



Spectrum Challenges

NEXRAD and Other Users of the S-Band

NEXRAD Technical Advisory Committee Meeting

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Engineering and Acquisition Branch

- Responsible for Engineering Modifications to National Weather Service (NWS) Operational Systems
- Responsible for Management of NWS Radio-Frequency Spectrum



S-Band Utilization

- Surveillance Radars

- The Federal Aviation Administration (FAA) and military services operate airport surveillance radars in this band for the management and control of aircraft in and around airports and military installations.

- Weather Radars

- Large numbers of weather radars, including NEXRAD, operate in this band.

- Radio Astronomy

- Observations of the cosmos are made in the 2640-2750 MHz Band to study the low galactic background radiation and both the ionized hydrogen clouds and general diffuse radiation of the galaxy.



S-Band Frequency Allocations

U.S. Non-Federal-Government Allocations

2700 - 2900 MHz

5.423 US18

FCC Rule Parts:
Aviation (87)

U.S. Federal Government Allocations

2700 - 2900 MHz

METEOROLOGICAL AIDS
AERONAUTICAL RADIONAVIGATION 5.337
Radiolocation G2

5.423 US18 G15

ITU Region 1 Allocations

2700 - 2900 MHz

AERONAUTICAL RADIONAVIGATION 5.337
Radiolocation

5.423 5.424

ITU Region 2 Allocations

2700 - 2900 MHz

AERONAUTICAL RADIONAVIGATION 5.337
Radiolocation

5.423 5.424

ITU Region 3 Allocations

2700 - 2900 MHz

AERONAUTICAL RADIONAVIGATION 5.337
Radiolocation

5.423 5.424

FOOTNOTES

5.337 The use of the bands 1300-1350 MHz, 2700-2900 MHz and 9000-9200 MHz by the aeronautical radionavigation service is restricted to ground-based radars and to associated airborne transponders which transmit only on frequencies in these bands and only when actuated by radars operating in the same band.

5.423 In the band 2700-2900 MHz, ground-based radars used for meteorological purposes are authorized to operate on a basis of equality with stations of the aeronautical radionavigation service.

5.424 *Additional allocation:* in Canada, the band 2850-2900 MHz is also allocated to the maritime radionavigation service, on a primary basis, for use by shore-based radars.

G2 In the bands 216.965-216.995 MHz, 420-450 MHz (except as provided for in G129), 890-902 MHz, 928-942 MHz, 1300-1390 MHz, 2310-2390 MHz, 2417-2450 MHz, 2700-2900 MHz, 3300-3500 MHz (except as provided for in US108), 5650-5925 MHz, and 9000-9200 MHz, use of the Federal radiolocation service is restricted to the military services.

G15 Use of the band 2700-2900 MHz by the military fixed and shipborne air defense radiolocation installations will be fully coordinated with the meteorological aids and aeronautical radionavigation services. The military air defense installations will be moved from the band 2700-2900 MHz at the earliest practicable date. Until such time as military air defense installations can be accommodated satisfactorily elsewhere in the spectrum, such operations will, insofar as practicable, be adjusted to meet the requirements of the aeronautical radionavigation service.

US18 In the bands 9-14 kHz, 90-110 kHz, 190-415 kHz, 510-535 kHz, and 2700-2900 MHz, navigation aids in the U.S. and its insular areas are normally operated by the Federal Government. However, authorizations may be made by the FCC for non-Federal operations in these bands subject to the conclusion of appropriate arrangements between the FCC and the Federal agencies concerned and upon special showing of need for service which the Federal Government is not yet prepared to render.

Threats to the S-Band Spectrum

General

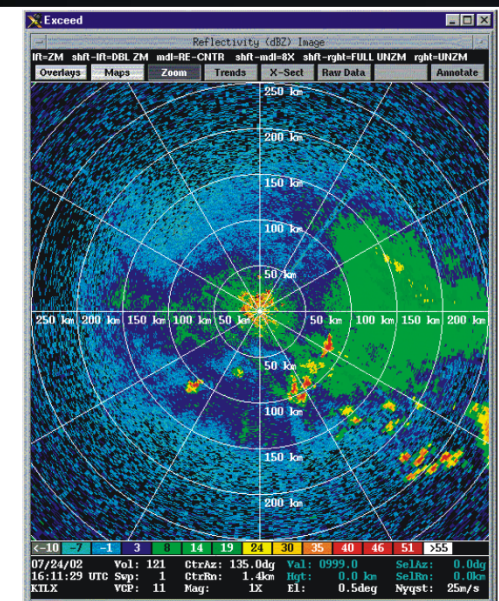
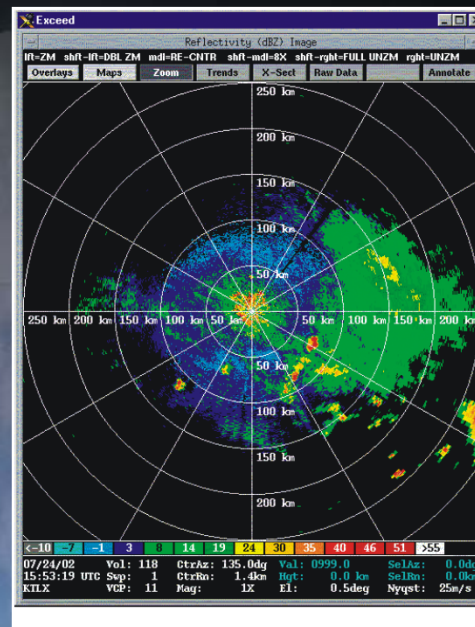


