

**NATIONAL TELECOMMUNICATIONS AND
INFORMATION ADMINISTRATION**

OFFICE OF SPECTRUM MANAGEMENT

**The Spectrum Needs of U.S. Space-based
Operations:**

An Inventory of Current and Projected Uses

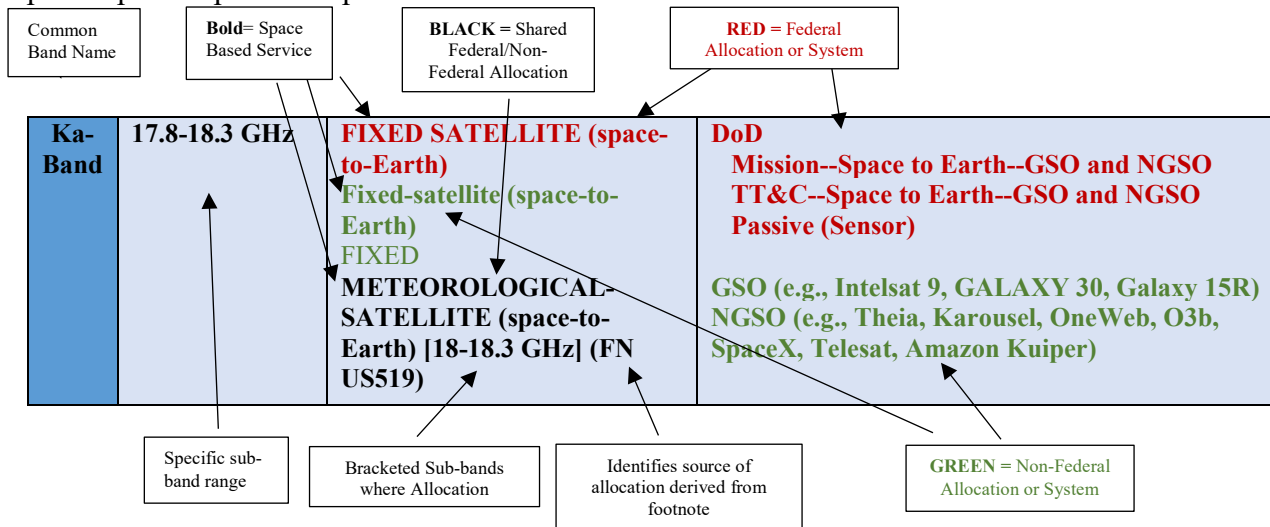


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This appendix surveys major unclassified systems and uses for U.S.-based space operations at frequencies from 137 MHz to 1000 GHz. The first column provides the common name of the band of frequencies. The second column provides a more specific sub-band. The third column lists all allocations in the band, including any footnote allocations that enable a U.S. space-based use. All space-based allocations are in **bold text**.

Primary allocations are in upper case and secondary allocations are shown in lower case. The fourth column identifies illustrative systems that are present in the band. (The list of systems is not exhaustive.) The third and fourth columns are also color coded: those in red are federal allocations or systems; those in green are non-federal; and those in black are either shared federal and non-federal or, in some cases in the fourth column, Radio Astronomy systems, reflecting the public-private partnerships that are common in that field.



Please refer to the Table of Frequency Allocations (47 C.F.R. § 2.106) for complete and up-to-date information on allocations. The latest online version maintained by the FCC is available at <https://transition.fcc.gov/oet/spectrum/table/fctable.pdf>.

For complete information regarding satellites and systems licensed by the FCC or approved by the FCC for access to the U.S. market, including all conditions and limitations on operations, please consult FCC databases such as the International Bureau Filing System (IBFS) and Experimental Licensing System (ELS). The FCC also maintains an informal list of commercial space station licenses and grants of U.S. market access on its website at <https://www.fcc.gov/approved-space-station-list>.

NOTE: This appendix refers to specific radio astronomy allocations and facilities. Many radio astronomy observations also occur by listening at times outside those allocations, albeit without the protections provided by use of spectrum allocated specifically for radio astronomy.

Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
VHF	137-138 MHz	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Mobile-satellite (space-to-Earth)	NASA VHF Downlink DoD Telemetry, tracking, and control (TT&C)--Space to Earth--Non-geostationary (NGSO) Mission--Space to Earth--NGSO NOAA Polar Operational Environmental Satellites (POES) [Space to Earth (S-E)] NGSO (e.g., ORBCOMM, Swarm) Experimental
VHF	138-144 MHz	FIXED MOBILE SPACE RESEARCH (space-to-Earth) (Regions 1, 2, 3) [143.6-143.65 MHz] Space research (space-to-Earth) (in Regions 2 and 3) [138.6-143.6 MHz/143.65-144 MHz]	
VHF	144-146 MHz	AMATEUR-SATELLITE AMATEUR	Experimental Amateur Satellite (e.g., HUSKYSAT-1, Swampsat 2)
VHF	146-148 MHz	AMATEUR	
VHF	148.0-150.8 MHz	MOBILE-SATELLITE (Earth-to-space) FIXED MOBILE SPACE OPERATION (Earth-to-space) [148-149.9 MHz] (FN 5.218) RADIO ASTRONOMY (150.05-150.8 MHz)[Region 1] (FN 5.149/US342)	DoD Mission--Earth to Space--NGSO National Science Foundation (NSF) Precision Array for Probing the Epoch of Reionization (PAPER) NGSO (e.g., ORBCOMM, Swarm) Experimental
VHF	150.8000-156.5125 MHz	FIXED MOBILE LAND MOBILE RADIO ASTRONOMY (150.8-153 MHz) [Region 1] (FN 5.149/US342)	NSF PAPER
VHF	156.5125-156.7625 MHz 156.7875-156.8125 MHz 156.8375-157.1875 MHz 161.5750-161.6250 MHz	MARITIME MOBILE (distress, urgency, safety and calling) 5.111 - search and rescue operations for manned space vehicles under terrestrial rules. [2182 kHz, 3023 kHz, 5680 kHz, 8364 kHz and the frequencies 121.5 MHz, 156.525 MHz, 156.8 MHz and 243 MHz]	NASA Orion Post-Landing Communications System (Search & Rescue (SAR) Voice Radio - Aeronautical) NGSO (e.g., Iridium - for reception of Automatic Identification System, Application Specific Messages, Digital Selective Calling, and maritime distress, urgency and safety calling transmission from maritime vessels; HawkEye 360 - reception of Digital Selective Calling)

Key: Allocated Space Services are in Bold | UPPER CASE=Primary Allocation | Lower Case=Secondary Allocation
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Band	US Allocation Range	Allocated Services	Illustrative Systems
VHF	156.7625-156.7875 MHz 156.8125-156.8375 MHz	MOBILE-SATELLITE (Earth-to-space) (AIS 3) MOBILE-SATELLITE (Earth-to-space) (AIS 4)	NGSO (e.g., Hawkeye 360 - reception AIS 3 and AIS 4, Spire Global - limited reception AIS 3 and AIS 4)
VHF	157.1875-161.5750 MHz 161.6250-161.7750 MHz	MOBILE except aeronautical mobile FIXED LAND MOBILE	
VHF	161.9625-161.9875 MHz	MOBILE-SATELLITE (Earth-to-space) (AIS 1) AERONAUTICAL MOBILE (OR) (AIS 1) MARITIME MOBILE (AIS 1)	DoD Mission--Space to Earth--NGSO TT&C--Earth to Space--NGSO NGSO (e.g., Planet Labs Flock - reception AIS 1, Hawkeye 360 - reception AIS 1, Spire Global - reception of AIS 1 ORBCOMM)
VHF	161.9875-162.0125 MHz	MOBILE except aeronautical mobile	
VHF	162.0125-162.0375 MHz	MOBILE-SATELLITE (Earth-to-space) (AIS 2) AERONAUTICAL MOBILE (OR) (AIS 2) MARITIME MOBILE (AIS 2)	DoD Mission--Earth to Space--NGSO TT&C--Earth to Space--NGSO NGSO (e.g., Planet Labs Flock - reception AIS 2; Hawkeye 360 - reception AIS 2, Spire Global - reception AIS-2)
VHF	162.0375-235.0000 MHz	Multiple non-space allocations in FIXED, MOBILE, MOBILE except aeronautical mobile, BROADCASTING, Fixed, Land Mobile, Mobile, Amateur services	
VHF	235-267 MHz	FIXED MOBILE MOBILE-SATELLITE [235-322 MHz and 335.4-399.9 MHz] [military] (FN G100) 5.111 - search and rescue operations for manned space vehicles under terrestrial rules. [2182 kHz, 3023 kHz, 5680 kHz, 8364 kHz and the frequencies 121.5 MHz, 156.525 MHz, 156.8 MHz and 243 MHz]	NASA Orion Post-Landing Communications System (SARSAT Beacon) DoD Mission--Space to Earth--GSO and NGSO Mission--Earth to Space--GSO and NGSO TT&C--Earth to Space--GSO TT&C--Space to Earth--GSO
VHF	267-322 MHz	FIXED MOBILE MOBILE-SATELLITE [235-322 MHz and 335.4-399.9 MHz] [military] (FN G100) SPACE OPERATION [272-273 MHz][International Allocation] Space Operation [267-272 MHz][International Allocation]	NASA Orion Post-Landing Communications System (Search & Rescue (SAR) Voice Radio - Aeronautical) DoD Mission--Space to Earth--GSO and NGSO Mission--Earth to Space--GSO and NGSO TT&C--Earth to Space--GSO TT&C--Space to Earth--GSO

