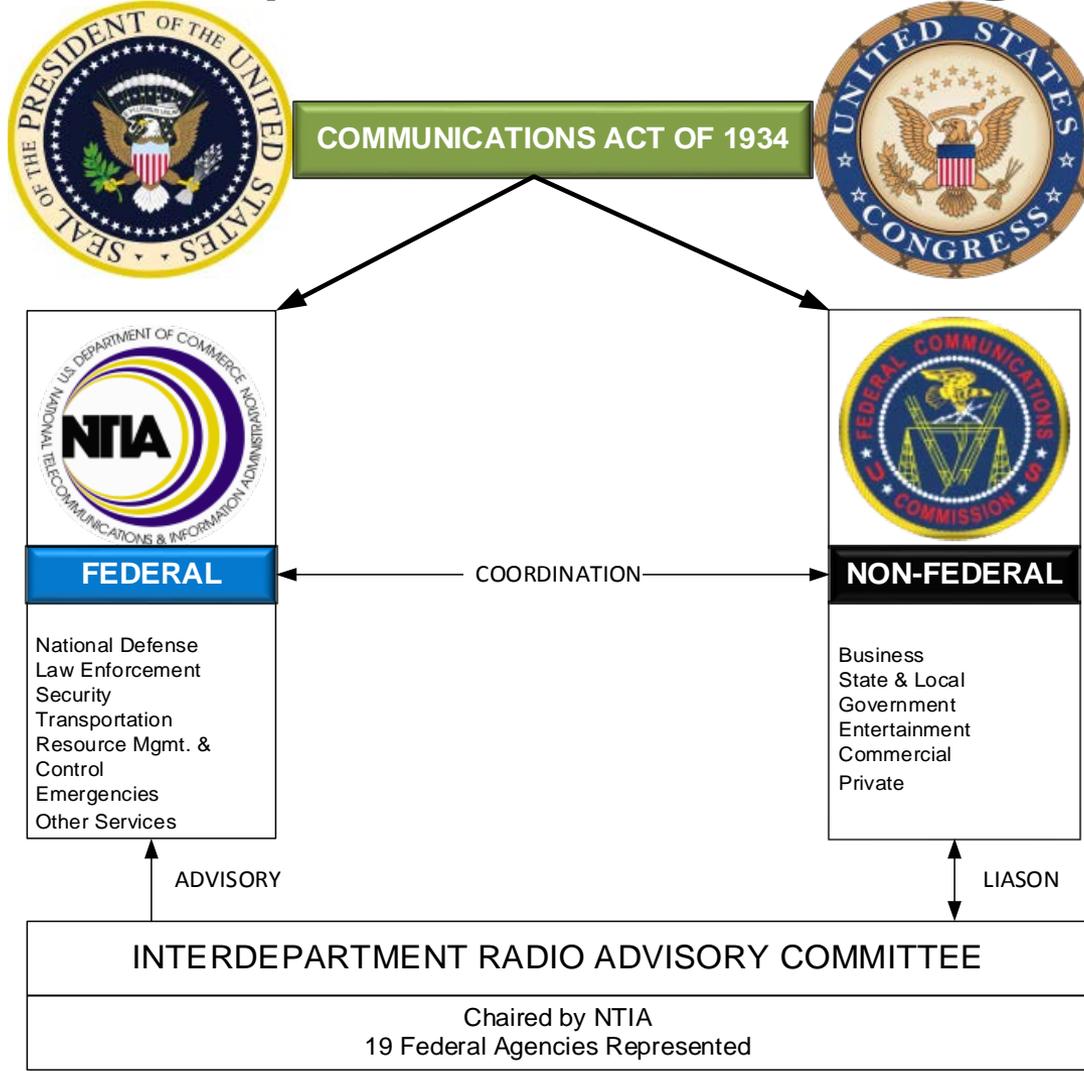


# RF Spectrum Shared & Valuable Resource

Anand Kandasamy  
Spectrum & Radio Communications Manager  
DOE-BHSA Authority Having Jurisdiction (AHJ) for BNL

