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By IHS Markit

CBRS spectrum: An overview of use cases and user tiers

The release of CBRS spectrum is one of the most highly anticipated events in the US mobile network industry in 2020. Read on for an in-depth look at how it works and the impact it will make.

What is CBRS spectrum?

CBRS stands for Citizens Broadband Radio Systems and is an exciting development for mobile networks, businesses, industrial applications, and consumers.

CBRS is a band of important radio frequency spectrum in the 3.5 GHz range. The FCC is releasing 150 MHz of 3.5 GHz spectrum for use across three tiers of users. CBRS will help enhance both 4G LTE and 5G mobile connectivity.

3.5 GHz spectrum: Why the hype?

3.5 GHz spectrum is located within the mid-band spectrum range, often considered the most desirable of the spectrum divisions because it carries some benefits of both low- and high-band: faster speeds than low-band and greater geographical range than high-band.

But, 3.5 GHz is in short supply.

Whereas 3.5 GHz spectrum is commonly used for mobile networks in the UK and other countries, in the US it has historically been reserved for the US military, public safety, and emergency response agencies.



Low-band <1 GHz

Travels far and penetrates deep indoors. Can reach rural communities. Works with 5G and 4G LTE. Biggest disadvantage: slowest speeds of all spectrum types.



Mid-Band 1-6 GHz

Known as the “sweet spot” for 5G connectivity. Faster than low-band. Works with 5G and 4G LTE. CBRS falls within mid-band at 3.5 GHz.



High-Band (mmWave)

Incredibly fast speeds and hotspots of 5G connectivity. Faster than other bands. Works with 5G only. Biggest disadvantage: travels a very short distance.



3.5 GHz spectrum: Why the hype?

3.5 GHz spectrum is highly coveted by all major US cellular carriers because it will increase their spectrum holdings and help provide an optimal blend of comprehensive coverage and speed, delivering outstanding mobile service to people in rural, suburban, and urban areas, as well as serving as the backbone of our connected communities and the IoT.

CBRS also promises to expand spectrum resources for Wireless Internet Service Providers (WISPs) and can provide additional connectivity options for private networks.

