

July 14th, 2020

FuTURE spectrum WG 2020#2

Qualcomm

U.S. Spectrum Update

37.6-38.6 GHz, 38.6-40GHz and 47.2-48.2 GHz Auction

December 10, 2019 - March 5, 2020

- Auction 103 was the largest auction of millimeter wave spectrum the FCC has conducted. The Commission is making 3,400 MHz of millimeter-wave spectrum available through this auction.
- **Verizon, AT&T biggest winners**
 - Verizon bid through the Straight Path Spectrum unit it acquired in February 2018, offering USD3.417 billion for a total of 4,940 licences
 - AT&T bid via FiberTower Spectrum Holdings (also acquired in February 2018), offering USD2.379 billion for 3,267 concessions
- The nationwide price per MHz-POP for category P blocks (47 GHz) in Auction 103 ended clock phase at \$0.001099, while category MN blocks (37.6-38.6 GHz and 38.6-40 GHz) ended the clock phase at \$0.009613,

Auction 103 – Upper 37 GHz, 39 GHz, and 47 GHz

Auction 103 is the Federal Communications Commission's third auction of Upper Microwave Flexible Use Service (UMFUS) licenses. Auction 103 offered a total of 3,400 megahertz of spectrum — the most spectrum ever offered in an auction — in the Upper 37 GHz, 39 GHz, and 47 GHz bands. These bands will be licensed as 100-megahertz blocks covering Partial Economic Areas (PEAs). See the [Auction 103 website](#) for additional information.

Auction ID	103	Qualified Bidders	35
Auction Description	Upper 37 GHz, 39 GHz, and 47 GHz	Winning Bidders	28
Date Opened	12/10/2019	Licenses Won	14,142
Date Closed	3/5/2020	FCC Held Licenses	2
		Total Licenses	14,144
Gross Proceeds	\$7,569,983,122	Incentive Payments	\$3,084,172,898
Bidding Credit Discounts	\$11,279,921	Net Proceeds - Auction	\$4,474,530,303
Net Proceeds - Bids	\$7,558,703,201		

<https://www.fcc.gov/auction/103>

<https://www.commsupdate.com/articles/2020/03/13/fcc-announces-auction-103-winners-verizon-att-dominate-bidding/>

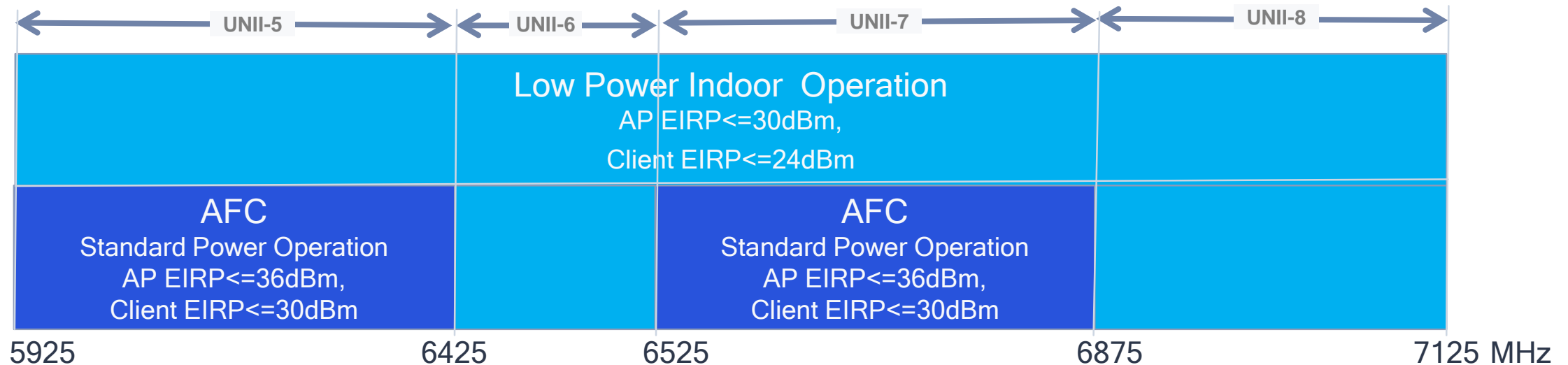
Allocation of 6 GHz (2-1)

April 23, 2020

FCC allocated 1200 MHz (5.9 to 7.1 GHz) for unlicensed operations

- Technology neutral: allow Wi-Fi and NR-U
- -27 dBm/MHz limit on 6 GHz OOB into the licensed 5.9 ITS spectrum
- Further Notice of Proposed Rulemaking
 - FCC proposes to permit very low power devices to operate in the entirety of 6 GHz band, indoor and outdoors. FCC is asking comment on pros/cons of such approach. FCC asks what power levels, noting they consider 4 dBm to 14 dBm EIRP.
 - SD increase for LPI. FCC asks questions on whether to increase LPI power from 5 dBm to 8 dBm.
 - FCC is seeking comment on portable standard power device operation (currently not allowed).
 - FCC is seeking comment on allowing AFC to consider antenna directionality for unlicensed P2P links.