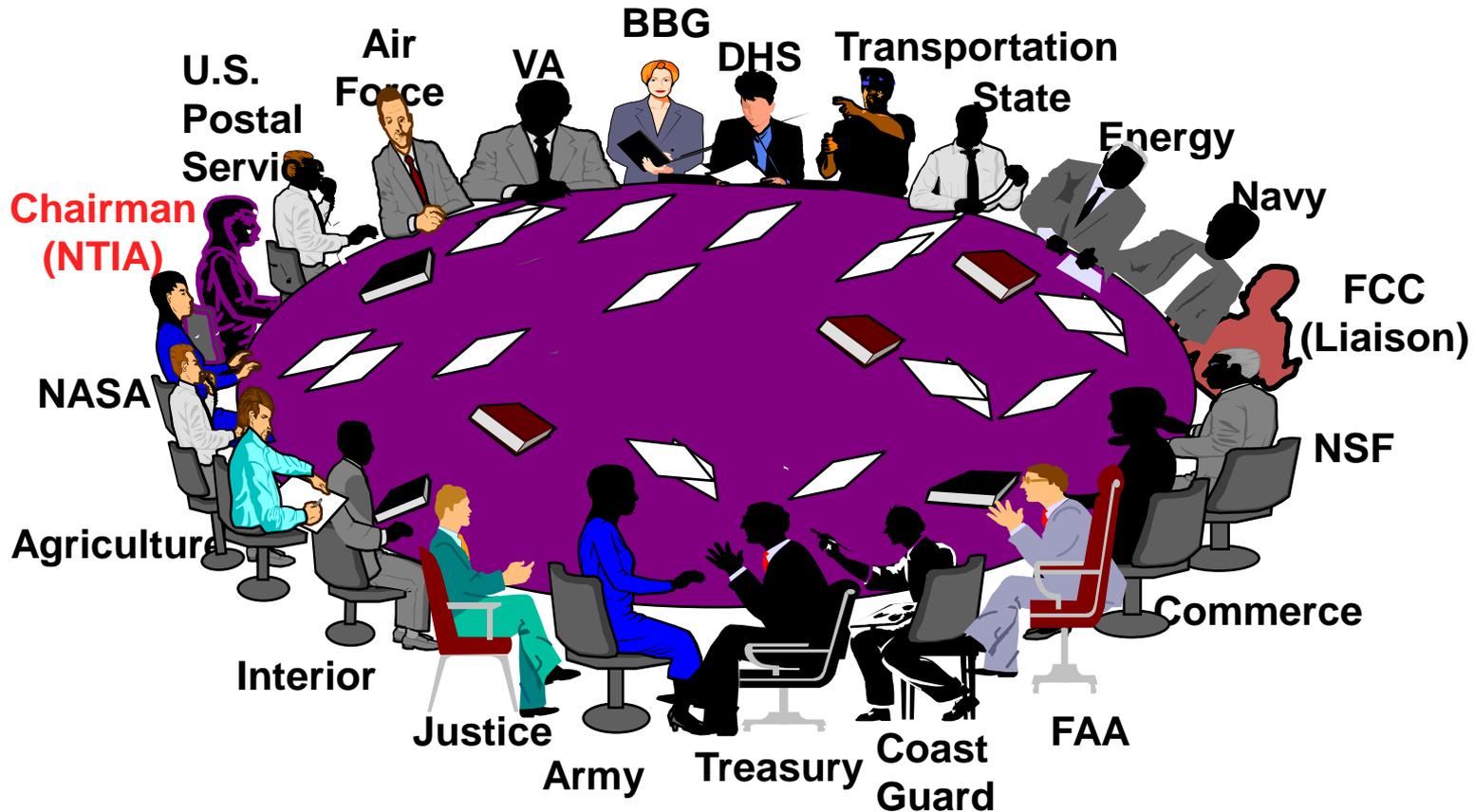


# National Spectrum Management



**The law provides FCC and NTIA authority over USERS, NOT over Spectrum**

# Inter-department Radio Advisory Committee



IRAC is an ADVISORY committee that provides to NTIA the views of the federal agency spectrum managers

Existed since 1922

Work is considered executive branch pre-decisional and not releasable

Subcommittees: FAS, SPS, SSS, EPS, TSC, RCS and Ad Hoc Groups

# FCC Equipment Authorization

**FCC Equipment Authorization is not a license to operate!  
Don't let vendors fool you**

Manufacturers test their products using accredited laboratories to ensure their product meets technical specifications required by FCC, as a part of the type acceptance process. – Equipment Authorization Process

- Verification (unintentional radiators)
- Declaration of Conformity (unintentional radiators that connect with PC's or television systems)
- Certification (intentional radiators, radar detectors)
- Registration (telephones & telecommunication devices)

Upon meeting the requirements, FCC assigns a unique ID – this is the FCC ID

- Illegal to Sell/Lease/Import any “Intentional Radiators” in the US without a FCC-ID

# Home Built Kits

- Do Home Built kits tested, verified and certified ?
  - Answer is No
  - There are caveats, check 47 CFR PART 97
  - Personal Use only, No Sale of built devices
- Don't always assume your license gives you unrestricted access, even if you are an AE.
  - Rules and Regulations are always confusing and can get you into trouble.
  - Talk to a cognizant authority.