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VHF	322.0-328.6 MHz	FIXED MOBILE RADIO ASTRONOMY [International Allocation] (FN 5.149/US342)	National Radio Astronomy Observatory (NRAO)/NSF Very Large Array (VLA) P band
VHF	328.6-335.4 MHz	AERONAUTICAL RADIONAVIGATION	
UHF	335.4-399.9 MHz	FIXED MOBILE MOBILE-SATELLITE [235-322 MHz and 335.4-399.9 MHz] [military] (FN G100)	NASA Mars Curiosity Rover DoD Mission--Space to Earth--Geostationary (GSO) TT&C--Space to Earth--GSO Active (Sensor)
UHF	399.90-400.05 MHz	MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE	NASA CubeSat Proximity Operations Demonstration (CPOD) Uplink Mars Curiosity Rover DoD Mission--Earth to Space--NGSO NOAA Cooperative Data and Rescue Services (CDARS) (Argos ADCS) NGSO (e.g., Hiber) Experimental
UHF	400.05-400.15 MHz	STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz)	NGSO (e.g., AstroDigital Landmapper-BC) Experimental
UHF	400.15-401.00 MHz	METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Space operation (space-to-Earth) METEOROLOGICAL AIDS (radiosonde)	NASA Shields-1 (Cubesat) RainCube (CubeSat radar) Lunar IceCube (commercial 883-GHz cloud radiometer)(nanosatellite) Mars Curiosity Rover DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--NGSO NGSO (e.g., ORBCOMM, Hiber)

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UHF	401-402 MHz	SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) Meteorological-satellite (Earth-to-space)	NASA Doppler Orbitography by Radiopositioning Integrated on Satellite (DORIS) Aerosol Robotic Network (AERONET) RainCube (CubeSat radar) Mars Curiosity Rover InSIGHT DoD TT&C--Space to Earth--NGSO Mission--Earth to space--GSO and NGSO NOAA [E-S] Cooperative Data and Rescue Services (CDARS) Jason-2 Jason-3 POES Geostationary Operational Environmental Satellite (GOES)-R GOES N-P NGSO (e.g., Spire Global, Planet Labs Flock, BlackSky Global) Experimental
UHF	402-403 MHz	EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) Meteorological-satellite (Earth-to-space) METEOROLOGICAL AIDS (radiosonde)	NASA Mars Curiosity Rover InSIGHT Radiosonde System (WFF) Global Hawk - Advanced Vertical Atmospheric Profiling System DoD Mission--Earth to space--GSO and NGSO NOAA [E-S] GOES-R GOES-NP CDARS (Argos ADCS) NGSO (e.g., Spire Global, AstroDigital Landmapper-BC) Experimental

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UHF	403-406 MHz	METEOROLOGICAL AIDS (radiosonde)	<p>NASA Mars Curiosity Rover Radiosonde System (WFF) Global Hawk - Advanced Vertical Atmospheric Profiling System</p> <p>DoD Active (Sensor)</p> <p>NOAA Radiosondes</p> <p>Experimental</p>
UHF	406.0-406.1 MHz	MOBILE-SATELLITE (Earth-to-space)	<p>DoD Active (Sensor) Mission--Earth to space--GSO and NGSO</p> <p>NOAA [E-S] POES CDARS GOES N-P GOES-R Search And Rescue Satellite Aided Tracking (SARSAT)</p> <p>NGSO (e.g., HawkEye 360 - reception of Emergency Position-Indicating Radiobeacon)</p>
UHF	406.1-410.0 MHz	RADIO ASTRONOMY FIXED MOBILE	<p>DoD Active (Sensor) TT&C--Earth to Space--NGSO</p> <p>NRAO/NSF VLA P band</p>
UHF	410-420 MHz	SPACE RESEARCH (space-to-space) FIXED MOBILE	<p>NASA Astronaut EVA Communications System Unmanned Aerial Vehicle (UAV)</p> <p>DoD Active (Sensor) TT&C--Earth to Space--NGSO</p>

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UHF	420-450 MHz	RADIOLOCATION Amateur Space operation (Earth-to-space) and the space research (Earth-to-space) [449.75-450.25 MHz] (FN 5.286) Space telecommand (Earth-to-space) [449.75-450.25 MHz] (FN US87) Earth exploration-satellite (active) [432-438 MHz] (FN US397)	NASA Space Launch System (SLS) Flight Termination System Mars Curiosity Rover Shields-1 (Cubesat) DoD Active (Sensor) TT&C--Earth to Space--NGSO NGSO (e.g., Spire Global, HawkEye 360, Planet Labs Flock, BlackSky Global) Experimental Amateur Satellite (e.g. HUSKYSAT-1, Swampsat 2)
UHF	450-454 MHz	LAND MOBILE Space operation (Earth-to-space) and the Space research (Earth-to-space) [449.75-450.25 MHz](FN 5.286) Space telecommand (Earth-to-space) [449.75-450.25 MHz] (FN US87)	NASA Advanced eLectrical Bus (ALBus) Antenna - Morehead, KY Compact Radiation bElt Explorer (CeREs) DoD TT&C--Earth-to-space--NGSO
UHF	454-460 MHz	FIXED LAND MOBILE	
UHF	460-470 MHz	Meteorological-satellite (space-to-Earth) FIXED LAND MOBILE US289 - Earth exploration-satellite (EESS) (space-to-Earth)	NASA Compact Radiation bElt Explorer (CeREs) IceCube (commercial 883-GHz cloud radiometer) DoD TT&C--Earth-to-space--NGSO Mission--Space to Earth--NGSO NOAA [S-E] CDARS GOES N-P GOES-R Experimental
UHF	470-608 MHz	FIXED LAND MOBILE BROADCASTING	
UHF	608-614 MHz	RADIO ASTRONOMY LAND MOBILE (medical telemetry and medical telecommand)	NASA Goldstone Apple Valley Radio Telescope National Radio Astronomy Observatory (NRAO)/NSF Very Long Base Array (VLBA) (10 sites) Arecibo Observatory

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UHF	614-894 MHz	Non-Federal non-space allocations in FIXED, MOBILE, BROADCASTING, LAND MOBILE, AERONAUTICAL MOBILE services	NASA International Space Station (ISS) Spheres (SmallSats onboard ISS) ISS Treadmill Heart Monitors Experimental
UHF	894-902 MHz	Non-Federal non-space allocations in FIXED, MOBILE, LAND MOBILE, AERONAUTICAL MOBILE services	
UHF	902-928 MHz	RADIOLOCATION	NASA Mars Helicopter Scout Integrated Solar Array and Reflectarray Antenna (ISARA) DoD Mission--Space to Earth--NGSO TT&C--Space to Earth--NGSO Mission--Earth to Space--NGSO Experimental
UHF	928-960 MHz	Non-space allocations in FIXED, MOBILE, LAND MOBILE, services	
L-Band	960-1164 MHz	AERONAUTICAL MOBILE (R) AERONAUTICAL RADIONAVIGATION	NGSO (e.g., Iridium - reception of ADS-B; HawkEye 360 - reception of ADS-B, Spire Global - reception of ADS-B)
L-Band	1164-1215 MHz	RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) AERONAUTICAL RADIONAVIGATION	NASA ISS Global Positioning System (GPS) L5 Receivers Tactical Air Navigation (TACAN) [NASA is User Only, provided by DoT or DoD] DoD (1164-1215 MHz) PNT--Space to Earth--NGSO PNT--Space to Space--GSO and NGSO GSO (e.g., SES-15; GALAXY 30; E117WB; LM-RPS1) NGSO (Spire Global - Galileo E5 Receive)

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L-Band	1215-1240 MHz	EARTH EXPLORATION-SATELLITE (active) RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION	NASA ISS GPS L5 Receivers CYGNSS, GRACE, Sentinel-6(with others) GPS Receivers DoD PNT--Space to Earth--NGSO PNT--Space to Space--GSO and NGSO TT&C--Earth to Space--NGSO TT&C--Space to Earth--NGSO NOAA [S-S Rx] Suomi National Polar-orbiting Partnership (S-NPP) Joint Polar Satellite System (JPSS) Constellation Observing System for Meteorology, Ionosphere, and Climate-2 (COSMIC-2) CDARS NGSO (e.g., Theia, Spire Global - GPS L2 Receive for Radio Occultation)
L-Band	1240-1300 MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION Amateur Earth exploration-satellite (active) Space research (active) RADIOLOCATION	NASA NASA-Indian Space Research Organisation (ISRO) Synthetic Aperture Radar (NISAR) Airborne Synthetic Aperture Radar (AirSAR) CYGNSS, GRACE, Sentinel-6(with others) GPS Receivers DoD PNT--Space to Earth--NGSO PNT--Space to Space--GSO and NGSO Active (Sensor) NOAA [S-S Rx] S-NPP JPSS COSMIC-2 CDARS NGSO (e.g., Theia)
L-Band	1300-1350 MHz	AERONAUTICAL RADIONAVIGATION Radiolocation Radio Astronomy (1330-1350 MHz) (FN US342 and 5.149 [International])	DoD Active (Sensor) NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array(CA)

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L-Band	1350-1400 MHz	<p>Non-space allocations in FIXED, MOBILE, RADIOLOCATION, LAND MOBILE (medical telemetry and medical telecommand) services</p> <p>5.339 - Space research (passive) and Earth exploration-satellite (passive) [1370-1400 MHz] G114 - FIXED-SATELLITE (space-to-Earth) and MOBILE-SATELLITE (space-to-Earth) [1369.05-1390 MHz][Relay of nuclear burst data]</p> <p>Radio Astronomy (1330-1350 MHz) (FN US342, US385 and 5.149 [International])</p>	<p>DoD PNT--Space to Earth--NGSO PNT--Space to Space--GSO and NGSO Active (Sensor)</p> <p>NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)</p>
L-Band	1400-1427 MHz	<p>EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)</p> <p>5.340 - passive-only 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	<p>NASA Soil Moisture Active Passive (SMAP)</p> <p>NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array(CA)</p>
L-Band	1427-1435 MHz	<p>Non-space allocations in FIXED(telemetry and telecommand), LAND MOBILE (telemetry and telecommand) and MOBILE services</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	
L-Band	1435-1525 MHz	<p>MOBILE (aeronautical telemetry)</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	<p>DoD Mission--Space to Earth--NGSO</p> <p>GSO (e.g., AFRISTAR-2)</p>
L-Band	1525-1535 MHz	<p>MOBILE-SATELLITE (space-to-Earth)</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	

