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SandDust Tactical HF Geolocation

IARPA HF Geo Phase 1B Proposer's Day

13 July 2012

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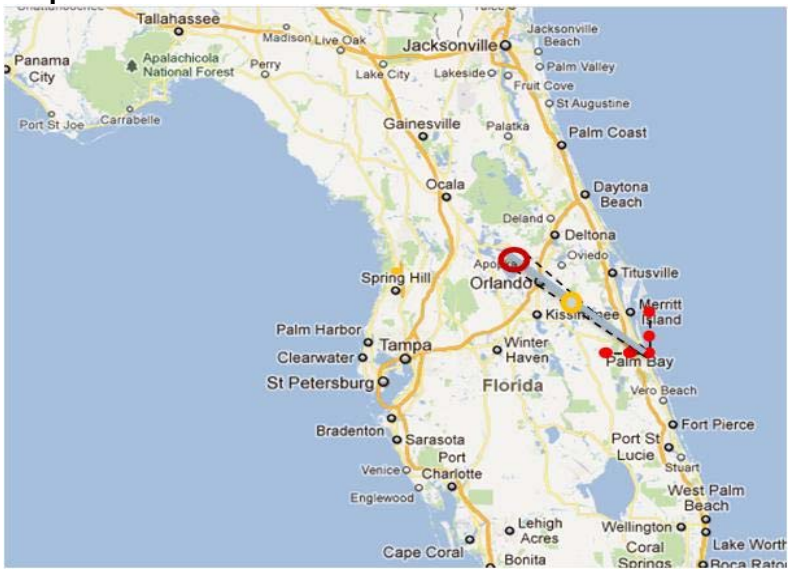
SandDust Overview

- Sponsored by Counter Narco-Terrorism Technology Program Office
- Deliver a prototype tactical HF geolocation system “tool kit” exploiting the strengths of TDOA and DF techniques
  - Time Difference of Arrival
  - Direction Finding
- Propagation modes
  - LOS / Surface-wave
  - Near Vertical Incidence Skywave
  - Skywave
- Modulation types
  - AM, FM, PSK, SSB
  - Emphasis on Single Side Band
- Tactical sounding for single site geolocation of NVIS



Creating performance advantage through tactical position

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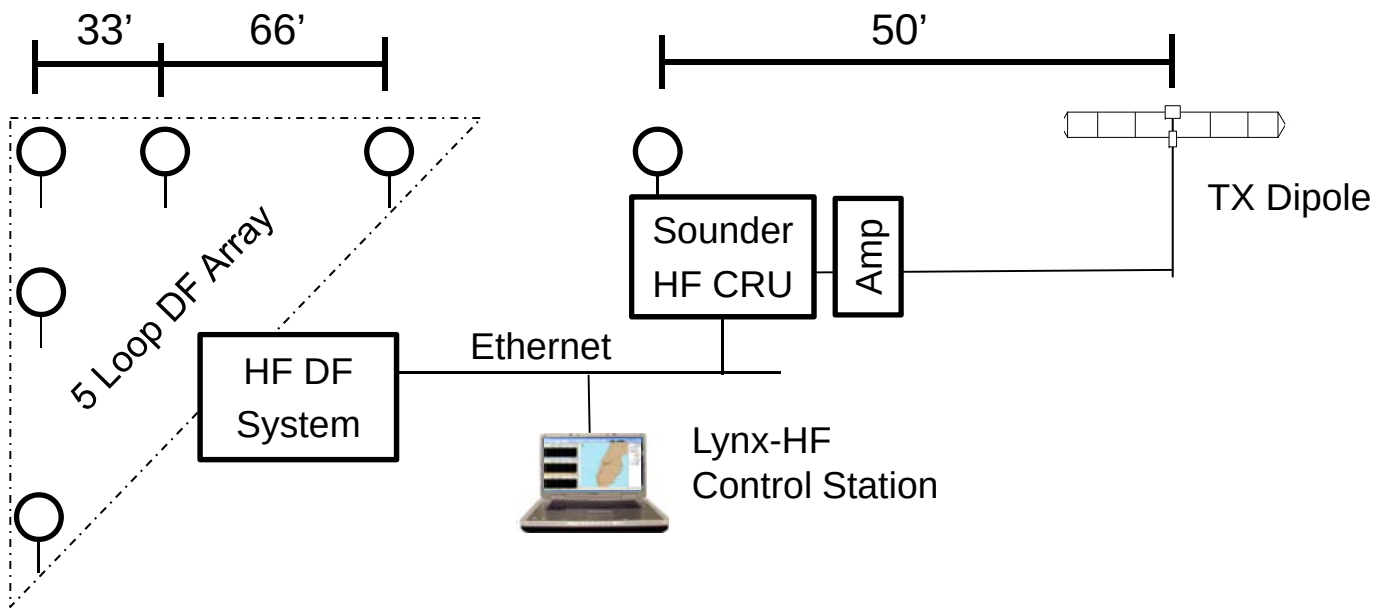
True Tactical Deployment

