



FCC Regulatory Update



Nicholas Oros, Deputy Chief
Policy and Rules Division
Office of Engineering and Technology

Federal Communications Commission
United States of America

Committee on Radio Frequencies
May 29, 2024

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



Supplemental Coverage From Space (SCS)

- Report and Order and Further Notice of Proposed Rulemaking adopted March 14, 2024
- Permits terrestrial licensees to expand coverage to subscribers through a collaboration (lease arrangement) with a satellite operator
 - Adds MSS allocation to flexible use bands that currently do not have a satellite allocation
 - 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
 - Allows NGSO MSS licensees to modify licenses to access terrestrial spectrum, if:
 - Application on file for MSS licensee to lease terrestrial exclusively licensed spectrum; and
 - Terrestrial licensee holds all co-channel licenses in a band throughout a geographically independent area (e.g., contiguous U.S., Hawaii, Alaska); and
 - Terrestrial licensee has a part 25 blanket earth station license covering all subscribers' terrestrial devices that may provision SCS
 - Limited to 6 geographically independent areas (GIA)
 - CONUS; Alaska; Hawaii; American Samoa; Puerto Rico/U.S. Virgin Islands; Guam/Northern Mariana Islands
 - Only a single terrestrial licensee that holds all licenses or multiple terrestrial licensees that collectively hold all licenses in a GIA may provide SCS



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
 - Are any rule changes or coordination requirements necessary to protect radio astronomy services?
 - Seeks information on requirements for routing emergency calls (e.g., 911)
 - Is it technically feasible to route to a local PSAP?
- SpaceX has experimental license to test in 25 locations using 1910-1915 MHz and 1990-1995 MHz bands.
- AT&T has agreement with AST SpaceMobile for SCS.



Spectrum Allocation for Non-Federal Space Launch Operations

- September 2023 – Second Report and Order and Second Further Notice of Proposed Rulemaking
- Allocations
 - 2025-2110 MHz – Secondary space operations (earth to space) allocation
 - Telecommand use for pre-launch testing and space launch operations
 - 2200-2290 MHz – Secondary space operation service (space-to-Earth) and mobile service
 - Telemetry use for pre-launch testing and space launch operations
- Permissible operations
 - Prelaunch testing, such as pre-flight checks, ground testing, and telemetry
 - Vehicle tracking, including transmitting data from a launch vehicle to ground
 - Telecommand for propulsive maneuvering and separation of payload from launch vehicle
 - Telecommand for propulsive maneuvering of a reentry vehicle for return and recovery
- Frequencies are shared and use must be coordinated
- Technical rules (bandwidth, power, out-of-band emissions) adopted
- Second Further Notice seeks comment on additional allocations to encompass manned and unmanned spacecraft, use of 2360-2395 MHz band during space launches.



3.1-3.45 GHz Band

- DoD released the Emerging Mid-Band Radar Spectrum Sharing (EMBRSS) report in September 2023.
- Report concludes that 5G commercial systems cannot operate in the same frequency band at the same time as Federal government systems without unacceptably degrading the capability of the government systems.
- Report states that developing a dynamic sharing system presents a possible solution but must be proven through rigorous testing.
 - Expand the existing CBRS sharing framework
 - DoD should maintain regulatory primacy
 - Establish interference safeguards
 - Even with such a system, sharing will be challenging.
- This band will be subject of sharing study to be jointly conducted by NTIA and DoD as part of the NSS implementation plan.
 - In addition to Federal/non-Federal sharing will also study 1) moving systems out of band; 2) compressing frequency range within the band; 3) Additional Federal access below 3.1 GHz; 4) Any other mechanism to permit expanded use of spectrum.
- Partnering to Advance Trusted and Holistic Spectrum Solutions (PATHSS) Task Group being reconstituted for new study
 - Forum for industry and the Defense Department to exchange information on current and projected military and commercial requirements in these bands
 - The group identified and developed use cases based on a shared understanding of federal and commercial needs
 - Various options for mitigating interference and coexisting are under consideration
 - Extensive modelling efforts



70/80/90 GHz Bands

Report and Order & Further Notice of Proposed Rulemaking adopted January 2024 (WT Dkt. No. 20-133)

