



Spectrum Proceedings Update



Federal Communications Commission
United States of America

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Note: The views expressed in this presentation are those of the author and may not necessarily represent the views of the Federal Communications Commission



Citizens Broadband Radio Service (CBRS)

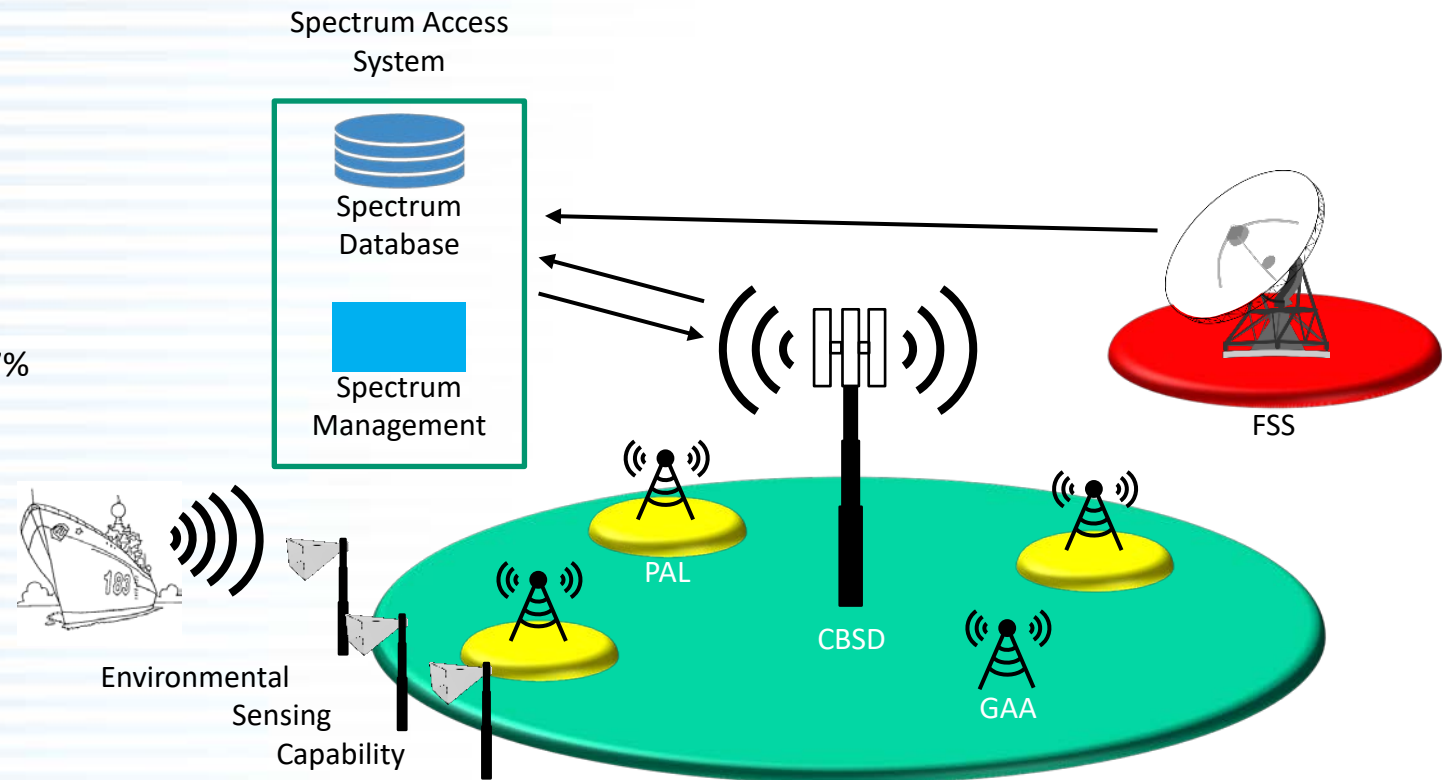


3.55-3.7 GHz Band (CBRS Band)

GN Docket No. 12-354 (3.5 GHz), 15-319 (SAS/ESC), Docket 17-258 (October 2018 R&O)