- System deploys in under 15 minutes
- Array erected with compass and tape measure
- Lynx-HF interface for differential GPS to improve sighting
- Deploy with as few as three elements with limited degradation
- Accommodates varied element heights (rugged terrain)

Field Test Range in Palm Bay, FL

Small-Footprint Tactical SSL

- DF system generating AOA once per second
- Lynx-HF records all AOA including operator target “marks”
- Sounder ionosphere measurement immediately following each mark
- Ray trace Geolocation following Sounder ionosphere measurement
- Lynx-HF records can be recalled for displaying average



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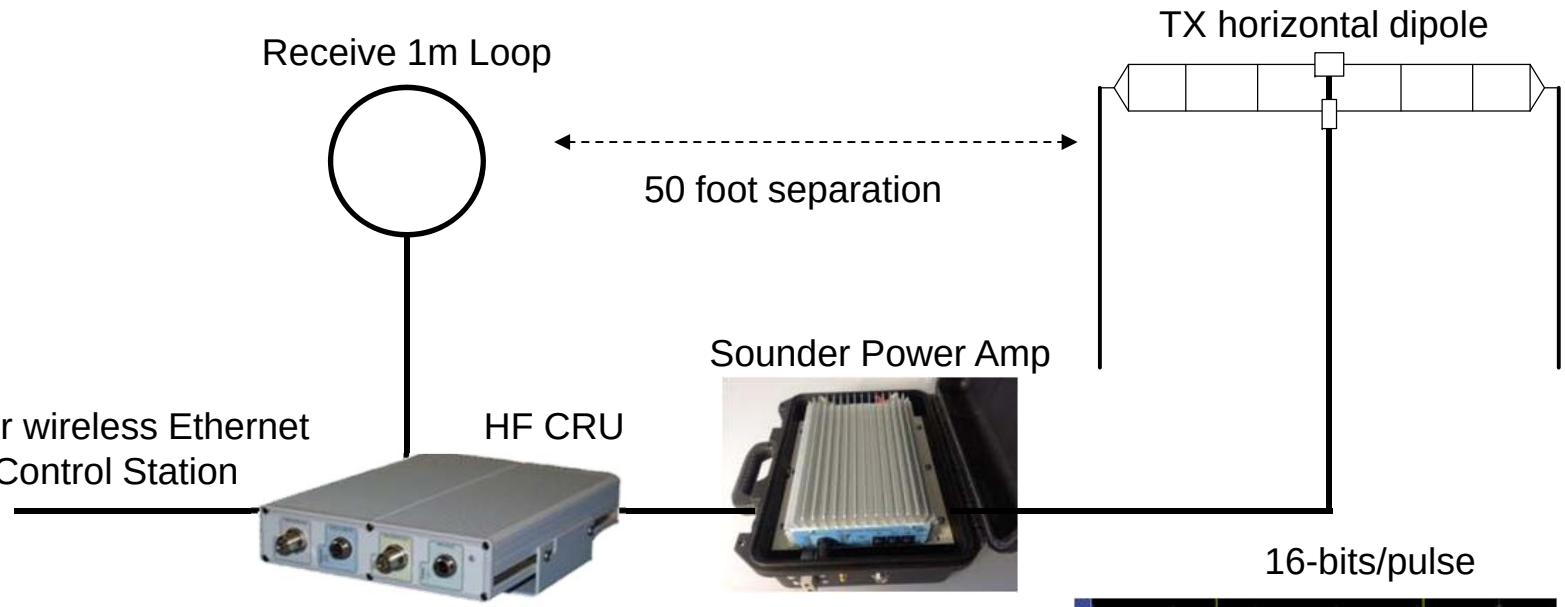
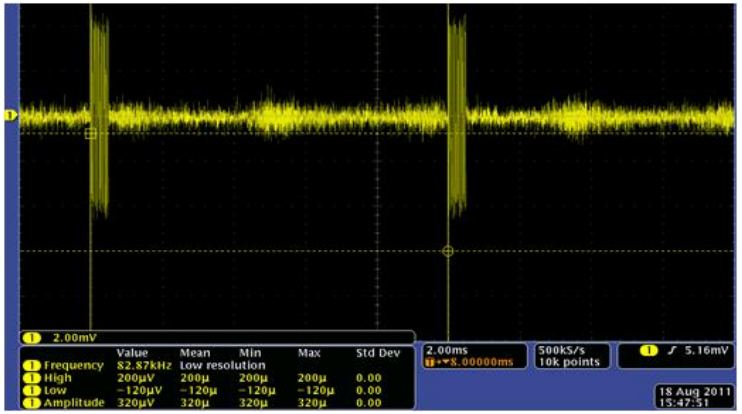
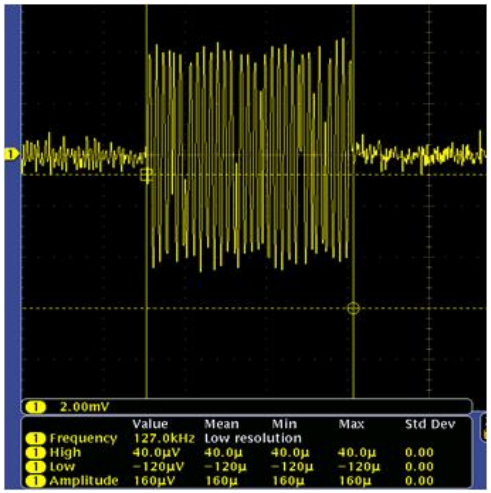
Sounder Block Diagram



