

# L-band Interference Monitoring: DOT Developments

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U.S. Department of Transportation

**Volpe Center**

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# Focused L-band Interference Monitoring Scope

## Immediate Scope for Domestic L-band Interference Monitoring

- **Baseline:** Survey RF environment at or near adjacent band sources a priori
- **IDM:** Interference detection and mitigation – localize, report, and enforce
- **ABC:** Signal Conformance – models of PNT (defense) and comm (offense)

## Precision Spectrum Sensor + Network + Software Defined Radio

- DOT mission as spectrum monitor, event-based & responsive
- Interoperable devices & data, e.g. NGA HRTR, MITRE GNSSTA, FAA GIII, etc.
- Rapid Deployment – existing networks, DOT and USG facilities
- Joint Ops Center – DHS/DOT/DOD watch-standers, notification, and archives

# A Contributing Proposal for USG/DOT IDM Plan

## Four Increasing Levels of Capability – Preparing for Adjacent Band RFI

### 1. Rapid laboratory integration of spectrum monitoring equipage

- 2 rack units, 4-6 mo
- HRTR, patch/dish/directional antennas, digital RF/IF/base band feed, customized SDR functions
- command/control, clock, array storage, and event detection computer – WAAS/GBAS RFI analog

### 2. Mobile host platforms as responsive asset

- 3 DOT + FAA mobile units, 2-4 mo
- fully functional, portable laboratory
- modular, coordinated, and expandable

### 3. Rapid deployment, fixed network on existing backbone(s) (12-15 units, 6-12 mo)

### 4. Scaled deployment, coordinated high density network (40-50 addtl. units, 15-18 mo)

- compatible and/or interoperable with DHS/DOD/DOI/DOC/NASA assets
- lead-time to develop joint operations center, economy of scale units, custom monitoring



# FAA Spectrum Engineering Mobile System

## Designed and Implemented for VHF/UHF – Direct Upgrade to L-Band

**Individual Site Control**

**Transmitter Position**

**Foxhunt Site Locations**

**Multiple Connected Sites**

**Connect**  
Remotely connect to multiple Foxhunt installations at once

**Monitor**  
Monitor multiple locations from a single remote command center

**Record**  
Record and playback data for assistance with intermittent cases

**Resolve**  
Utilize bearings from multiple locations to quickly locate RFI

Node ID	Description	Duration	Auto (Delay)	Heatmap Enabled	Status	Address	DataPort	Endpoint Status	SA	Type	DF	Type	GPS	Type	RX	Type	Software Version
0	White Plains	00:00:01m		<input checked="" type="checkbox"/>	✓	127.0.0.1	9202	Connected	✓	Sim SA	✓	Sim DF	✓	Sim GPS	✓		Sim 1.0
1	Mt Freedom	00:00:01m		<input checked="" type="checkbox"/>	✓	127.0.0.1	9203	Connected	✓	Sim SA	✓	Sim DF	✓	Sim GPS	✓		Sim 1.0
2	East Meadow	00:00:01m		<input checked="" type="checkbox"/>	✓	127.0.0.1	9204	Connected	✓	Sim SA	✓	Sim DF	✓	Sim GPS	✓		Sim 1.0
3	St Francis	00:00:01m		<input checked="" type="checkbox"/>	✓	127.0.0.1	9205	Connected	✓	Sim SA	✓	Sim DF	✓	Sim GPS	✓		Sim 1.0
4	Douglston	00:00:01m		<input checked="" type="checkbox"/>	✓	127.0.0.1	9206	Connected	✓	Sim SA	✓	Sim DF	✓	Sim GPS	✓		Sim 1.0

**Spectrum Analyzer**  
 Hardware Type: Sim SA  
 Status: Good  
 Center Frequency: 118 MHz  
 Span Frequency: 20 KHz  
 Span: 20 Hz  
 Power Units: dBm  
 Reference Level: 0  
 Vertical Position: 0  
 Attenuation: 0  
 Pre-amp On?: False  
 Trace 1 Mode: Normal  
 Trace 2 Mode: Off  
 Traces Averages (Averaging Only): 10