- **Sharing 150 MHz in 3550-3700 MHz for flexible use between mobile broadband, incumbent DoD Radar, and Commercial FSS.**

- Dynamic sharing since January 2020
- Protected Area Licensees and General Access Licensees operating throughout U.S.
- NTIA Usage Study (May 2023)
 - As of January 2023, almost 300,000 CBSDs deployed
 - Deployments grew at 12% quarterly rate
 - GAA is predominant, but PAL devices grew at 17% quarterly rate
 - Most usage in rural census blocks
- Growing device market (30 August 2024)
 - 283 certified CBSDs
 - 853 certified end user devices
- Innovative use cases
 - Private networks
 - Neutral hosts (expanding indoor coverage)
 - IoT
 - 5G





Enhancing CBRS

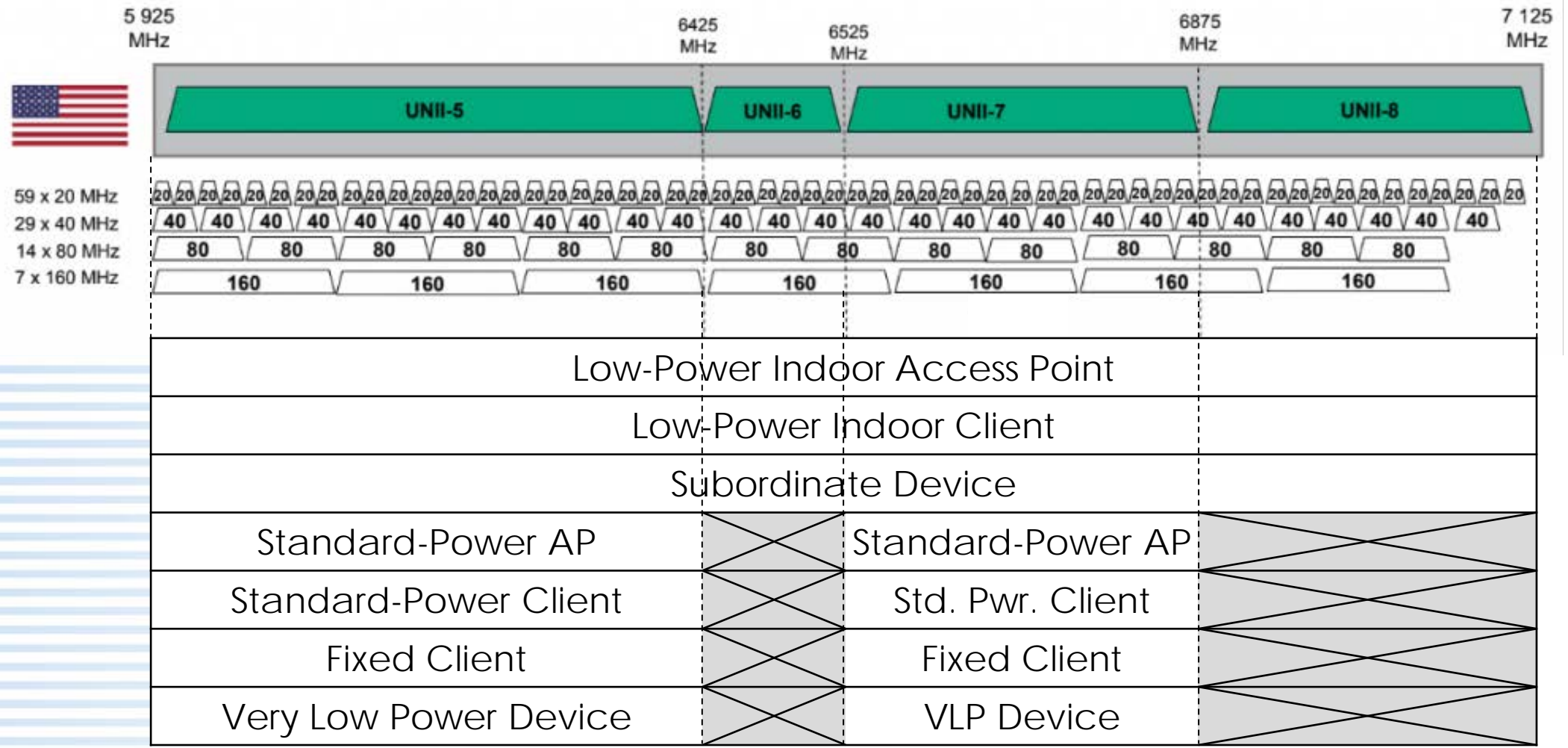
- FCC released Notice of Proposed Rulemaking August 2024 – seeks to preserve and enhance CBRS and seeks comment on service rule improvements; Comments: October 7; Replies: November 5
 - Codifying Dynamic Protection Areas (DPAs)
 - Coastal
 - Portal activated – to protect test and training ranges
 - Always activated – to protect ground-based radar sites
 - Codify use of on-line Telecommunications Advanced Research and Dynamic Spectrum Sharing System (TARDyS3) as replacement for manual system
 - Codify updated propagation model – takes advantage of better clutter modeling to ensure uninterrupted service to inland service areas
 - Alternate approaches to areas outside contiguous U.S. (where ESC sensors may not be easily deployed)
 - CBSD information reporting
 - Seeks comment on whether different information should be collected and reported
 - Out of Band Emission Limits
 - Should OOB limits better align with the OOB limits in adjacent bands?
 - EIRP Limits
 - Should there be another device class with higher radiated limits commensurate with limits in adjacent bands?
 - SAS Connectivity
 - Could some requirements be relaxed in certain situations (e.g., for NFL football games and similar events – consistent with FCC issued waivers)
 - TDD Synchronization
 - Private network and low power indoor facilities
 - GAA coexistence



