

# Sharing Federal Government Radar Spectrum



Federal Aviation  
Administration

## Federal Aviation Administration Views

### Sharing Radar Bands

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# Outline

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# FAA Uses of Radars

- Terminal Surveillance
- Nexrad (Weather)
- En-route Surveillance
- Terminal Doppler Weather
- Airport Surface Detection Equipment X
- Airport Surface Detection Equipment 3
- 2700-2900 MHz
- 2700-3100 MHz
- 1215-1370 MHz
- 5600-5650 MHz
- 9000-9200 MHz
- 15.7-16.2 GHz



# Secondary Surveillance Radars

## A Special Category of Radar

- **The FAA primarily uses the Air Traffic Control Radar Beacon System (ATCRB) for surveillance. Controllers use the frequency 1030 MHz to interrogate aircraft equipped with a transponder that replies on the frequency 1090 MHz.**
- **Primary surveillance radars (PSR) provide valuable information when ATCRB is not working or is turned off.**
- **PSR proved their value during the terrorist events of 9/11, when terrorists turned off the transponders.**
- **Information from PSR is shared between the FAA, DoD, and DHS.**



# Other Aviation Use of Radars

- Radar Altimeter
- Airborne
- Airborne
- Precision Approach
- Airborne
- 4200-4400 MHz
- 5350-5470 MHz
- 8750-8850 MHz
- 9000-9200 MHz
- 9300-9500 MHz



# FAA Views on Spectrum Sharing

- **Under no circumstances can safety be compromised, therefore systems that are relied upon for safety-of-life cannot be allowed to experience interference.**
- **Generally, the FAA does not support sharing aeronautical spectrum (including radar) with non-aeronautical services due to the critical functions of aeronautical systems.**
- **The FAA prefers to share the spectrum with licensed systems vs. unlicensed systems when spectrum sharing is mandated.**
- **Spectrum used by the FAA is shared with non-federal users for aviation, and provides services to non-federal users.**
- **The feasibility of sharing is dependent upon many factors including technical, regulatory, operational, frequency congestion, geographical congestion, etc.**



# FAA Views on Spectrum Sharing (cont'd)

- **Reliance on regulations and technical design of non-aeronautical systems does not guarantee radars will be protected from interference.**
- **Software defined radios, cognitive radios, and other devices that utilize new technologies such as dynamic spectrum access or dynamic frequency selection might interfere if not implemented such that all sharing factors are fully considered in advance of deployment.**
- **Any transition to new spectrum management techniques or new technologies should be phased in gradually.**
- **Spectrum sharing depends on cooperation between all parties (FAA, Industry, Regulators).**



# Technical Concerns

- **Non-aeronautical systems need to be designed so that**
  - The radar's probability of target detection is not reduced
  - The radar receiver's noise floor is not increased
  - False targets or alerts are not created on the radar
  - Interference mitigations are not required of the radar
  - Future design enhancements of the radars are not constrained by the introduction of new systems
- **Studies that include analyses and controlled repeatable tests need to be performed prior to allowing new systems into radar bands and the studies need show compatibility under all conditions.**



# Regulatory Concerns

- **Regulations need to:**
- **Be enforceable**
- **Give higher regulatory status to radars**
- **Account for all radar operational and receiver characteristics**
- **Ensure future radar designs are not constrained**



# Experience with Sharing Radar Spectrum

- **FAA facilities and aircraft receive harmful radio frequency interference (RFI) daily and for much of it, the sources are never identified.**
- **In-band interference has been avoided largely due to the lack of sharing radar spectrum.**
- **Radar spectrum sharing with devices employing Dynamic Frequency Selection (DFS) has been shown that it can be ineffective in some cases.**



# Experience with Sharing Radar Spectrum (cont'd)

- **FAA weather radars are experiencing interference from unlicensed devices due to:**
  - Regulations that did not adequately consider radar characteristics
  - DFS technology that failed to prevent interference while complying with the regulations
  - Some users violating regulations
  - The difficulty in enforcing regulations violations by users of unlicensed devices



# Experience with Sharing Radar Spectrum (cont'd)

- **Difficulty of Eliminating RFI when caused by unlicensed devices with DFS**
  - Interference sources appear at different locations at different times
  - Contacting operator of unlicensed devices is time consuming
  - Elimination of one interference source creates opportunity for another interference source to fill the void and cause RFI



# Experience with Sharing Radar Spectrum (cont'd)

- **Expense of RFI investigation**
  - Personnel
    - Regional FAA engineers to investigate RFI
    - Headquarters engineers to address regulatory issues
    - TDWR Program Office engineers
    - Radar technician
    - Airport personnel
  - Equipment
    - Direction finding equipment
    - Spectrum analyzer
    - Vehicles
  - Time
    - Problem started over one year ago and it still exist
    - Planning/coordinating
    - Locating interference sources, access to antenna of unlicensed devices, contacting operators
  - Cost
    - Dollar amount to be determined
    - All resources including time have a dollar amount
  - Impact
    - TDWR out of service during investigation
    - Recertification of radar to return to service
    - Technicians are not providing other necessary services

