Tutorial: Millimeter Waves from a Regulatory and Policy Perspective

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Outline

• Why Millimeter Wave?
• Overview of National Spectrum Policy and Management Framework
• Federal Uses of Millimeter Wave Spectrum
• Spectrum Frontiers Proceeding
• Where Do We Go From Here?
Why Millimeter Wave?

• Lower bands are crowded, need to look elsewhere
• Very wide bandwidths available, support high capacity requirements
• Technological advances (e.g. adaptive antennas)
• Propagation characteristics traditionally viewed as major limitation have some benefits including efficient spectrum utilization and increased security in some cases
National Spectrum Policy Framework

The President

Communications Act of 1934

Congress

NTIA

Federal Users

Interdepartment Radio Advisory Committee
  Chaired by NTIA
  19 Federal agency members

Spectrum Policy Framework

Advisory

Policy and Plans Steering Group
  Chaired by NTIA Assistant Secretary
  Federal agencies plus FCC and the White House

Other Interagency Groups
  (e.g., PNT ExCom; WSRD)

Non-Federal Users

FCC

Coordination

Technological Advisory Council

U.S. Department of Commerce · National Telecommunications and Information Administration
National Spectrum Management

COMMUNICATIONS ACT OF 1934

THE PRESIDENT

CONGRESS

NTIA

Federal Users

National Defense
Federal Law Enforce. & Security
Transportation
Resource Mgmt. & Control
Emergencies
Other Services

FCC

Non-Federal Users

Business
State & Local Government
Entertainment
Commercial
Private

COORDINATION

- FCC-NTIA Memorandum of Understanding
- FCC Chairman – NTIA A/S bi-annual meetings
- Preparation for ITU meetings

ADVISORY

INTERDEPARTMENT RADIO ADVISORY COMMITTEE (IRAC)

Chaired by NTIA
19 Federal Agencies Represented

LIAISON

NTIA Organization Act

NTIA Manual

47 CFR
Part 300

FCC Rules
(47 CFR Parts 0-199)

U.S. Department of Commerce · National Telecommunications and Information Administration
Current and Potential Federal Uses of Millimeter Wave Spectrum

• More diverse than many realize
• Radars
• Military communications applications incl. person-to-person, machine-to-machine, vehicle-to-vehicle
• Fixed and mobile platforms, point-to-point and point-to-multipoint
• High resolution video, imaging, sensing
• Passive applications include earth exploration satellite and radio astronomy
• Research, development, testing and evaluation (RDT&E)
Spectrum Frontiers Proceeding

• Significant FCC proceeding has put many of the millimeter wave range bands in play for commercial, terrestrial use, i.e. wireless broadband, while acknowledging other important non-federal and federal uses

• 2016 Report and Order made almost 11 gigahertz of spectrum available for terrestrial use, with mix of licensed and unlicensed

• Further Notice of Proposed Rulemaking teed up over 17 gigahertz more
Spectrum Frontiers Proceeding

Report and Order Bands

The Upper Microwave Flexible Use Service (UMFUS)

- 28 GHz (27.5-28.35 GHz)
- 37 GHz (37-38.6 GHz)
- 39 GHz (38.6-40 GHz)

Unlicensed Use

- 64-71 GHz – for unlicensed use
NTIA Letter to FCC (July 12, 2016)

- Supported FCC unlocking access to higher bands to facilitate innovative uses such as 5G
- Summarized current and projected federal operations in and adjacent to NPRM bands, provided supplemental data and analysis
- Supported rules to protect such operations
- Supported development of a flexible and innovative sharing approach in the 37 GHz band
- Addressed issues related to protecting passive services at 64-71 GHz
NTIA Letter to FCC – 37 GHz Band (37-38.6 GHz)

- Allocated on a primary basis to federal and non-federal fixed and mobile services and the federal space-to-earth Space Research Service
- Technical recommendations to protect passive sensors in adjacent 36-37 GHz band
- Protect SRS earth station receive locations through required coordination with NTIA
- Protect existing and planned DOD operations at 14 sites through required coordination with NTIA for non-federal operations within those geographic areas – coordination zones
- Supported a modified version of FCC’s NPRM Alternative Proposal to create a band plan with a 600 megahertz shared block at 37-37.6 GHz
NTIA Letter to FCC – 37-37.6 GHz

• This 600 megahertz would be fully available to federal and non-federal users on a coordinated, co-equal basis

• Frequency access through a coordination mechanism, potentially dynamic sharing, with the framework to be developed through a collaborative process
Spectrum Frontiers Proceeding

FCC Report and Order – 37-37.6 GHz

• Adopted fed/non-fed co-equal shared access
• Unique opportunity to facilitate expanded spectrum use by commercial and federal users in spectrum range conducive to sharing
• May promote dual-use technology development and federal access to commercial equipment ecosystem
• Bakes in sharing expectation at outset of technology development and network deployment – increases certainty and promotes technological innovation
• Non-federal users to be authorized by rule, with technical rules consistent from 37-39 GHz
• Fed and non-fed users to access the band by registering individual sites through a coordination mechanism to be jointly developed
Spectrum Frontiers Proceeding

37-37.6 GHz Sharing – Developing the Coordination Framework

• Traditional or static coordination mechanism?
• Use existing or new tools?
• More dynamic coordination – centralized or decentralized?
• Can it evolve from an initial approach to a more complex framework as technology matures?
Spectrum Frontiers Proceeding

Further Notice of Proposed Rulemaking Bands

- 24.25-24.45 GHz
- 24.75-25.25 GHz
- 31.8-33.4 GHz
- 42-42.5 GHz
- 47.2-50.2 GHz
- 71-76 GHz
- 81-86 GHz
- Bands above 95 GHz
Where Do We Go From Here?

• Establish and evolve various sharing frameworks – federal/non-federal, terrestrial/satellite
• R&D to help fill the technical gaps (e.g. improved propagation modeling) to better inform policy decisions and sharing frameworks
• Continue study of the additional bands in the Spectrum Frontiers proceeding
• Better understand opportunities to further technology alignment for different use cases? Dual-use technologies?
• Increases in sharing must be accompanied by effective enforcement – how will it evolve? Automated?
• Address network and cyber security risks
Thank You!

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