6 GHz Unlicensed Devices - VLP

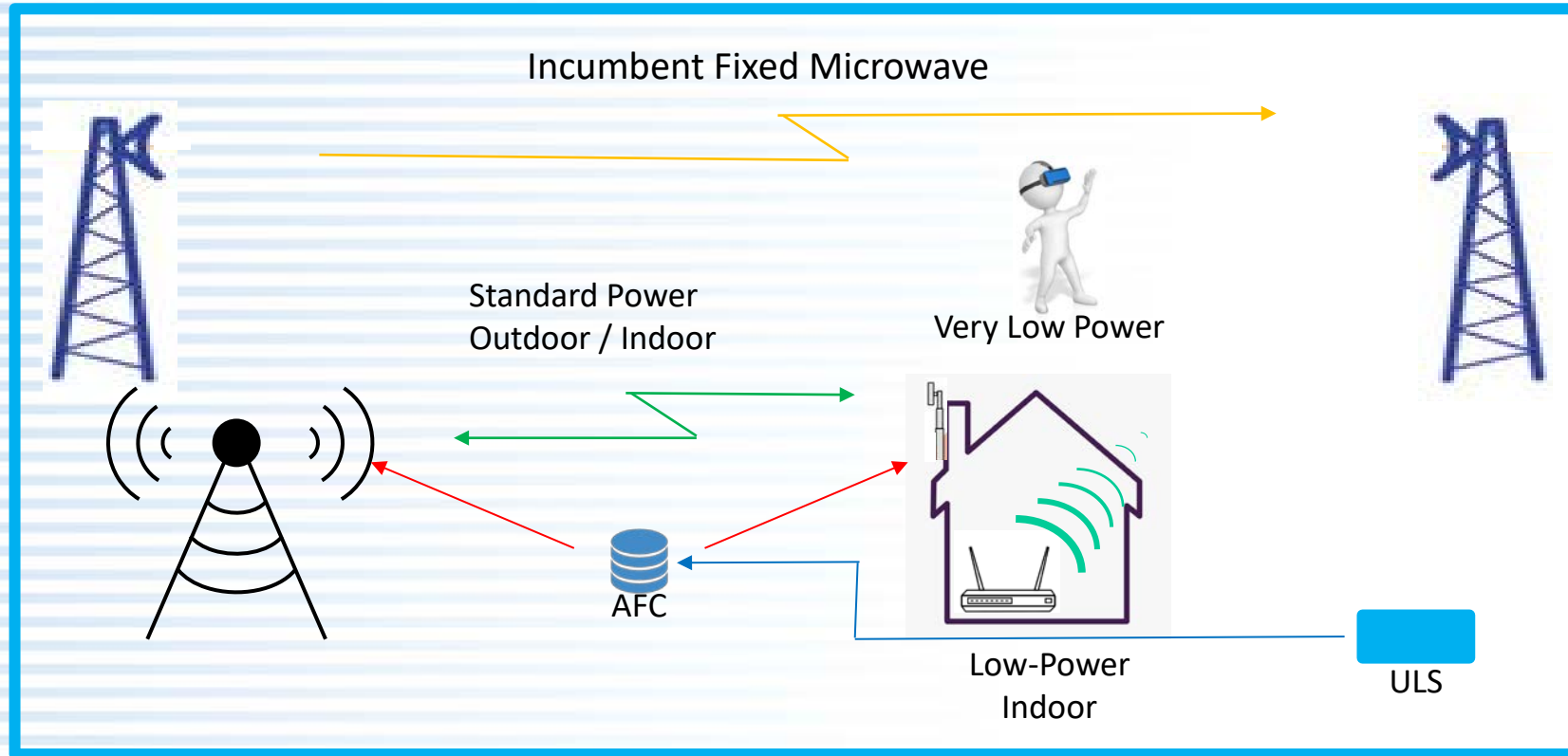


6 GHz Band Overview





6 GHz Band Basic Concept



Standard-Power Access Point: limited to U-NII-5 & 7 (avoids operation in bands with mobile services), can operate outdoors and must be under the control of an Automated Frequency Coordination system (i.e., database)

Low-Power Indoor Access Point: can operate throughout entire 1200 megahertz, but is limited to indoor usage (takes advantage of building attenuation to enable co-existence)

Very Low Power Device: limited to U-NII-5 & 7, can operate outdoors without AFC, but limited to lower power level



Technical & Operational Rules Overview

Device Class	Operating Bands	Maximum EIRP	Maximum EIRP Power Spectral Density	Out-of-Band Emissions at Band Edges (Below 5.925 GHz) (Above 7.125 GHz)
Standard-Power Access Point and Fixed-Client Devices (AFC Controlled)	U-NII-5 (5.925-6.425 GHz) U-NII-7 (6.525-6.875 GHz)	36 dBm	23 dBm/MHz	-27 dBm/MHz EIRP
Client Connected to Standard-Power Access Point		30 dBm	17 dBm/MHz	