- Current use: P2P Links (Nationwide non-exclusive license; each link coordinated and registered); FSS; Radio Astronomy above 76 GHz
- Permits point-to-point links to endpoints in motion (i.e. aircraft and ships) in 70 GHz and 80 GHz
- Air-ground links
 - Required separation distances from federal earth stations (10 km) and radio astronomy facilities (150 km)
 - Minimum elevation angle (5°) to protect terrestrial operations
- Air-air links
 - Stringent out-of-band emission limits to protect passive services
 - Lower power within 375 km of certain military installations
 - Limited to between 10,000 and 50,000 feet above ground level
 - Minimum slant distance---aircraft at different altitudes (50 km)
- Maritime
 - Shore to ship or aerostat in 70 GHz band; Ship to shore in 80 GHz band
 - Ship to ship only permitted when at least 30 km from shore or when pointing at least 15° away from shore
 - Ship and aerostat required 150 km separation distance from federal facilities
- Relaxation of P2P Antenna Requirements
 - Reduces minimum antenna gain from 43 dBi to 38 dBi
 - Reduces co-polar and cross-polar antenna discrimination requirements
- Further Notice
 - Whether to permit ship to aerostat communications links





42-42.5 GHz Band

- Notice of Proposed Rulemaking adopted June 2023
- Seeks comment on three shared licensing approaches:
 - A nationwide non-exclusive licensing approach, in which licensees would apply for such a license with the Commission, and then coordinate and register specific deployment sites with a third-party database;
 - A site-based licensing approach, in which licensees would apply for each deployment site directly with the Commission; and
 - A technology-based sensing approach, in which operators would employ certain technologies to avoid harmful interference from one another without the use of a registration database.
- Seeks comment on potential coordination mechanisms, first-in-time protections, buildout requirements, and technical rules.
- Proposes to license the 42 GHz band as five 100 megahertz channels.
- Proposes to protect radioastronomy in adjacent 42.5-43.5 GHz band
 - Power flux density limit of $-227 \text{ dBW/m}^2/\text{Hz}$ over 42.5-43.5 GHz and $-210 \text{ dBW/m}^2/\text{Hz}$ over any 500 kHz channel in band at Haystack, Greenbank, and Very Large Array
 - Power flux density limit of $-175 \text{ dBW/m}^2/\text{Hz}$ at Very Long Baseline Array over 42.5-43.5 GHz.



12.2-12.7 GHz Band

- 12 GHz band is 500 megahertz of mid-band spectrum between 12.2-12.7
- Currently supports Direct Broadcast Satellite downlink, Non-geostationary Satellite Operations and Multichannel Video Distribution and Data Service (MVDDS) (one-way)
- Report and Order and Further Notice of proposed rulemaking adopted May 2023
 - Declines to authorize two-way, high-power terrestrial mobile operations
 - Seeks comment on permitting additional flexibility to deploy one-way point-to-point or point-to-multipoint links
 - Seeks comment on permitting two-way point-to-point links
 - Seeks comment on permitting indoor-only underlay or unlicensed use





12.7-13.25 GHz Band

- Notice of proposed rulemaking and Order adopted May, 2023
- Currently allocated for primary fixed, mobile, & FSS
 - Use includes Fixed point-to-point links, Mobile TV pickup, FSS uplinks
 - Limited federal use: NASA deep space receive only earth station; DoD leased commercial FSS
- Proposes to:
 - Repurpose some or all of the band for mobile broadband or other expanded use
 - Grandfather, relocate, and/or repack incumbent non-federal licensees
 - 25 megahertz for repacked mobile BAS; would free up 525 megahertz for mobile broadband
 - Explore using sharing methodologies among incumbents and new entrants
 - Seeks comment on use of a database (CBRS, AFC) as alternative approach
 - Seeks comment on protection of in-band and adjacent federal operations
 - Directs BAS licensees to certify the accuracy of their licensing records



6 GHz Band Unlicensed Devices

Report & Order adopted April 2020 permitting 2 types of unlicensed operations in the 6 GHz band:

Standard-Power Access Point is 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 (AFC) system (i.e., database)