16-bits/pulse

1-ms width
10-ms spacing
64kHz bandwidth
Complementary Code





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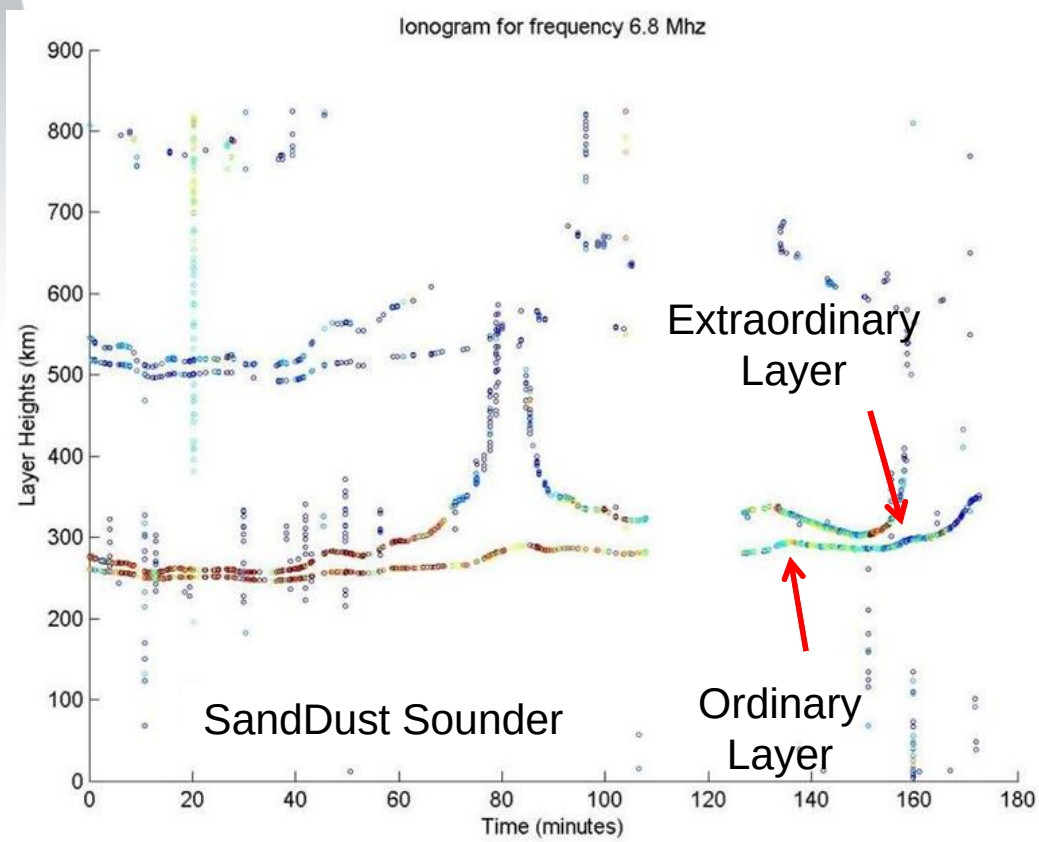
HF Sounder Results

- Results from multiple collections (day, time, frequency)
- Continually referencing results to Eglin sounder data