# What does Equipment Authorization mean ?

Equipment Authorization - equipment has been tested, verified and type certified for use in specific class of service.

- Part 15 – Unlicensed Devices
- Part 24 – Personal Communication Service (PCS)
- Part 74 – Experimental, Broadcast Distribution
- Part 90 – Land Mobile Radio
  
- Wireless microphones is a classical case of Vendor Exploiting unsuspecting users
  - Part 74 – qualifying users only, but sellers never told you that before.
- FRS/GMRS
  - Part 95 – Personal Radio Service

# Rules are there for a reason

- Take for example 47 CFR PART 95
  - FRS – license free, power – 0.5w, 462.5625 – 467.7125 MHz
  - GMRS – license required, power < 5W, 462.550 – 467.725 MHz
  - CB – license free, power (AM 3W, SSB 12W), 26 to 28 MHz
  - MURS – license free, Power 2W, antenna height, etc, 151.82-154.60 MHz



## Baofeng UV5R is Part 90 Type Certified

Operates in the above frequencies (except CB)

Can I use this radio for FRS ? GMRS ? MURS ?

“Absolutely NOT”

Using a piece of equipment that is not type-certified for its intended use, or using type-certified equipment that has been illegally modified is a violation of FCC Rules.

# I have a license already!

- I already have a HAM license, can I use my gear in the GMRS band:
  - No
  - You need a separate GMRS license
    - No Test Required
    - Fee
- I have a HAM license, what's the big deal.
  - Violation of FCC rules, can cost you your amateur radio license, even if the violation did not involve operation in the amateur service.

The risk of losing your amateur radio license, together with any other FCC license you may hold, or the cost of an FCC fine far outweighs the cost savings of using one radio for everything instead of carrying appropriately authorized radio equipment for each separate radio service.

TCB

GRANT OF EQUIPMENT  
AUTHORIZATION

TCB

Certification  
Issued Under the Authority of the  
Federal Communications Commission  
By:

ACB, Inc.  
6731 Whittier Avenue Suite C110  
McLean, VA 22101

Date of Grant: 04/10/2003  
Application Dated: 04/10/2003



**Lear Corporation**  
**21557 Telegraph Road**  
**Building 100**  
**Southfield, MI 48033**

**Attention: Jason Summerford , RF Engineer**

**NOT TRANSFERABLE**

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE,  
and is VALID ONLY for the equipment identified hereon for use under the  
Commission's Rules and Regulations listed below.

**FCC ID KOB-GT04A**

FCC IDENTIFIER: KOBGT04A  
**Name of Grantee:** Lear Corporation  
**Equipment Class:** Part 15 Security/Remote Control  
Transmitter  
**Notes:** Car Keyless Entry Transmitter

<u>Grant Notes</u>	<u>FCC Rule Parts</u>	<u>Frequency Range (MHZ)</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission Designator</u>
	15.231	315.0 - 315.0			

**Part 15 : Unlicensed Operation**

# UNITED STATES FREQUENCY ALLOCATIONS THE RADIO SPECTRUM

## RADIO SERVICES COLOR LEGEND

- AERONAUTICAL MOBILE
- INTER-SATELLITE
- RADIO ASTRONOMY
- AERONAUTICAL MOBILE SATELLITE
- LAND MOBILE
- RADIO DETERMINATION SATELLITE
- AERONAUTICAL BROADCASTING
- LAND MOBILE SATELLITE
- RADIOLOCATION
- AMATEUR
- MARITIME MOBILE
- RADIOLOCATION SATELLITE
- AMATEUR SATELLITE
- MARITIME MOBILE SATELLITE
- RADIOAGNATION
- BROADCASTING
- MARITIME BROADCASTING
- RADIOAGNATION SATELLITE
- BROADCASTING SATELLITE
- METEOROLOGICAL AID
- SPACE OPERATION
- Earth Exploration Satellite
- METEOROLOGICAL SATELLITE
- SPACE RESEARCH
- FIXED
- MOBILE
- STANDARD-FREQUENCY AND TIME SIGNAL
- FIXED SATELLITE
- MOBILE SATELLITE
- STANDARD-FREQUENCY AND TIME SIGNAL SATELLITE