- System information (transmitter & receiver locations) obtained from ULS
- FCC specified propagation models
 - 0 – 30 m: Free Space
 - 30m – 1 km: Winner II
 - > 1 km: ITM

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)

First seven AFCs approved for commercial service – February 2024

- Extensive lab testing against Wi-Fi Alliance / WinnForum test vectors
- Extensive public testing by any interested party
- Required by April 23, 2024, to implement a system for receiving and processing potential interference complaints
- C3Spectra filed a proposal to operate an AFC system in December 2023
- Additional conditionally approved AFCs have not yet completed testing



6 GHz Band - Very Low Power (VLP) Operation

- **2nd R&O and 2nd FNPRM and MO&O (October 18, 2023) expands unlicensed device rules in 850 megahertz of spectrum:**
 - In the 5.925-6.425 GHz (U-NII-5) and 6.525-6.875 GHz (U-NII-7) bands, very low power devices may operate at any location and do not operate under the control of an AFC system
 - VLP devices must meet the following requirements:
 - Restricted to maximum -5 dBm/MHz PSD.
 - Maximum EIRP limited to 14 dBm.
 - OOB limit to -27 dBm/MHz
 - VLP devices must employ Transmit Power Control, must not be deployed as part of a fixed outdoor infrastructure, and are required to prioritize operations above 6105 MHz prior to operating on the other available channels.
- **Proposes to expand rules for very low power devices**
 - Expand VLP devices to U-NII-6 and U-NII-8 bands with same rules
 - Increase power to 1 dBm/MHz and 14 dBm EIRP maximum based on implementing a geo-fencing system to protect fixed point-to-point systems
 - Seeks comment on additional power (e.g., up to 21 dBm EIRP)



5030-5091 MHz – Unmanned Aerial Systems

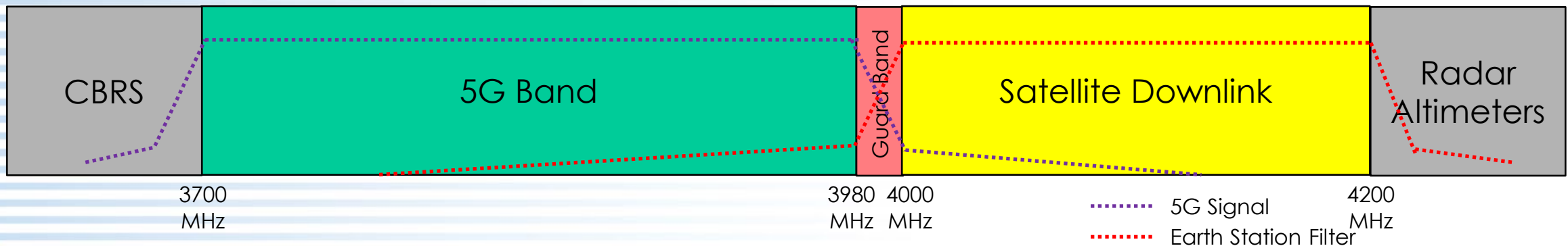
- NPRM adopted December 2022; Next step after 2017 decision to allocate this band for UAS needs
- R&O is currently on circulation at FCC
- Comment sought on:
 - 2 types of operation:
 - Non-networked (i.e., line-of-sight) operations (NNA)
 - networked operations (NSS) for beyond LOS operations
 - Limited use for licensed control-and-non-payload communications (CNPC) links
 - Use Dynamic Frequency Management System to manage spectrum access
 - Potential use of flexible use spectrum (i.e. wireless carriers) to support UAS services
 - Use of aeronautical VHF band
- NSS Implementation Plan Study Band



3.7-4.2 GHz C-Band



- Licensees operating in the full band across the contiguous
 - Filters installed on earth stations
- On-going coordination with FAA to enable deployments near airports
 - Carriers agreed to voluntary conditions to limit emissions near airports
 - New voluntary conditions to go into effect July 1, 2023; more flexible deployment permitted
 - RTCA convened standards group to develop new standards for radio altimeters
 - Other radio altimeter testing/assessments
 - Joint Interagency Five G Radar Altimeter Interference (Ji-FRAI) Group
 - On-going testing in many countries around the world
 - Altimeter upgrades on aircraft completed September 2023





