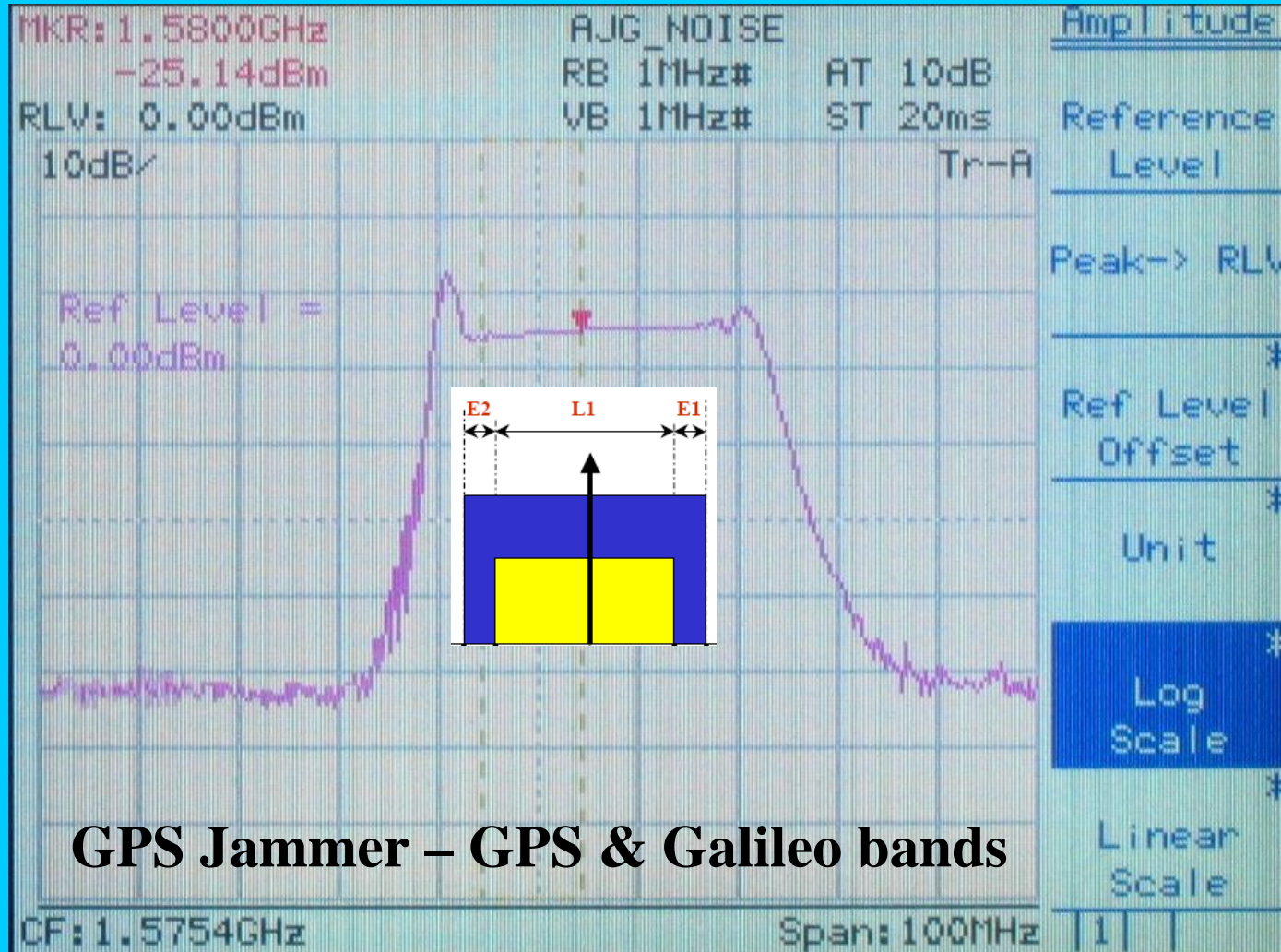
## 2 Watt GPS & Mobile Phone Jammer

Pictures: <http://www.gpsjammers.net/gmw08.html> ,  
[http://www.gla-rnav.org/pdfs/GPS\\_Jamming\\_and\\_the\\_impact\\_on\\_maritime\\_navigation.pdf](http://www.gla-rnav.org/pdfs/GPS_Jamming_and_the_impact_on_maritime_navigation.pdf)

