



LICENSED 6 GHZ SYSTEMS FIXED POINT-TO-POINT TRENDS

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EXECUTIVE SUMMARY

It has been over a year since the FCC approved the first Automatic Frequency Coordination (AFC) System Operators in the United States, enabling unlicensed devices in the 6 GHz bands (5925-6425 MHz and 6525-6875 MHz) to transmit both indoors and outdoors at standard power levels. These devices may be Wi-Fi 6E and Wi-Fi 7 access points or fixed wireless access devices.

AFC systems are essential for enabling unlicensed access to these frequency bands while ensuring coexistence with licensed fixed point-to-point microwave systems. These microwave systems have served as the foundation of cellular, long-haul, and private communication networks across the U.S. for decades and hold primary rights to this spectrum.

This paper explores whether this novel approach to sharing spectrum has changed the licensees' sentiment on use of 6 GHz spectrum as a viable solution for their networks. It also compares use of the 6 GHz band by industry type (such as telecom and utilities) to that of other microwave bands to answer the question as to whether any perceptible decline in use is correlated to overall decline in that industry or whether the decline indicates a shift to other bands.

The primary conclusion of this paper finds that the use of the 6 GHz band for licensed microwave networks continues to grow, both in the amount of spectrum licensed and in the capacity per path. It also concludes that alternative licensed bands such as 11 and 18 GHz are more attractive due to capacity and economics.

LICENSED 6 GHZ SYSTEMS AND THE INTRODUCTION OF UNLICENSED DEVICES

The 6 GHz band in the United States has been the backbone of microwave communication networks for decades. These networks include telecom and mobile backhaul, state and local governments, electric and gas utilities, internet providers, financial, hospitals, universities, broadcast and cable operators, and other private use. This band is also shared with the fixed satellite service, providing uplinks for various forms of broadcast programming, and radio astronomy services.

On April 24, 2020, the FCC released an order¹ that opened up the 6 GHz band (5925 – 7125 MHz) for unlicensed devices. The entire band segment is allocated for low power indoor (LPI) use, up to 5 dBm/MHz and must not exceed 30 dBm EIRP over the frequency band of operation. It is also allocated for very low power (VLP) outdoor use, up to -5 dBm/MHz and must not exceed 14 dBm EIRP over the frequency band of operation. Devices at these power levels may operate in their respective locations without the control of an Automatic Frequency Coordination (AFC) System. If higher power is required, standard power (SP) devices may contact the AFC System to obtain a list of channels for operation to avoid interference into the licensed systems. The SP devices may transmit up to 23 dBm/MHz and must not exceed 36 dBm EIRP over the frequency band of operation.

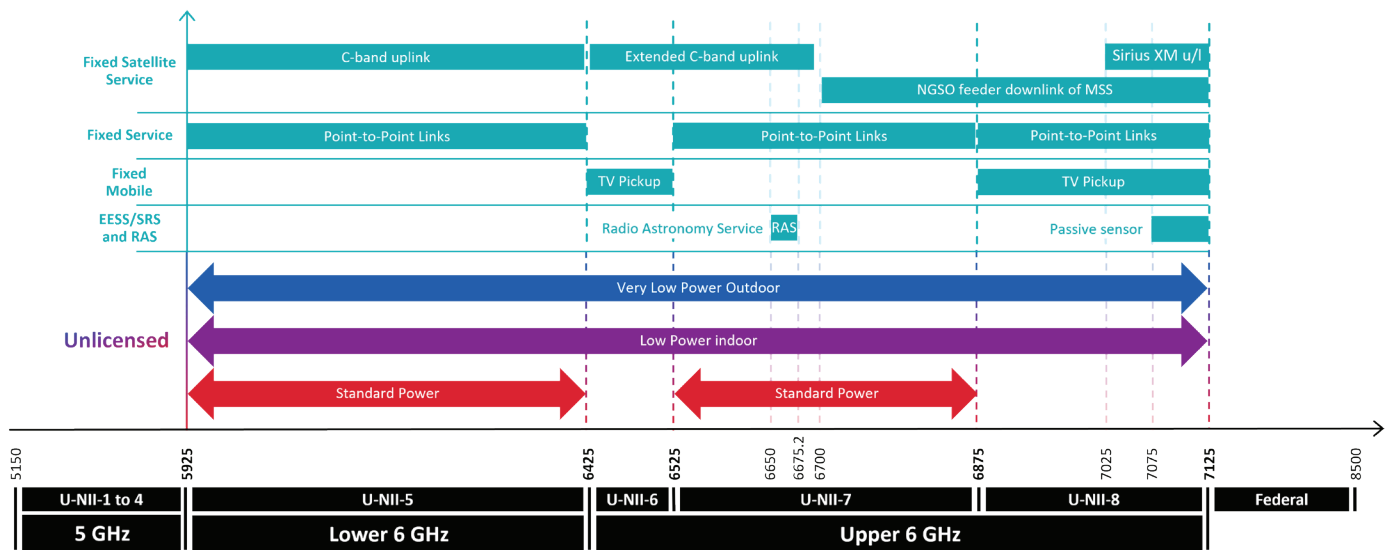


FIGURE 1: 6 GHz Band Uses in the United States

Typical use cases for 6 GHz unlicensed devices include primarily Wi-Fi and Fixed Wireless Access. It is also envisioned that VLP applications could include virtual reality and augmented reality headsets, automotive infotainment systems, maintenance, tracking, patient monitoring and security applications. In the Wi-Fi space, it has been shown that Wi-Fi 6E and 7 has the capacity to enable a high quality of service in stadiums and other places where there are a high concentration of people².

