



# Tutorial: Millimeter Waves from a Regulatory and Policy Perspective

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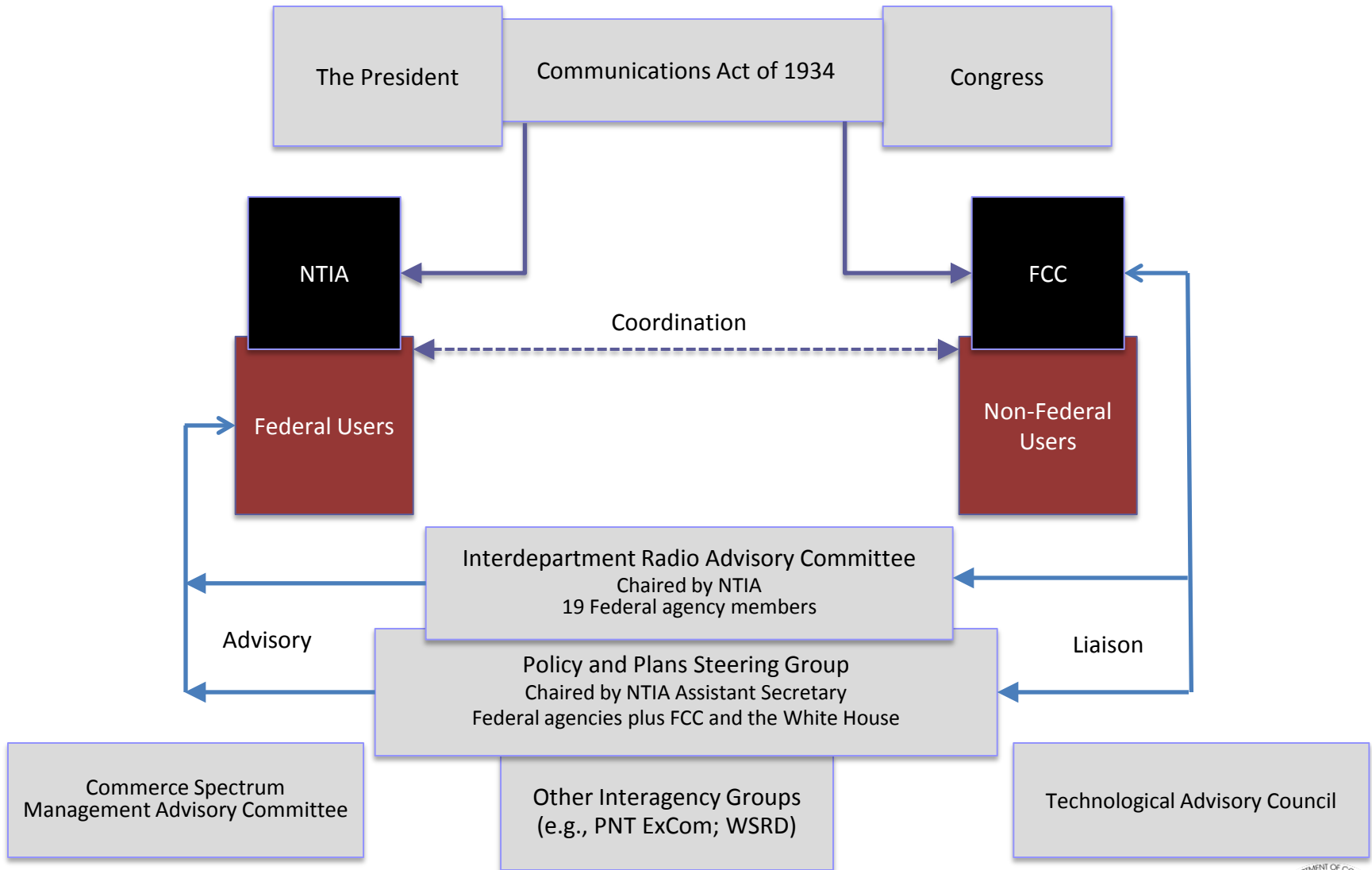
# Outline

- 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?

