

EXCERPT FROM:

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GPS Interference & Spoofing: Origins, Effects and Mitigations for the Military and Civil Communities

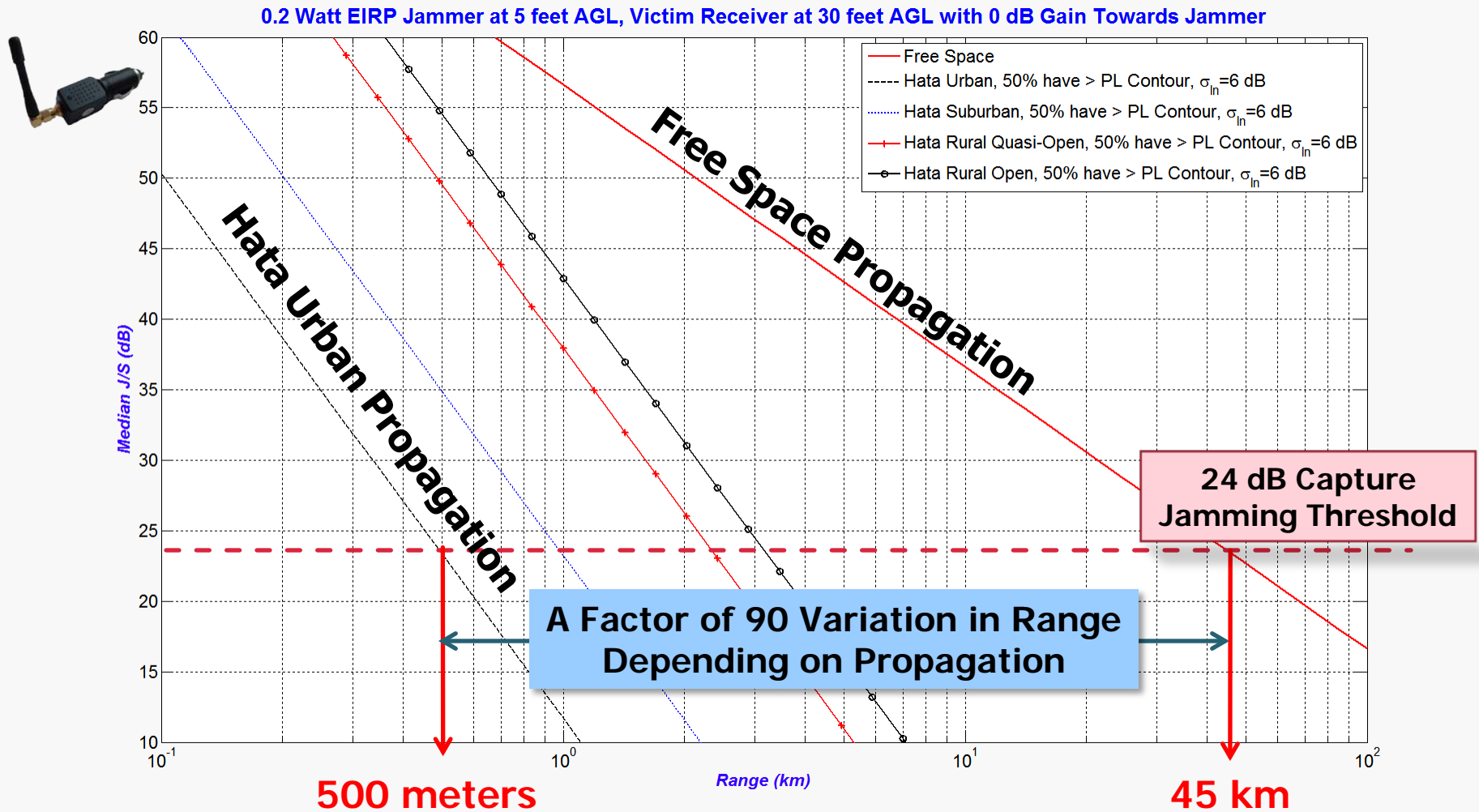
Part I: The **Effects** of Jamming on GPS/GNSS Signals

Part II: Jamming & Spoofing **Mitigations** for Military and Civil GPS/GNSS

Part III: **Future Directions** In GPS Location Assurance: Jammer Location, Receiver Certification, Antispoofing and Proof of Location