¹ Unlicensed Use of the 6 GHz Band, Report And Order And Further Notice Of Proposed Rulemaking, ET Docket No. 18-295, April 24, 2020, <https://docs.fcc.gov/public/attachments/fcc-20-51a1.pdf>

² Notre Dame Stadium becomes first outdoor university venue to move to Wi-Fi 6E standard, 10 December, 2024, <https://news.nd.edu/news/notre-dame-stadium-becomes-first-outdoor-university-venue-to-move-to-wi-fi-6e-standard/>

The first 6 GHz devices were introduced in late 2020. These LPI devices were Wi-Fi 6E devices that had a channel bandwidth of 160 MHz. As of April 2025, there are more than 5000³ Wi-Fi device models that support 6 GHz operation. Also, an RCR article⁴ from December 2024 reported a prediction by IDC that over 800 million devices would be shipped in 2024.

SENTIMENT OF 6 GHZ LICENSEES

As unlicensed 6 GHz use grows and matures, there is a question regarding how it will affect licensed systems and licensees' views of 6 GHz. Licensees use several criteria to determine the best solution when designing their networks. These criteria include tangible items like cost, capacity and network management capabilities as well as harder to quantify items like preferred suppliers, longevity of the product, and sentiment. With the addition of unlicensed operations at 6 GHz there is a legitimate concern that these operations may affect the overall reliability of licensed systems. By evaluating spectrum occupied over time in 6 GHz with other available frequency bands, trends can be evaluated for each industry type to determine if there is an overall decline in use of microwave networks and whether there is a perceptible change in sentiment toward the 6 GHz band.

FCC AND COMSEARCH DATA

The data used to answer these questions include both the FCC's Universal Licensing System (ULS) data, and Comsearch's frequency coordination data. The FCC ULS data contains the official record of what is permitted to operate and the Comsearch frequency coordination data is useful in providing both a lead indicator of licensee plans and more granular data that includes industry types for evaluation.

FCC Data

The FCC licenses fixed point-to-point systems on a site basis. Each site is issued a call sign, and that call sign may have one or more directional transmit antennas assigned, each of which is issued a path number. Each path is assigned one or more frequencies, each with an associated emission bandwidth. The total bandwidth per path is aggregated on a per-frequency assigned basis to eliminate skewing due to multiple modulations on each assigned frequency⁵. Two snapshots of ULS data sets were used for this comparison:

- **October 24, 2021:** This is the dataset that was used by AFC System Operators approved in the United States for lab certification.
- **May 5, 2025:** This is more than 14 months after the first 7 AFC System Operators were approved.

For this study, the FCC's ULS data was filtered to consider all active, licensed, fixed point-to-point transmitters.

For reference, the following maps show the locations of all of the licensed 6 GHz paths in the lower 6 GHz (5925-6425 MHz) and upper 6 GHz (6525-6875 MHz) bands as of May 5, 2025.

³ Massive market adoption: 5000+ Wi-Fi devices now support 6 GHz, 1200+ support Wi-Fi 7, Intel says, 22 April 2025, <https://wifinowglobal.com/news-and-blog/massive-market-adoption-5000-wi-fi-devices-now-support-6-ghz-1230-support-wi-fi-7-intel-says/#::~:~:text=Approximately%2077%25%20of%20all%20Wi-Fi,Claus>

⁴ What is the global status of 6 GHz Wi-Fi?, 9 December 2024, <https://www.rcrwireless.com/2024/12/09/fundamentals/global-of-6-ghz-wi-fi/#::~:~:text=IDC%20predicts%20that%20807.5%20million,GHz%20and%20Wi-Fi%207>

⁵ When a licensee deploys an adaptive modulation radio, the FCC requires each modulation be included on the license.