Low-Power Access Point (indoor only) and Subordinate Devices	U-NII-5 (5.925-6.425 GHz) U-NII-6 (6.425-6.525 GHz) U-NII-7 (6.525-6.875 GHz) U-NII-8 (6.875-7.125 GHz)	30 dBm	5 dBm/MHz	
Client Connected to Low-Power Access Point		24 dBm	-1 dBm/MHz	
Very Low Power Device	U-NII-5 (5.925-6.425 GHz) U-NII-7 (6.525-6.875 GHz)	14 dBm	-5 dBm/MHz	

Maximum EIRP is based on a 320-megahertz wide channel; power density limits EIRP for other channel bandwidths



VLP Devices

● Technical and operational rules

- Integrated antenna required
- Must prioritize operations above 6105 MHz prior to operating between 5925 MHz and 6105 MHz
 - Protects C-V2X vehicular operations in 5895-5925 MHz
- Must incorporate transmit power control (TPC) capable of operating at least 6 dB below maximum power
- Operation prohibited on Oil Platforms
- Operation is permitted in vehicles
- Operations is permitted in U-NII-5 in large aircraft when above 10,000 feet
- No fixed outdoor infrastructure permitted

● Additional work

- Report and Order on circulation that would expand VLP devices into the U-NII-6 and U-NII-8 bands
- Commission proposed permitting higher power VLP devices using geolocation and exclusion zones to protect incumbent operators



