

# **USA NAS RFI Investigation Resources**

## **→ FAA Personnel and Organizations:**

### **→ ATC Spectrum Engineering Services**

- Headquarters – Washington, DC**
- Technical Center – Atlantic City, NJ**
- Command Center – Herndon, VA**

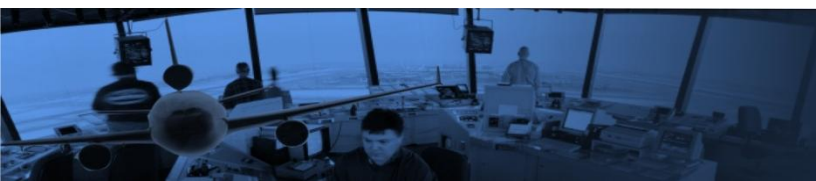
### **→ Frequency Management Officers (FMO)**

- Three Technical Operations Service Areas**
  - Atlanta, GA; Dallas, TX; Seattle, WA**
- Aeronautical Center – Oklahoma City, OK**

### **→ Technical Support Field Specialists (Technicians)**

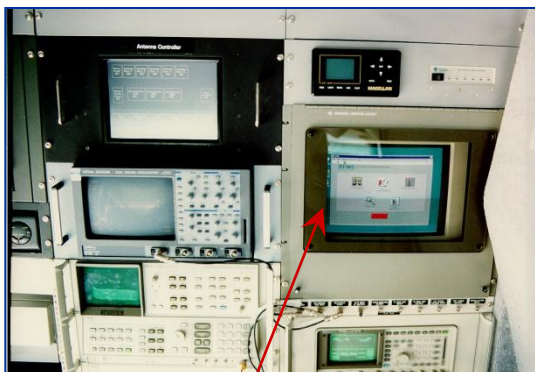
### **→ Aviation System Standards (Flight Inspection)**

- One International FIO**
- Six National FIOs**



# USA NAS RFI Resources – RFIM

- ✈ **FAA Assets and Software Tools**
- ✈ **Radio Frequency Interference Monitoring (RFIM) Vans**



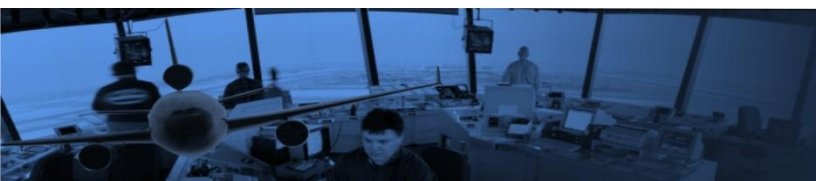
**Automated or Manual  
Full Equipment Suite**



**DF Control/Mapping  
20 - 3000 MHz**



**Regional Used mainly by FMOs  
Most Complete Measurement System**



# USA NAS RFI Resources – RFID

## ✈️ **FAA Assets and Software Tools**

## ✈️ **Radio Frequency Interference Detector (RFID) Portable**



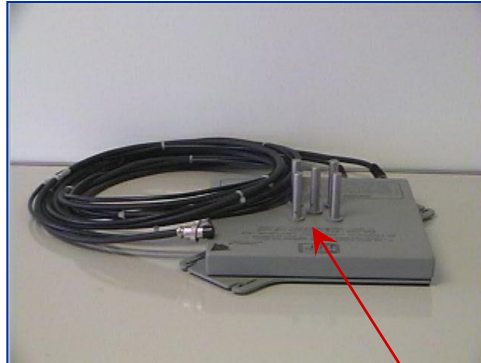
**Service Area**

**Automated Vehicle mounted  
Portable mobile DF**

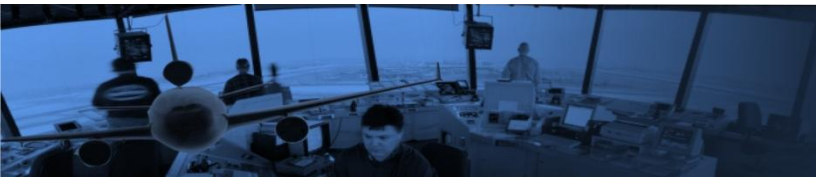
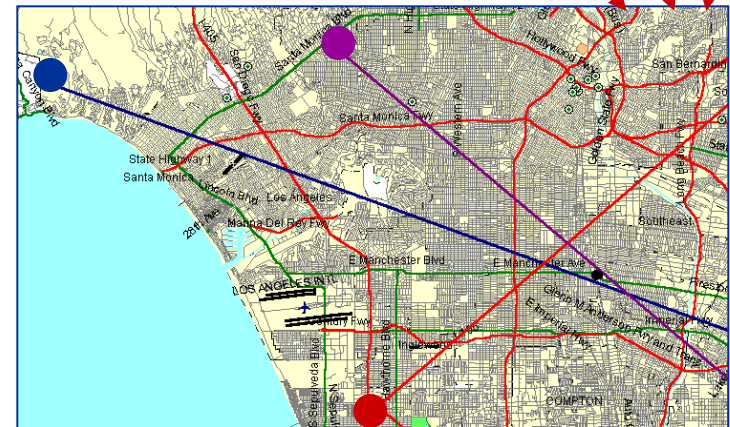
**Detection Band 20-2000 MHz**



**29 RFID  
Systems**



**GPS DF Antenna  
L1 - 1575.42 MHz**





# USA NAS RFI Resources – K95-103

## → **FAA Assets and Software Tools**

## → **Radio Frequency Interference Kit (K95-103) Handheld**

**District Field Offices**  
**33 Offices in the FAA NAS**

**K95-103 Detection Coverage**  
**20 – 3000 MHz**  
**Typically 2 miles**



**Approx. 300**  
**K95-100 Systems**



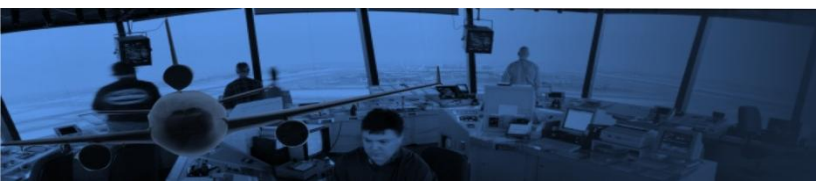
**GPS DF Antenna**  
**L1,L2,L5**



**VHF Yagi Antenna**  
**Directional**

**Service Area**

**Most Cost effective**  
**First choice**  
**instrument for**  
**technicians**



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



**Federal Aviation**  
**Administration**



# USA NAS RFI Resources – NASE-RFI



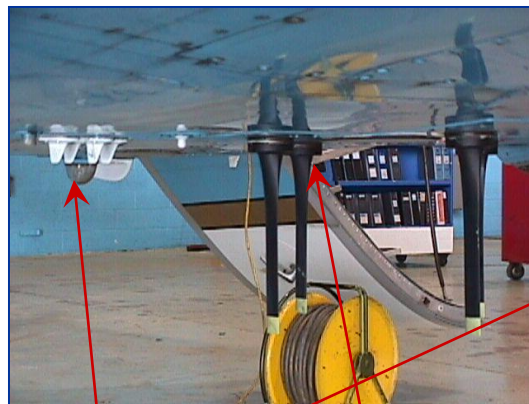
**AVN**

**Flight Check  
NASE/RFI  
Program to  
assist in  
locating  
RFI/GPS  
sources**

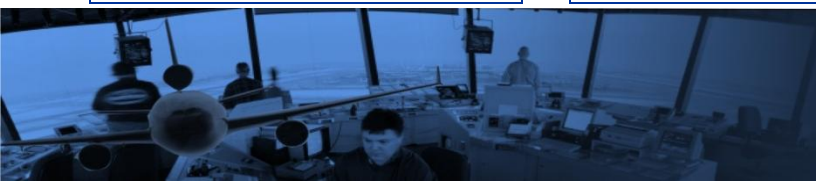
**First Choice  
when High  
Altitude  
PIREPS  
ONLY**