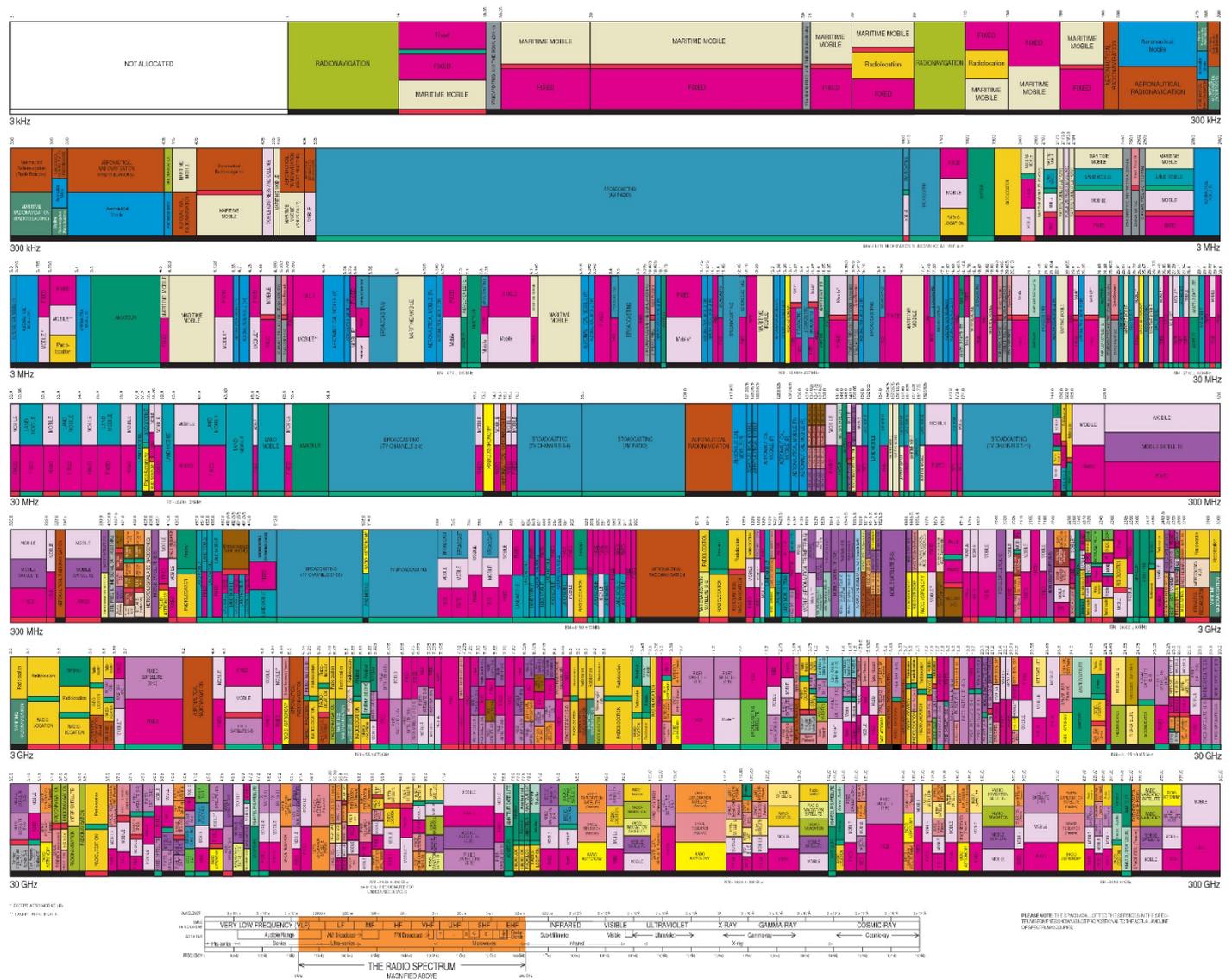
## ACTIVITY CODE

- GOVERNMENT EXCLUSIVE
- GOVERNMENT-NON-GOVERNMENT SHARED
- NON-GOVERNMENT EXCLUSIVE

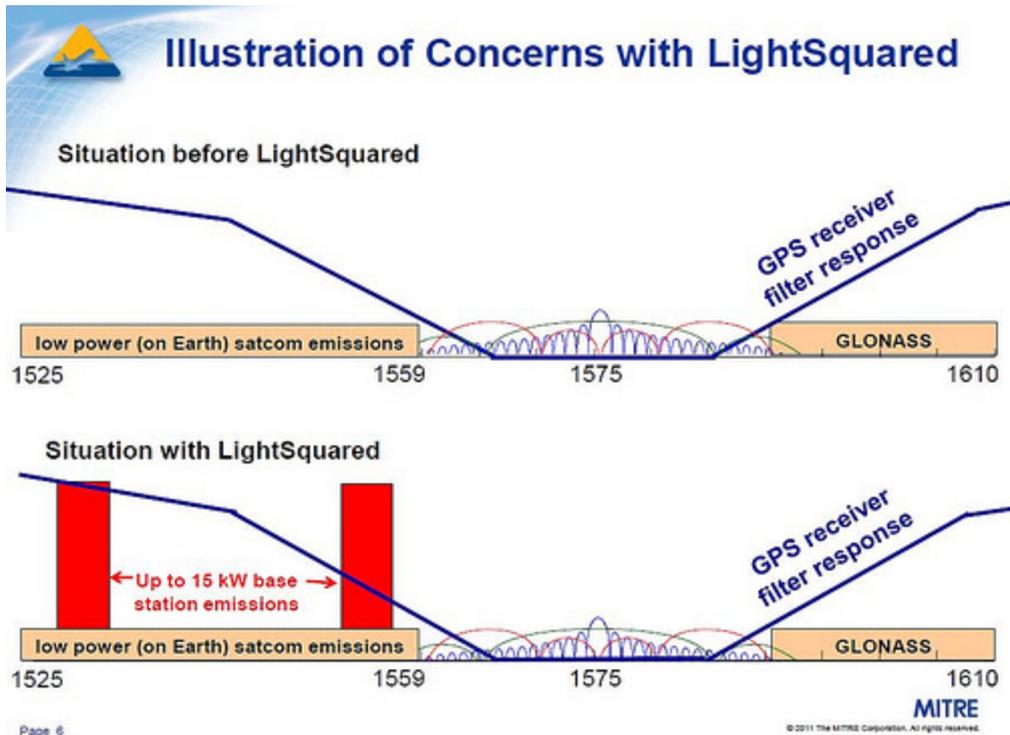
## ALLOCATION USAGE DESIGNATION

SERVICE	EXAMPLE	DESCRIPTION
Primary	F1E3D	Fixed Earth Station
Secondary	N3E	1st Class with clear class letters

Note: This is a partial frequency allocation chart. The full chart is available in the Radio Spectrum Management (RSM) website. The RSM website is the primary source for the most current and complete information on the radio spectrum. The RSM website is available at <http://www.fcc.gov/rsm>.



# GPS - LightSquared



Page 6

TECHNOLOGY

## LightSquared Pulls the Plug

Hedge-Fund Manager Falcone's Telecom Firm Files for Bankruptcy Protection

# Take away

- RF Spectrum is a valuable and invaluable resource at the same time.
  - Invaluable by users of spectrum
  - Valuable by regulators (Congress) – revenue \$\$ stream

## Why ?

*The FCC said in a public notice that it will start an auction of the 1900 MHz PCS H Block on Jan. 14, 2014, its first major spectrum auction since 2008.*