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L-Band	1535-1559 MHz	<p>MOBILE-SATELLITE (space-to-Earth)</p> <p>Aeronautical mobile-satellite (r) [1549.5-1558.5 MHz and 1651-1660 MHz][If aeronautical mobile-satellite (R) service cannot be accommodated in 1545-1549.5 MHz, 1558.5-1559 MHz, 1646.5-1651 MHz and 1660-1660.5 MHz] [priority access with real-time preemptive capability for communications in the mobile-satellite service] (US308) 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	<p>DoD PNT--Space to Earth--GSO and NGSO Mission--Space to Earth--GSO and NGSO</p> <p>NOAA SARSAT (Space to Earth)</p> <p>GSO (e.g., Inmarsat 4F1, Inmarsat 4F3, SKYTERRA-1, MSAT-1)</p>
L-Band	1559-1610 MHz	<p>RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) AERONAUTICAL RADIONAVIGATION</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	<p>NASA ISS GPS L1 Receivers CYGNSS, GRACE, Sentinel-6(with others) GPS Receivers</p> <p>DoD TT&C--Space to Earth--NGSO PNT--Space to Earth--NGSO PNT--Space to Space--GSO and NGSO Active (Sensor)</p> <p>NOAA [S-E] POES CDARS GOES N-P GOES-R COSMIC GPS Receivers</p> <p>GSO (e.g., SES-15, GALAXY 30, E117WB, LM-RPS1) NGSO (Spire Global - GPS L1 Receive for Radio Occultation, Galileo E1 Receive)</p>

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L-Band	1610.0-1613.8 MHz	<p>MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY RADIODETERMINATION-SATELLITE (Earth-to-space) AERONAUTICAL RADIONAVIGATION</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz] 5.367 - AERONAUTICAL MOBILE-SATELLITE (R) [1610-1626.5 MHz]</p>	<p>NASA Goldstone Apple Valley Radio Telescope</p> <p>DoD (1610.6 - 1613.8 MHz) Mission--Space to Space-GSO and NGSO TT&C--Space to Space--GSO and NGSO Mission--Earth to space--GSO and NGSO</p> <p>NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)</p> <p>NGSO (e.g., Globalstar, AstroDigital Landmapper-BC) Experimental</p>
L-Band	1613.8-1626.5 MHz	<p>MOBILE-SATELLITE (Earth-to-space) RADIODETERMINATION-SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) AERONAUTICAL RADIONAVIGATION AERONAUTICAL MOBILE-SATELLITE (R) [1610-1626.5 MHz] (FN 5.367)</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	<p>NASA HaloSat</p> <p>DoD (1613.8 - 1626.5 MHz) Mission--Space to Space-GSO and NGSO TT&C--Space to Space--GSO and NGSO Mission--Earth to space--GSO and NGSO</p> <p>NGSO (e.g., Iridium); Experimental</p>
L-Band	1626.5-1660.5 MHz	<p>MOBILE-SATELLITE (Earth-to-space) Aeronautical mobile-satellite (r) [1549.5-1558.5 MHz and 1651-1660 MHz][If aeronautical mobile-satellite (R) service cannot be accommodated in 1545-1549.5 MHz, 1558.5-1559 MHz, 1646.5-1651 MHz and 1660-1660.5 MHz] [priority access with real-time preemptive capability for communications in the mobile-satellite service] (US308)</p> <p>5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]</p>	<p>NASA DC-8 Aircraft (Inmarsat RDTE Support)</p> <p>DoD Mission--Earth to space--GSO and NGSO</p> <p>GSO (e.g., Inmarsat 4F1, Inmarsat 4F3, SKYTERRA-1, MSAT-1)</p>

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L-Band	1660.0-1660.5 MHz	MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]	NASA Goldstone Apple Valley Radio Telescope NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
L-Band	1660.5-1668.4 MHz	RADIO ASTRONOMY SPACE RESEARCH (passive) 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz] US246 - passive only (except low power medical/white space devices)	NASA Goldstone Apple Valley Radio Telescope NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
L-Band	1668.4-1670.0 MHz	RADIO ASTRONOMY METEOROLOGICAL AIDS (radiosonde) 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]	NASA Goldstone Apple Valley Radio Telescope NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
L-Band	1670-1675 MHz	FIXED MOBILE except aeronautical mobile US362 METEOROLOGICAL-SATELLITE (space-to-Earth) [1670-1675 MHz] 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]	
L-Band	1675-1695 MHz	METEOROLOGICAL-SATELLITE (space-to-Earth) METEOROLOGICAL AIDS (radiosonde) US289 - EESS applications, other than the meteorological-satellite service [space-to-Earth] [1690-1695 MHz] [NIB] 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]	NASA GOES VARIable (GVAR) Service Receiver GOES environmental data receiver DoD Mission--Space to Earth--GSO NOAA [S-E] GOES N-P GOES-R GOES-S GOES-T

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
L-Band	1695-1710 MHz	METEOROLOGICAL-SATELLITE (space-to-Earth) FIXED MOBILE except aeronautical mobile 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]	NOAA [S-E] GOES N-P GOES-R CDARS POES
L-Band	1710-1780 MHz	SPACE OPERATION (Earth-to-space)[1761-1780 MHz] [1750-1850 MHz (in Region 2) (FN 5.386)] FIXED MOBILE SPACE RESEARCH [1750-1850 MHz] (FN 5.386) 5.341 - extraterrestrial origin emissions search (passive) [1400-1727 MHz]	DoD TT&C--Earth to Space--GSO and NGSO Mission--Earth to space--GSO and NGSO NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
L-Band	1780-1850 MHz	SPACE OPERATION (Earth-to-space) FIXED MOBILE SPACE RESEARCH [1750-1850 MHz](in Region 2) (FN 5.386)	NASA Cloudsat Ground-to-Air Telecommand DoD TT&C--Earth to Space--GSO and NGSO Mission--Earth to space--GSO and NGSO NOAA Defense Meteorological Satellite Program (DMSP) TT&C (Earth-to-space)
L-Band	1850-2000 MHz	FIXED MOBILE	
S-Band	2000-2020 MHz	MOBILE-SATELLITE (Earth-to-space) FIXED MOBILE	GSO (e.g., TERRESTAR 1[DISH], ICO G1/DBSD G1[DISH])
S-Band	2020-2025 MHz	FIXED MOBILE	NGSO (e.g., Spire Global)

Key: Allocated Space Services are in Bold | UPPER CASE=Primary Allocation | Lower Case=Secondary Allocation
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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
S-Band	2025-2110 MHz	<p>SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) SPACE RESEARCH (Earth-to-space) (space-to-space) FIXED MOBILE Space research and Earth exploration-satellite [Earth-to-space and space-to-space] [case-by-case basis](FN US347)</p>	<p>NASA Orion Multi-Purpose Crew Vehicle (MPCV) Hubble Space Telescope Plankton, Aerosol, Cloud and ocean Ecosystem (PACE) Time-Resolved Observations of Precipitation (TROPICS) Near Earth Network (NEN) Ground Stations Tracking and Data Relay Satellite (TDRS)</p> <p>DoD Mission--Earth to space--GSO and NGSO TT&C--Earth to Space--GSO and NGSO Mission--Space to Space--GSO and NGSO TT&C--Space to Space--GSO and NGSO</p> <p>NOAA [E-S & S-S Rx (JPSS)] POES / S-NPP GOES-R / GOES N-P Jason-3/Jason-CS COSMIC / COSMIC-2 Deep Space Climate Observatory (DSCOVR) Joint Polar Satellite System (JPSS)</p> <p>NGSO (e.g., BlackSky Global, Spire Global, Planet Labs Flock, Terra Bella, Worldview-4, Worldview-1, 2, & 3, Hawk Eye 360)</p>
S-Band	2110-2120 MHz	<p>FIXED MOBILE</p> <p>US252 - SPACE RESEARCH (deep space) (Earth-to-space) [Goldstone, CA]</p>	<p>NASA Voyager 1 & 2</p>
S-Band	2120-2180 MHz	<p>FIXED MOBILE</p>	
S-Band	2180-2200 MHz	<p>MOBILE-SATELLITE (space-to-Earth) FIXED MOBILE</p>	<p>GSO (e.g., TERRESTAR 1[DISH], ICO G1/DBSD G1[DISH])</p>

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
S-Band	2200-2290 MHz	SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) SPACE RESEARCH (space-to-Earth) (space-to-space) FIXED (line-of-sight only) MOBILE (line-of-sight only including aeronautical telemetry, but excluding flight testing of manned aircraft) Space operation [2200-2290 MHz] (prelaunch or space launch operations) (FN US96) Space research, space operation and Earth exploration-satellite [2285-2290 MHz] (Tracking and Data Relay Satellite System transmission on a case-by-case basis) (FN US303)	NASA TT&C Orion Multi-Purpose Crew Vehicle (MPCV) Hubble Space Telescope PACE TROPICS NEN Ground Stations TDRS DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO Mission--Space to Space--GSO and NGSO TT&C--Space to Space--GSO and NGSO NOAA [S-E and S-STx] GOES N-P / GOES-R COSMIC / COSMIC-2 DSCOVR POES / S-NPP / JPSS Jason-3 / Jason-CS DSMP NGSO (e.g., Spire Global) Launch or Pre-launch Testing (TT&C) Experimental
S-Band	2290-2300 MHz	SPACE RESEARCH (deep space) (space-to-Earth) FIXED MOBILE except aeronautical mobile	NASA Voyager 1 & 2
S-Band	2300-2310 MHz	FIXED MOBILE except aeronautical mobile RADIOLOCATION Amateur	
S-Band	2310-2320 MHz	Fixed Mobile Radiolocation FIXED MOBILE BROADCASTING-SATELLITE RADIOLOCATION	NASA NEN Launch Communication Stations (LCS)
S-Band	2320-2345 MHz	Fixed Radiolocation BROADCASTING-SATELLITE	NASA NEN Launch Communication Stations (LCS) GSO (e.g., Sirius XM Radio FM-6, SXM-8, XM-4)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
S-Band	2345-2360 MHz	BROADCASTING-SATELLITE Fixed Mobile Radiolocation FIXED MOBILE RADIOLOCATION	NASA Goddard Space Flight Center (GSFC) Very-long-baseline interferometry (VLBI) System
S-Band	2360-2390 MHz	MOBILE RADIOLOCATION Fixed	NASA NEN Launch Communication Stations (LCS) Space Launch System (SLS) Scientific Balloon (Nevada) GSFC VLBI System Lunar Reconnaissance Orbiter (LRO) S-Band Synthetic Aperture Radar (SAR)
S-Band	2390-2400 MHz	MOBILE [2390-2395 MHz] AMATEUR [2390-2400 MHz]	NASA NEN Launch Communication Stations (LCS) Scientific Balloon (Nevada) Experimental
S-Band	2400-2450 MHz	Radiolocation [2417-2450 MHz] AMATEUR [2400-2250] Amateur-satellite [NIB] (FN 5.282)	Experimental Amateur Satellite (e.g. HUSKYSAT-1, Swampsat 2, NASA Phonesat, Multi-Application Survivable Tether (MAST))
S-Band	2450.0-2483.5 MHz	FIXED MOBILE Radiolocation	NASA Technology Education Satellite TechEdSat-7 / 8 / 9 Experimental
S-Band	2483.5-2500 MHz	MOBILE-SATELLITE (space-to-Earth) RADIODETERMINATION-SATELLITE (space-to-Earth) 2495-2500 MHz FIXED MOBILE except aeronautical mobile	NASA HaloSat Airborne Subscale Transport Aircraft Research (AirSTAR) DoD Mission--Space to Earth--GSO and NGSO Mission--Space to Space--GSO and NGSO TT&C--Space to Earth--GSO and NGSO TT&C--Space to Space--GSO and NGSO NGSO (e.g., AstroDigital Landmapper-BC, Globalstar, HawkEye 360) Experimental
S-Band	2500-2655 MHz	FIXED MOBILE except aeronautical mobile Space research (passive) and Earth exploration-satellite (passive) [2640-2655 MHz] (FN 5.339)	