**DF Control/Mapping  
Operated Automation**



**GPS DF Array & VHF DF Array  
L1,L2,L5 & 108 - 174 MHz**



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



**Federal Aviation  
Administration**

# USA NAS RFI Resources – IMDS

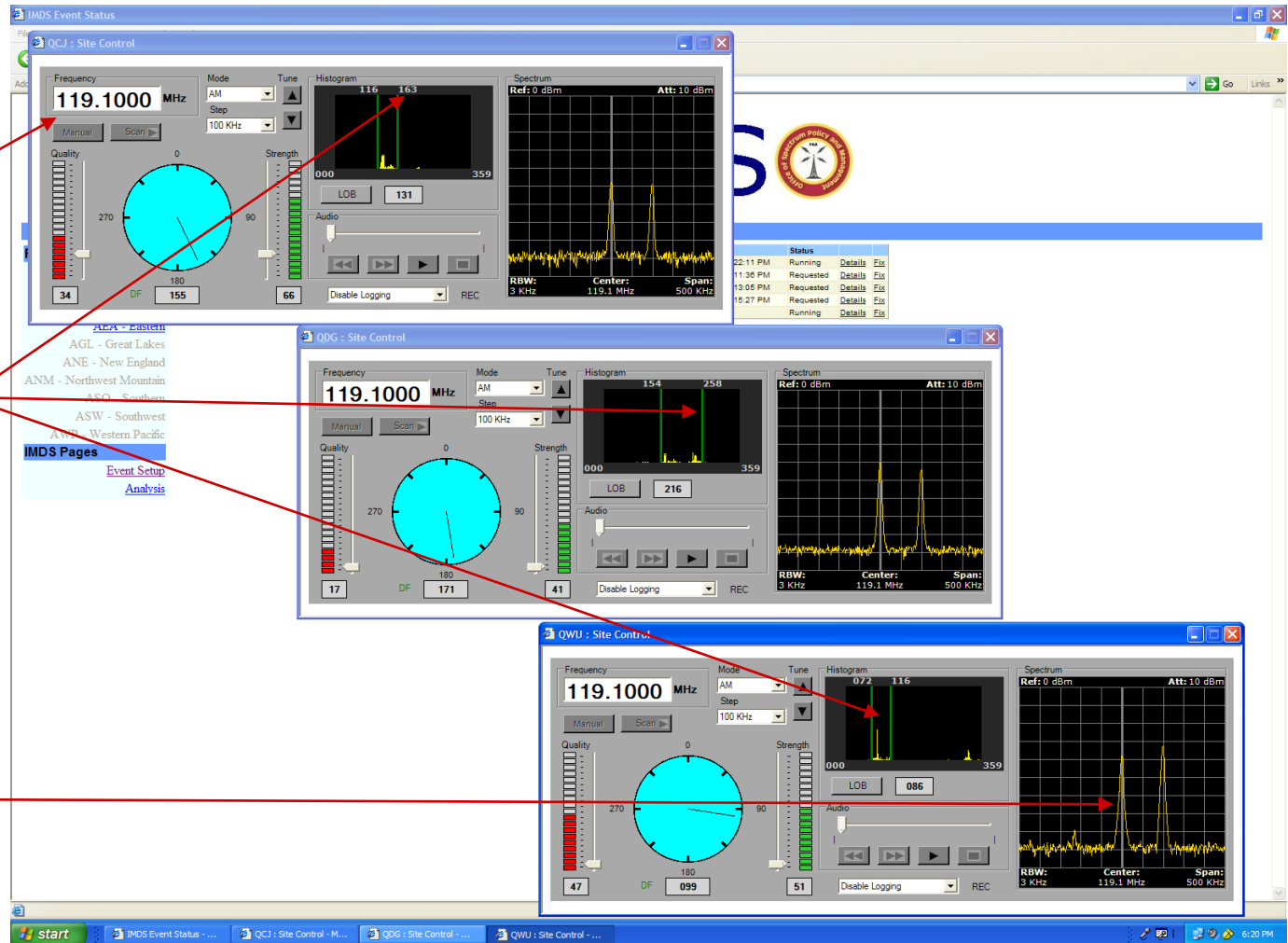
## WEB IMDS

Receiver  
Tuned  
Frequency

DF Processor  
Bearing  
Averaging  
Triangulation

Multiple Audio  
Playback  
Capability

Synchronized  
Spectrum  
Analyzer  
Spectral View



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



Federal Aviation  
Administration

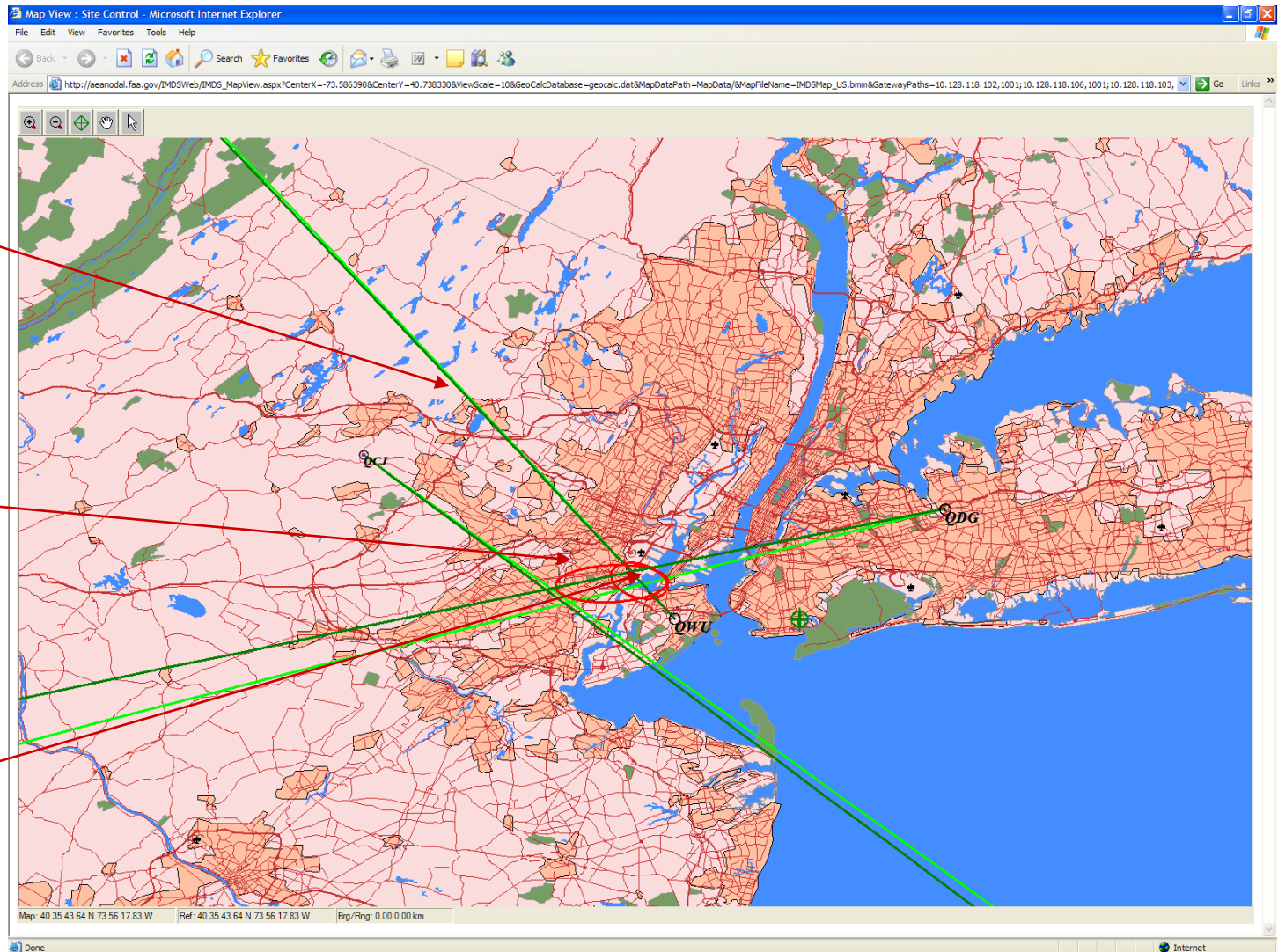
# USA NAS RFI Resources – IMDS

## WEB IMDS

Triangulated  
Bearing  
Averages  
Overlay on  
Map

Increases Fix  
Calculation  
Ellipse  
Accuracy

Multiple  
Ellipse  
Calculation for  
Smaller Ellipse



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



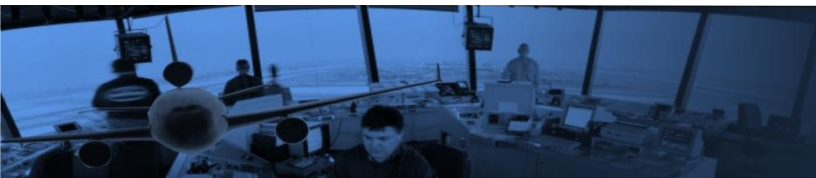
Federal Aviation  
Administration



# Software Engineering Analysis Tools

## → **FAA ATC Spectrum Engineering Services:**

- **Spectrum Engineering Tracking System (SETS)**
- **Automated Frequency Manager (AFM)**
- **Flight Explorer Aircraft Situation Display (FE ASD)**
- **Integrated Common Analytical Viewer (iCAV)**
- **GPS Interference Navigation Tool (GiANT)**
- **Enhance Traffic Management System (ETMS)**
- **Space Loss Calculator (SPLC)**
- **Google Earth 3-Dimensional Analysis**
- **Government Master File (GMF)**



# Spectrum Engineering Tracking System

SETS - Windows Internet Explorer

http://sets.faa.gov/

SETS Read-Only Search Form

**Spectrum Engineering Tracking System (SETS) Search Form** Login Active Ticket Report Active Events Map Change Request

**Ticket Information**

TIX Opened:     Name:  Event Start:      
mm/dd/yy hhmi

TIX Closed:     Phone:  Event End:      
mm/dd/yy hhmi

**Event Information**

Ident:  Equip:  City:  St:  Lead Org:   
Svc Area:  Event Type:  Freq:

Log Id:  Code:  Event Mgr:  Source:   
Delays:  Platform:  Cost:  Sub Source:

**Event Summary**

**Event Notes**

The FAA Intranet community can search for an event based on any one or combination of the searchable fields in the form (20 fields).