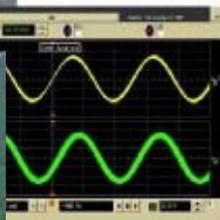
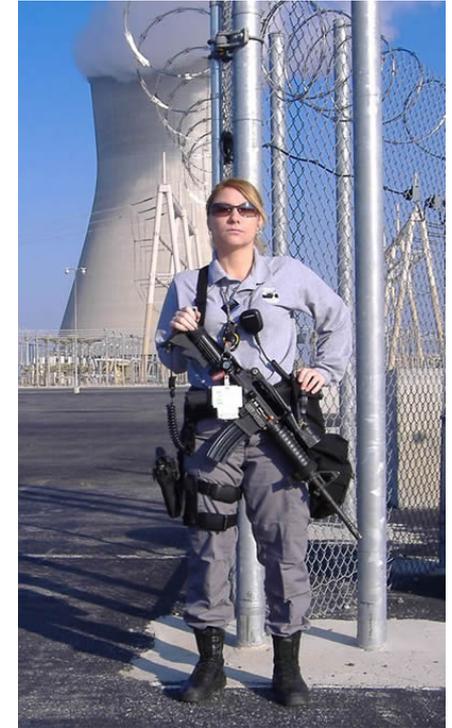
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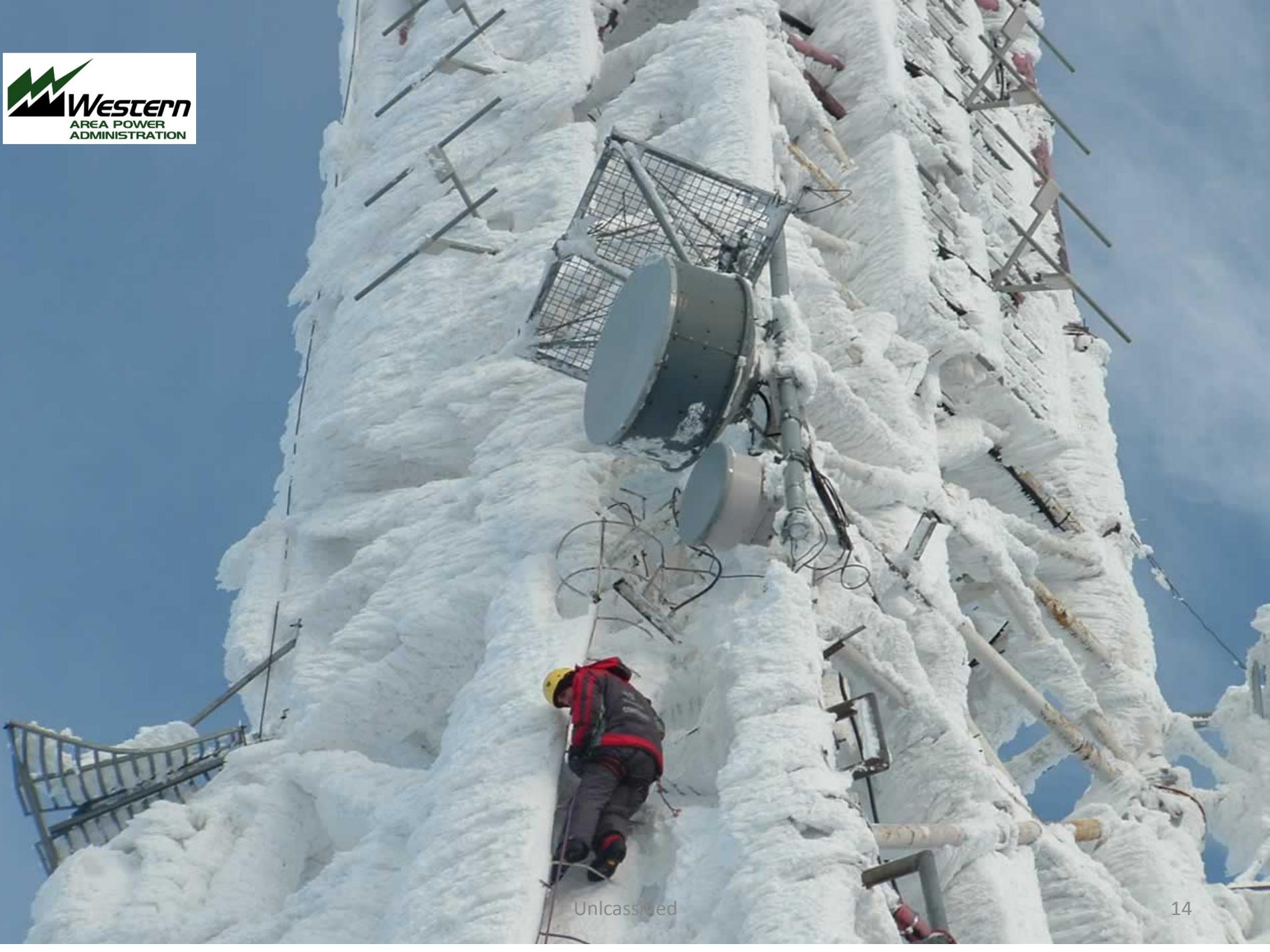
*As things stand, the FCC said the H Block auction, dubbed Auction 96, will have a reserve price of \$1.56 billion.*



# DOE and its Spectrum Use

- Safeguards and Security
- Office of Secure Transportation
- Power Management Administration
- Routine Administrative Use
- Direct Science and Support
- RAP/NEST/EACT/ERS
- Missiles and Weapon Testing
- Mutual-Aid/Public Safety



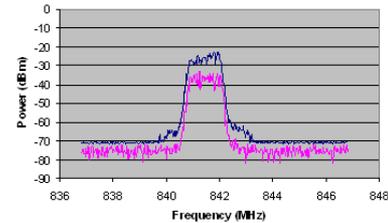






# RFI Culprit Sources

- Citizens Band (CB) Radios (5<sup>th</sup> harmonic)
- Paging Systems
- Stuck Microphone Transmissions
- Cell phone Spurious Emissions
- Electronic Attack (EA) Missions
- Power line Noise (Broadband Noise)
- Anomalous Propagation
- Atmospheric Conditions
- Amateur "HAM" Radio
- Land Mobile/Dispatch



