CSMAC UWB Subcommittee Report

December 22, 2022

Overview: NTIA's Charge to the Subcommittee

- An increasing number of wireless devices employ Ultra-Wideband (UWB), a radio-based communication technology for short-range data transmission, mainly using pulse or impulse modulated waveforms. UWB is often used in location and distance measurements. Since the inception of the rules, an increasing number of wireless devices are employing UWB at higher frequency ranges. The NTIA Redbook mirrors the FCC's rules for Ultra-Wideband. With greater UWB use, more potential users have approached the FCC with waiver requests, which are then coordinated between FCC and NTIA.
- NTIA is increasingly concerned that while a single waiver request may address a minor deviation from the UWB rules, when taken in aggregate, the waiver requests may result in de facto changes to the UWB rules that can potentially impact federal users.

Note: This report does not consider the issue of protecting non-Federal incumbents. This is an important issue but was not within the scope of the questions presented to the subcommittee by NTIA.

Questions Presented by NTIA

- What recommendations can the CSMAC make for NTIA to consider in terms of potential modifications to the UWB rules that would increase usage while adequately protecting incumbent services, including critical federal systems? As an initial matter, is it possible to make changes to the rules governing UWB operation in federal government bands without the FCC making similar changes to its rules or would any changes need to be made in coordination with the FCC? What areas of minor potential changes could be explored such as power limits, definitions, or application categories, including harmonizing to many international regulations? Could NTIA modify some restrictions or include new ones or expand existing frequency bands?

UWB Subcommittee

- Reza Arefi
- Hilary Cain
- Michael Calabrese
- Tom Dombrowsky
- Mark Gibson
- Dale Hatfield
- Paul Margie (Co-Chair)
- Karl Nebbia
- Dennis Roberson (Co-Chair)
- Mariam Sorond
- Bryan Tramont
- Jennifer Warren

- Edward Drocella (NTIA Sr. Principal Contact)
- April Lundy (NTIA Principal Contact)
- Jennifer Manner (CSMAC Co-Chair)
- Jessica Quinley (FCC Liaison)
- Charla Rath (CSMAC Co-Chair)
- Antonio Richardson (Designated Federal Officer)