The Effective Range Of a Jammer Varies Widely Depending on Propagation

Can Also Make Jammers Hard to Find

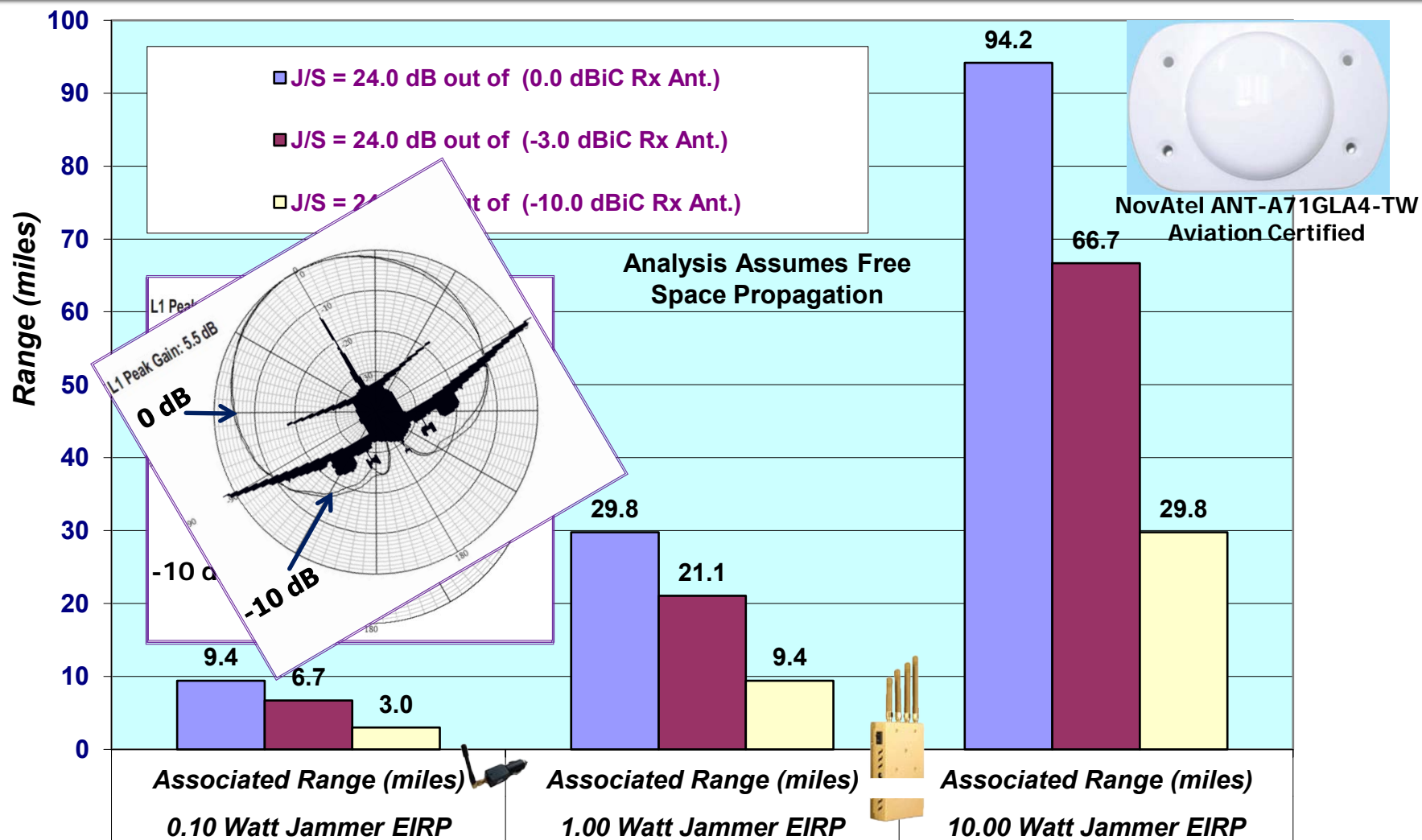


J_{over}_S_for_J911.m

Civil Jamming Doesn't Require High Power to Be Damaging to Aircraft At Long Ranges