5 GHz UAS



5030-5091 MHz – Uncrewed Aircraft Systems (UAS)

- Report and Order adopted August 2024
 - Initial phase – non-networked access (NNA); i.e., line-of-sight UAS
 - Only control-and-non-payload communications (CNPC) links permitted
 - New Part 88 for UAS frequency assignments and service rules in 5 GHz band
 - Definition (consistent with FAA): UAS is a UA and its associated elements (including an uncrewed aircraft station, communication links, and the components not on board the UA that control the UA) that are required for the safe and efficient operation of the UA in U.S. airspace
 - Access controlled by database – Dynamic Frequency Management System (DFMS)
 - Must have nationwide capability
 - Must have capability for assigning use across entire 5030-5091 MHz range
 - 10-megahertz block at 5040-5050 MHz designated for NNA UAS; interim placement pending additional study
 - Away from edges protects adjacent band services
 - 20-megahertz at 5040-5060 MHz permitted for use until DFMS are certified; interim access mechanism
 - Simple registration process
 - Technical requirements
 - RTCA DO-362A standard's equipment and operational performance requirements
 - Power, bandwidth, TDD, out-of-band emission limits
 - Time division duplexing required
- Networked operations for beyond LOS operations to be considered in a future Order

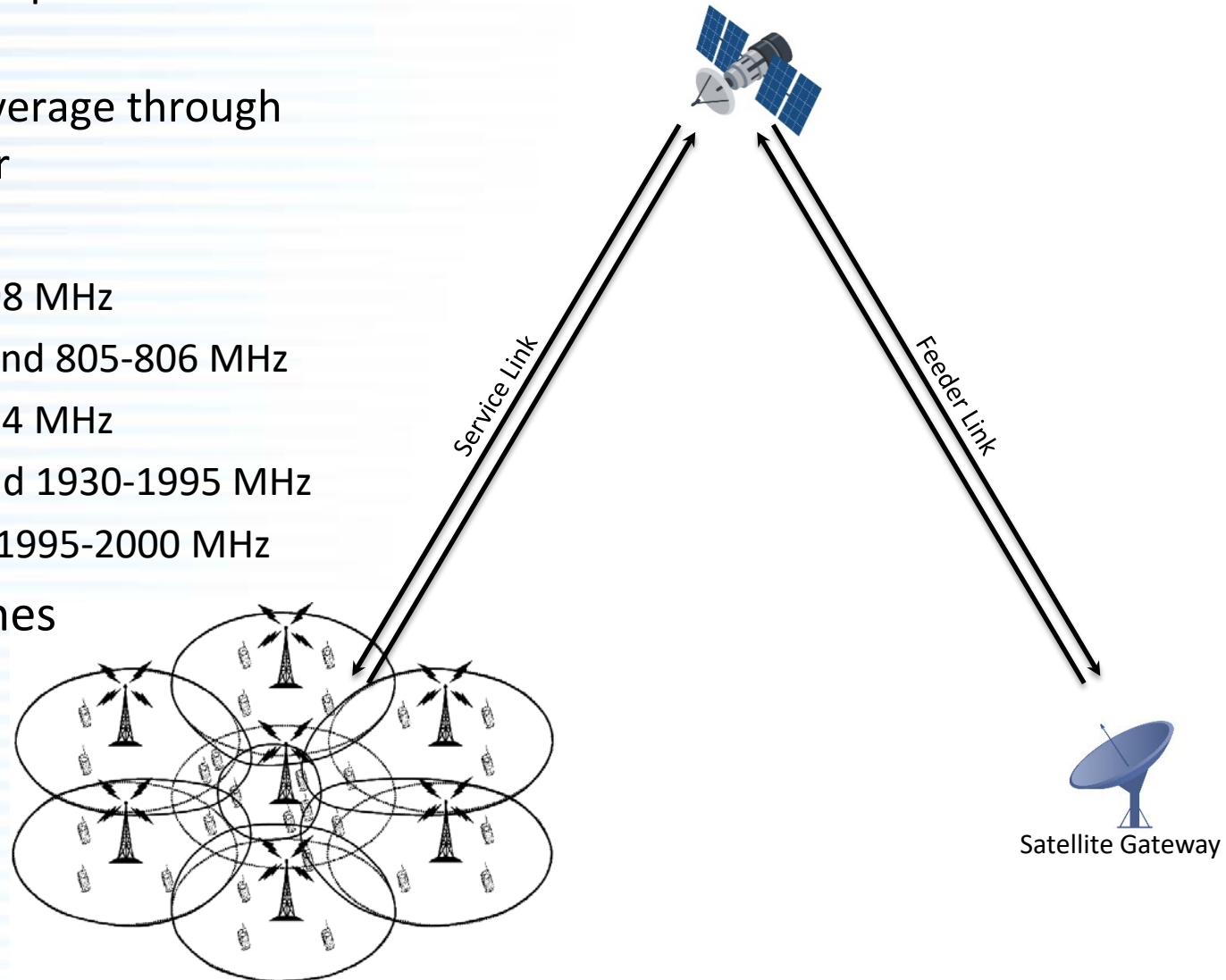


Direct-to-Device Satellite Communications



Supplemental Coverage from Space

- Rules adopted March 2024 – First steps towards single network future