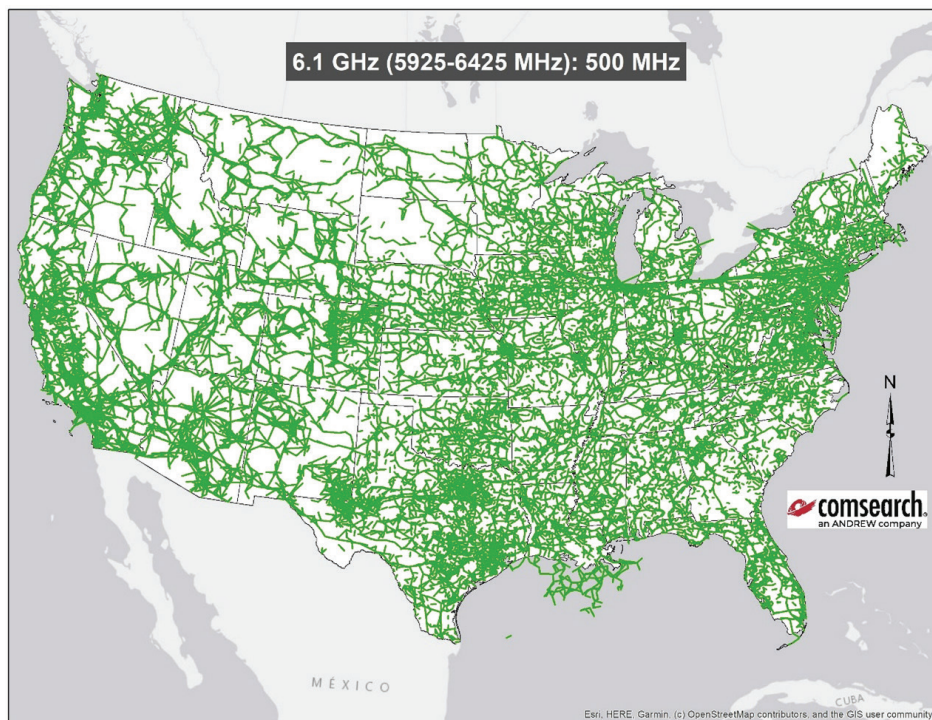


FIGURE 2: 6.1 GHz FCC Licensed Paths

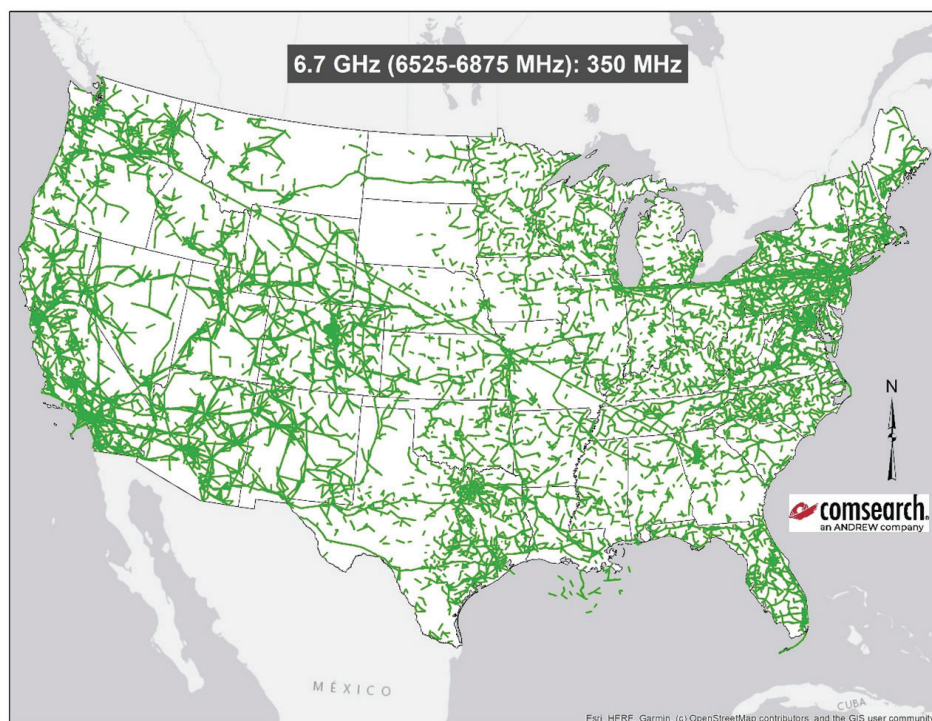


FIGURE 3: 6.7 GHz FCC Licensed Paths

Comsearch Data

Comsearch's mission is to enable the most efficient and intelligent use of the wireless spectrum, a precious and limited resource. The thousands of customers we serve each year trust us to provide expert solutions in the design, engineering, and management of reliable wireless communications networks globally.

As a premier frequency coordinator⁶, Comsearch sends and receives FCC Part 101.103 frequency coordination data for all paths that licensees anticipate building. This data is aggregated and provided to customers through its Vendor Competitive Intelligence Report (VCIR)⁷ product that spans decades.

The VCIR provides forward-looking information on what licensees are planning to deploy 6-12 months in the future. This is very useful information to have when assessing the sentiment of 6 GHz licensees. Since the VCIR covers the FCC microwave bands from 900 MHz to 23 GHz, this paper will also be able to compare the 6 GHz data to sentiment in other bands these licensees may use for their communication networks.

6 GHZ LICENSED PATH TRENDS

To evaluate trends in 6 GHz licensed systems, two metrics will be used: path counts and the amount of spectrum licensed.

Over the 3-and-a-half-year period between the FCC ULS data sets, Figure 4 shows that the number of paths in the 6.1 GHz band grew by 5,097 paths or 8.2%, while the 6.7 GHz band shrunk by 617 paths or 2.1%.

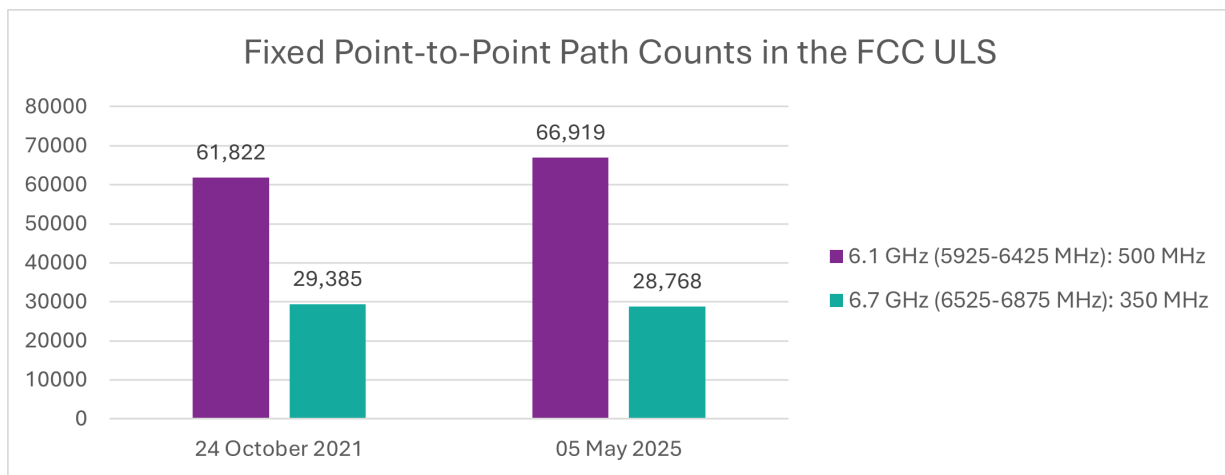


FIGURE 4: Fixed Point-to-Point Path Counts in the FCC ULS

However, if we compare the total spectrum licensed, we find both bands grew by over 10% each. The 6.1 GHz band grew by 355 GHz or 15.2% and the 6.7 GHz band grew by 44 GHz or 10.5%.