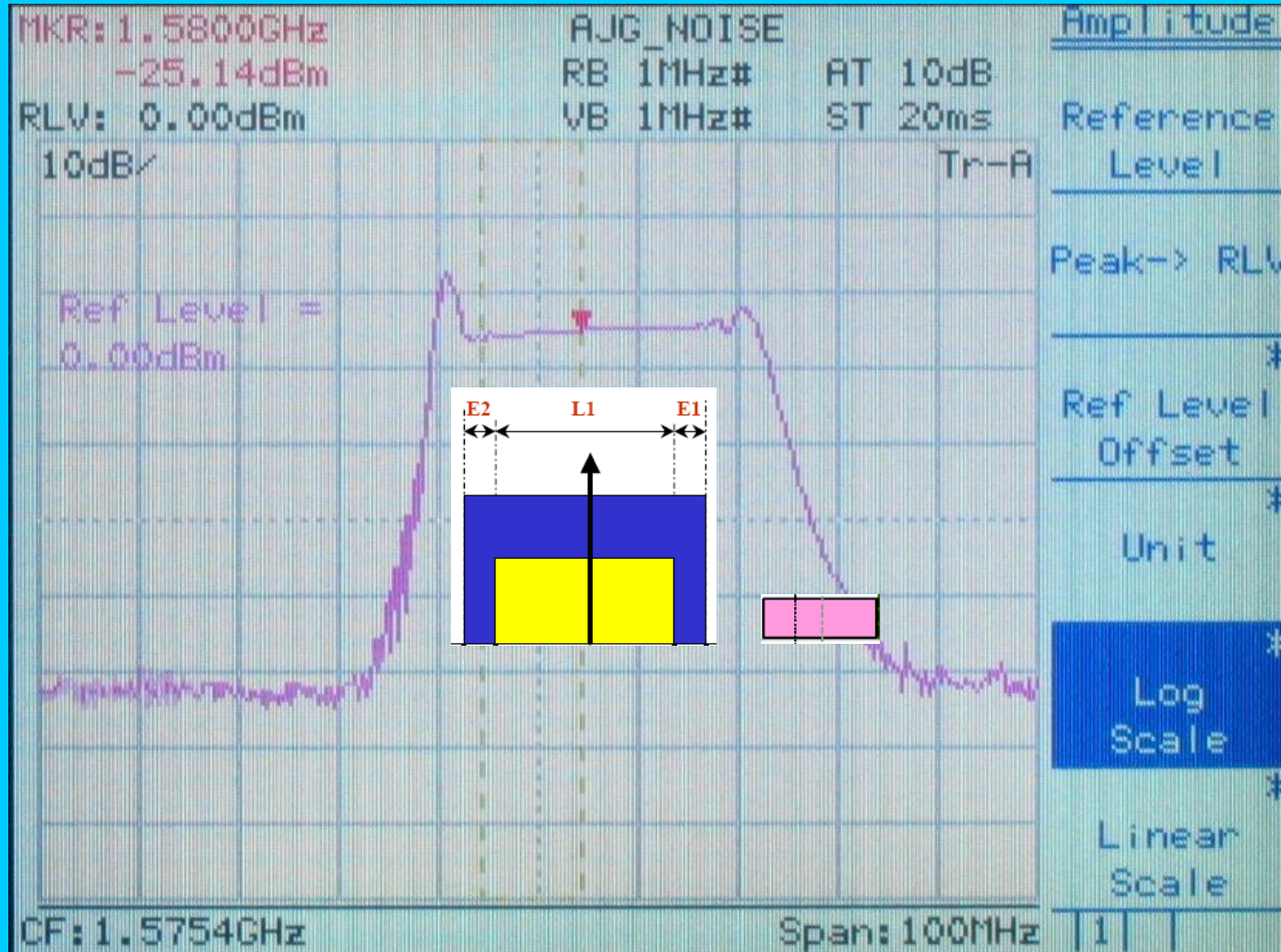


Picture: [http://galileo.khem.gov.hu/documents/angol/technikai\\_dokumentumok/status\\_of\\_galileo\\_frequency\\_and\\_signal\\_design.pdf](http://galileo.khem.gov.hu/documents/angol/technikai_dokumentumok/status_of_galileo_frequency_and_signal_design.pdf)





Picture: [http://galileo.khem.gov.hu/documents/angol/technikai\\_dokumentumok/status\\_of\\_galileo\\_frequency\\_and\\_signal\\_design.pdf](http://galileo.khem.gov.hu/documents/angol/technikai_dokumentumok/status_of_galileo_frequency_and_signal_design.pdf)

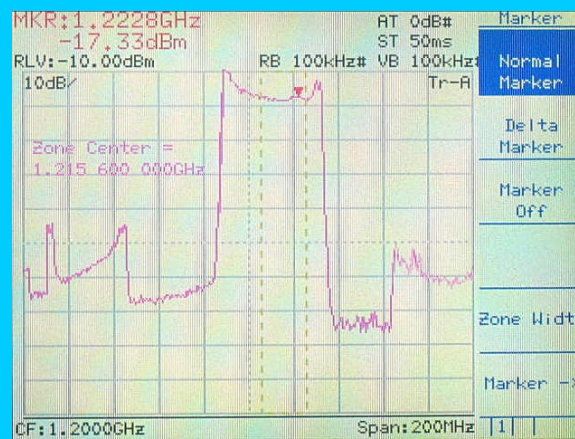


**GPS Jammer – GPS, Galileo & GLONASS bands**





**L1**



**L2**

**GPS jammer for both L1 and L2**



## Options to mitigate jamming and spoofing

- *Datatrak*
- *Tracker*
- *Dead-reckoning*
- *Enhanced Loran*



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

# *Enhanced Loran (eLoran)*

- On earth, high-powered
- Different from GPS!
- Digital
- 10m accuracy, precise time



Pictures: Mitchell Narins, Federal Aviation Administration; Reelektronika bv



**So ...  
where are we headed?**



- *GPS evidence vital in vehicle crime*
- *Forensic use of GPS growing rapidly*
- *GNSS-based systems now under attack*
- *Enhanced Loran is The Answer!*