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
S-Band	2655-2690 MHz	Earth exploration-satellite (passive) Radio astronomy Space research (passive) FIXED MOBILE	NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
S-Band	2690-2700 MHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) FN 5.340 / US246 passive only (except low power medical/white space devices)	NASA Goldstone Apple Valley Radio Telescope NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
S-Band	2700-2900 MHz	METEOROLOGICAL AIDS AERONAUTICAL RADIONAVIGATION Radiolocation	NASA S-band dual-POLarimetric Radar (NPOL) Space and Range Radar (SPANDAR) - WFF
S-Band	2900-3100 MHz	RADIOLOCATION MARITIME RADIONAVIGATION Radiolocation	
S-Band	3100-3300 MHz	Earth exploration-satellite (active) Space research (active) RADIOLOCATION Radiolocation Radio Astronomy (3260-3267 MHz) (FN US342, 5.149 [International])	NASA NISAR DoD Active (Sensor) NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
S-Band	3300-3500 MHz	RADIOLOCATION Amateur Radiolocation Amateur-satellite [3400-3410 MHz] (in Regions 2 and 3 only) [NIB] (FN 5.282) Radio Astronomy (3332-3339 MHz and 3348.8-3352.5 MHz) (FN US342, 5.149 [International])	DoD Active (Sensor) NRAO / NSF Very Large Array (NM) Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arecibo Observatory (PR) Owens Valley Solar Array (CA)
S-Band	3500-3550 MHz	RADIOLOCATION AERONAUTICAL RADIONAVIGATION (ground-based) Radiolocation	DoD Active (Sensor)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
S-Band 3550-3600 MHz	3550-3650 MHz	RADIOLOCATION AERONAUTICAL RADIONAVIGATION (ground-based)	DoD Active (Sensor) Mission--Space to Earth--GSO
C-Band 3600-3650 MHz		3600-3650 MHz FIXED-SATELLITE (space-to-Earth) FIXED MOBILE except aeronautical mobile	
C-Band	3650-3700 MHz	FIXED-SATELLITE (space-to-Earth) FIXED MOBILE except aeronautical mobile	DoD Mission--Space to Earth--GSO
C-Band	3700-4000 MHz	FIXED MOBILE except aeronautical mobile	DoD Mission--Space to Earth--GSO
		NG182 - FIXED-SATELLITE (space-to-Earth) [outside contiguous US]	GSO (e.g., Intelsat 28, Intelsat 904, Intelsat 33E, Apstar 5, NSS-9, GALAXY 30; Intelsat 10-02, Intelsat 702, Galaxy 15R, MEASAT-2, JCSAT-2A/2R, Eutelsat 172B, MEV-1 Space Logistics, E117WB)
C-Band	4000-4200 MHz	FIXED-SATELLITE (space-to-Earth) FIXED	DoD Mission--Space to Earth--GSO
			GSO (e.g., Intelsat 28, Intelsat 904, Intelsat 33E, Apstar 5, NSS-9, GALAXY 30, Intelsat 10-02, Intelsat 702, Galaxy 15R, MEASAT-2, JCSAT-2A/2R, Eutelsat 172B, MEV-1 Space Logistics, E117WB)
C-Band	4200-4400 MHz	AERONAUTICAL RADIONAVIGATION Standard frequency and time signal-satellite [space-to-Earth] [4202 MHz] (FN 5.440) - Earth-exploration satellite and Space research services [no protection from radio altimeters](FN US261)	
C-Band	4400-4940 MHz	FIXED MOBILE	NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) Arecibo Observatory Owens Valley Solar Array (CA)
		4500-4800 MHz FIXED SATELLITE (space-to-Earth) Radio Astronomy (4800-4940 MHz) [International]	

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
C-Band	4940-4990 MHz	FIXED MOBILE Space research (passive) and Earth exploration-satellite (passive) (4950-4990 MHz) (FN 5.339) Radio Astronomy (4800-4940 MHz) [International]	NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) Arecibo Observatory Owens Valley Solar Array (CA)
C-Band	4990-5000 MHz	RADIO ASTRONOMY Space research (passive) US246 - passive only (except low power medical/white space devices)	Goldstone Apple Valley Radio Telescope NRAO/NSF Very Long Base Array (10 sites) Green Bank Observatory (W VA) Owens Valley Solar Array (CA)
C-Band	5000-5010 MHz	AERONAUTICAL MOBILE-SATELLITE(R) RADIONAVIGATION-SATELLITE (Earth-to-space) AERONAUTICAL MOBILE (R) AERONAUTICAL RADIONAVIGATION	DoD TT&C--Earth to Space--NGSO
C-Band	5010-5030 MHz	AERONAUTICAL MOBILE-SATELLITE(R) RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) AERONAUTICAL RADIONAVIGATION	DoD TT&C--Space to Earth--NGSO
C-Band	5030-5091 MHz	AERONAUTICAL MOBILE-SATELLITE (R) AERONAUTICAL MOBILE (R) AERONAUTICAL RADIONAVIGATION	
C-Band	5091-5150 MHz	AERONAUTICAL MOBILE-SATELLITE (R) AERONAUTICAL RADIONAVIGATION AERONAUTICAL MOBILE FIXED-SATELLITE (Earth-to-space) [5091-5150 MHz] (US444A)	NGSO (e.g., Globalstar)
C-Band	5150-5250 MHz	FIXED-SATELLITE (Earth-to-space) AERONAUTICAL RADIONAVIGATION Fixed-satellite (space-to-Earth) [5150-5216 MHz](feeder links in conjunction with the radiodetermination-satellite service in 610-1626.5 MHz and 2483.5-2500 MHz) (FN US307)	NGSO (e.g., Globalstar)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
C-Band	5250-5350 MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research RADIOLOCATION Radiolocation	NASA Sentinel-6/JASON-CS SWOT DoD Active (Sensor) NOAA [S-E] Jason-2 Jason-3 Experimental
C-Band	5350-5460 MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Radiolocation Space research (active) RADIOLOCATION AERONAUTICAL RADIONAVIGATION	NASA Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) C-Band Tracking Radar (vehicle tracking) DoD Active (Sensor) NOAA [S-E] Jason-2 Jason-3
C-Band	5460-5470 MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION RADIONAVIGATION Radiolocation	NASA Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) C-Band Tracking Radar (vehicle tracking) DoD Active (Sensor) NOAA [S-E] Jason-2 Jason-3
C-Band	5470-5570 MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION MARITIME RADIONAVIGATION	NASA Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) C-Band Tracking Radar (vehicle tracking) DoD Active (Sensor) NOAA [S-E] Jason-2 Jason-3 Experimental

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
C-Band	5570-5600 MHz	RADIOLOCATION MARITIME RADIONAVIGATION	<p>NASA Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) C-Band Tracking Radar (vehicle tracking)</p> <p>DoD Active (Sensor)</p>
C-Band	5600-5650 MHz	METEOROLOGICAL AIDS RADIOLOCATION MARITIME RADIONAVIGATION	<p>NASA Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) C-Band Tracking Radar (vehicle tracking) Tropical Ocean Global Atmosphere (TOGA)</p> <p>DoD Active (Sensor)</p>
C-Band	5650-5925 MHz	<p>RADIOLOCATION</p> <p>5650-5725 Space Research [International Allocation]</p> <p>5830-5850 Amateur-satellite (space-to-Earth) Amateur</p> <p>5850-5925 FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Amateur-satellite [5650-5670 MHz] [NIB] (FN 5.282) Fixed-satellite [international inter-continental systems on case-by-case EM compatibility analysis] (FN US245)</p>	<p>NASA Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) C-Band Tracking Radar (vehicle tracking)</p> <p>DoD Active (Sensor) Mission--Space to Earth--GSO</p> <p>Experimental Experimental (LAUNCH)</p>