⁶ <https://www.comsearch.com/services/frequency-coordination-fcc-licensing/>

⁷ The VCIR product contains data collected on a monthly basis, enabling insights on market share for both radios and antennas, <https://www.comsearch.com/products/data-tools/vcir/>

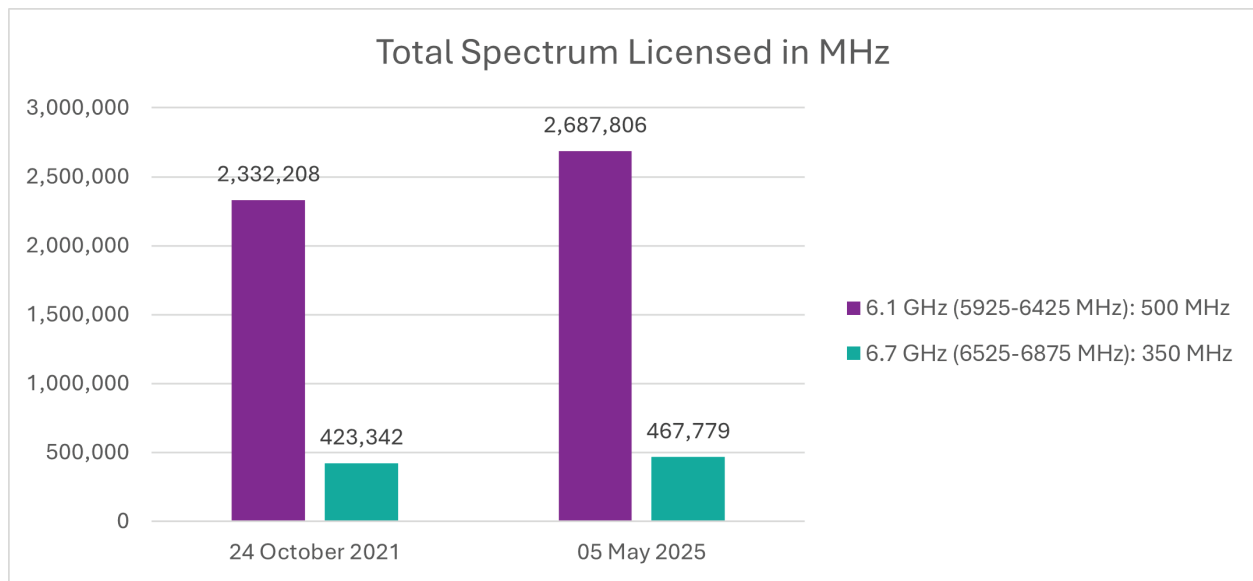


FIGURE 5: Total 6 GHz Spectrum Licensed in MHz

The reason for this difference can be explained if you consider that for both bands, over the 3.5-year period there are paths that are removed and paths that are added. This churn happens for several reasons: license expirations or deletions and upgrades of systems to increase capacity.

If the same data is reviewed on a per-assigned-channel basis, we see that 6.1 GHz grew by 6.5% and 6.7 GHz grew by 12.9%.

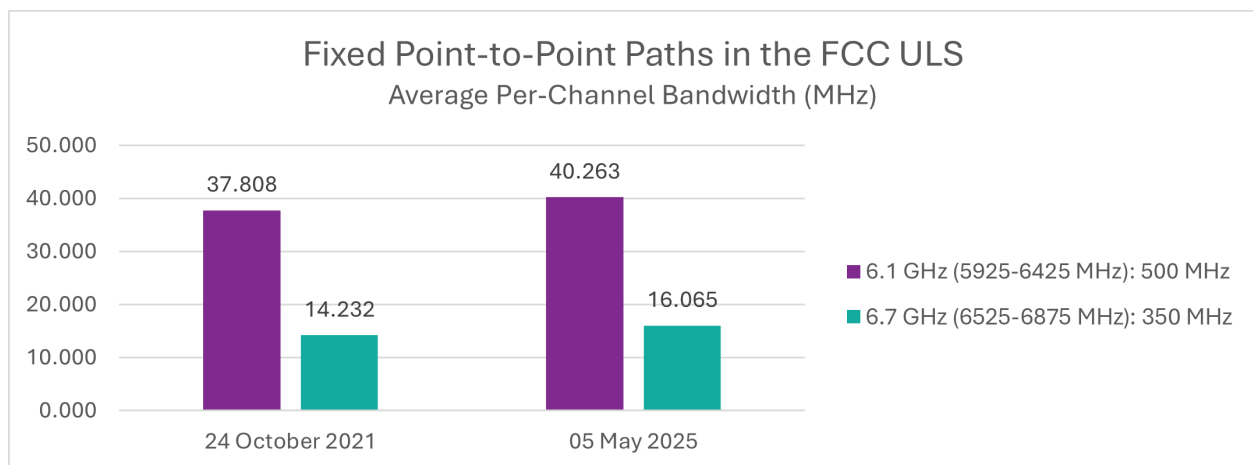


FIGURE 6: Average per-channel bandwidth comparison for all fixed point-to-point paths in the FCC ULS

If we filter the data further and look at paths in the May 2025 data set that were added since October 2021, it is clear that wider bandwidths are being deployed, replacing the narrow bandwidth systems that were removed. Note that the difference in the per-channel bandwidth at 6.1 GHz and 6.7 GHz is due to the maximum bandwidth per-channel allowed in each band. The 6.1 GHz band allows channels up to 60 MHz wide, while 6.7 GHz only allows channels up to 30 MHz wide.