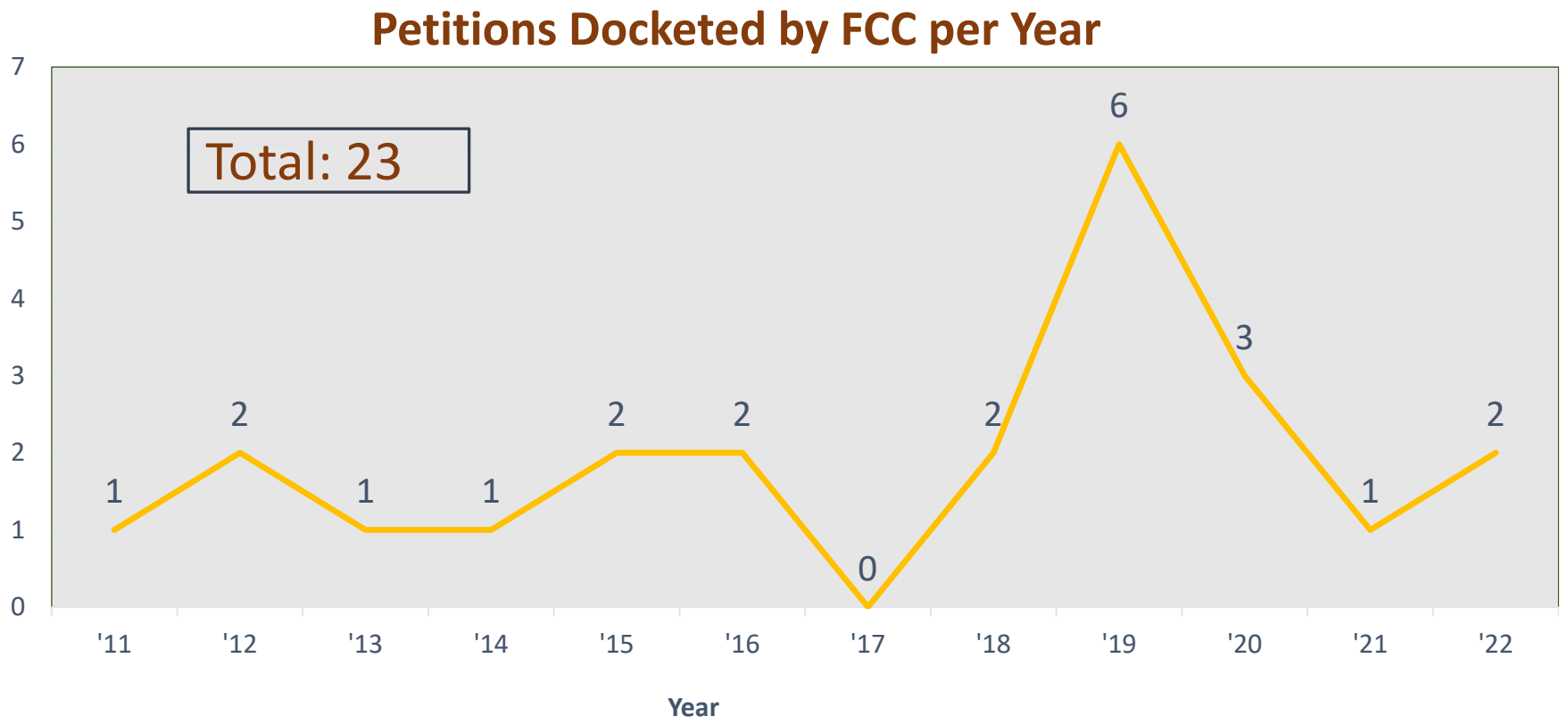
12 Meetings Held / SME Presentations

- UWB Alliance – Tim Harrington
- Fira - Dries Neirynck
- NXP - Riku Pirhonen
- ETSI, CEPT/EU - Dr. Michael Mahler
- UWB Waiver Research – Stacey Weber
- UWB Waiver IRAC Coordination – Ed Drocella

UWB Waivers Petitions Landscape 2012 – 2022

Basic Data
Characteristics
Trends

Basic Data on Waiver Requests



Basic Data

Rules Waivers Most Often Address

Rule	Area of Focus
15.31	Frequency sweep stepped requirement - RFD measurement standards
15.503(d)	UWB transmitter definition
15.519	Transmission length, emissions (handheld UWB systems)
15.521(d)	Emission limits & measurements (all UWB devices)
15.525	UWB coordination requests

Characteristics of UWB Technologies at Issue in Waivers

Safety & Infrastructure

- Construction
- Building inspection
- Highways/bridges
- Threat detection

Medical Uses

- Imaging/diagnostic devices
- Body-worn devices
- Environmental safety

Consumer Products

- Vehicles/autonomous vehicles
- Door locks
- Other (e.g., autonomous lawnmower)

Waiver Trends

- 2-4 waiver requests/year; slowly increasing
- Rule amendments/pressure
- FCC considers whether a waiver is similar to an already-granted waiver
- Limited but consistent opposition
- Rise of IoT/consumer devices
- Most waiver requests include geographic limits and/or limits on number of devices

Background and Subcommittee Observations

- There has been substantial change in UWB use cases since FCC adopted rules
  - FCC initially expected UWB would be used for communications/wireless networking technology, as well as for wall/ground penetrating devices.
    - Today, low-power, secure, precision location and sensing-related applications are driving UWB innovation, not communications and wireless networking.
    - Wall/ground penetrating devices remain important.
- FCC rules have not changed, but technology, the direction of innovation, and use cases have changed—leading to waiver requests
  - Waiver requests create substantial resource challenges for NTIA.
  - Waiver process creates substantial delay and uncertainty for the UWB industry.
- UWB device volume has grown substantially—this happened far slower than expected but is now here
- European UWB use is much greater, and the regulatory environment is much different than that of the U.S.