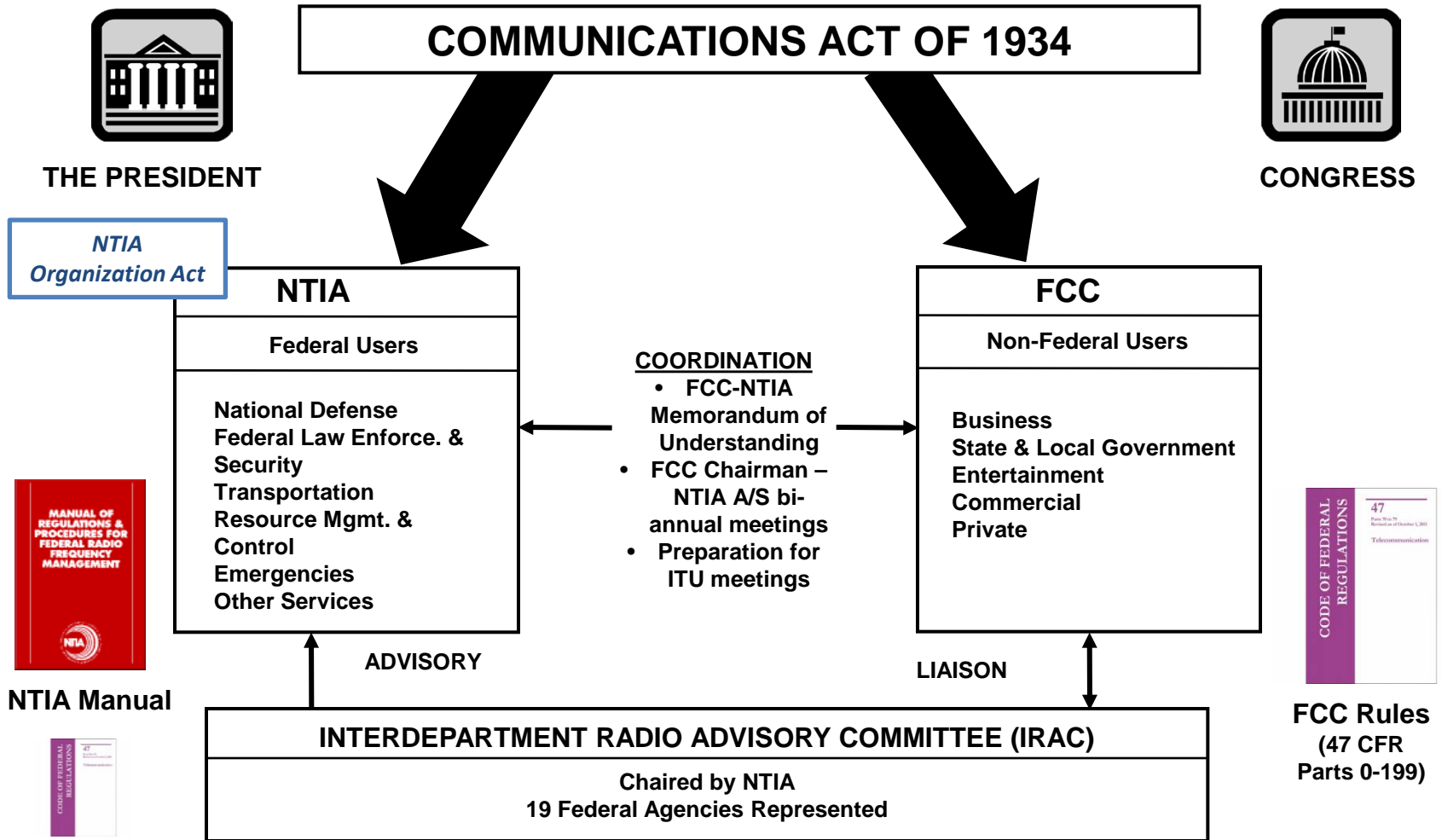
# Why Millimeter Wave?

- 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



# National Spectrum Management



47 CFR  
Part 300

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



# *Spectrum Frontiers* Report and Order

## **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

# *Spectrum Frontiers* Report and Order

## **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

# *Spectrum Frontiers* Report and Order

## **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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