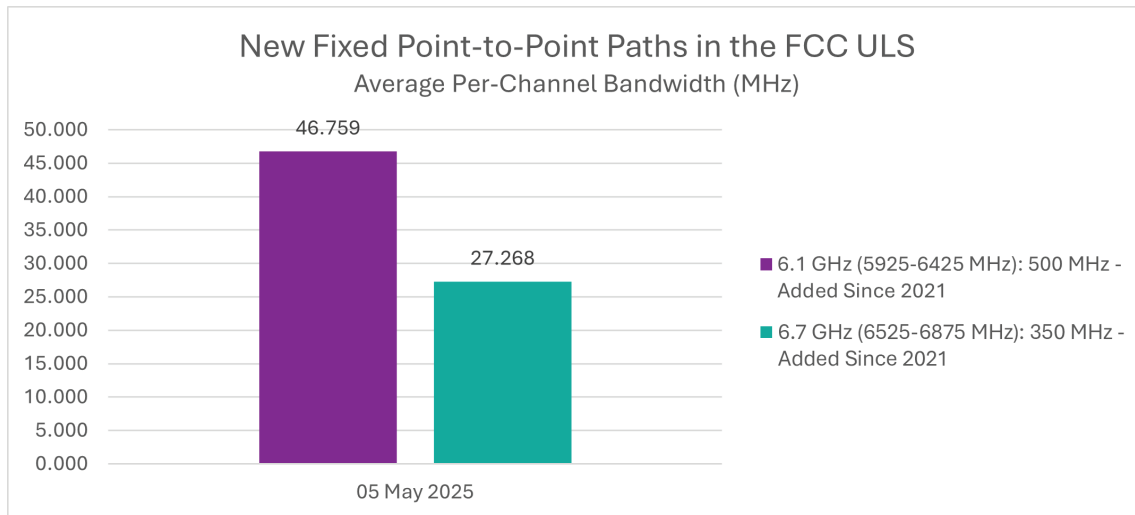


FIGURE 7: Average per-channel bandwidth for new paths in the FCC ULS since October 2021

6 GHZ COORDINATION DATA TRENDS

The FCC Part 101 frequency coordination data that Comsearch collects is forward-looking, showing what licensees are planning to deploy. While not all paths coordinated are licensed, this is a good indicator of licensees' intentions.

Similar to the FCC ULS data, the frequency coordination data is shown by site and path, with aggregation of spectrum occupied by channel assigned. Only frequency coordination data for new paths are reflected here; frequency coordination data for modifications of existing paths are not included. While data is presented for the last 10 years, the primary interest is in the last 5 years since the FCC opened up 6 GHz for unlicensed use. The average annual spectrum coordinated for 6 GHz has been flat with an annual average of 185 GHz for the 6.1 GHz band and 32 GHz for the 6.7 GHz band.

This shows that there is no wholesale decline in favorable sentiment for the 6 GHz band among all licensees.

Breaking these numbers down further, the licensees can be grouped by industry. For this purpose, the following industry groups are formed in order of largest to smallest amount of spectrum licensed:

- **Communication Services:** Includes cellular, internet, land mobile, SMR, and other carriers.
- **Government:** State and local governments, public safety.
- **Utilities:** Electric and local gas utilities, petroleum exploration and refining, pipelines, and water.
- **Financial:** Banking and other financial uses such as securities trading.

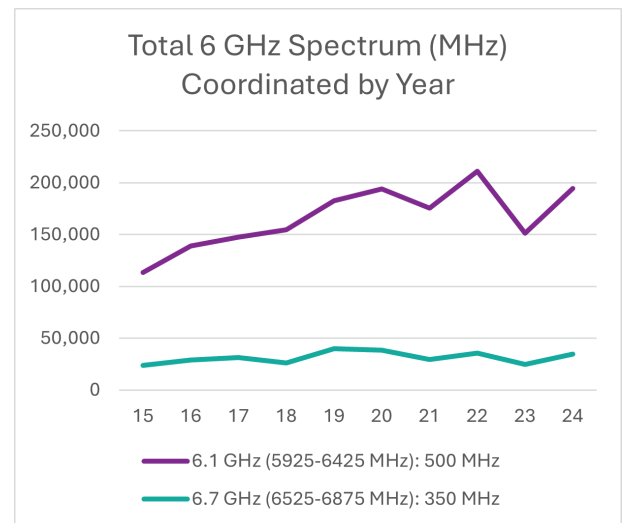


FIGURE 8: Total 6 GHz spectrum coordinated by year

- **Transportation:** Primarily railroads, plus other transportation companies.
- **Media:** Radio and TV broadcasters, media production, cable operators, and other video systems.
- **Other Private Use:** Manufacturing, education, healthcare, religious institutions, and other private users.

The top users are shown in the following figure:

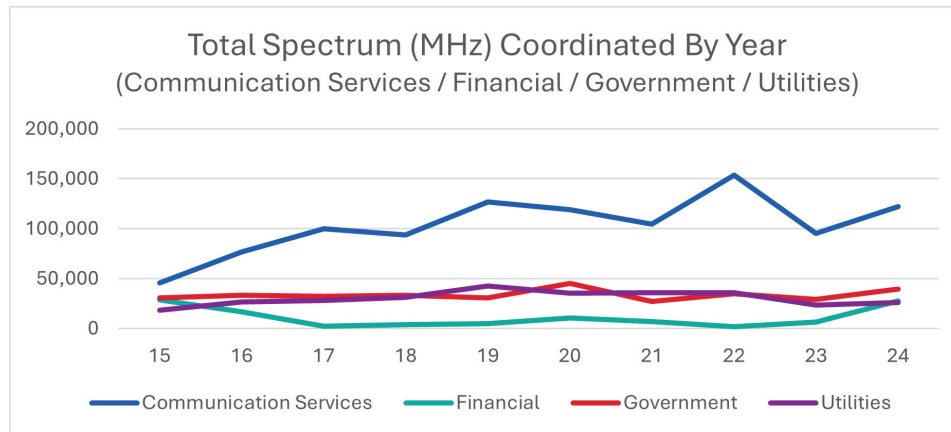


FIGURE 9: Total spectrum coordinated for communication services, financial, government and utility industries

Communication services is the largest overall group of licensees and is the primary driver for growth of 6 GHz usage. The amount of spectrum licensed does vary widely over the last 5 years, but on the whole, there is no noticeable decline. This figure shows that the Government and Financial group of licensees do not show any decline in spectrum licensed. However, the Utilities group shows a 25% decline of spectrum licensed from 35 GHz in 2020 to 26 GHz in 2024.