3.7-4.2 GHz Carrier Commitments

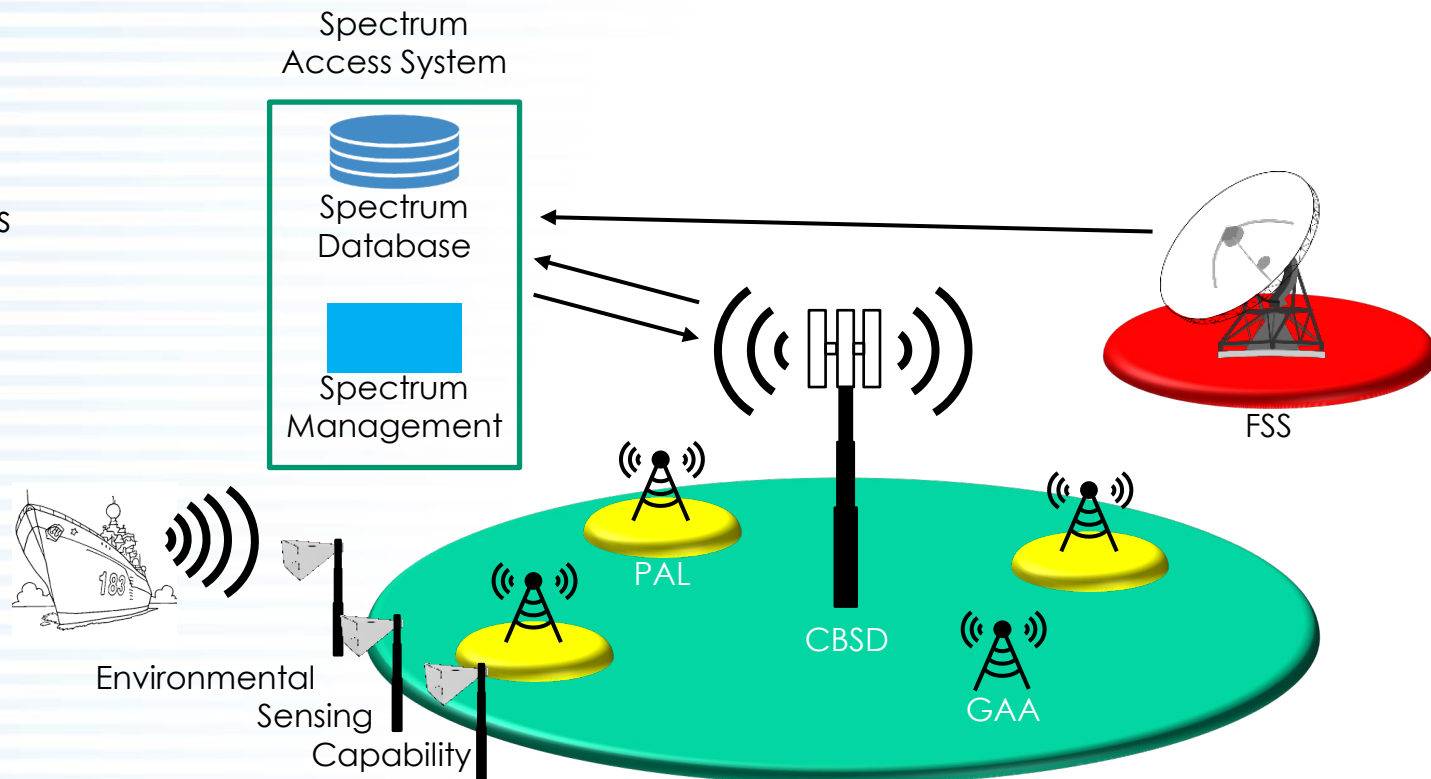
- As of January 1, 2024, base stations may operate at EIRP levels up to 65 dBm/MHz in rural areas; 62 dBm/MHz elsewhere
- Implement skyward EIRP mask for base stations
 - Permits full power at and below horizontal plane
 - Reduces power by up to 14 dB above horizontal plane
- Will coordinate base stations near 188 high-priority airports using FAA signal-in-space model
 - Based on spectral density curves derived from altimeter ability to filter out-of-band signals
 - FAA required altimeter upgrade/replacement requirements on air carriers
 - September 2023 - Equipment upgrades completed on U.S. fleet
- Equipment out-of-band emissions requirements
 - Outdoor equipment limited to maximum -48 dBm/MHz conducted spurious emissions
 - In-building operations limited to maximum -30 dBm/MHz conducted spurious emissions
- Voluntary commitments expire January 1, 2028
 - Can be extended or altered by mutual agreement