Earth Obscuration Limits Range

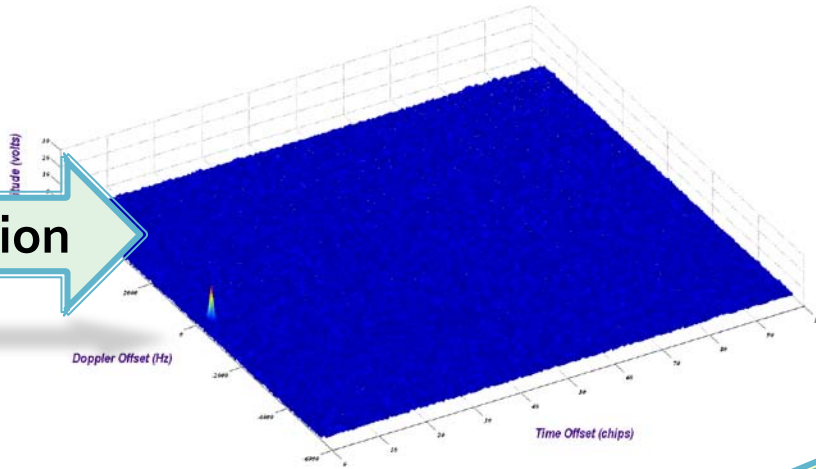
Nominal GPS Signal: -157 dBW into +3 dBiC



What if Expectation Doesn't Match Reality?

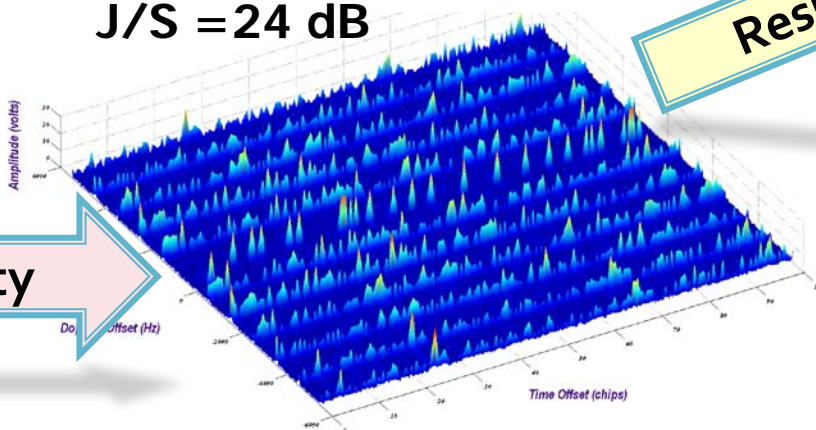
Simple Checks Would Have Kept Receiver From Reporting False Position

Expectation



$J/S = 24 \text{ dB}$

Reality



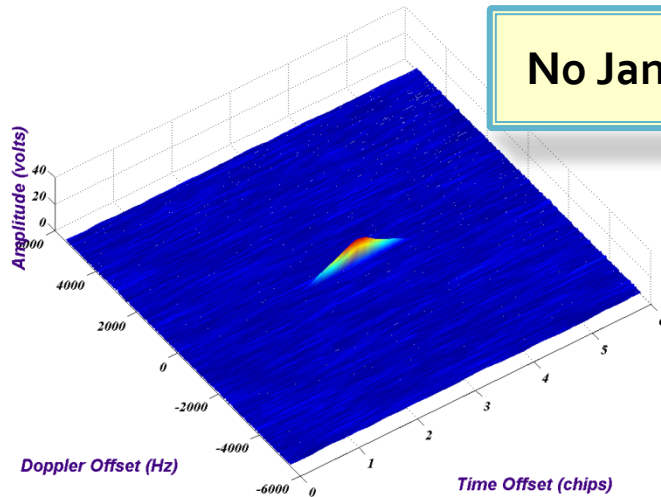
Result



Weak Jammers May Appear Benign But...

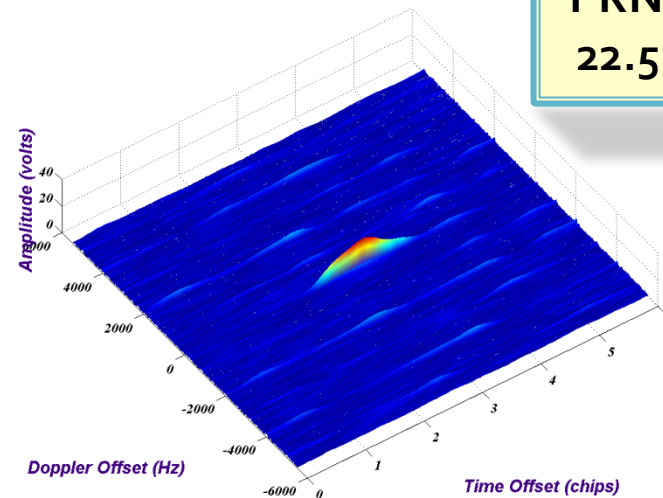
Both Cases, Nominal C/No = 44 dB-Hz, 20 msec PIT