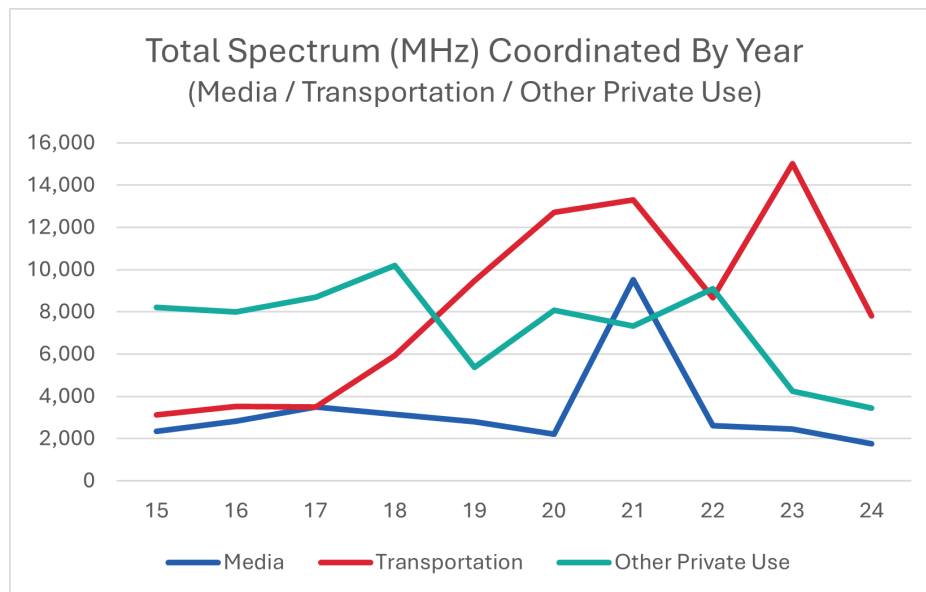


FIGURE 10: Total spectrum coordinated for media, transportation and other private industries

In the next tier, we explore the media, transportation and other private use industry groups. The transportation group shows a significant increase in spectrum licensed from 3.5 GHz in 2015 to 12.7 GHz in 2020, and then reflects significant

fluctuation over the last 5 years, varying between 7 GHz and 15 GHz of spectrum licensed per year. A trend for this group is not clear.

Likewise for the media group, we see variation in the form of a single spike in 2021 of 9.5 GHz of spectrum licensed that upon investigation was made by private cable operators. This could be attributed to the COVID pandemic, where there were more people home watching TV. Besides this spike, the media group hovers around 2 GHz of spectrum licensed each year, and no downward trend can be distinguished.

The other private use group shows a 56% decline in spectrum licensed, hovering around from 8 GHz of spectrum licensed per year between 2015 and 2020 and declining to 3.4 GHz in 2024.

Therefore, in the 6 GHz bands, most industry groups are not experiencing a decline in spectrum licensed per year. The only 2 groups that are showing a decline are the utilities and other private users.

COMPARISON OF MICROWAVE BANDS

To provide further understanding on 6 GHz licensee sentiment, a comparison to other frequency bands is important. Licensees are free to choose what frequency band they want to use for their networks. The microwave bands currently available to licenses includes: 6 GHz, 11 GHz, 18 GHz and 23 GHz.

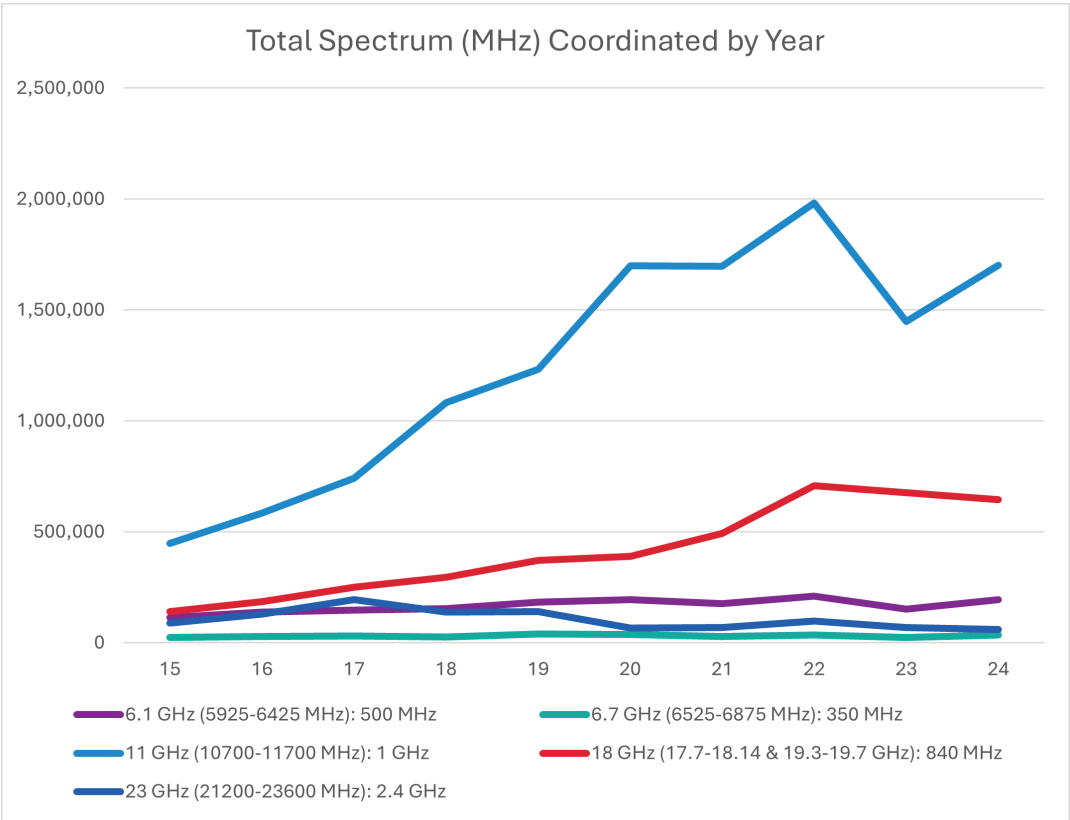


FIGURE 11: 6 GHz spectrum coordinated compared to other bands

In this figure, the 11 and 18 GHz bands are clearly the preferred choice by licensees in comparison to the 6 and 23 GHz bands. The 11 GHz band’s growth is flat between 2020 and 2024 at 1.7 THz of spectrum licensed, while the 18 GHz band grew from 389 GHz to 646 GHz in 2024, although the last 3 years has not shown any growth.