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)

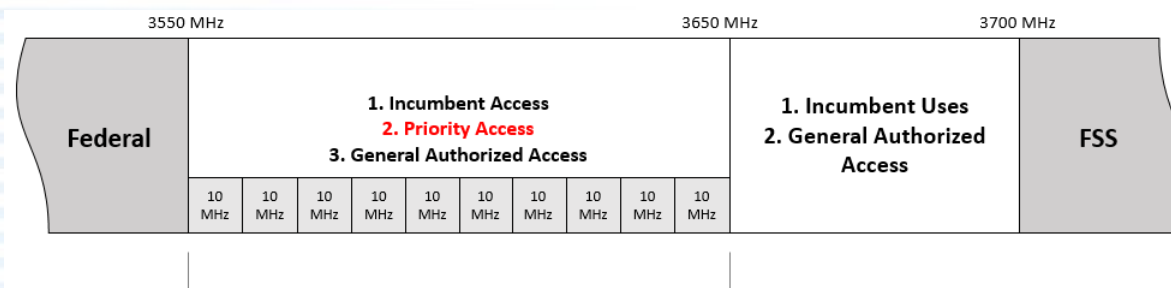
- **Sharing 150 MHz in 3550-3700 MHz for flexible use between mobile broadband, incumbent DoD Radar, and Commercial FSS.**
- Dynamic sharing since January 2020
- 3 tiers of users: Incumbents, Priority Access Licensees and General Access Licensees operating throughout U.S.
- NTIA Usage Study (May 2023)
 - 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 (18 March 2024)
 - 267 certified CBSDs
 - 731 certified end user devices
- Innovative use cases
 - Private networks
 - Neutral hosts (expanding indoor coverage)
 - IoT
 - 5G





3.55-3.7 GHz Band (CBRS Band)

- OET/WTB recently granted waiver to require SAS to use DoD operated online TardyS3 portal for activating dynamic protection areas
 - Protects covered facilities such as test ranges
 - Permits limited CBRS use in Hawaii despite no ESC
 - Navy retains exclusive access to three 10-megahertz channels until ESC is operational
- WinnForum has updated the CBRS technical specification
 - New propagation model reduces the areas that cannot be used when radar use is detected—will enable service to approximately 72 million more people
 - Allows CBSDs outside of Dynamic Protection Areas (i.e. not near coastal areas) to continue to transmit up to 24 hours without reauthorization by SAS. Currently CBSDs must contact SAS at least every 5 minutes.
 - SAS will have to undergo testing before they can operate with new specification.



Each PAL is a 10 MHz channel in the 3550-3650 MHz band.

No more than seven PALs will be issued in any county.

A licensee can aggregate up to four PALs channels in one county.



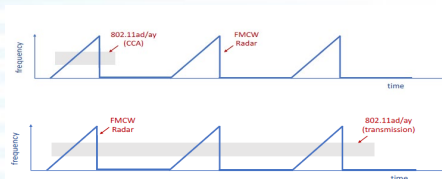
60 GHz Short-Range Radars

ET Docket No. 21-264

- **R&O adopted May 2023**
- **R&O revised section 15.255 to permit unlicensed field disturbance sensor (FDS) devices to operate in the 57-71 GHz (60 GHz band)**
- **Adopted changes include:**
 - Allows both mobile and fixed FDS / radars operation in the entire 60 GHz band
 - Clarifies the relationship between communications and FDS applications and modifies the rules to expand mobile FDS operations within the 60 GHz band.
 - Permits various EIRP levels along with duty cycles restrictions related to specific segments of the band.
 - Permits FDS operation for on-board unmanned aircraft (UA).



Source: <https://hexus.net/>



In-cabin person detection



Source: Texas Instruments
(<https://e2e.ti.com/>)



Thank You!