- Terrestrial licensees can expand coverage through collaboration with satellite operator
- Mobile Satellite Allocation added:
 - 600 MHz: 614-652 MHz and 663-698 MHz
 - 700 MHz: 698-769 MHz, 775-799, and 805-806 MHz
 - 800 MHz: 824-849 MHz and 869-894 MHz
 - Broadband PCS: 1850-1915 MHz and 1930-1995 MHz
 - AWS H-Block: 1915-1920 MHz and 1995-2000 MHz
- No modifications to mobile phones
- Limited to licensees holding all licenses within a geographic independent area
- Ongoing work to ensure radio astronomy sites are protected





SCS - Continued

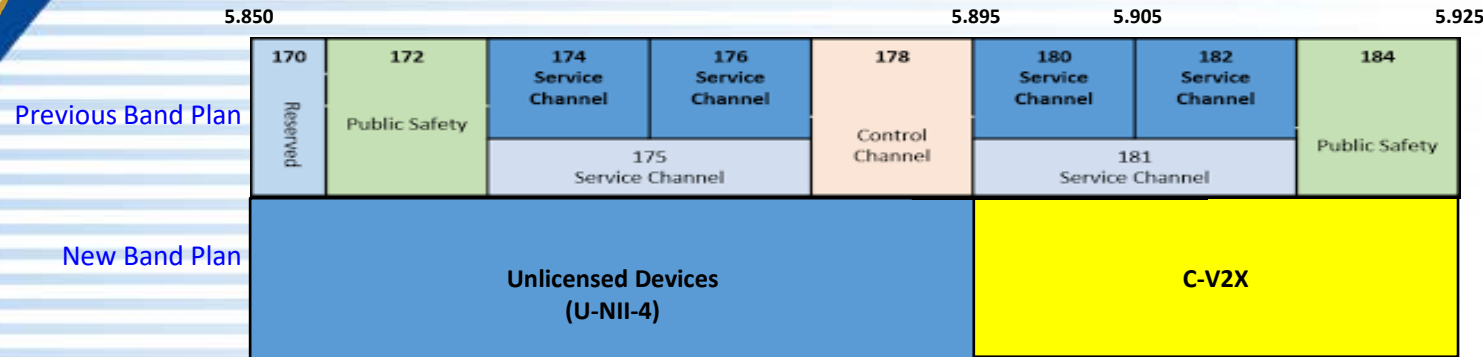
- Technical rules to protect terrestrial users from harmful interference from satellite transmissions
 - Aggregate out-of-band emissions PFD limit: $-120 \text{ dBm/m}^2/\text{MHz}$
 - Field strength limit at Earth's surface – consistent with terrestrial limits
 - Limits in-band power / accommodates various orbit altitudes
 - Protects adjacent service areas, including international borders
 - $40 \text{ dB}\mu\text{V/m}$ below 1 GHz
 - $47 \text{ dB}\mu\text{V/m}$ above 1 GHz
 - International borders are protected under No. 4.4 of the ITU Radio Regulations
 - Radio astronomy concerns addressed on a per application basis
- Further Notice of Proposed Rulemaking
 - Seeks information on requirements for routing emergency calls (e.g., 911)
 - Is it technically feasible to route to a local PSAP?
 - Are any rule changes or coordination requirements necessary to protect radio astronomy services?