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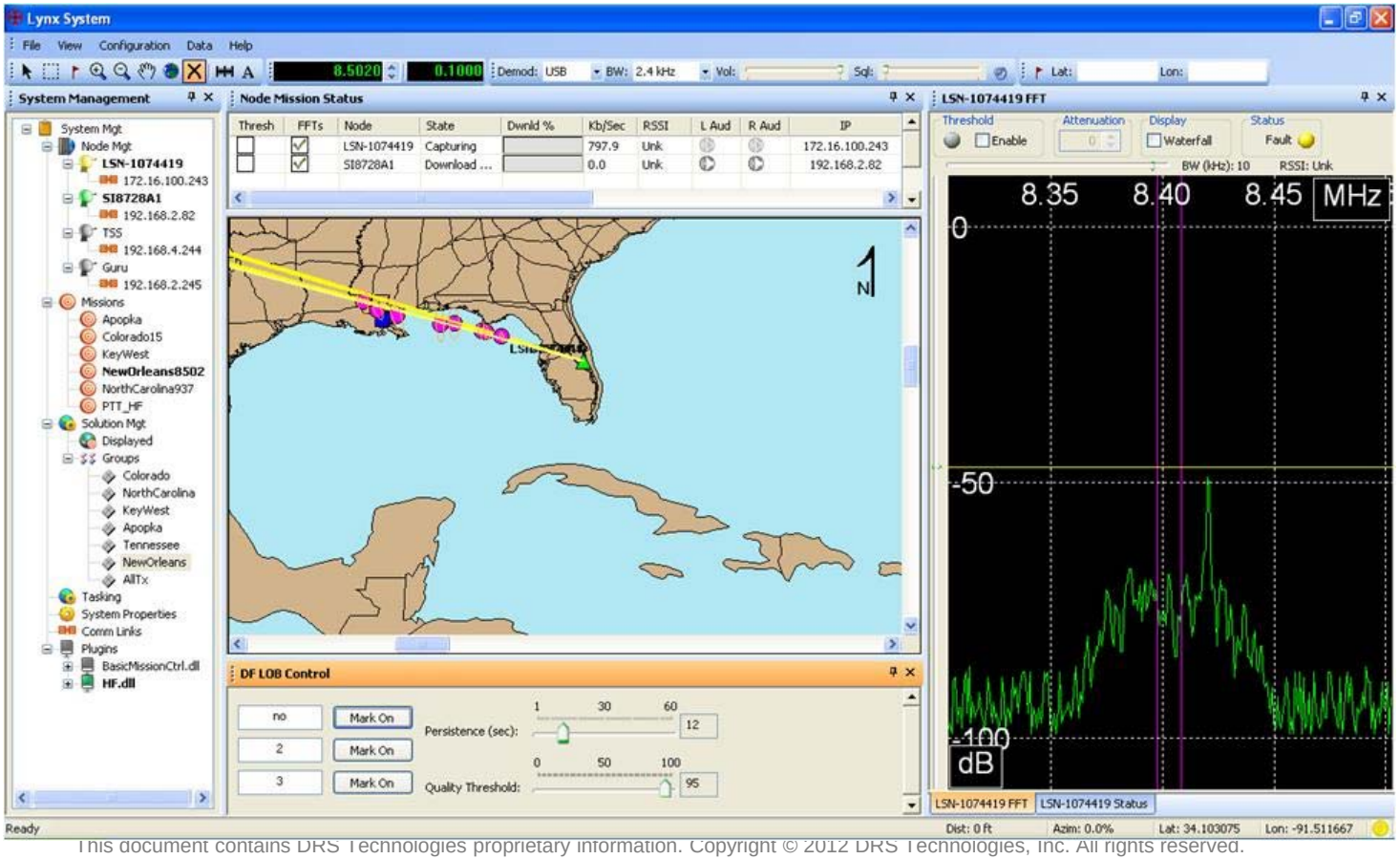
Display Real Time SSL Geos

- Real time display of LOBs and SSL Geos after each target “Mark”
- Transmitter in New Orleans (926km down range), 8.50MHz USB
- 4 collections per minute for 10 minutes, each collect about 6 seconds