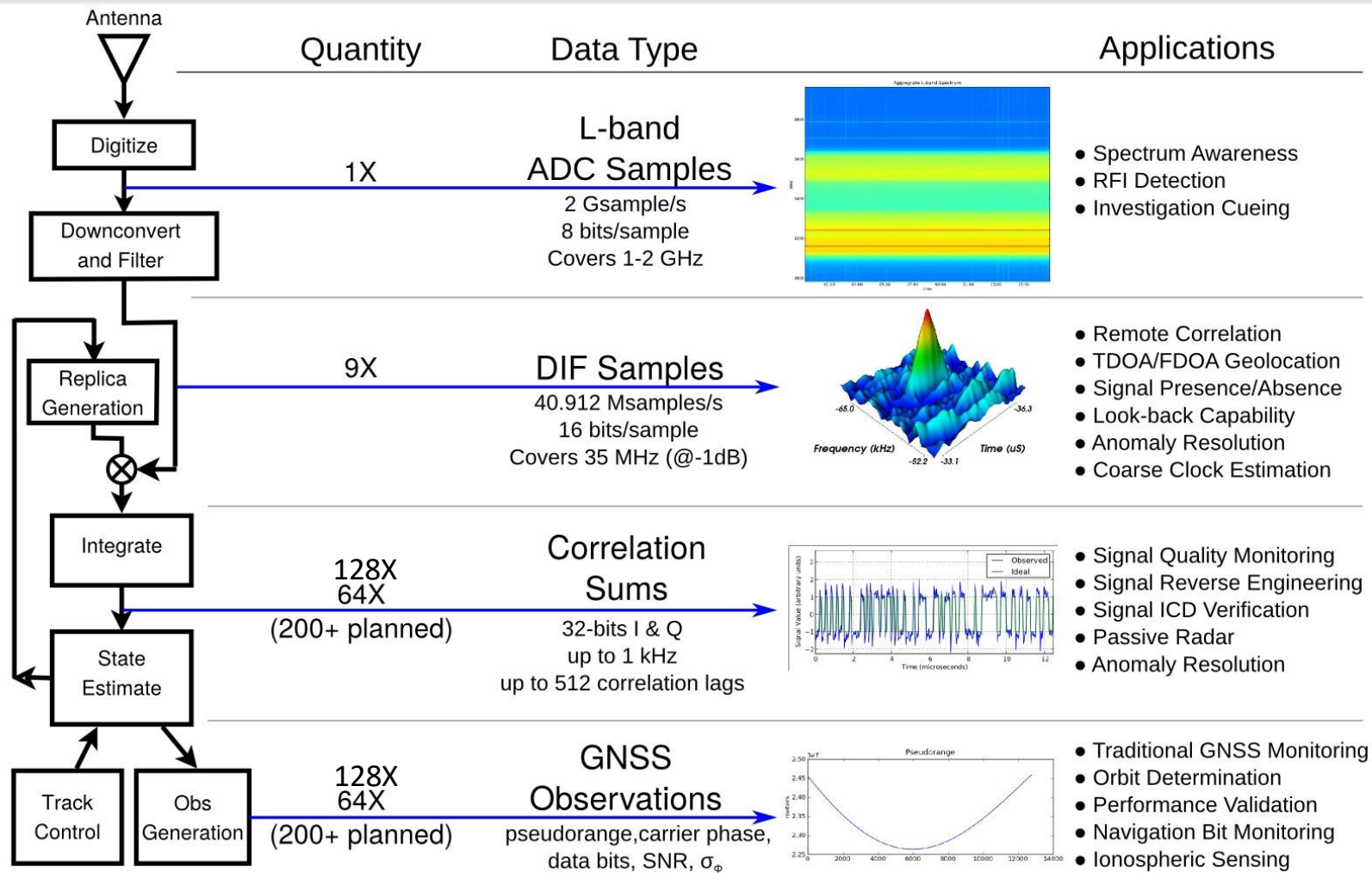
**Spectrum Analyzer**  
 10 dB/Ref Level: 0 dBm  
 div: -10  
 Freq: -20  
 Span: 20 KHz  
 Det: +Peak  
 Pre-A: -70  
 Off: -60  
 Center: 118 MHz  
 Span: 20 KHz