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
C-Band	5925-6700 MHz	5925-6425 FIXED-SATELLITE (Earth-to-space) FIXED	DoD Mission--Earth-to-Space--GSO
		6425-6525 FIXED-SATELLITE (Earth-to-space) MOBILE	NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) Arecibo Observatory Owens Valley Solar Array (CA)
		6525-6700 FIXED-SATELLITE (Earth-to-space) FIXED Radio Astronomy (6650-6675.2 MHz) (FN US342, 5.149 [International])	GSO (e.g., NSS-9, Intelsat 10-02, Intelsat 28, Intelsat 904, Apstar 5, Intelsat 33E, GALAXY 30, Intelsat 702, Galaxy 15R, MEASAT-2, JCSAT-2A/2R, Eutelsat 172B, MEV-1 Space Logistics, E117WB, LM-RPS1); Experimental
C-Band	6700-6875 MHz	FIXED-SATELLITE (Earth-to-space) (space-to-Earth) FIXED MOBILE	NASA Coriolis DoD Mission--Earth-to-Space--GSO and NGSO Mission--Space-to-Earth--GSO and NGSO
C-Band	6875-7025 MHz	FIXED-SATELLITE (Earth-to-space) (space-to-Earth) FIXED MOBILE	DoD Mission--Earth-to-Space--GSO GSO (e.g., Hispasat 30W-6) NGSO (e.g., Globalstar)
C-Band	7025-7125 MHz	7025-7075 MHz FIXED-SATELLITE (Earth-to-space) FIXED MOBILE	DoD Mission--Earth-to-Space--GSO GSO (e.g., Sirius XM FM-6, SXM-8, XM-4, Afristar-2)
		7075-7125 MHz FIXED MOBILE	
C-Band	7125-7145 MHz	FIXED Space Operation (Earth-to-space) [7125-7155 MHz] [at max 2 sites] (FN G116)	NASA LRO
X-Band	7145-7190 MHz	SPACE RESEARCH (deep space) (Earth-to-space) FIXED Space Operation (Earth-to-space) [7125-7155 MHz] [at max 2 sites] (FN G116) Space research (deep space) (Earth-to-space) (FN US262)	NASA New Horizons Spitzer Space Telescope Parker Solar Probe DSN Antennas

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
X-Band	7190-7235 MHz	SPACE RESEARCH (Earth-to-space) FIXED	NASA Lunar Flashlight Lunar IceCube (commercial 883-GHz cloud radiometer)(nanosatellite) Gateway DoD TT&C--Earth-to-Space--NGSO NOAA [E-S] GOES-R GOES-S GOES-T
X-Band	7235-7250 MHz	FIXED	Identified For Future NASA use DoD TT&C--Earth-to-space--NGSO
X-Band	7250-7300 MHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Fixed	DoD Mission--Space to Earth--GSO TT&C--Space-to-Earth--GSO
X-Band	7300-7450 MHz	FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) FIXED	DoD Mission--Space to Earth--GSO TT&C--Space-to-Earth--GSO
X-Band	7450-7550 MHz	FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) FIXED	NASA XBOOM System Testbed DoD Mission--Space to Earth--GSO TT&C--Space-to-Earth--GSO
X-Band	7550-7750 MHz	FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) FIXED	DoD Mission--Space to Earth--GSO TT&C--Space-to-Earth--GSO
X-Band	7750-7900 MHz	METEOROLOGICAL-SATELLITE (space-to-Earth) FIXED	NOAA [S-E] S-NPP JPSS
X-Band	7900-8025 MHz	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Fixed	DoD Mission--Earth-to-space--GSO TT&C--Earth-to-space--GSO

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
X-Band	8025-8175 MHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions) FIXED EARTH EXPLORATION-SATELLITE (space-to-Earth) [8025-8400 MHz and 25.5-27 GHz] (FN US258)	NASA AQUA AURA Terra NEN Antennas (Data Downlink) DoD Mission--Earth-to-space--GSO TT&C--Earth-to-space--GSO Mission--Space-to-Earth--NGSO TT&C--Space-to-Earth--NGSO NOAA Jason-CS (space-to-Earth) NGSO (e.g., DG Consents (RESOURCESAT-1), Spire Global, Planet, Terra Bella, Worldview 1, 2, & 3, Worldview 4, BlackSky Global, HawkEye 360) Experimental
X-Band	8175-8215 MHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions) FIXED EARTH EXPLORATION-SATELLITE (space-to-Earth) [8025-8400 MHz and 25.5-27 GHz] (FN US258)	NASA AQUA AURA Terra NEN Antennas (Data Downlink) DoD Mission--Earth-to-space--GSO TT&C--Earth-to-space--GSO Mission--Space-to-Earth--NGSO TT&C--Space-to-Earth--NGSO NGSO (e.g., BlackSky Global, Spire Global, Planet, Terra Bella, Worldview-4, Worldview-1, 2 & 3, HawkEye 360) Experimental