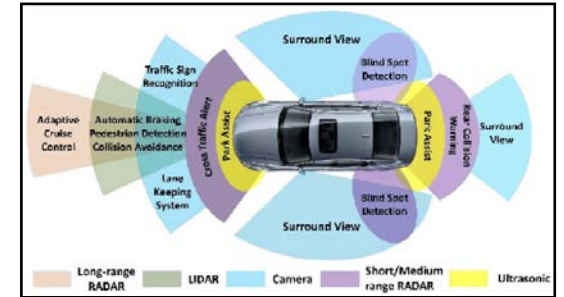
5.9 GHz Band – C-V2X



Unlicensed devices in 5.9 GHz



Sensors & Comm. Equipment on Cars Today



- Rules effective July 2, 2021
 - July 5, 2022, transition date for existing DSRC systems to vacate the lower portion of the band
- Decision upheld in court
- Further Notice
 - Technical rules and transition timeline for C-V2X
 - How to protect incumbent federal radiolocation sites
- August 2021 Actions
 - Lifted filing freeze for new DSRC systems in 5.895-5.925 GHz band
 - Waiver guidance for early transitions to C-V2X
- Waivers for early transition to C-V2X pending
 - Three rounds of waivers issued since April 24, 2023, for certain car companies, State DOTs and equipment manufacturers to obtain equipment certification and operate C-V2X equipment in the upper 20 megahertz
 - Ongoing work on additional waiver requests



5.9 GHz Band – Ongoing Work

- Second Report and Order – on circulation with Commission
 - Codify final C-V2X technical and service rules
 - Generally consistent with parameters in existing waivers
 - Waiver recipients would not have to make changes to currently deployed systems
 - Channel Plan
 - Three 10-megahertz channels that can be used individually or combined to 20 megahertz or 30 megahertz channels
 - Power limits
 - RSU: 33 dBm
 - OBU (generally):
 - » Upper 20 megahertz: 33 dBm except 27 dBm EIRP within 5 degrees of horizontal
 - » Lower 10 megahertz: 23 dBm
 - Optional geofencing for OBUs
 - Permits higher power when operating outside federal radar protection zones – 33 dBm on all channels
 - Out-of-band emission limits
 - Message prioritization for safety of life communication
 - Two-year sunset period for existing DSRC systems



Wireless Multi-Channel Audio Systems (WMAS)



WMAS

- FCC adopted a Report and Order February 15, 2024
 - WMAS - wireless audio transmission systems using broadband digital transmission techniques for microphone and in-ear monitor system applications and other multichannel audio use

 - Licensed WMAS
 - Permitted in most bands where wireless microphones can already operate; including UHF-TV, VHF-TV, 600 MHz band duplex gap, 1.4 GHz, 6 GHz, and 7 GHz
 - Maximum permitted bandwidth:
 - TV bands: 6 megahertz and must stay within a single TV channel to enable coexistence with narrowband microphones
 - Other bands: 20 megahertz
 - Spectral efficiency requirement
 - Must have an operational mode capable of providing at least three audio channels per megahertz
 - Power levels
 - Consistent with existing microphone requirements
 - » VHF-TV band: 50 milliwatts EIRP
 - » UHF-TV band and 1.4 GHz band: 250 milliwatts conducted
 - » 600 MHz band duplex gap: 20 milliwatts conducted
 - » All other bands: 1 watt conducted
 - Emission mask
 - Required to comply with the emission mask and spurious emission limits in ETSI EN 300 422-1 V2.2.1 (2021-11)
 - Also, updated rules for narrowband microphones to comply with ETSI EN 300 422-1 V2.2.1 (2021-11)