Device Class	Operating Bands	Maximum EIRP	Maximum EIRP Power Spectral Density
Standard-Power Access Point (AFC Controlled)	U-NII-5 (5.925-6.425 GHz)	36 dBm	23 dBm/MHz
Client Connected to Standard-Power Access Point	U-NII-7 (6.525-6.875 GHz)	30 dBm	17 dBm/MHz
Low-Power Access Point (indoor only)	U-NII-5 (5.925-6.425 GHz)	30 dBm	5 dBm/MHz
Client Connected to Low-Power Access Point	U-NII-7 (6.525-6.875 GHz) U-NII-8 (6.875-7.125 GHz)	24 dBm	-1 dBm/MHz



Allocation of 6 GHz (2-2)

AFC System Details

- Only centralized model, i.e. AP access AFC remotely is allowed.
- FCC ULS is the source of truth for FS data. AFC system is required to download data on a daily basis.
- Interference protection criteria is -6 dB I/N per RLAN AP, i.e. RLAN energy should be 6 dB below thermal noise. No aggregate interference calculation and, hence, synchronization across AFC systems is not required.
- Should calculate available spectrum for between 36 dBm and 21 dBm EIRP with maximum 3 dB increments. (AFC systems can also calculate spectrum below 21 dBm).
- APs are required to include geo-location capability (not clear what this exactly means). External geo-location source is also allowed.
- APs are required to determine their location with 95% confidence level. Height can be determined automatically or via manually (by installer).
- AP needs to check with AFC system at least once per day, with one day grace period.
- FCC encourage formation of a multi-stakeholder group to develop AFC. Multi-stakeholder group will also develop interference detection and mitigation for LPI devices.
- Multiple AFC systems are allowed, AFC system functions can be divided among multiple entities. AFC system can charge fee.
- (Skipping details about AFC System Operator designations)
- Propagation model:
 - 0-30 meters: FSPL
 - 30 m - 1km : Winner II
 - 1 km + : ITM + P.2108 clutter for urban/suburban and P.452 clutter for rural.
- AFC system should also calculate adjacent channel protection zones based on Standard Power AP out-of-band mask.
- AFC systems and standard-power APs should employ secure protocols.
- APs need to register with AFC system before receiving list of channels to operate in. Device's FCC ID and serial number will be registered with AFC System. Registration data can also be sent via a proxy, e.g. network controller. Registration information should be stored for 3 months (after last access by AP).

FCC NPRM on 70/80/90 GHz Bands

June 10, 2020

- The NPRM proposed rule changes to enable improved use of these bands for 5G backhaul.
- The FCC believes co-existence of multiple deployment types is possible due to the highly directional nature of RF signals in these high bands.
- The FCC seeks to allow higher power levels and smaller, lighter antennas for deployments in the 70 GHz and 80 GHz bands, as they take up less space and are less susceptible to sway than larger antennas, making them useful for 5G network densification.
- The agency also seeks input on antenna polarization and discrimination rules.
- Finally, the FCC seeks input on means of improving sharing with co-primary federal users of these bands.
- Mobile industry expressed interest in the rule changes for 70 and 80 GHz to use the band for wireless backhaul.

Band	Non-Federal Use	Federal Use
71–74 GHz	Fixed, Fixed Satellite, Mobile, and Mobile Satellite	Fixed, Fixed Satellite, Mobile, and Mobile Satellite
74–76 GHz ²	Fixed, Fixed Satellite, Mobile, Broadcasting, and Broadcasting Satellite	Fixed, Fixed Satellite, and Mobile
81–84 GHz ³	Fixed, Fixed Satellite, Mobile, Mobile Satellite, and Radio Astronomy	Fixed, Fixed Satellite, Mobile, Mobile Satellite, and Radio Astronomy
84–86 GHz	Fixed, Fixed Satellite, Mobile, and Radio Astronomy	Fixed, Fixed Satellite, Mobile, and Radio Astronomy
92–94 GHz, 94.1–95 GHz	Fixed, Mobile, Radio Astronomy, and Radiolocation	Fixed, Mobile, Radio Astronomy, and Radiolocation

Current frequency allocation in US

NTIA Report on 3.1 to 3.55 GHz

July 06, 2020





- NTIA evaluated the feasibility of allowing commercial wireless services, on both a licensed and unlicensed basis, to share use of the radio frequency spectrum at 3100-3550 MHz, under the assumption of no changes in incumbent operations, except for possibly limiting some use of airborne radar systems over the continental United States.
- The report is positive about 3.45 to 3.55 GHz
 - The 3450-3550 MHz portion of this band is a good candidate for potential spectrum sharing, including at the commercial system power levels sought by the wireless industry.
- The report is more pessimistic about 3.1 to 3.45 GHz range
 - Although ultimately some sharing of spectrum below 3450 MHz may be possible as well, additional analysis of the entire band should be conducted to assess the various sharing mechanisms and the potential for relocating incumbents from some portion of the remainder of the band for commercial use.
 - Currently, there are both classified and unclassified federal operations below 3450 MHz, which could be problematic for sharing with a commercial wireless system. This would also need to be addressed, as well as the prospect that this portion of the frequency range may become even more congested if some federal operations are shifted down from above 3450 MHz to accommodate sharing at 3450-3550 MHz.

CBRS Band Auction

- FCC Auction in CBRS (n48/Band 48) to Start on July 23rd
- Auction of up to 7 licenses in each US county (over 3,000 counties)
- Each license is for 10 MHz within 3550-3650 MHz
- Each license is Priority Access License—a database will assign the particular 10 MHz and will attempt to assign contiguous spectrum for multiple licenses for the same operator, but US government incumbents have the highest priority for protection
- 271 companies qualified to bid—includes most US wireless carriers & US cable operators



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