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
X-Band	8215-8400 MHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions) FIXED EARTH EXPLORATION-SATELLITE (space-to-Earth) [8025-8400 MHz and 25.5-27 GHz] (FN US258)	NASA AQUA AURA Terra NEN Antennas (Data Downlink) DoD Mission--Earth-to-space--GSO TT&C--Earth-to-space--GSO Mission--Space-to-Earth-NGSO TT&C--Space-to-Earth--NGSO NOAA [S-E] GOES-R GOES-S GOES-T GOES-R Series GOES Next SNPP NGSO (e.g., BlackSky, Spire Global, Planet, Terra Bella, Worldview-4, Worldview-1, 2, 3, DG Consents (RESOURCESAT-1)) Experimental
X-Band	8400-8450 MHz	SPACE RESEARCH (deep space)(space-to-Earth) Space research (deep space)(space-to-Earth) FIXED	NASA Voyager 1 & 2 Parker Solar Probe Mars Odyssey Deep Space Network (DSN) Antennas
X-Band	8450-8500 MHz	SPACE RESEARCH (space-to-Earth) FIXED	NASA Lunar Flashlight Lunar IceCube (commercial 883-GHz cloud radiometer)(nanosatellite) Gateway Experimental
X-Band	8500-8550 MHz	RADIOLOCATION Radiolocation	DoD Active (Sensor)
X-Band	8550-8650 MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION Radiolocation	NASA Goldstone Solar System Radar DoD Active (Sensor)
X-Band	8.65-9.00 GHz	RADIOLOCATION Radiolocation	DoD Active (Sensor)
X-Band	9.0-9.2 GHz	AERONAUTICAL RADIONAVIGATION RADIOLOCATION Radiolocation	DoD Active (Sensor)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
X-Band	9.2-9.3 GHz	MARITIME RADIONAVIGATION Radiolocation Earth exploration-satellite (active) [9200-9300 MHz] [for systems that need b/w greater than 600 MHz that operate in 9300-9900] (FN 5.474)	DoD Active (Sensor)
X-Band	9.3-9.5 GHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION RADIONAVIGATION Radiolocation Meteorological aids	NASA Launch Operations Support (Range Clearance) - WFF Avian Detection Radar - KSC Meteorological Radar - GRC SCLP (future-2040) DoD Active (Sensor) Experimental
X-Band	9.5-9.8 GHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION Radiolocation	DoD Active (Sensor) Experimental
X-Band	9.8-9.9 GHz	Earth exploration-satellite (active) Space research (active) RADIOLOCATION	DoD Active (Sensor) Experimental
X-Band	9.9-10.0 GHz	RADIOLOCATION Radiolocation Meteorological-satellite [9975-10 025 MHz] (weather radar use) (FN 5.479)	DoD Active (Sensor)
Ku-Band	10-10.5 GHz	RADIOLOCATION 10-10.4 GHz EARTH EXPLORATION-SATELLITE (active) [International Allocation] 10.45-10.5 GHz Amateur-satellite Amateur Radiolocation Meteorological-satellite [9975-10 025 MHz] (weather radar use) (FN 5.479)	NASA Expendable Launch Vehicle (ELV) Tracking Radar (Launch vehicles, balloons, satellites, and aircraft) DoD Active (Sensor)
Ku-Band	10.5-10.55 GHz	RADIOLOCATION	DoD Active (Sensor)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ku-Band	10.55-10.60 GHz	FIXED	
Ku-Band	10.60-10.68 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) FIXED RADIO ASTRONOMY [10.6-10.68 GHz] (FN US130)	NASA Global Precipitation Measurement (GPM) DoD Passive (Sensor) NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) Arecibo Observatory Owens Valley Solar Array (CA)
Ku-Band	10.68-10.70 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) FN 5.340 / US246 passive only (except low power medical/white space devices)	NASA Goldstone Apple Valley Radio Telescope Coriolis GMI NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) Arecibo Observatory Owens Valley Solar Array (CA)
Ku-Band	10.7-11.7 GHz	FIXED-SATELLITE (space-to-Earth) FIXED	DoD Mission--Space to Earth--GSO and NGSO GSO (e.g., GALAXY 30, Terrestar 1, Eutelsat 172B, Galaxy 15R, Hispasat 30W-6, Intelsat 10-02, Intelsat 702, Intelsat 904, Intelsat 28, MEV-1 Space Logistics, MSAT-1, SES-15, SKYTERRA-1, Telstar 12V, TERRESTAR 1, E117WB) NGSO (e.g., SpaceX, OneWeb, Space Norway ASBM, Theia, Karousel, Kepler)
Ku-Band	11.7-12.2 GHz	FIXED-SATELLITE (space-to-Earth)	DoD Mission--Space to Earth--GSO and NGSO GSO (e.g., Echostar 9, SES-15, Galaxy 15R, Hispasat 30W-6, Telstar 12V, MEV-1 Space Logistics) NGSO (e.g., Space X, OneWeb, Theia, Karousel, Space Norway ASBM)
Ku-Band	12.2-12.7 GHz	BROADCASTING-SATELLITE FIXED FIXED-SATELLITE (space-to-Earth) [12.2-12.7 GHz](FN 5.487A)	DoD Mission--Space to Earth--GSO and NGSO GSO (e.g., Ciel-2, Directv T8 (D), DirecTV T9S, Eutelsat 172B, Intelsat 10-02, Telstar 12V, Intelsat 702) NGSO (e.g., Karousel, Kepler, Space Norway ASBM, SpaceX, Theia)
Ku-Band	12.7-12.75 GHz	FIXED-SATELLITE (Earth-to-space) Fixed MOBILE	GSO (e.g., Intelsat 702, Telstar 12V)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ku-Band	12.75-13.25 GHz	FIXED-SATELLITE (Earth-to-space) FIXED MOBILE Space research (deep space) (space-to-Earth) [12.75-13.25 GHz] (reception only at Goldstone, CA)[FNUS251]	Identified For Future NASA use (Space Research service at Goldstone, CA only) DoD Mission--Earth to Space--GSO and NGSO GSO (e.g., TERRESTAR 1/T-1, GALAXY 30, Intelsat 11, SKYTERRA-1, Telstar 12V, Hispasat 30W-6, MSAT-2) NGSO (e.g., Theia, SpaceX)
Ku-Band	13.25-13.40 GHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) AERONAUTICAL RADIONAVIGATION	DoD Active (Sensor)
Ku-Band	13.40-13.75 GHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH Standard frequency and time signal-satellite (Earth-to-space) Earth exploration-satellite (active) Space research RADIOLOCATION Radiolocation	NASA TDRS Advanced Airborne Precipitation Radar-2 (APR-2) High Altitude Imaging Wind and Rain Airborne Profiler (HIWRAP) GPM Surface Water and Ocean Topography (SWOT) DoD Active (Sensor) NOAA [S-E] Jason-2 Jason-3 Sentinel-6/JASON-CS
Ku-Band	13.75-14.0 GHz	Standard frequency and time signal-satellite (Earth-to-space) Space research FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Radiolocation Earth exploration-satellite [International Allocation]	NASA TDRS Terra DoD Mission--Earth to Space--GSO and NGSO GSO (e.g., E117WB, Galaxy 30, Intelsat 10-02, Telstar 12V, MEV-1 Space Logistics, Galaxy 15R, Hispasat 30W-6); NGSO (e.g., Theia, SpaceX)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ku-Band	14.0-14.2 GHz	Space research FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space)	NASA TDRS NASA Field Operations Support (KSC) Armstrong Flight Research Center (AFRC) - Unmanned aerial vehicle (UAV) Ku Satellite Communication (SatCom) System DoD Mission--Earth to Space--GSO and NGSO GSO (e.g., Echostar 9, SES-15, Intelsat 10-02, Intelsat 28, Intelsat 702, Intelsat 904, Galaxy 15R, Eutelsat 172B, Telstar 12V, Intelsat 33e, MEV-1 Space Logistics) NGSO (e.g., Theia, Kepler, Karousel, Space Norway ASBM, OneWeb)
Ku-Band	14.2-14.47 GHz	FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) 14.2-14.3 GHz Space Research [International Allocation] 14.4-14.47 GHz Fixed Mobile Space research (space-to-Earth) [International Allocation]	NASA Field Operations Support (KSC) AFRC - UAV Ku Satellite Communication (SatCom) System DoD Mission--Earth to Space--GSO and NGSO GSO (e.g., Echostar 9, Eutelsat 172B, Galaxy 15R, Intelsat 10-02, Intelsat 33e, Intelsat 702, Intelsat 904, Intelsat 28, MEV-1 Space Logistics, Telstar 12V, SES-15) NGSO (e.g., Kepler, OneWeb, Space Norway ASBM, SpaceX, Theia)
Ku-Band	14.47-14.50 GHz	FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) Fixed Mobile	NASA Field Operations Support (KSC) AFRC - UAV Ku Satellite Communication (SatCom) System DoD Mission--Earth to Space--GSO and NGSO NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) Owens Valley Solar Array (CA) GSO (e.g., Echostar 9, SES-15, Intelsat 28, Intelsat 702, Intelsat 904, Intelsat 33e, Galaxy 15R, Telstar 12V, Eutelsat 172B, MEV-1 Space Logistics) NGSO (e.g., Theia, Kepler, Space Norway ASBM, OneWeb, SpaceX)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ku-Band	14.5-14.7145 GHz	Space research FIXED Mobile	NASA TDRS DoD Mission data--Space to Earth--GSO and NGSO
Ku-Band	14.7145-14.8000 GHz	Space research MOBILE Fixed	NASA TDRS DoD Mission data--Space to Earth--GSO and NGSO
Ku-Band	14.8000-15.1365 GHz	SPACE RESEARCH MOBILE Fixed Space research [14.896-15.121 GHz] [transmit to Tracking and Data Relay Satellites](FN US310)	NASA TDRS Wide-field Infrared Survey Explorer (WISE) ISS DoD Mission data--Space to Earth--GSO and NGSO
Ku-Band	15.1365-15.3500 GHz	SPACE RESEARCH FIXED Mobile Space research (passive) and Earth exploration-satellite (passive) [15.20-15.35 GHz] (FN 5.339)	NASA TDRS High Speed Video Weather Microwave Data Link - Houston, TX DoD Mission data--Space to Earth--GSO and NGSO
Ku-Band	15.35-15.40 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) FN 5.340 / US246 passive only (except low power medical/white space devices)	NASA Goldstone Apple Valley Radio Telescope NRAO Very Long Base Array (10 sites) Green Bank Observatory (W VA) Owens Valley Solar Array (CA)
Ku-Band	15.4-15.7 GHz	AERONAUTICAL RADIONAVIGATION RADIOLOCATION 15.43-15.63 GHz FIXED-SATELLITE (Earth-to-space)	NASA Microwave Scanning Beam Landing System (MSBLS) - KSC
Ku-Band	15.7-16.6 GHz	RADIOLOCATION Radiolocation	DoD Active (Sensor)
Ku-Band	16.60-17.1 GHz	Space research (deep space) (Earth-to-space) RADIOLOCATION Radiolocation	Identified For Future NASA use DoD Active (Sensor)
Ku-Band	17.1-17.2 GHz	RADIOLOCATION Radiolocation	DoD Active (Sensor)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ku-Band	17.2-17.3 GHz	EARTH-EXPLORATION SATELLITE (active) SPACE RESEARCH (active) Earth exploration-satellite (active) Space research (active) RADIOLOCATION Radiolocation	NASA SAR on SCLP (2040?) DoD Active (Sensor)
Ku-Band	17.3-17.7 GHz	Radiolocation 17.3-17.7 GHz FIXED-SATELLITE (Earth-to-space) BROADCASTING-SATELLITE	DoD Active (Sensor) GSO (e.g., Ciel-2, DirecTV T8 (D), DirecTV T9S, Intelsat 33e, Intelsat 9)
Ku-Band	17.7-17.8 GHz	FIXED-SATELLITE (Earth-to-space) FIXED	DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO GSO (e.g., Ciel-2, DirecTV T8 (D), DirecTV T9S, Intelsat 33e, Intelsat 9) NGSO (e.g., Amazon Kuiper)
Ka-Band	17.8-18.3 GHz	FIXED SATELLITE (space-to-Earth) Fixed-satellite (space-to-Earth) FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) [18-18.3 GHz] (FN US519)	DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO Passive (Sensor) GSO (e.g., Intelsat 9, GALAXY 30, Galaxy 15R) NGSO (e.g., Theia, Karousel, OneWeb, O3b, SpaceX, Telesat, Amazon Kuiper)
Ka-Band	18.3-18.6 GHz	FIXED SATELLITE (space-to-Earth)	DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO Passive (Sensor) GSO (e.g., GALAXY 30, Anik F2, SES-15, DirecTV T8 (K), HNS-95W, DirecTV T9S, Intelsat 33e, Telstar 12V, Galaxy 15R, Echostar 9, ViaSat-1, ViaSat-2, ViaSat-3) NGSO (e.g., Theia, Karousel, OneWeb, O3b, SpaceX, Telesat, Amazon Kuiper)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ka-Band	18.6-18.8 GHz	EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (passive)	NASA GPM Coriolis SWOT DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO Passive (Sensor) NOAA [sensors - Advanced Microwave Radiometer (AMR), AMR-C] JASON GSO (e.g., ICO G1/DBSD G1, Echostar 9, Anik F2, GALAXY 30, HNS-95, SES-15, DirecTV T9S, Intelsat 33e, Telstar 12V, Galaxy 15R) NGSO (e.g., O3b, Karousel)
Ka-Band	18.8-20.2 GHz	FIXED-SATELLITE (space-to-Earth) 19.3-19.7 GHz FIXED 19.7-20.2 GHz MOBILE-SATELLITE (space-to-Earth) Radio Astronomy (20.01-20.2 GHz) (FN US342, 5.149[International])	DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO Passive (Sensor) NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) GSO (e.g., Telstar 12V, DirecTV T8 (K), DirecTV T9S, Echostar 9, Galaxy 15R, GALAXY 30, Galaxy 15R, ICO G1/DBSD G1, Intelsat 33e, SES-15, ViaSat-1, ViaSat-2, ViaSat-3) NGSO (e.g., Audacy, Iridium, Karousel, O3b, OneWeb, Space X, Telesat, Theia, Amazon Kuiper)
Ka-Band	20.2-21.2 GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth)	NASA STPSat-6 Mission (Air Force) Support DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO
Ka-Band	21.2-21.4 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) FIXED MOBILE	
Ka-Band	21.40-22.21 GHz	FIXED MOBILE except aeronautical mobile Radio Astronomy (22.01-22.1 GHz) (FN US342, 5.149[International])	NASA Deep Space Station 14 (DSS-14) NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ka-Band	22.21-22.5 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) FIXED MOBILE except aeronautical mobile	NASA Deep Space Station 14 (DSS-14) NOAA [sensor - SSMIS] DMSP NRAO/NSF Very Long Base Array (10 sites)
Ka-Band	22.5-23.6 GHz	INTER-SATELLITE SPACE RESEARCH (Earth-to-space) FIXED MOBILE Radio Astronomy (22.81-22.86 GHz, 23.07-23.12 GHz) (FN US342, 5.149[International])	NASA Deep Space Station 14 (DSS-14) NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA) NGSO (e.g., Audacy, Iridium)
Ka-Band	23.6-24.0 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)	NASA Deep Space Station 14 (DSS-14) GPM Coriolis SWOT DoD Passive (Sensor) NRAO/NSF Radio Astronomy NOAA [sensors - Advanced Technology Microwave Sounder (ATMS), Advanced Microwave Sounding Unit (AMSU)-A,AMR, AMR-C] JPSS, SNPP,POES,JASON
Ka-Band	24-24.45 GHz	24-24.05 GHz AMATEUR-SATELLITE AMATEUR 24.05-24.25 GHz Earth exploration-satellite (active) RADIOLOCATION Amateur Radiolocation	NASA GRACE
Ka-Band	24.25-24.45 GHz	FIXED MOBILE	
Ka-Band	24.45-24.65 GHz	INTER-SATELLITE RADIOLOCATION-SATELLITE RADIONAVIGATION	NASA UAS Traffic Management (UTM) Radar NGSO (e.g., Audacy)
Ka-Band	24.65-24.75 GHz	INTER-SATELLITE RADIOLOCATION-SATELLITE	NASA UAS Traffic Management (UTM) Radar NGSO (e.g., Audacy)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ka-Band	24.75-25.25	FIXED-SATELLITE (Earth-to-space) FIXED MOBILE	
Ka-Band	25.25-25.50 GHz	INTER-SATELLITE (limited to space research and Earth exploration-satellite applications) (FN5.536) Standard frequency and time signal-satellite (Earth-to-space) Inter-satellite (limited to space research and Earth exploration-satellite applications) (FN5.536) FIXED MOBILE	NASA TDRS
Ka-Band	25.5-27.0 GHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) INTER-SATELLITE SPACE RESEARCH (space-to-Earth) Standard frequency and time signal-satellite (Earth-to-space) Inter-satellite FIXED MOBILE EARTH EXPLORATION-SATELLITE (space-to-Earth) [8025-8400 MHz and 25.5-27 GHz](FN US258)	NASA TDRS NEN Antennas Gateway NISAR PACE Orion Multi-Purpose Crew Vehicle (MPCV) DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO Mission--Space to Space-GSO and NGSO TT&C--Space to Space--GSO and NGSO NOAA [S-E and S-STx] JPSS NGSO (e.g., AstroDigital Landmapper-BC) Experimental
Ka-Band	27-27.5 GHz	INTER-SATELLITE (limited to space research and Earth exploration-satellite applications) (FN5.536) Inter-satellite (limited to space research and Earth exploration-satellite applications) (FN5.536) FIXED MOBILE	NASA TDRS
Ka-Band	27.5-29.5 GHz	FIXED SATELLITE (Earth-to-space) FIXED MOBILE	DoD Mission--Earth to Space--GSO and NGSO GSO (e.g., GALAXY 30, Anik F2, Directv T8 (K), DirecTV T9S, Galaxy 15R, HNS-95W, ICO G1/DBSD G1, Intelsat 33e, SES-15, Echostar 9, ViaSat-1, ViaSat-2, ViaSat-3) NGSO (e.g., O3b, Iridium, Karousel, OneWeb, SpaceX, Telesat, Theia, Amazon Kuiper)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ka-Band	29.5-30.0 GHz	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space)	DoD Mission--Earth to Space--GSO and NGSO GSO (e.g., HNS-95W, Echostar 9, GALAXY 30, SES-15, Intelsat 33e, Galaxy 15R, ICO G1/DBSD G1, ViaSat-1, ViaSat-2, ViaSat-3) NGSO (e.g., Theia, Karousel, Space Norway ASBM, OneWeb, O3b, Audacy, SpaceX, Telesat, AstroDigital Landmapper-BC, Amazon Kuiper)
Ka-Band	30.0-31.3 GHz	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) 31-31.3 GHz FIXED MOBILE Radio Astronomy (31.2-31.3 GHz) (FN US342, 5.149[International])	DoD Mission--Earth to Space--GSO and NGSO TT&C--Earth to Space--GSO and NGSO NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA)
Ka-Band	31.3-31.8 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) FN 5.340 / US246 - passive only (except low power medical/white space devices)	NASA AQUA Deep Space Station 14 (DSS-14) NOAA [sensors - ATMS,AMSU-A] JPSS, SNPP,POES NRAO/NSF Green Bank Observatory (W VA)
Ka-Band	31.8-32.3 GHz	SPACE RESEARCH (deep space) (space-to-Earth) RADIONAVIGATION	NASA AQUA Juno Deep Space Mission to Jupiter Parker Solar Probe (PSP) DSN Antennas
Ka-Band	32.3-33.0 GHz	INTER-SATELLITE RADIOLOCATION	NGSO (e.g., Audacy)
Ka-Band	33.0-33.4 GHz	RADIONAVIGATION FIXED-SATELLITE (space-to-Earth) [33-36 GHz](FN US360)	DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO
Ka-Band	33.4-34.2 GHz	RADIOLOCATION Radiolocation FIXED-SATELLITE (space-to-Earth) [33-36 GHz](FN US360)	NASA Surface Water and Ocean Topography (SWOT) High Altitude Imaging Wind and Rain Airborne Profiler (HIWRAP) Law Enforcement Radar - KSC DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO NOAA [sensors - AMR, AMR-C] JASON