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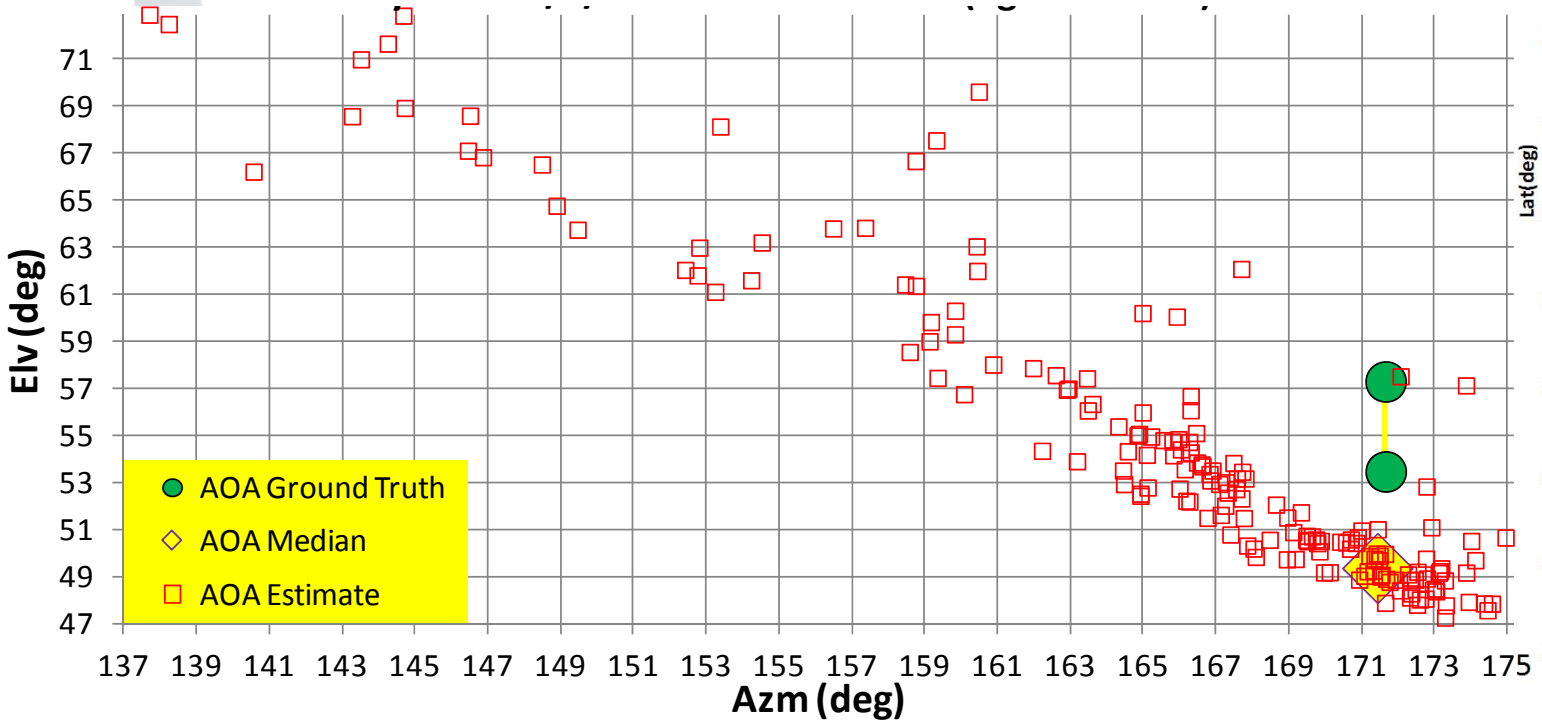
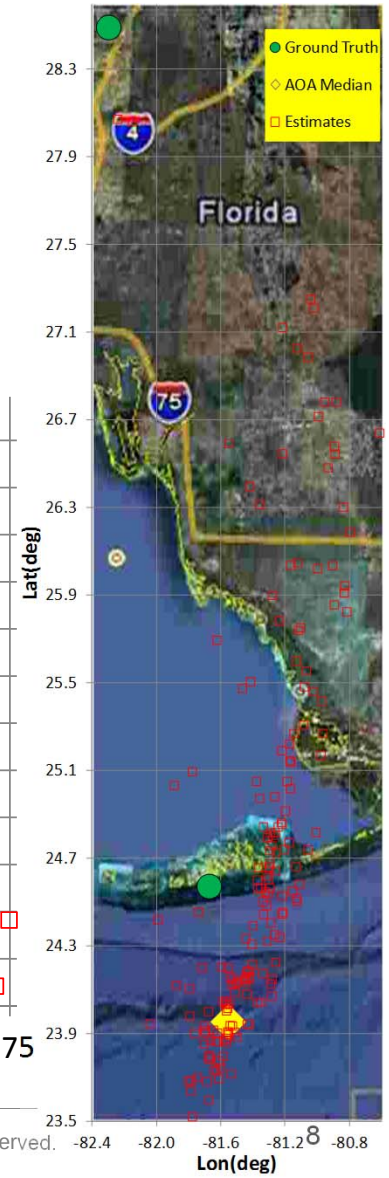
SSL NVIS from 439km

- Key West USB 7.811MHz
- 439km from Brooksville (GeoErr~69km)
- Eglin Sound Alt~275km
- 2D Median AOA propagated to median geo
- Project 1-sec AOA estimates with mirror