In comparison to the other bands, 6 GHz accounts for roughly 8% of all spectrum coordinated annually, even though it is 17% of the allocated spectrum.

Band (GHz)	Spectrum Allocated (MHz)	Spectrum Allocated (%)	Spectrum Coordinated (MHz), 2020-2024	Spectrum Coordinated (%)
6.1	500	10%	926,430.70	7%
6.7	350	7%	162,224.14	1%
11	1000	20%	8,528,028.00	66%
18	840	17%	2,913,094.42	23%
23	2400	47%	362,358.36	3%

FIGURE 12: Spectrum allocation vs. spectrum coordinated

The above table is a bit skewed though, due to the 23 GHz band. This band has challenges that make it unattractive. First, the propagation characteristics for 23 GHz are not as attractive. 18 GHz has roughly half the absorption loss of 23 GHz, which significantly shortens the path length to maintain a reliable link. Second, Federal approval is required for most of the spectrum, and the approval can add months to the licensing process. There is 600 MHz set aside for low power systems (<55 dBm EIRP), but that further shortens the path length.

So if we remove the 23 GHz band from the chart above, the picture changes significantly.

Band (GHz)	Spectrum Allocated (MHz)	Spectrum Allocated (%)	Spectrum Coordinated (MHz), 2020-2024	Spectrum Coordinated (%)
6.1	500	19%	926,430.70	7%
6.7	350	13%	162,224.14	1%
11	1000	37%	8,528,028.00	68%
18	840	31%	2,913,094.42	23%

FIGURE 13: Spectrum allocation vs. spectrum coordinated, excluding 23 GHz

Here we see that 6 GHz is 32% of all allocated spectrum, but only 8% of the spectrum coordinated.

Comparing these bands, there are a few factors making 6 GHz less attractive than 11 and 18 GHz.

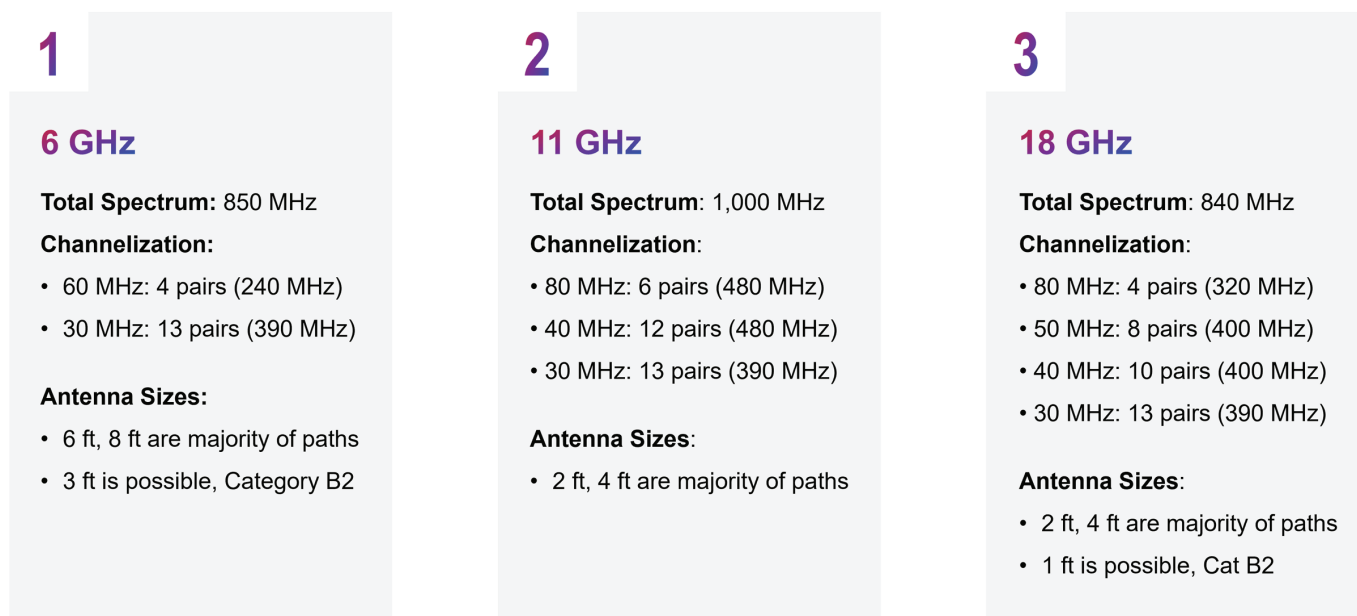


FIGURE 14: Comparison of spectrum, channelization and antenna sizes for 6, 11, and 18 GHz bands

In the 2007 report and order, FCC 07-163⁸, the FCC modified its Rules to allow for smaller antennas in the 11 GHz band, as small as 2 feet in diameter. This spurred new interest in the 11 GHz band. Then in the 2012 second report and order, FCC 12-87⁹, the FCC modified its Rules to allow for smaller antennas in the 6, 18 and 23 GHz band, as well as allowing for wider channels in the lower 6 GHz and 11 GHz bands.

The ability to deploy smaller antennas is a large contributing factor to the attractiveness of the 11 and 18 GHz bands. A 2-foot antenna at 11 GHz has the same gain as a 4-foot antenna at 6 GHz, and the added size and weight adds significant cost to deploy a path—not only in the upfront cost of the antenna. It also requires stronger, more expensive towers, increased recurring tower leasing costs.