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ka-Band	34.2-34.7 GHz	SPACE RESEARCH (deep space) (Earth-to-space) Space research (deep space) (Earth-to-space) RADIOLOCATION Radiolocation FIXED-SATELLITE (space-to-Earth) [33-36 GHz] (FN US360)	NASA Surface Water and Ocean Topography (SWOT) Juno Deep Space Mission to Jupiter DSN Antennas Law Enforcement Radar - KSC DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO NOAA [sensors - AMR, AMR-C] JASON
Ka-Band	34.7-35.5 GHz	RADIOLOCATION Radiolocation FIXED-SATELLITE (space-to-Earth) [33-36 GHz] (FN US360)	DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO
Ka-Band	35.5-36.0 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) Earth exploration-satellite (active) Space research (active) RADIOLOCATION Radiolocation FIXED-SATELLITE (space-to-Earth) [33-36 GHz] (FN US360)	NASA PACE Mars 2020 Radar in a CubeSat (RainCube) Meteorological Radar Law Enforcement Radar - KSC SWOT DoD Mission--Space to Earth--GSO and NGSO TT&C--Space to Earth--GSO and NGSO
Ka-Band	36-37 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (space-to-Earth) FIXED MOBILE Radio Astronomy (36.43-36.5 GHz) (FN US342, 5.149[International])	NASA GPM Coriolis DoD Passive (Sensor) NOAA [sensors - SSMIS, SSM/I] DMSP NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA)
Ka-Band	37-38 GHz	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) [International Allocation] 37.5-38 GHz FIXED-SATELLITE (space-to-Earth)	NASA Windsat DoD Mission--Space to Earth--GSO and NGSO