- Interference from Domestic Broadband Systems
 - LTE (Long Term Evolution)
 - WIMAX (Worldwide Interoperability for Microwave Access)
 - Spread Spectrum
- Interference from other systems that may be relocated into or near the S-Band
- International re-evaluation of harmonized spectrum for IMT and Broadband

Threats to the S-Band Spectrum

Interference

- Increased noise floor level from in band and or adjacent band deployments of broadband and advanced cellular systems.
- Increased potential for Out-of-Band (OOB) interference.
- In-band interference due to inter-modulation products falling within the IF bandwidth of the NEXRAD receiver.
- Corruption of weather forecasting products.
 - Incomplete picture of hazardous weather events
 - False indications of the intensity of rainfall events which could lead to the generation of unsubstantiated alerts and warnings.



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Threats to the S-Band Spectrum

Domestic and International Re-Allocation

- Domestic Broadband
 - Broadband initiative activities to re-allocate the S-Band spectrum and or move other services into the band. (WIMAX, LTE, Radar, etc.)
- International
 - Initiatives within the ITU (International Telecommunication Union) to harmonize additional spectrum for Broadband and IMT services. (WRC-15 Agenda Item 1.1 and 1.2)¹

¹“The main focus for WRC-15 (World Radio Conference-12) Agenda items 1.1 and 1.2 is allocation of frequency bands to the mobile service and identification of frequency bands for IMT Broadband. “ All previously studied bands (including the S-Band) have been re-opened for consideration.

Strategies to Alleviate Threats to the S-Band

Domestic

- Continue participation at Policy and Plans Steering Group (PPSG)² meetings.
- Work closely with the National Telecommunications and Information Administration (NTIA) and other government agencies to develop a broader understanding of the importance of the S-Band to the NWS and the FAA
- Leverage previous work and or conduct studies which will be used to prepare a report on the viability of using Dynamic Frequency Selection (DFS) to detect Meteorological and Aeronautical Surveillance Radars.

²The Policy and Plans Steering Group (PPSG) comprised of Assistant Secretaries and other government officials helps resolve spectrum policy issues.

Strategies to Alleviate Threats to the S-Band International

- Participate in the ITU-R Joint Task Group JTG 4-5-6-7
 - The JTG will be the ITU focal point for conducting sharing and compatibility studies in support of Agenda Items 1.1 and 1.2
- Continue participation in ITU-R Working party 5B
 - Work within the context of WP5B to provide other ITU working groups or task forces that have the responsibility of defining spectrum for International Mobile Telecommunications (IMT) up to date and accurate information on Meteorological and Aeronautical Surveillance radars.

Strategies to Alleviate Threats to the S-Band

International

- Update ITU-R Recommendation ITU-R M.1849 “Technical and operational aspects of ground-based meteorological radars” to include Dual-Polarized S-Band Meteorological Radars
- Update ITU-R REPORT ITU-R M.2136 “Theoretical analysis and testing results pertaining to the determination of relevant interference protection criteria of ground-based meteorological radars” to include Dual-Polarization S-Band radars and the impact that interference from Broadband and advanced cellular systems (IMT) has on differential weather forecasting products.
 - Conduct NEXRAD Dual Polarization interference and compatibility studies . The objective of this work will be to define, if required, protection criteria levels which will insure that forecasting products will not be corrupted by IMT or Broadband transmissions.²

² A preliminary NEXRAD Dual Polarization Interference Test Plan is currently under development and review by the NWS.

Strategies to Alleviate Threats to the S-Band International

- Increase participation in ITU-R Working party 5D
 - Play an active role in any studies, interference or compatibility analysis efforts that are undertaken by working party 5D.
 - Leverage working party 5B efforts on updating Meteorological Radar and Aeronautical Radar documentation updates within working party 5D.
 - Provide Working Party 5D accurate and up to date Meteorological and Aeronautical Surveillance Radar technical and operational data.

Conclusions

- Meteorological and Aeronautical Surveillance radar systems operating within the S-Band are in jeopardy of being impacted by increased interference events due to the potential for re-allocation of the band and widespread deployment of broadband and advanced cellular systems on both a domestic and an international basis. This represents a significant threat to radar systems that are currently operating in the S-Band.
- Ongoing participation at PPSG and ITU meetings needs to continue in order to positively influence the outcome of spectrum deliberations as they relate to the S-Band.
- Studies focusing on interference analysis, enhanced protection criteria and the viability of using DFS as an interference mitigation technique for dual polarized S-Band Meteorological, Aeronautical Surveillance radars and Broadband systems will need to be undertaken in order to be prepared to defend the S-Band.

Questions?