In addition, 11 and 18 GHz have larger channel bandwidths, with up to 80 MHz for both bands versus 60 MHz for 6.1 GHz and 30 MHz for 6.7 GHz. This increased bandwidth translates to higher throughput (capacity) for a single radio.

DECLINING INDUSTRIES IN 6 GHZ

Taking a closer look at the two declining industries at 6 GHz and comparing them to 11 and 18 GHz, an assessment is made as to whether the industry is growing or declining its use as a whole.

First, the electric and gas utility industry is examined. For this industry, we see that after a peak of 65 GHz of spectrum coordinated in 2021, the 11, 18 and 23 GHz bands have declined back to 2020 levels.

This signals an overall decline in the need for additional spectrum, rather than a sentiment leading away from the 6 GHz bands.

⁸ WT Docket No. 07-54, Report and Order, Released September 10, 2007, FCC-07-163, <https://docs.fcc.gov/public/attachments/FCC-07-163A1.pdf>

⁹ WT Docket No. 10-153, Second Report and Order, Second Further Notice of Proposed Rulemaking Second Notice of Inquiry, Order on Reconsideration, and Memorandum Opinion and Order, Released August 3, 2012, <https://www.fcc.gov/ecfs/document/6017098761/6>

Second, the other private use group of industries shows two peaks in spectrum coordinated, one in 2019 and one in 2023.

One potential factor that could be reflected as a lower amount of spectrum coordinated in 2020 and 2021 is the COVID pandemic. During this time many private industries could have been delaying their network development plans as private businesses were not operating or were working from home.

Also note that for this industry, the amount of 6 GHz spectrum coordinated is only 3% of the total spectrum coordinated in 2024. As mentioned in the Comparison of Microwave Bands, the likely reason for use of 11, 18 GHz bands over 6 GHz, and the decline in 6 GHz spectrum coordinated is likely due to the economic advantages of 11 and 18 GHz, due to smaller antennas and larger channel bandwidths.

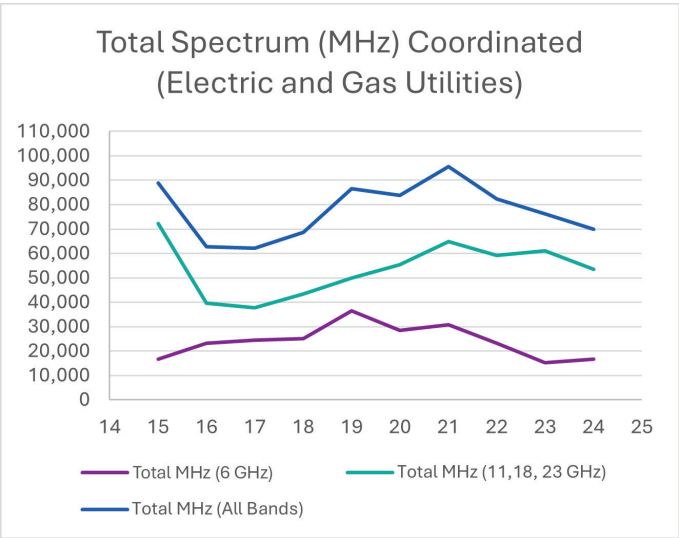


FIGURE 15: Electric and gas utility trends, 6 GHz vs. 11, 18 and 23 GHz

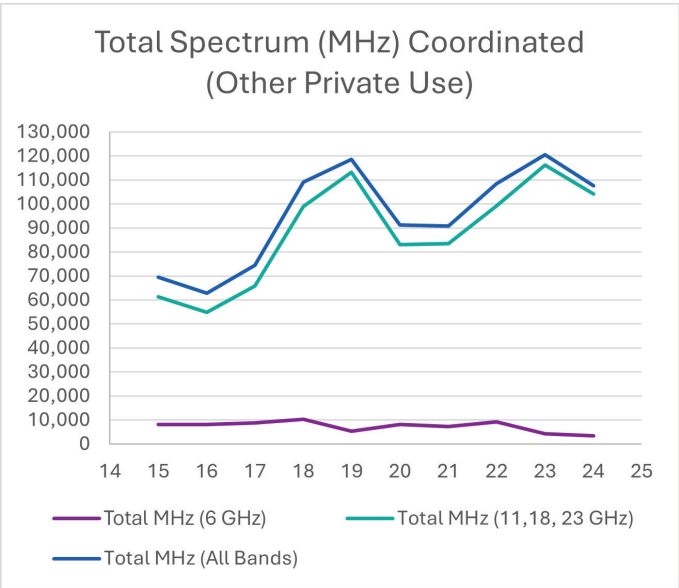


FIGURE 16: Private use trends, 6 GHz vs. 11, 18 and 23 GHz

CONCLUSION

Based on examining the license data and frequency coordination data presented, the 6 GHz band continues to be a viable band to deploy licensed microwave networks for the following reasons:

- The amount of spectrum occupied by licensed systems in both 6.1 and 6.7 GHz is experiencing modest growth at 4.1% per year.
- Within the 6 GHz band, there is a significant growth in the amount of spectrum occupied on each path as the appetite for throughput grows.
- While there are specific industries within the 6 GHz band that are declining, there is no evidence that this decline currently indicates a change in licensees' sentiment in use of the 6 GHz band.
- Growth in use of licensed microwave is more heavily focused on the 11 and 18 GHz bands. These bands are more popular due to economic factors: the availability of wider bandwidths, amount of spectrum available, and smaller antenna sizes.

Comsearch will continue to monitor this information and update it periodically.

Founded on January 21, 1977, Comsearch was established to address frequency coordination of the early developing microwave network companies. Today, Comsearch is celebrated as a pre-eminent global provider of spectrum management and wireless engineering products and services. We have developed industry-standard interference analysis and interference mitigation processes and procedures, and we maintain state-of-the-art software and comprehensive databases used in the design of complex wireless systems.



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