UWB Waivers: Numbers and Challenges

- UWB industry experience:
  - UWB companies find the FCC/NTIA waiver process opaque and complex, especially for start-up companies.
  - Waiver applicants report delay, confidentiality, and information request challenges.
  - UWB device and system providers would prefer an FCC rulemaking to the current waiver approach.
- NTIA experience:
  - NTIA finds the information in the waivers often insufficient to assess impact on federal users.
  - UWB waivers are more complex (see next slide)
  - The number of agencies involved given the frequency bands covered also adds to the complexity.
  - NTIA gets little notice from FCC before a coordination request arrives.

Technology Shift Based UWB Waiver Requests

- Use of fixed infrastructure (or even temporary or nomadic infrastructure)
  - E.g., perimeter identifiers, active rail line infrastructure.
- Outdoor operations
  - E.g., external building door locks.
- Increased power levels
  - Indoor, but also Outdoor.
- Alternative waveforms
  - Studies focused on impulse vs. new requests for swept and stepped waveforms.
- Ground penetrating UWB
  - Currently restricted to official uses by government agencies.
  - Desire is for broad scale commercial use.

Enforcement

- The nature of UWB signals raise important questions about enforcement.
- The “software-ization” of radio function makes the enforcement challenge greater—including making type certification more complex.
- NTIA, in coordination with the FCC, should investigate the challenges of enforcement of current and future UWB rules and their role in ensuring the reliability of government systems.

Proposals

1. Recommendations for NTIA
2. Best practices for UWB waiver applicants
3. Collaboration between NTIA and UWB groups to identify a set of generic tests and technical work to support future waiver requests

Recommendations for NTIA

- NTIA / FCC collaboration on UWB waiver process
  - E.g., FCC should provide quarterly “preview” listing and prioritization of active UWB waiver requests – the new NTIA/FCC MOU is important and could accommodate this information sharing.
- NTIA should provide guidance on federal use characteristics that UWB waiver applicants can use to compose technical studies and improved waiver requests
  - NTIA should lay out what characteristics it needs in a waiver request to perform its analyses.
  - NTIA should extend its Spectrum Compendium at least to 12 GHz to assist in the assessment of UWB waiver requests and to inform applicants in advance of filing.
  - NTIA should make available publicly for UWB developers’ information regarding the UWB techniques or levels that NTIA would find acceptable in federal bands under waivers.
- NTIA should identify a set of waiver characteristics that are associated with lower risk and therefore can receive expedited treatment—this will reduce the burden on both NTIA and federal agency resources
  - E.g., waivers that include geographic limits or limitations on number of devices should expect a lower risk of delays or denials.
- NTIA should identify a set of waiver characteristics that are associated with higher risk requests and where NTIA will need to concentrate its review and analysis and where those providing waiver requests should expect delays or denials.
- NTIA should put in place a process to track whether any changes resulting from these recommendations produce better outcomes and/or address NTIA’s concerns.

Best Practices by UWB Waiver Applicants

- Applicants should meet with NTIA early in the process rather than waiting until FCC seeks interagency coordination
- Based on this discussion, applicants should prepare a technical report on the potential impact of requested waiver on federal users
- Applicants should consider NTIA-identified items that will likely delay waiver approvals if included in the waiver application
- Applicants that can demonstrate that the proposed system will result in no greater impact on incumbent systems than systems complying with the existing regulations should expect a lower risk of delay or denial

Recommendations for NTIA / FCC / UWB Industry Collaboration

- NTIA should work with industry groups to identify a set of generic industry studies that would provide better information/tools to NTIA when it reviews future waiver applications.
- NTIA should work with industry groups to identify a limited set of discrete changes to FCC's rules where general waivers have already been issued, or otherwise demonstrate that this limited set of changes would not negatively impact federal users with the goal of updating the rules and reducing need for waivers.