# US National Airspace System RFI

## → **Most Common Source of RFI:**

- **Unauthorized Transmissions**
- **Pirate FM Broadcast Spurious**

## → **Most Common FAA Victim:**

- **VHF/UHF Voice Communications**

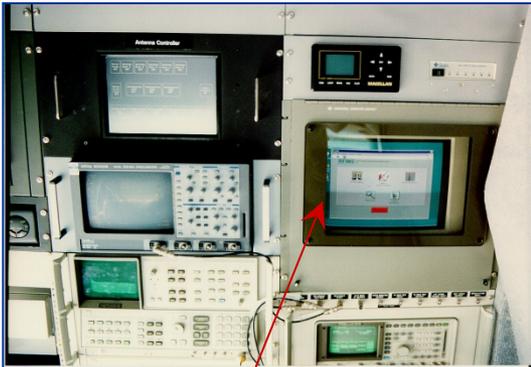
## → **Most Difficult RFI to Resolve:**

- **High Altitude Pilot Only Reported RFI**
- **Intermittent RFI (Airborne/Ground)**
- **Broadband RFI on Many Frequencies**
- **Phase Shift Keying RF Transmissions**



# USA NAS RFI Resources – RFIM

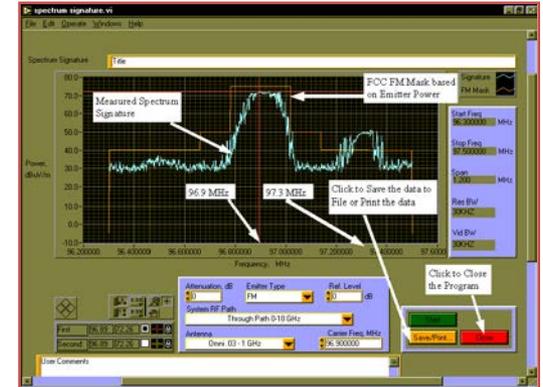
- **FAA Assets and Software Tools**
- **Radio Frequency Interference Monitoring (RFIM) Vans**



**Automated or Manual Full Equipment Suite**



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



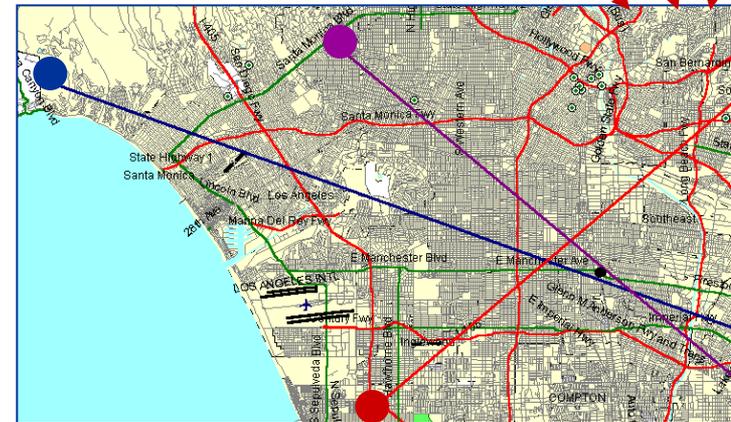
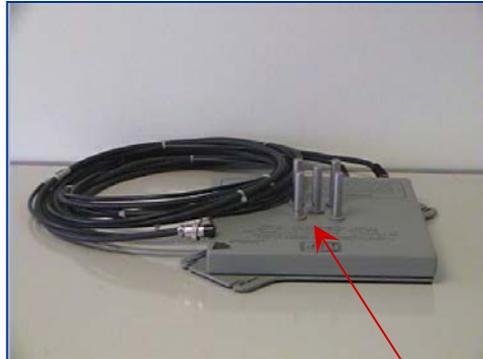
**Regional Used mainly by FMOs Most Complete Measurement System**

# 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**

# USA NAS RFI Resources – NASE-RFI



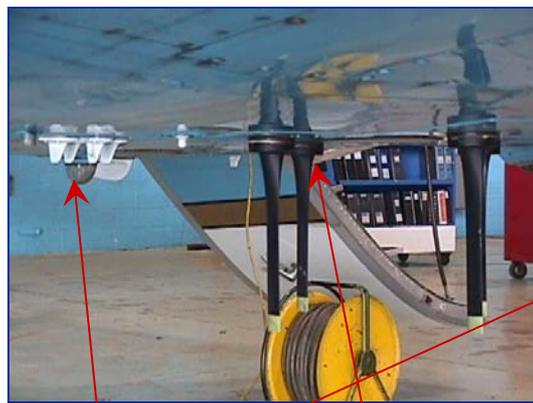
**AVN**

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

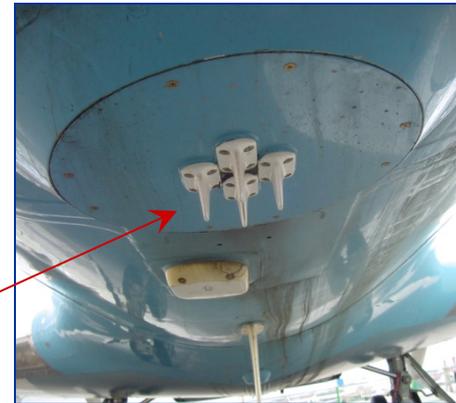
**First Choice  
when High  
Altitude  
PIREPS  
ONLY**