Search Open Tickets Reset

Done Internet 100%

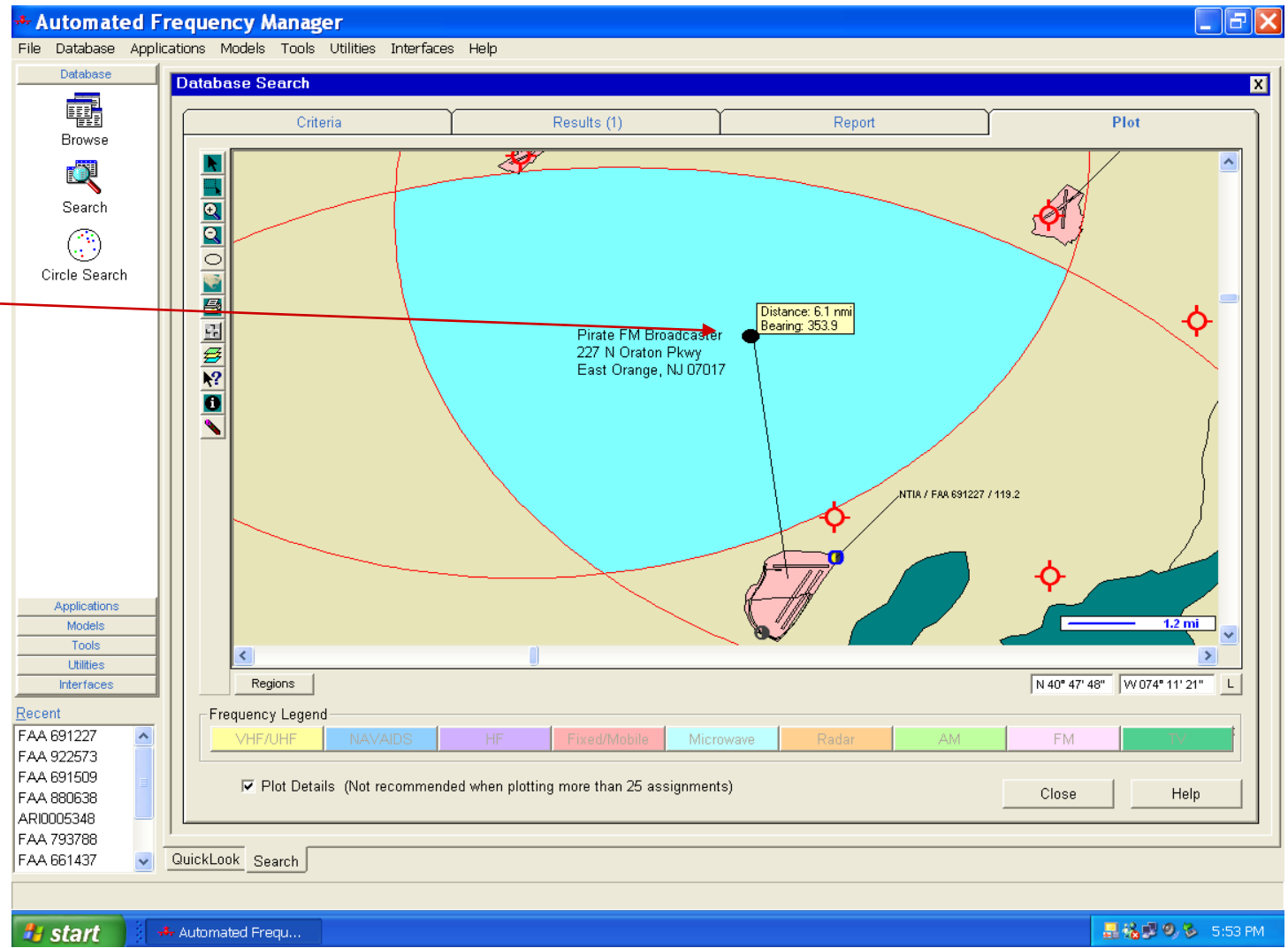
start SETS - Windows Inter... 10:56 AM



# Automated Frequency Manager

**VENN Area  
Centric  
Approximation**

**Provides a High  
Probability of  
Source  
Location**



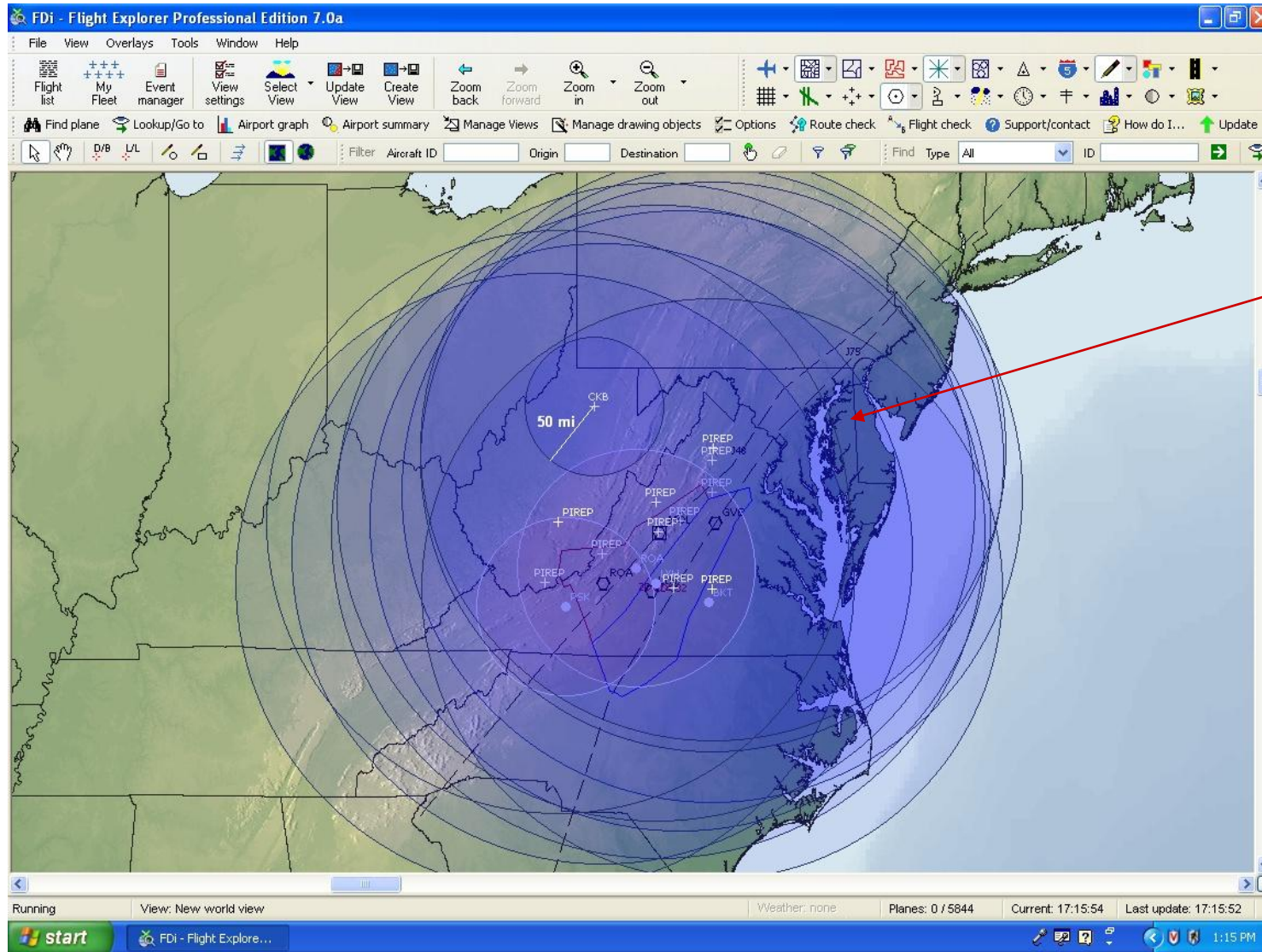
Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