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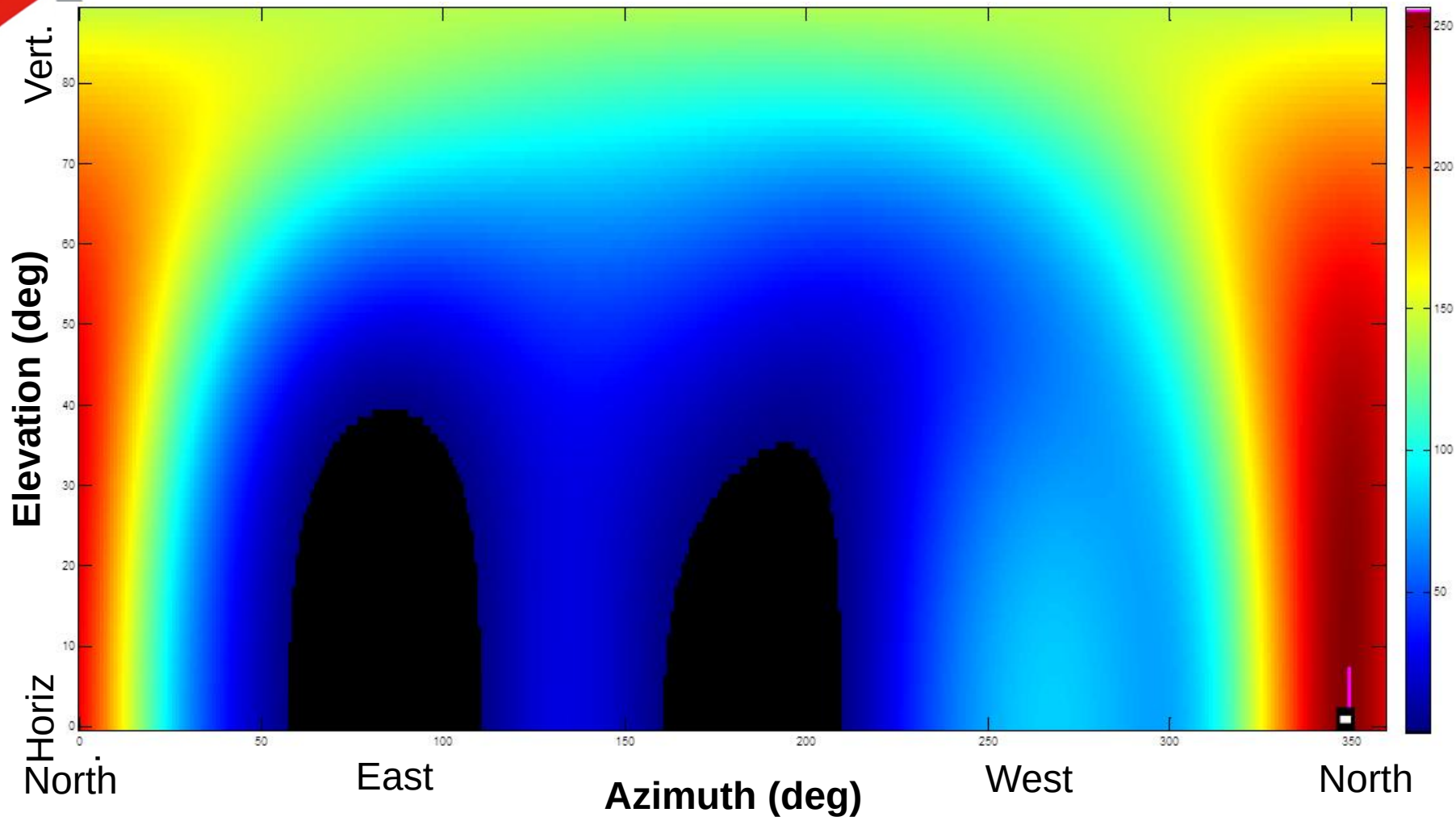
AOA Passive RADAR Image

Pixel intensity from coherent sum of signals with phases defined by Azm,Elv of beam



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Key West Passive RADAR Video

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