

Session 1 - The Federal Spectrum Ecosystem

A Maritime and Coast Guard Perspective on Spectrum Sharing:

Making it Work

Making sharing work

- C-band: Public Law 112-96 and the 5350-5470 MHz radar "refugee band"
- S-band: Sharing the band 2700-3600 MHz and ITS Boulder study of maritime navigation radars
- VHF: Maritime's only internationally interoperable spectrum above HF

C-band opening the radar "refugee band" to IEEE 802.11ac



Coast Guard also uses these radars > Defense Readiness

- > Drug Interdiction/Counter Drug
- Other Law Enforcement
- Living Marine Resource
- Ports, Waterways, and Coastal Security
- Migrant Interdiction
- Search and Rescue
- Marine Environmental Protection

C-band:

opening the radar "refugee band"
Concern:

 Radar operator unaware performance is degraded (e.g. CFAR works too well)

- "Druggies" use WiFi as low cost jammers
- Solution: late summer test degree of radar degradation from broadband
 - in the currently allowed band
 - in the "refugee band"
 - Radar ability to discern existence of interference and DF source

C-band:

opening the radar "refugee band"
 Remaining problems:

- Classified radar characteristics (eg USCG)
 Broadband/DFS developers need clearances!
- Radar manufacturers are not engaged
- How does DFS accommodate new radars?
- What happens when broadband population explodes?
 - DFS may work with low-moderate population

How do you locate malfunctioning DFS amongst large populations of broadband?

Sharing S-band

Maritime community do use this band too (not just DoD, FAA & NOAA)



 Some limited interference from licensed broadband now ~300 MHz away!

Ongoing work by ITS Boulder



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Effect of Spurious Emissions from Broadband Radio Service Transmitters on Marine Radars

> Robert Achatz, Paul McKenna, Roger Dalke, Nicholas DeMinco, Frank Sanders

> > January 2012

This document presents project information to an other-agency sponsor. Additional copies are not available, and this is not a referenceable document.

Also: "Non-linear Interference **Effects in S-Band** Marine Radars caused by **Broadband Radio** Service Emissions" Will include solid state radars

What is being measured



Output: Interference protection criteria

Sharing S-band

 Evaluating sharing of whole Sband is inevitable (e.g. PCAST 1000 MHz recommendation)

 Can DFS protect civil maritime radars?

Probably after further study, yes.
 But...

Maritime radar RF frequency selectivity



Maritime VHF

- 156-162 MHz band probably the most important maritime spectrum resource
- Only resource available for international interoperable communications

Used for

- distress and safety
- vessel traffic systems
- ship operations
- commercial fisherman
- Recreational boaters
- Intership navigation (bridge-to-bridge)
- Automatic Identification System (AIS)

Maritime VHF buried in Part 90

International maritime Part 80 maritime Part 80 maritime (auctioned) Part 90 Public safety Part 90 Industrial/Business Part 22 Public Mobile Service/pagers Part 74D Remote Pickup Broadcast NTIA Federal Land Mobile

155 156 157 158 159 160 161 162 163 MHz

Railroad

Maritime VHF

♦ Problem

- No data channels (except for AIS and distress)
- No provisions for growth
- ~¼ of available spectrum auctioned to a spectrum speculator

Possible solution?

 RTCM 12301.1 – Standard for VHF-FM Digital Small Message Services, July 2009

Provides data over voice channels on NIB basis

• PCAST spectrum recommendations?

PCAST: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth

New Technologies Allow for A New

Federal Spectrum Policy

- New Cognitive Technologies
 - Agile Radios
- Small Cell Technologies
 - Optimized for Aggregate Capacity
- New Spectrum Architecture
 - Divide spectrum into substantial blocks with common characteristics
 - Make sharing by Federal users with commercial users the norm
 - Make spectrum access available and affordable to a wide range of services and applications.
- New Metric for Utilization
 - Measure spectrum effectiveness
 - Potential impact that could be 1,000's times current capacity.