**Federal Aviation  
Administration**



# Flight Explorer Aircraft Display



**Cumulative  
RLOS with  
Aircraft or  
Drawing  
Objects Range  
Rings Tool**

**VENN  
Technique with  
FE ASD**

**Optional for  
Seamless  
Support  
Requirement**



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



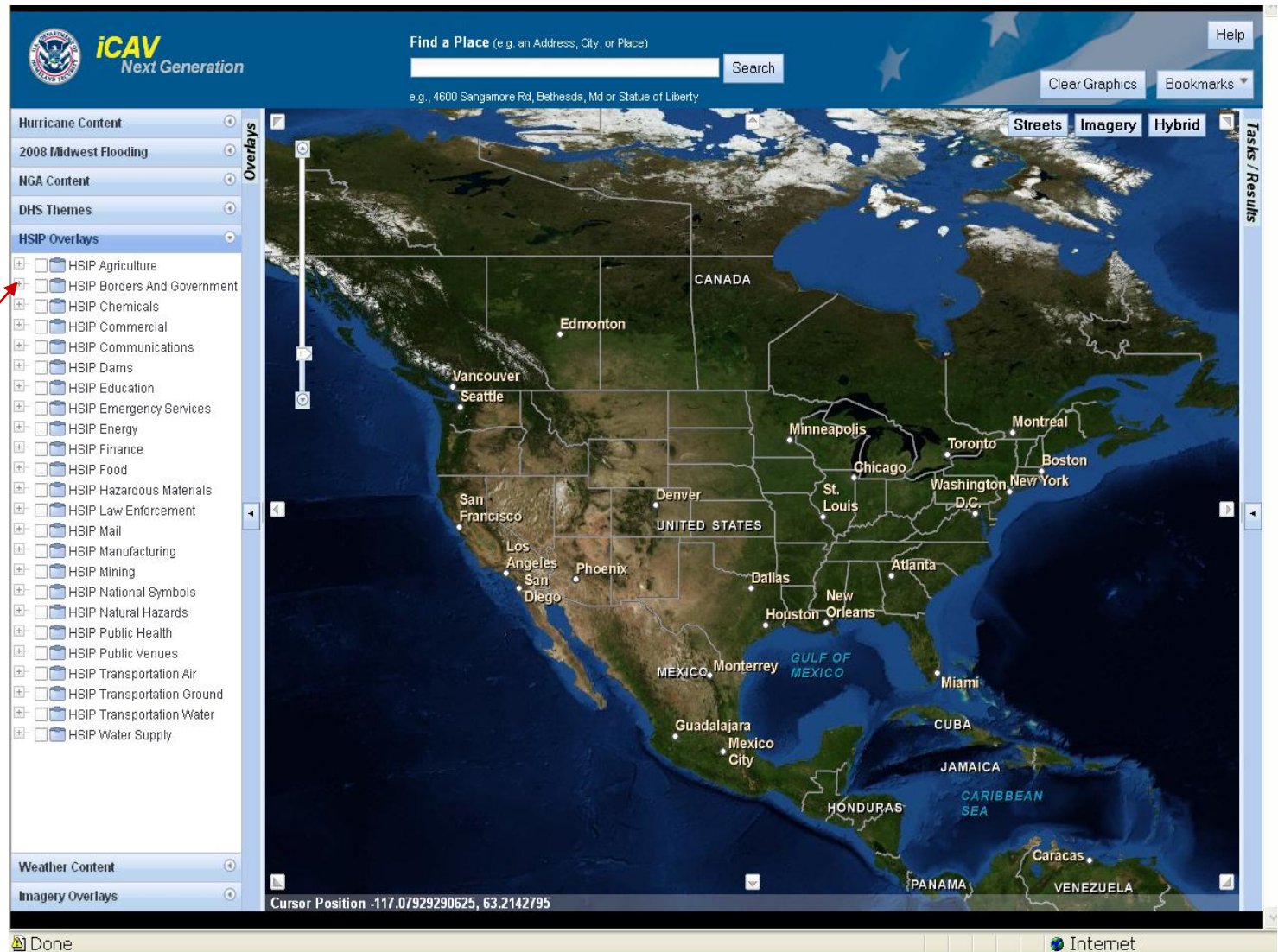
**Federal Aviation  
Administration**

# Integrated Common Analytical Viewer

Department of  
Homeland  
Security  
Geographical  
Tool

Most Extensive  
Layer Data  
Sets

Event  
Common  
Operational  
Picture



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009

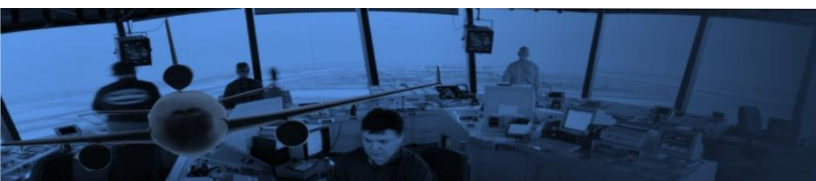
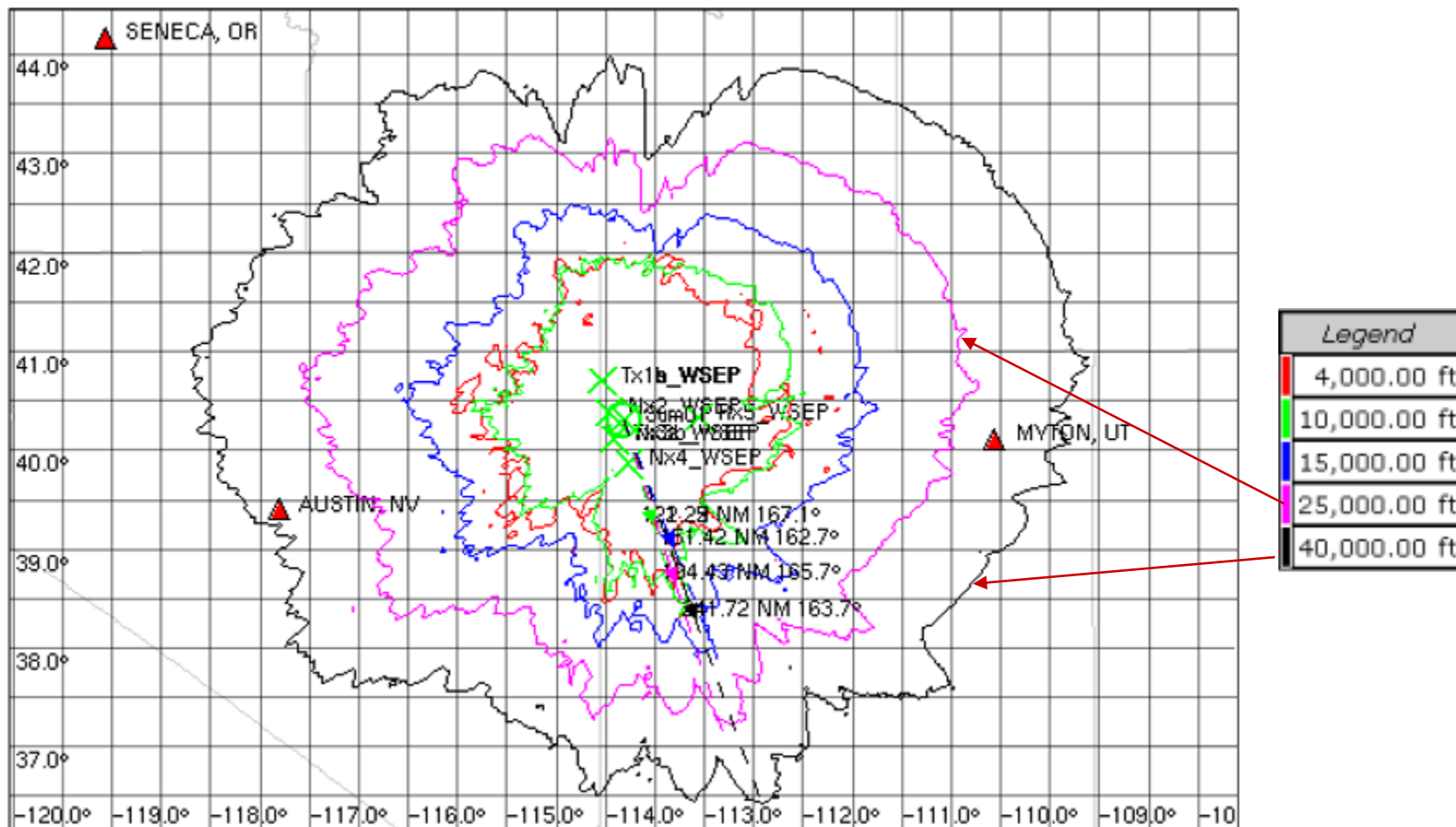