**Direction Finder Dial**  
 1000 Hrs TRUE NORTH 9 KHz AM  
 270 0 90  
 118 MHz 209.8  
 180

**Radio Receiver**



# (U) HRTR Data Types / Applications



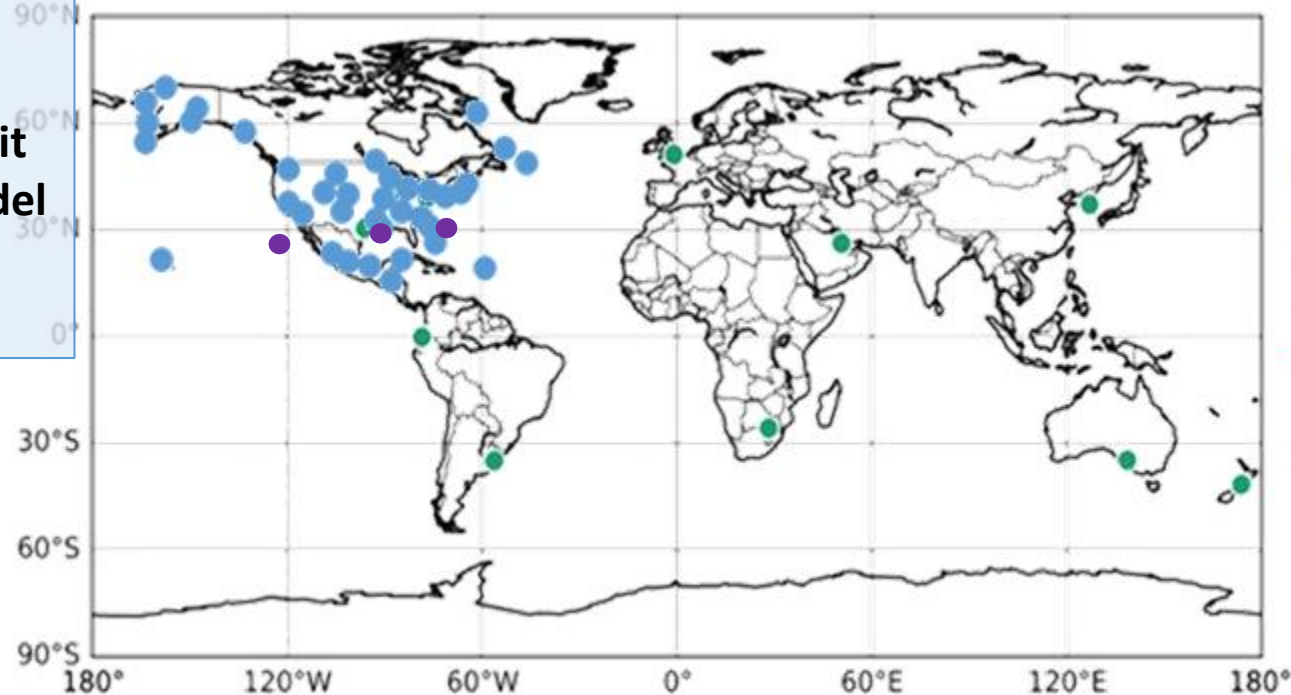
# Pathfinder DOT IDM Mobile & Fixed Networks

## Active Functions

- In-band Interference
- Phase Jump/Jitter
- Cross Ambiguity Function Inconsistency

## Future RFI Functions

- Adjacent Band Over-limit
- Adjacent Band PNT Model
- Adjacent Band Errant Modulation



## Possible Early Path-finders

- NGA Monitor Stations
- Volpe Wake Vortex Installations
- FAA WAAS/NSTB Network
- ADS-B Ground Base Transceiver (GBT) Network
- PIRT OLSON Network
- Airport Facilities, e.g. Glide Slope/Localizers
- Mobile/Dispatch Platform
- CISA National Critical Function Sites

# Questions?

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