Case 1, C/A Search Correlation Responses $C/N_{\text{max}} = 43.0503$ dB-Hz



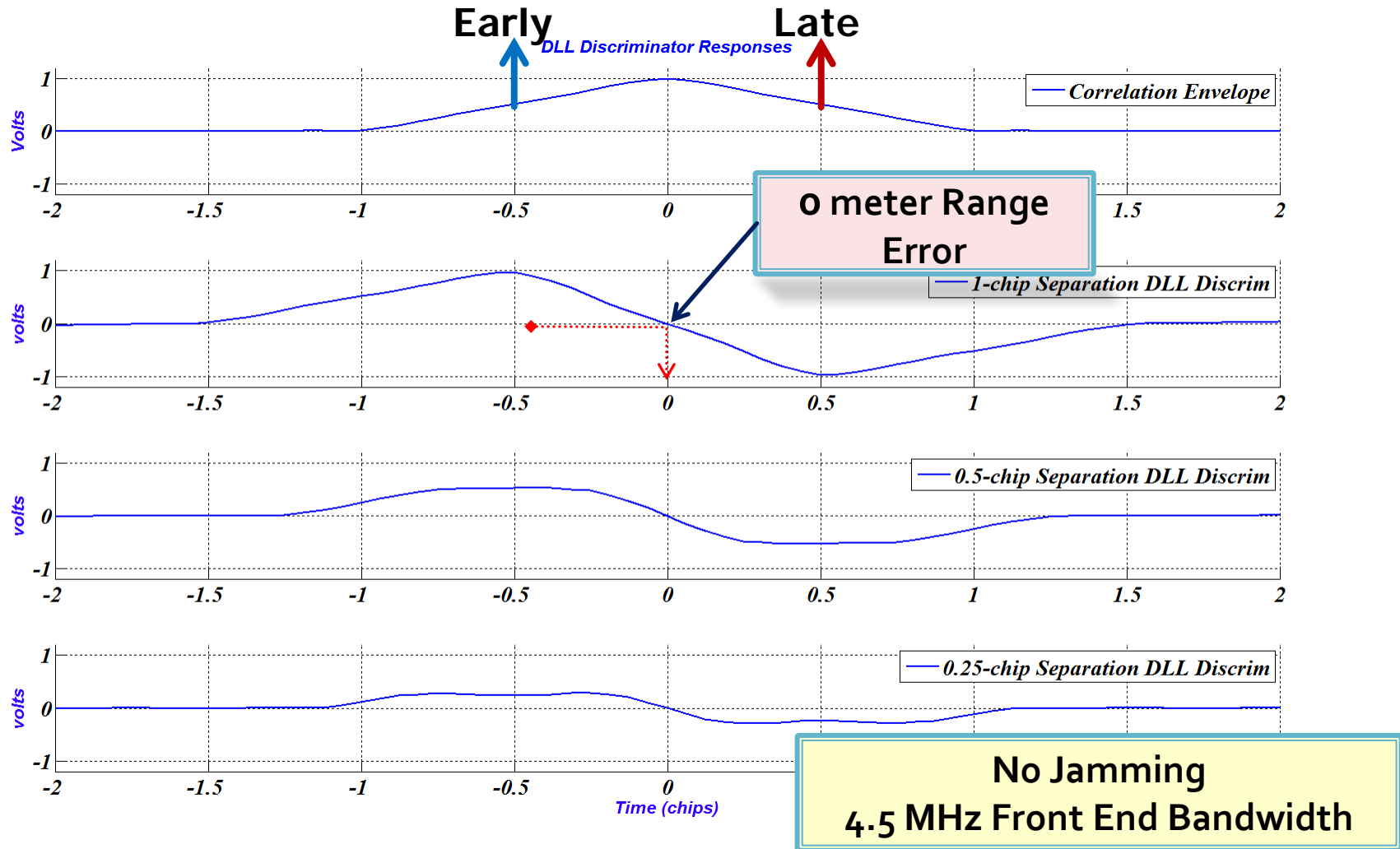
No Jamming

Case 1, C/A Search Correlation Responses $C/N_{\text{max}} = 44.1$

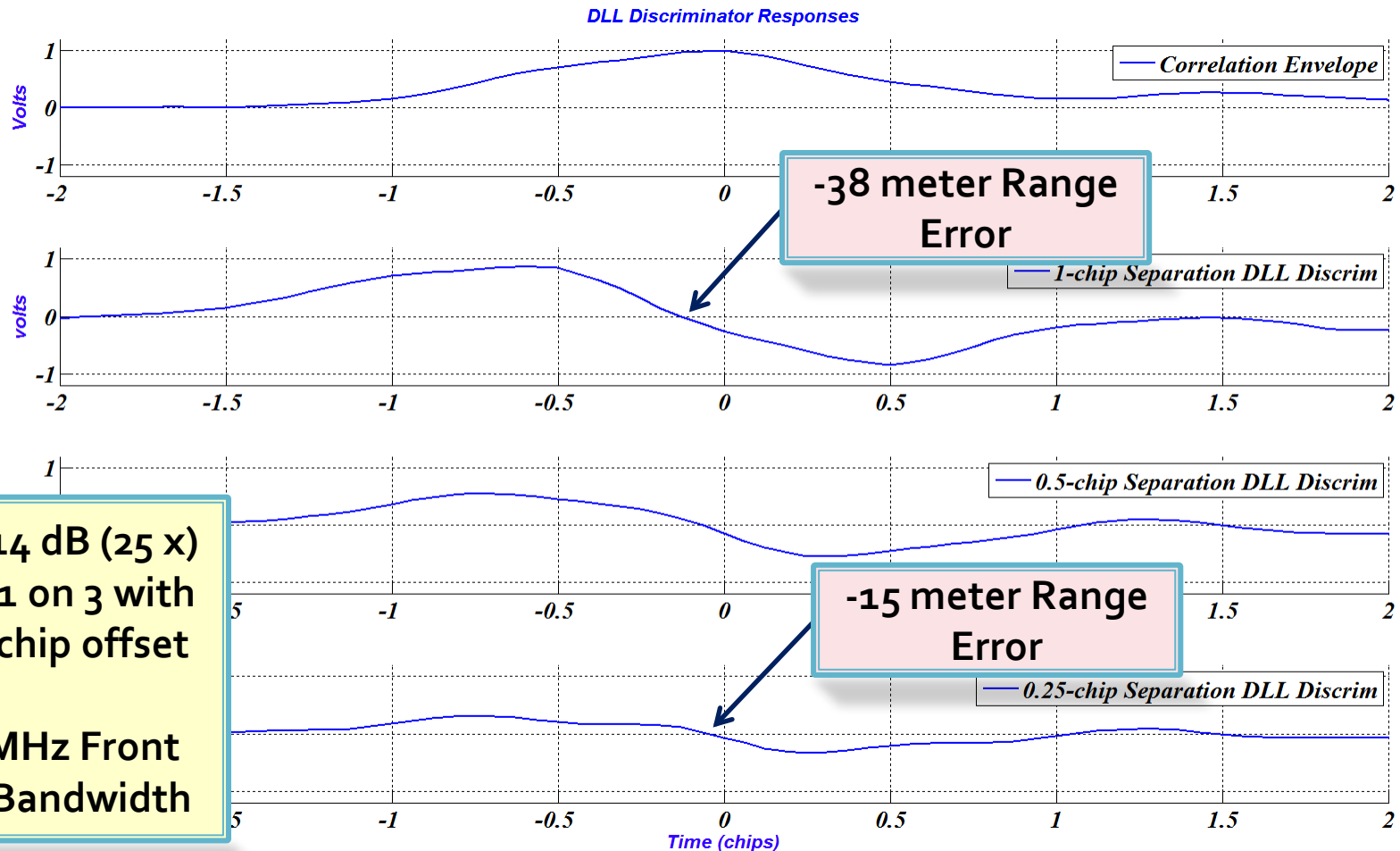


J/S = 14 dB (25 x)
PRN 1 on 3 with
22.5 chip offset

Smaller Jammers Can Introduce Subtle Changes In Correlation Response That Cause >30 meter Errors But Do Not Trigger Jamming Alarms (1/2)



Smaller Jammers Can Introduce Subtle Changes In Correlation Response That Cause >30 meter Errors But Do Not Trigger Jamming Alarms (2/2)



Cross Checks & Backups are Important — In the News...

UK Switches on eLoran for Backup in the English Channel

GPS World

by GPS World staff on January 9, 2013 with 0 Comments in [Defense News](#), [Latest News](#), [Marine](#), [Navigation](#), [Security & Surveillance](#), [Transportation](#), [Transportation News](#)

Nice Layman's broadcast at: <http://www.bbc.co.uk/programmes/p01gsjg7>

InsideGNSS

North Korea's GPS Jamming Prompts South Korea to Endorse Nationwide eLoran System

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January 6, 2010