Federal Aviation  
Administration



# GPS Interference Navigation Tool

## Airborne Receivers





# Enhance Traffic Management System

FAA Traffic  
Flow  
Management

Commercial  
Military and  
FAA Flight  
Check

Real Time  
Weather and  
TFM Initiatives



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



Federal Aviation  
Administration

# Space Loss Calculator Analysis

**Space Loss Calculator v.3.3.10**

File Edit Allocations Window Help

Exit New Open Save As Print Copy Paste Delete Search Sounds Pref

**Space Loss Calculator**

Calculator Summary

Space Loss

FM-TV Convert PwrDen InterMod Combiner Multi-Coupler Patterns Data Search

Freq. (Mhz) 125.675 Xmr Pwr (Watts) 25 Cable Loss (dB) 2 Antenna Gain -4 dBi Rx Level = -83.32 dBm

Distance 150 nm Free Space Loss = 123.31 dB

Rx Level = -86.33 dBm

EIRP = 39.72 Watts

Xmr Pwr (Watts) 50 Cable Loss (dB) 2 Antenna Gain 1 dBi

Untitled.slc [INS] [SCRL] [CAPS] [NUM] 5/10/2005 10:58 PM 10:58 PM

## Propagation Loss

Determine the potential signal levels received by Aircraft

Analyze:

Intermodulation  
FM Worksheet  
Site Specs  
Soil Conductivity

Optional for  
Seamless Support  
Requirement

# Space Loss Calculator Filter Design

**Space Loss Calculator v.3.3.10**

File Edit Options Tune-Up Span Window Help

Exit New Open Save Print Copy Paste Delete Search Sounds Pref

**Combiner Work Sheet**

**Frequencies**

☒ VHF ☒ Auto Sort  
☐ UHF 4 Freq

118.2250 126.7250  
 Configure Configure

132.5750 134.7750  
 Configure Configure

0.0000 0.0000  
 Configure Configure

0.0000 0.0000  
 Configure Configure

Set Defaults Draw Comb.

*Click on Desired Cable*

ETS2-50T	.83
FSJ1-50A	.84
FSJ2-50	.83
FSJ4-50B	.81
LDF2-50	.88
LDF4-50A	.88
LMR-240	.84
LMR-400	.85
LMR-500	.86
LMR-600	.87
RG-8	.52
RG-9	.66
RG-17	.66
RG-58	.66
RG-214	.66
RG-223	.66

**Diagram:** A schematic diagram of a combiner design. It shows four input lines (118.2250, 126.7250, 132.5750, 134.7750) entering from the left. Each line passes through a series of components: a Wacom filter, a 5" Bp filter, and a Wacom filter. The lines then converge into a single output line labeled "OUTPUT". Various cable lengths (L1, L2, L3) and insertion losses (0.5dB) are indicated throughout the circuit.

**NOTES:**

- Cable type RG-214 -> Velocity constant = 0.66.
- All Cable Dimensions are Without Connectors!
- Tee's are Type 'N' with Female Connections. (UG-28AU)
- Estimated Insertion Loss for each Transmitter is:

Frequency (MHz)	Insertion Loss (dB)
118.2250	1.40
126.7250	2.43
132.5750	2.65
134.7750	1.40

**One Way Open Ended Phase @ 128MHz (1 Conn.)**

Index	L1	L2	L3	L4
0	214.3"	44.0"	150.5"	N/A
1	189.3"	53.3"	189.3"	N/A
2	173.4"	36.0"	N/A	N/A
3	167.6"	38.1"	N/A	N/A

Start Space Loss Calcul... 11/28/2006 10:46 AM

**Combiner Design**

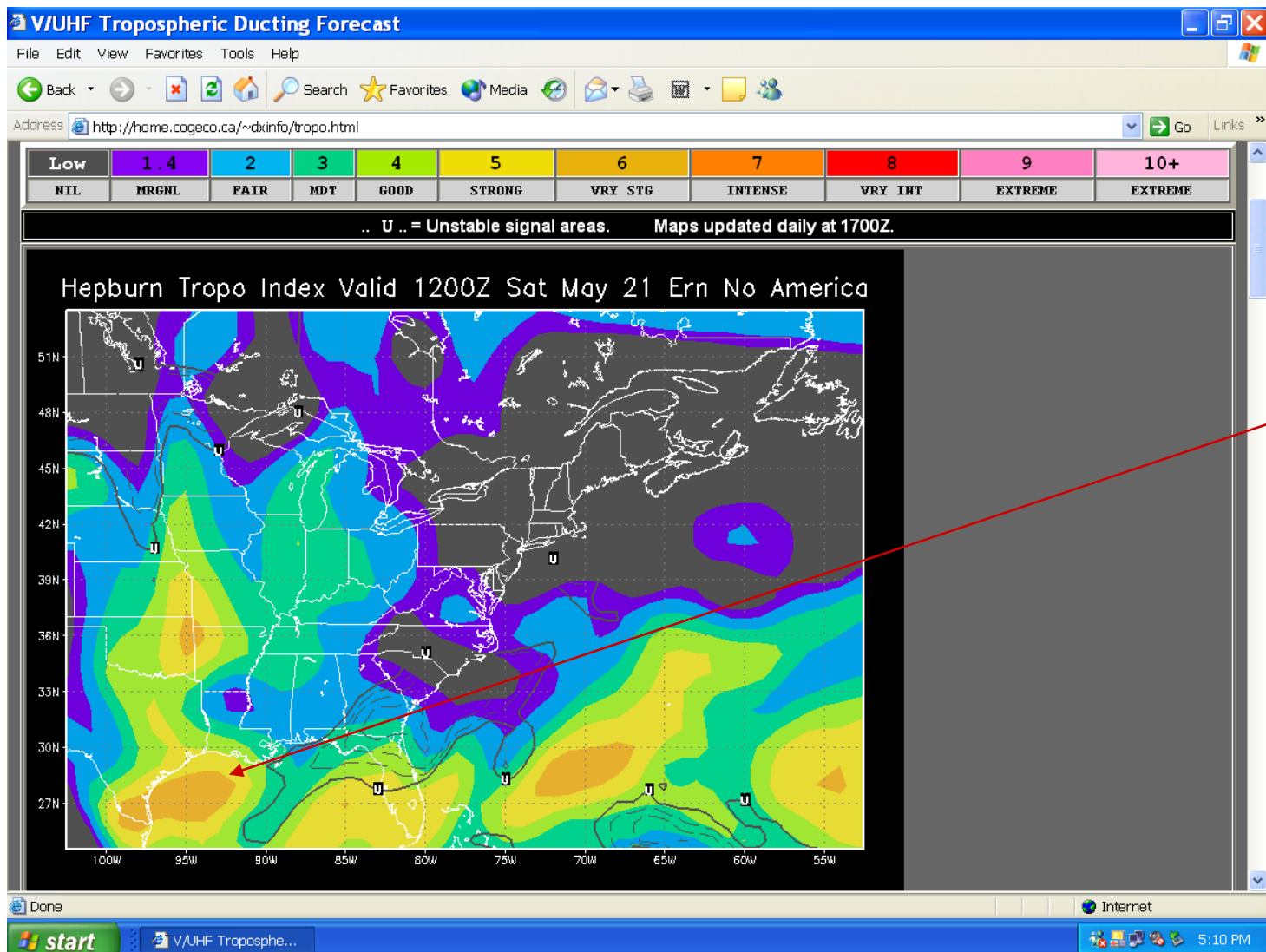
**Determine the filter parameters to avoid site RFI**