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
Ka-Band	38-39.5 GHz	Earth exploration-satellite (space-to-Earth) [International Allocation]	NASA Windsat
		38-38.6 GHz FIXED MOBILE 38-39.5 GHz FIXED-SATELLITE (space-to-Earth) FIXED MOBILE	DoD Mission--Space to Earth--GSO and NGSO NGSO (e.g., Theia, Telesat, SpaceX, O3b, Audacy)
Ka-Band	39.5-40.0 GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) FIXED MOBILE	DoD Mission--Space to Earth-GSO and NGSO TT&C--Space to Earth--GSO and NGSO
V-Band	40-40.5 GHz	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	Identified For Future NASA use DoD Mission--Space to Earth-GSO and NGSO TT&C--Space to Earth--GSO and NGSO
V-Band	40.5-41.0 GHz	FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Fixed Mobile	DoD Mission--Space to Earth-GSO and NGSO TT&C--Space to Earth--GSO and NGSO
V-Band	41.0-42.5 GHz	41-42 GHz FIXED-SATELLITE (space-to-Earth) BROADCASTING-SATELLITE FIXED MOBILE BROADCASTING 42-42.5 GHz FIXED MOBILE	GSO (e.g., HNS-95W) NGSO (e.g., Telesat, SpaceX, O3b, Audacy)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
V-Band	42.5-43.5 GHz	FIXED-SATELLITE (Earth-to-space) RADIO ASTRONOMY FIXED MOBILE except aeronautical mobile	NASA Deep Space Station 14 (DSS-14) DoD Mission--Earth to space--NGSO TT&C--Earth to Space--NGSO NRAO/NSF Very Long Base Array (10 sites) Very Large Array (NM) Green Bank Observatory (W VA)
V-Band	43.5-45.5 GHz	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space)	DoD Mission--Earth to space--GSO and NGSO TT&C--Earth to Space--GSO and NGSO
V-Band	45.5-47 GHz	MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE MOBILE 46.9-47 GHz FIXED 5.554 - Satellite links at specified fixed land station [use in conjunction with the mobile-satellite or radionavigation-satellite service [45.5-47 GHz, 66-71 GHz, 95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz]	
V-Band	47-48.2 GHz	47-47.2 GHz AMATEUR-SATELLITE AMATEUR 47.2-48.2 GHz FIXED-SATELLITE (Earth-to-space) FIXED	GSO (e.g., HNS-95W) NGSO (e.g., Theia, SpaceX, O3b, Audacy, Telesat)
V-Band	48.2-50.2 GHz	FIXED-SATELLITE (Earth-to-space) FIXED MOBILE RADIO ASTRONOMY [48.94-49.04 GHz] (via FN 5.555)	GSO (e.g., HNS-95W) NGSO (e.g., Theia, SpaceX, O3b, Audacy, Telesat)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
V-Band	50.2-50.4 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 - passive only	NASA AQUA DoD Passive (Sensor) NOAA Special Sensor Microwave Imager/Sounder (SSMIS), Special Sensor Microwave Sounder (SSM/T)] sensors [DoD DMSP weather S/C] ATMS sensor [NOAA SNPP & JPSS] AMSU-A sensor [NOAA POES]
V-Band	50.4-51.4 GHz	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) FIXED MOBILE	DoD Mission--Earth to Space--GSO and NGSO TT&C--Earth to Space--GSO and NGSO NGSO (e.g., Theia, Audacity, O3b, SpaceX, Telesat)
V-Band	51.4-52.6 GHz	FIXED MOBILE 51.4-52.4 GHz FIXED-SATELLITE (Earth-to-space)	NOAA [sensor - ATMS] JPSS, SNPP
V-Band	52.60-54.25 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 - passive only	NASA AQUA, DMSP, MetOp-SG DoD Passive (Sensor) NOAA SSMIS & SSM/T sensors [DoD DMSP weather S/C] ATMS sensor [NOAA SNPP & JPSS] AMSU-A sensor [NOAA POES]
V-Band	54.25-55.78 GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive)	NASA AQUA DoD Passive (Sensor) NOAA SSMIS & SSM/T sensors [DoD DMSP weather S/C] ATMS sensor [NOAA SNPP & JPSS] AMSU-A sensor [NOAA POES] NGSO (e.g., Audacity)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
V-Band	55.78-58.20 GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive) FIXED MOBILE	DoD Passive (Sensor) NOAA SSMIS & SSM/T sensors [DoD DMSP weather S/C] ATMS sensor [NOAA SNPP & JPSS] AMSU-A sensor [NOAA POES] NGSO (e.g., Audacy)
V-Band	58.2-59.3 GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive) FIXED MOBILE RADIOLOCATION	DoD Passive (Sensor) NOAA SSMIS & SSM/T sensors [DoD DMSP weather S/C]
V-Band	59.3-64 GHz	INTER-SATELLITE FIXED MOBILE RADIOLOCATION	DoD Mission--Space to Space--GSO and NGSO TT&C--Space to Space--GSO and NGSO NOAA SSMIS & SSM/T sensors [DoD DMSP weather S/C]
V-Band	64-65 GHz	INTER-SATELLITE FIXED MOBILE except aeronautical mobile	DoD Mission--Space to Space--GSO and NGSO TT&C--Space to Space--GSO and NGSO
V-Band	65-66 GHz	EARTH EXPLORATION-SATELLITE SPACE RESEARCH INTER-SATELLITE FIXED MOBILE except aeronautical mobile	Identified For Future NASA use NGSO (e.g., Audacy)
V-Band	66-71 GHz	MOBILE-SATELLITE RADIONAVIGATION-SATELLITE INTER-SATELLITE MOBILE RADIONAVIGATION 5.554 - satellite links at specified fixed land station [use in conjunction with the mobile-satellite or radionavigation-satellite service [43.5-47 GHz, 66-71 GHz, 95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz]	NGSO (e.g., Audacy)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
V-Band	71-74 GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) FIXED MOBILE	DoD Mission--Space to Earth--GSO and NGSO Experimental
V-Band	74-76 GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) BROADCASTING-SATELLITE Space Research (space-to-Earth) FIXED MOBILE BROADCASTING	DoD Mission--Space to Earth--GSO and NGSO Experimental
W-Band	76-81 GHz	RADIO ASTRONOMY Space research (space-to-Earth) RADIOLOCATION Amateur 77-81 GHz Amateur-satellite 5.560 – radars on earth exploration-satellite and space research space stations [78-79 GHz] [PRIMARY]	NASA TROPICS NRAO/NSF Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	81-84 GHz	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) FIXED MOBILE	Identified For Future NASA use DoD Mission--Earth to Space--GSO and NGSO NRAO/NSF Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	84-86 GHz	FIXED-SATELLITE (Earth-to-space) RADIO ASTRONOMY FIXED MOBILE	DoD Mission--Earth to Space--GSO and NGSO NRAO/NSF Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
W-Band	86-92 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only	NASA AQUA GPM TROPICS Sentinel-6/JASON CS DoD Passive (Sensor) NOAA [sensors AMSU-A, ATMS, SSMIS, Microwave Humidity Sounder (MHS), SSM/T2] POES, JPSS, SNPP, DMSP NRAO/NSF Very Long Base Array (10 sites) Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	92-94 GHz	RADIO ASTRONOMY FIXED MOBILE RADIOLOCATION	DoD Active (Sensor) NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	94.0-94.1 GHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) Radio astronomy RADIOLOCATION	NASA CloudSat Cloud Radar System (CRS) - Airborne DoD Active (Sensor) NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	94.1-95.0 GHz	RADIO ASTRONOMY FIXED MOBILE RADIOLOCATION	NASA Cloud Radar System (CRS) - Airborne Meteorological Radar - GRC DC-8 Aircraft Cloud Detection Radar - AFRC DoD Active (Sensor) NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
W-Band	95-100 GHz	RADIO ASTRONOMY RADIONAVIGATION-SATELLITE FIXED MOBILE RADIOLOCATION RADIONAVIGATION 5.554 - satellite links at specified fixed land station [use in conjunction with the mobile-satellite or radionavigation-satellite service [45.5-47 GHz, 66-71 GHz,95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz]	DoD Active (Sensor) NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	100-102 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	102-105 GHz	RADIO ASTRONOMY FIXED MOBILE 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
W-Band	105.0-109.5 GHz	RADIO ASTRONOMY SPACE RESEARCH (passive) FIXED MOBILE 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
EHF	109.5-111.8 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
EHF	111.80-114.25 GHz	RADIO ASTRONOMY SPACE RESEARCH (passive) FIXED MOBILE 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
EHF	114.25-116.00 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NASA TROPICS NRAO/NSF Green Bank Observatory (W VA) Arizona Radio Observatory (ARO) Haystack Radio Telescope (MA)
EHF	116.00-122.25 GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive) 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	NASA AURA
EHF	122.25-123.00 GHz	INTER-SATELLITE FIXED MOBILE <i>Amateur</i>	
EHF	123-130 GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) RADIONAVIGATION-SATELLITE Radio astronomy RADIONAVIGATION 5.554 - satellite links at specified fixed land station [use in conjunction with the mobile-satellite or radionavigation-satellite service [45.5-47 GHz, 66-71 GHz, 95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz]	
EHF	130-134 GHz	EARTH EXPLORATION-SATELLITE (active) INTER-SATELLITE RADIO ASTRONOMY FIXED MOBILE	

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
EHF	134-136 GHz	AMATEUR-SATELLITE Radio astronomy AMATEUR	
EHF	136-141 GHz	RADIO ASTRONOMY Amateur-Satellite RADIOLOCATION Amateur	
EHF	141.0-148.5	RADIO ASTRONOMY RADIOLOCATION FIXED MOBILE	
EHF	148.5-151.5 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only	NASA ANSR NOAA SSMIS, SSM/T2 sensors [DMSP]
EHF	151.5-155.5 GHz	RADIO ASTRONOMY FIXED MOBILE RADIOLOCATION	
EHF	155.5-158.5 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) FIXED MOBILE	NOAA MHS sensor [POES]
EHF	158.5-164.0 GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) FIXED MOBILE	
EHF	164-167 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only	NASA GPM Sentinel-6/JASON-CS NOAA ATMS sensor [JPSS, SNPP]
EHF	167.0-174.8 GHz	FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE FIXED MOBILE	
EHF	174.8-182.0 GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive)	NASA AQUA TROPICS GPM

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
EHF	182-185 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only	NASA GPM NOAA [sensors - ATMS,SSMIS, SSM/T2,MHS] JPSS, SNPP, DMSP, POES Smithsonian Millimeter Array (SMA)
EHF	185-190 GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE SPACE RESEARCH (passive)	NASA GPM NOAA [sensors ATMS, SSMIS] SNPP, JPSS, DMSP
EHF	190.0-191.8 GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 - passive only	NASA AQUA TROPICS GPM NOAA [sensors ATMS, MHS] POES JPSS SNPP
EHF	191.8-200.0 GHz	INTER-SATELLITE MOBILE-SATELLITE RADIONAVIGATION-SATELLITE FIXED MOBILE RADIONAVIGATION 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz] 5.554 - satellite links at specified fixed land station [use in conjunction with the mobile-satellite or radionavigation-satellite service [45.5-47 GHz, 66-71 GHz,95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz]	Smithsonian Millimeter Array (SMA)
EHF	200-209 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only 5.341 - extraterrestrial origin emissions search (passive) [[101-120 GHz and 197-220 GHz]	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
EHF	209-217 GHz	FIXED-SATELLITE (Earth-to-space) RADIO ASTRONOMY FIXED MOBILE 5.341 - extraterrestrial origin emissions search (passive) [101-120 GHz and 197-220 GHz]	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	217-226 GHz	FIXED-SATELLITE (Earth-to-space) RADIO ASTRONOMY SPACE RESEARCH (passive) FIXED MOBILE 5.341 - extraterrestrial origin emissions search (passive) [101-120 GHz and 197-220 GHz]	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	226.0-231.5 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only	NASA AURA Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	231.5-232 GHz	FIXED MOBILE Radiolocation	NASA AURA
EHF	232-235 GHz	FIXED-SATELLITE (space-to-Earth) FIXED MOBILE Radiolocation	NASA AURA
EHF	235-238 GHz	EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (passive) EARTH EXPLORATION-SATELLITE (active) and SPACE RESEARCH (active) [Only for spaceborne cloud radars] [237.9-238 GHz](FN 5.563B)	NASA AURA
EHF	238-240 GHz	FIXED-SATELLITE (space-to-Earth) RADIONAVIGATION-SATELLITE FIXED MOBILE RADIOLOCATION RADIONAVIGATION	

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Appendix Allocations and Systems

Band	US Allocation Range	Allocated Services	Illustrative Systems
EHF	240-241 GHz	FIXED MOBILE RADIOLOCATION	
EHF	241-248 GHz	RADIO ASTRONOMY Amateur-satellite RADIOLOCATION Amateur	NASA AURA Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	248-250 GHz	AMATEUR-SATELLITE Radio astronomy AMATEUR	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	250-252 GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 - passive only	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	252-265 GHz	MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY RADIONAVIGATION-SATELLITE FIXED MOBILE RADIONAVIGATION 5.554 - satellite links at specified fixed land station [use in conjunction with the mobile-satellite or radionavigation-satellite service [45.5-47 GHz, 66-71 GHz, 95-100 GHz, 123-130 GHz, 191.8-200 GHz and 252-265 GHz]	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	265-275 GHz	FIXED-SATELLITE (Earth-to-space) RADIO ASTRONOMY FIXED MOBILE	Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)
EHF	275-1000 GHz	(Not allocated)	NASA AURA IceCube (commercial 883-GHz cloud radiometer) Arizona Radio Observatory (ARO) Smithsonian Millimeter Array (SMA)

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