WMAS (cont'd)

- Unlicensed WMAS
 - Permitted in VHF-TV, UHF-TV, and 600 MHz duplex gap
 - Limited to 6 megahertz bandwidth and must be contained within a single TV channel
 - Spectral efficiency requirement is same as for licensed WMAS
 - Power levels
 - If bandwidth is up to 1 megahertz: 50 milliwatts EIRP
 - If bandwidth is greater than 1 megahertz: 100 milliwatts EIRP
 - Emission mask is same as for licensed WMAS

- Erratum issued October 8, 2024
 - Non-substantive modifications to the amendatory text and certain codified text to conform to federal register publishing conventions

- Rules are expected to be published in the federal register soon



National Spectrum Strategy



National Spectrum Strategy

- Issued by the Administration on November 13, 2023
 - Developed by NTIA in close coordination with FCC
- Intended to guide spectrum allocation decisions and ensure decisions are made through a rigorous, transparent process
- Pillar 1 - A Spectrum Pipeline to Ensure U.S. Leadership in Advanced and Emerging Technologies
 - 2,786 megahertz of spectrum to be studied for potential repurposing
- Pillar 2 - Collaborative Long-Term Planning to Support the Nation's Evolving Spectrum Needs
 - Develop robust processes that incorporate input of industry stakeholders, federal agencies, and advisory groups in spectrum allocation decisions
- Pillar 3 - Unprecedented Spectrum Access and Management Through Technology Development
 - Advance research, create investment incentives, and set forth measurable goals to advance spectrum access technology through test-beds and increased R&D
- Pillar 4 - Expanded Spectrum Expertise and Elevated National Awareness
 - Implement a national spectrum workforce plan and educate policymakers and the public
- Implementation plan released March 12, 2024 and work has begun!



5G Spectrum Strategy



3.7 GHz (3700 MHz)

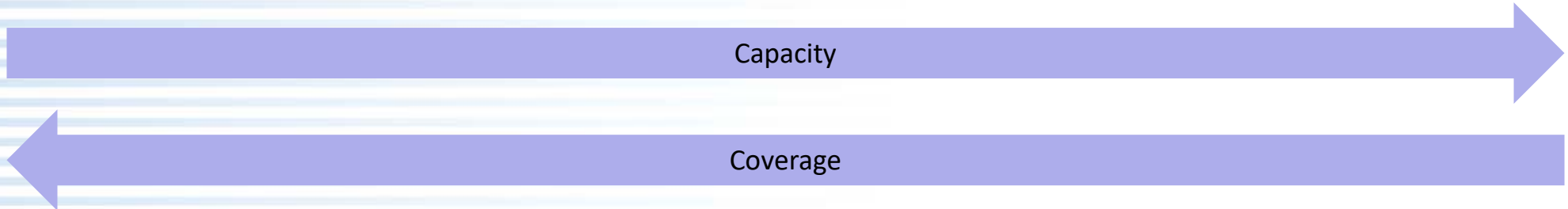
24 GHz

600 MHz – Incentive auction
 700 MHz
 800 MHz
 900 MHz

2500 MHz – Broadband Radio Service
3.1-3.45 GHz – Under study
 3.45-3.55 GHz – Auctioned
 3.55-3.7 GHz – CBRS (auctioned)
 3.7-3.98 GHz – C-Band (auctioned)
5.03-5.091 GHz – Designated for UAS; Under study
7.125-8.4 GHz – Under study
 12.2-12.7 GHz – Proposal to expand FS
 12.7-13.25 GHz – Proposed rules
18.1-18.6 GHz – Under study

24 GHz - auctioned
 26 GHz – under study
 28 GHz – auctioned
 37 GHz - auctioned
37-37.6 GHz shared fed/non-fed; Under study
 39 GHz - auctioned
 47 GHz - auctioned
 42 GHz – Proposed rules
 50 GHz - under study

Note: Bands depicted in red are designated for study in the National Spectrum Strategy



Current focus is on expanding access to mid-band spectrum



Thank You!