**Analyze:**

**Intermodulation  
FM Worksheet  
Site Specs  
Antenna  
Propagation**



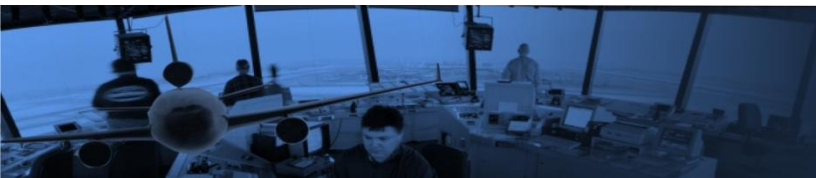
# Hepburn Ionosphere Skip Analysis



**Hepburn  
VHF  
Ionospheric  
Skip  
Intensities**

**Also  
Radio  
Blackouts**

**Tropospheric  
Ducting**

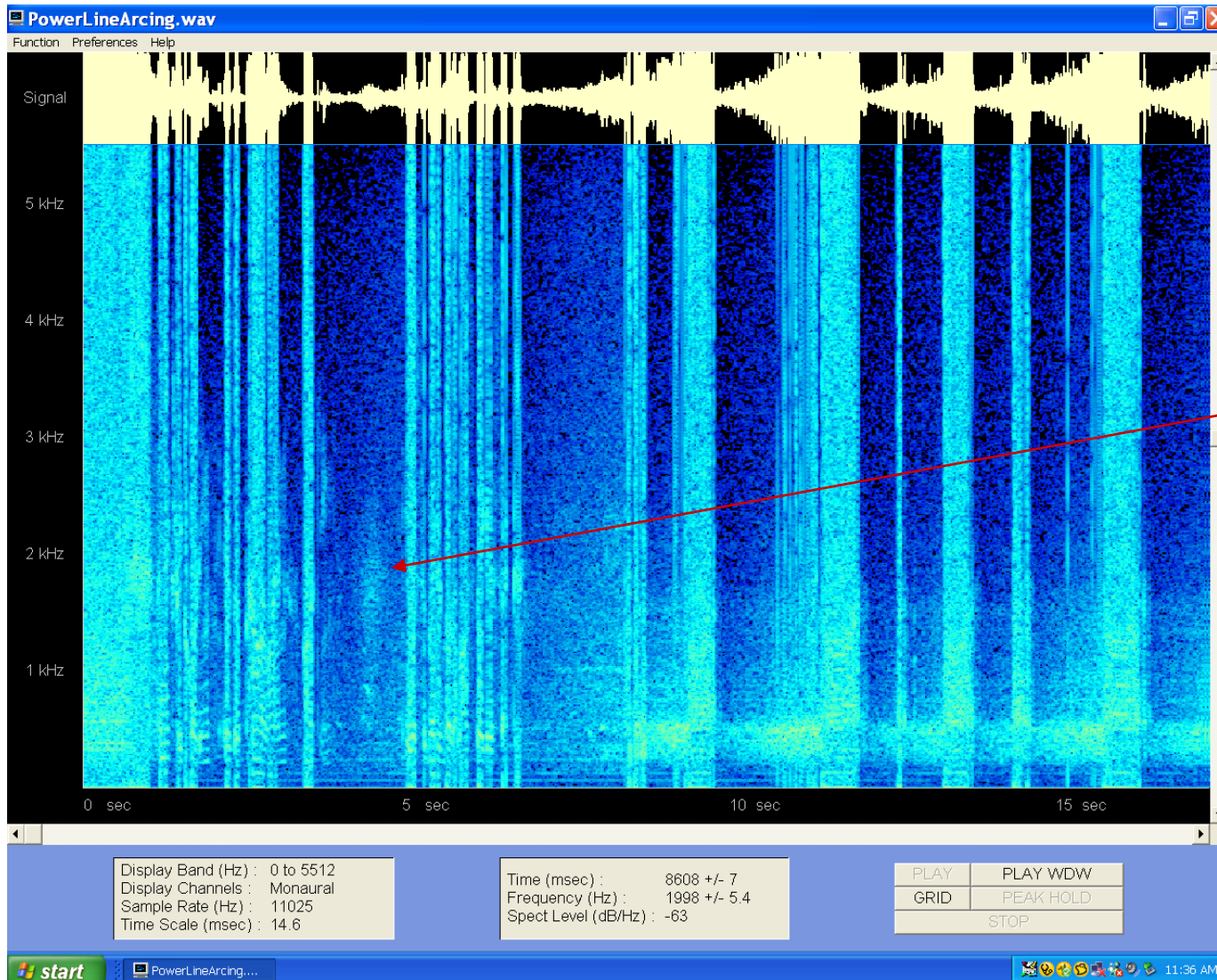


Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



**Federal Aviation  
Administration**

# Spectrogram Audio Analysis

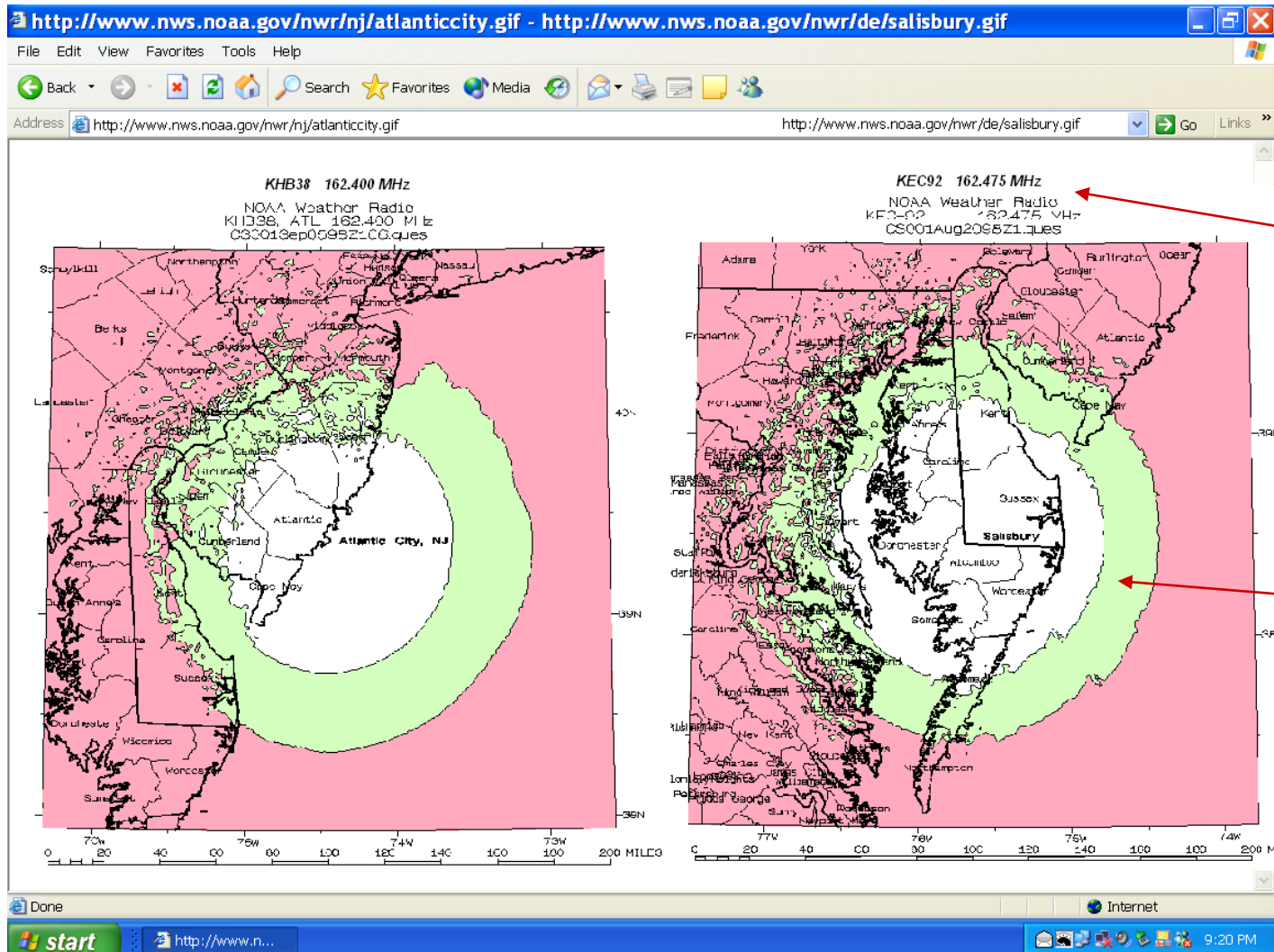


**Audio  
Detection  
Visual  
Intensities**

**Used for  
Matching with  
known  
sources**

**Audio Spectral  
Views**

# Weather Radio Transmitters Analysis



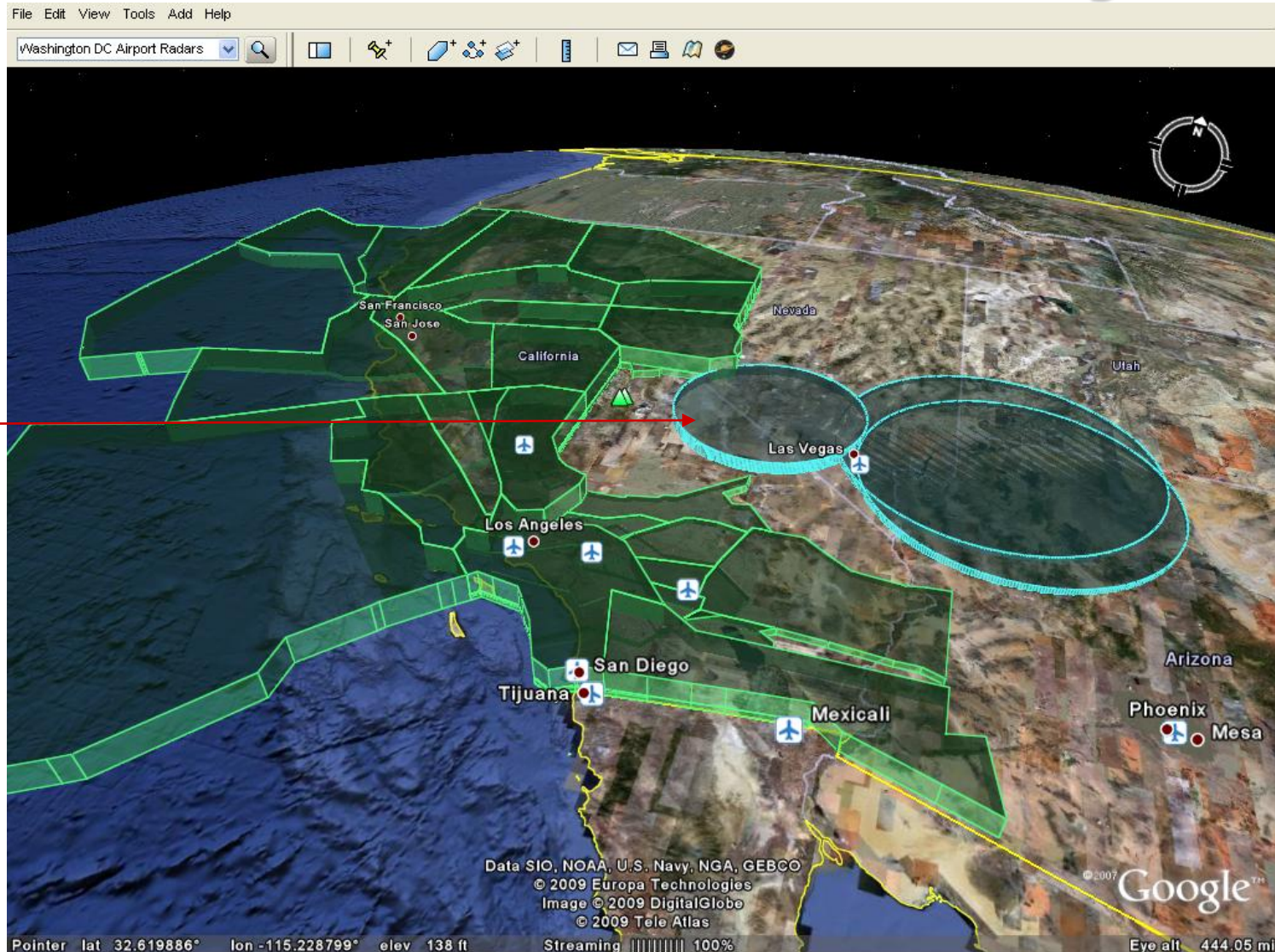


# Google Earth 3-Dimensional Analysis

FAA Airspace  
Sector 3D

Protected  
Service  
Volume  
Visualization

Propagation  
Models based  
on ICAO  
standards



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



Federal Aviation  
Administration



# Any Questions ?

**James.Aviles@faa.gov**  
**(202) 267-3035 FAA HQ**  
**(703) 326-3922 FAA NOCC**  
**(202) 267-5901 FAX HQ**  
**(202) 386-5411 Mobile**  
**ATC Spectrum Engineering Services**



Presented at the United States  
NTIA Telecommunications  
Training Institute (USTTI) Radio  
Frequency Spectrum Management  
Course April 8, 2009



**Federal Aviation  
Administration**