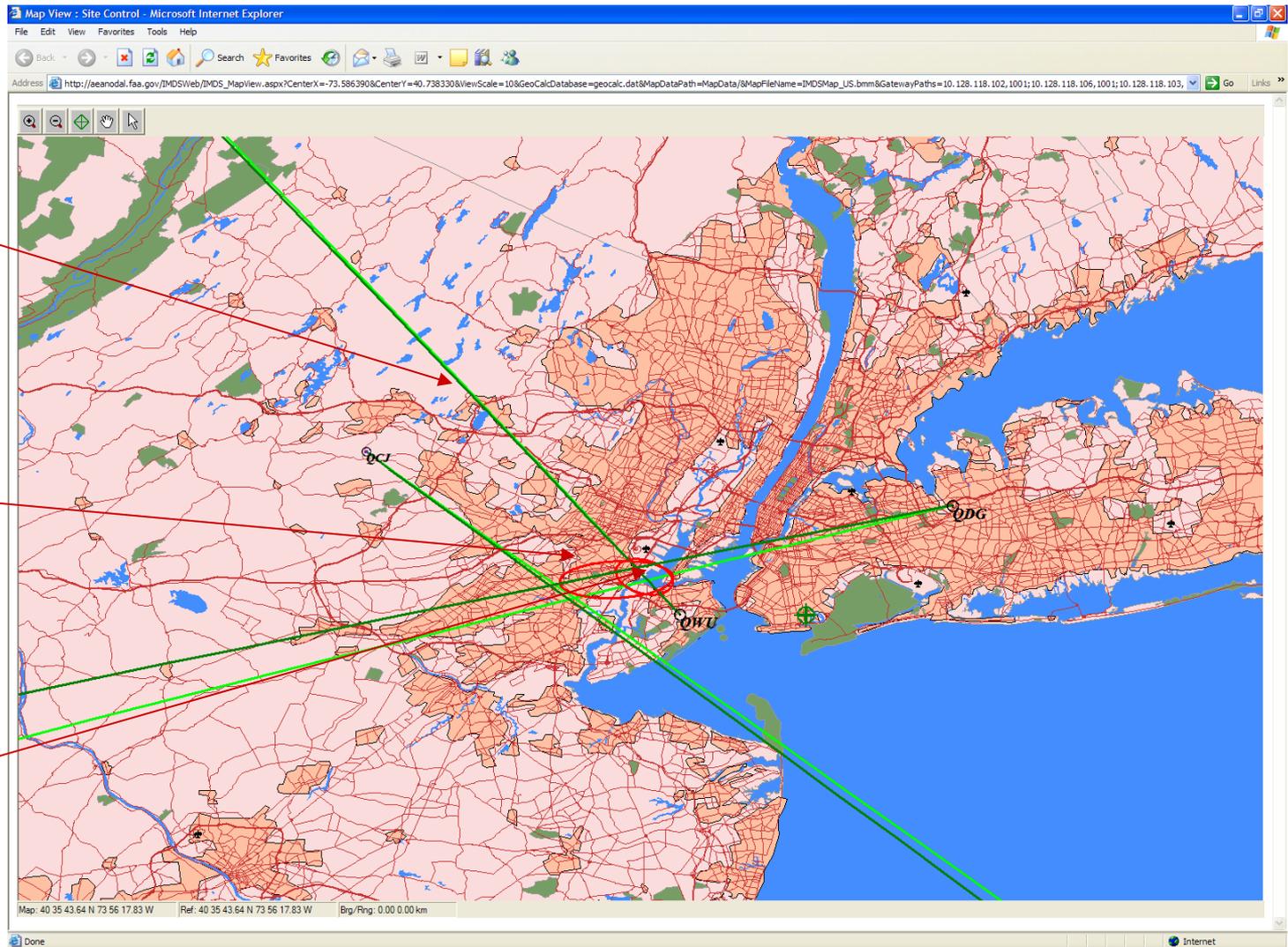
**DF Control/Mapping  
Operated Automation**



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



# USA NAS RFI Resources – IMDS



**WEB IMDS  
Triangulated  
Bearing  
Averages  
Overlay on  
Map**

**Increases Fix  
Calculation  
Ellipse  
Accuracy**

**Multiple  
Ellipse  
Calculation for  
Smaller Ellipse**