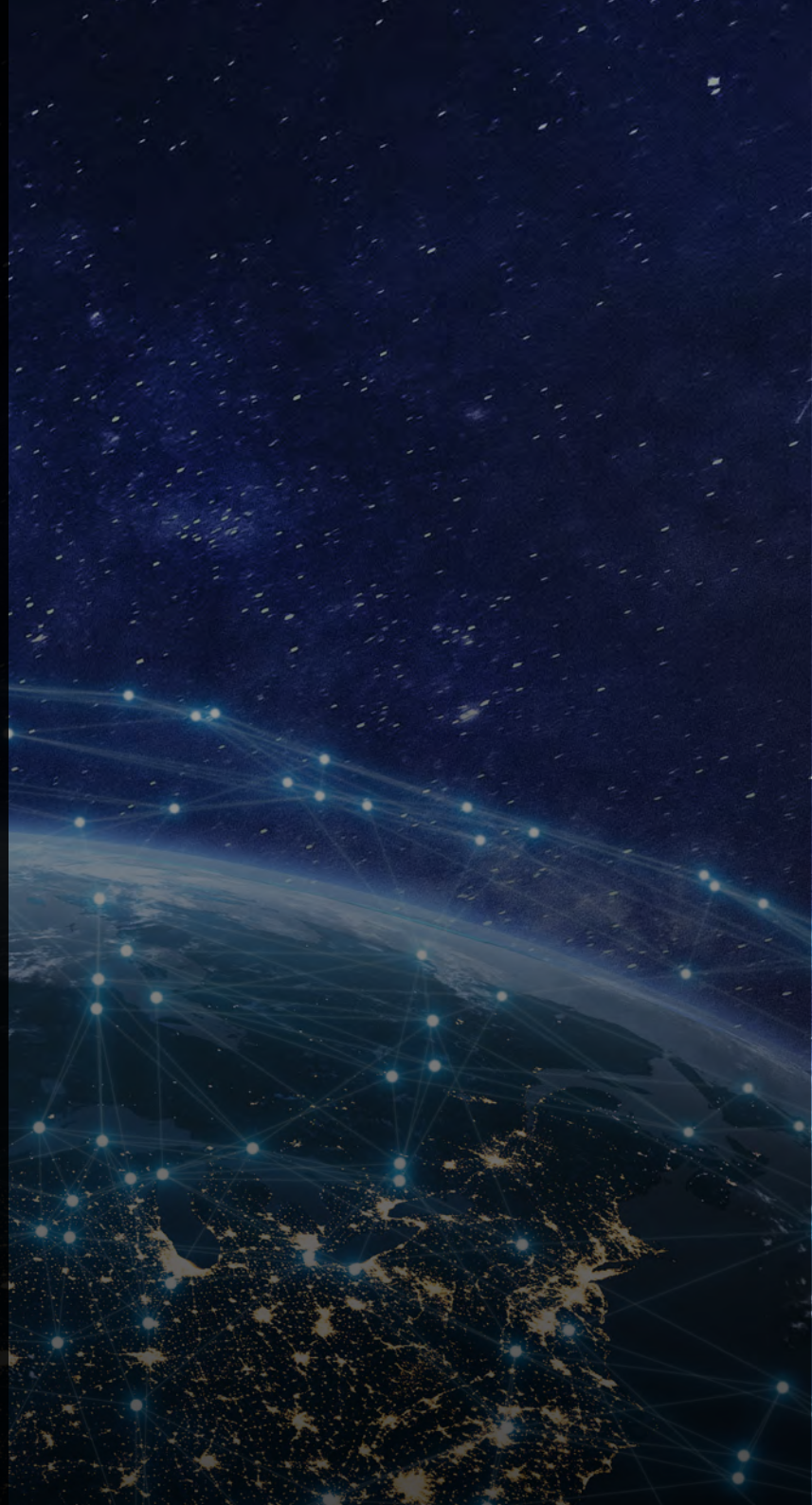


Use and operations

CBRS is an exciting development that brings new flexibility to mobile connectivity. But that same flexibility means it can be hard to navigate the ins and outs of CBRS at first glance.

Here's what you need to know and how to understand the various tiers of service and wide array of potential use cases.

Use and operations



Primary use cases

Wireless capacity in urban markets:

CBRS spectrum will have an important impact in the mobile network market, boosting capacity for both 4G LTE and 5G networks.

The 3.5 GHz spectrum made available by CBRS will increase wireless capacity in highly populated areas. When it comes to 5G, densely populated areas in the US largely rely on either high-band 5G, which delivers exceptionally fast speeds but only over a small geographic area, or low-band 5G, which spreads over a wider area but at speeds that are often similar to those of 4G LTE.

CBRS mid-band spectrum will enable businesses, industrial applications, and consumers to take advantage of faster 4G LTE and 5G across a wider area.

Primary use cases

Fixed wireless broadband for rural markets:

3.5 GHz spectrum will increase the ability for people living and working in rural areas to have access to reliable, high-speed internet. Fixed wireless access (FWA) uses cellular technology instead of fiber to provide high-speed broadband internet access powered by antennas installed at the service location such as the home or office.



Primary use cases

Private wireless networks:

Commercial enterprises, universities, and others in the public sector are expected to benefit from CBRS spectrum to provide a private wireless network for business and industrial operations, which will be crucial in cases where Wi-Fi or existing cellular networks have proven unreliable and ineffective.

WISPs and cable companies can also take advantage of private wireless networks enabled by 3.5 GHz spectrum to gain more subscribers in areas where service was not available before.

CBRS also provides the additional connectivity and reliability needed for Industrial IoT, smart factories, and other applications that depend on increased capacity and coverage.

Who gets to use CBRS spectrum?

Use and operations

CBRS user licenses are structured under a three-tiered system. CBRS can be used by any and all of the three tiers, but it's not a free-for-all or a pure first-come, first-served system. Different tiers have different access privileges.



Three tiers of access

3.5 GHz access licenses are divided into three tiers:

Three tiers of access



Three tiers of access

Tier 1: Incumbents

Incumbent access licenses include authorized federal users, fixed satellite service earth stations, and grandfathered wireless broadband licensees. The grandfathered wireless broadband group will have a finite term limit on Tier 1, and then will be moved to Tier 3.

Incumbent access users are protected against interference from both Tier 2 and Tier 3 users.



Three tiers of access

Tier 2: Priority Access Licenses (PALs)

If incumbents aren't using their CBRS resources, PALs have the right to utilize that spectrum. PALs will be licensed through a competitive bidding process on a county-by-county basis across the US. Each PAL is renewable every 10 years and consists of a 10 MHz channel within the 3.5 GHz band. Licensees are subject to a four PAL channel aggregation cap and must meet stringent performance requirements by the end of the initial license term.

PAL licensees must protect and accept interference from Tier 1 users but they are protected against interference from Tier 3 users. PALs have unique characteristics that set them apart from other tiers:

PALs are not issued for specific channel blocks. Rather, they are assigned dynamically by SAS providers to accommodate other users and to protect incumbents.

Use it or share it: GAA users can operate within an unused spectrum channel block owned by a PAL. Therefore, PAL users are encouraged to use the channel blocks they own, or they may have to give them up to a Tier 3 user.



Three tiers of access

Tier 3: General Authorized Access (GAA)

If neither incumbents nor PALs are using CBRS resources, then GAA users can take advantage of the spectrum for their own use.

GAA licenses offer open, flexible access to the 3.5 GHz band for the widest possible group of potential users. This spectrum is basically free, subject to only the small monthly service fee provided by vendors. However, GAA users must not cause interference to Tier 1 or Tier 2 users and receive no protection from other GAA users.

Like PALS, GAA spectrum is issued in 10 MHz channel blocks, and is available for use as long as there is no other GAA user at a specific location. Some experts believe that sharing amongst GAA licensees isn't so simple, however. Competition may become crowded in some locations in the future and the SAS will have to step in to maintain order. How that will pan out remains speculative.



Three tiers of access

Understanding the interplay between the three tiers can be tricky. As an analogy, you might think of CBRS like a high school football field.

The field can be open to different types of users but not all users have the same priorities and privileges.

For instance, throughout the day, many different groups may use that field for activities and practice: the soccer team, track team, cheerleading squad, and maintenance crews.

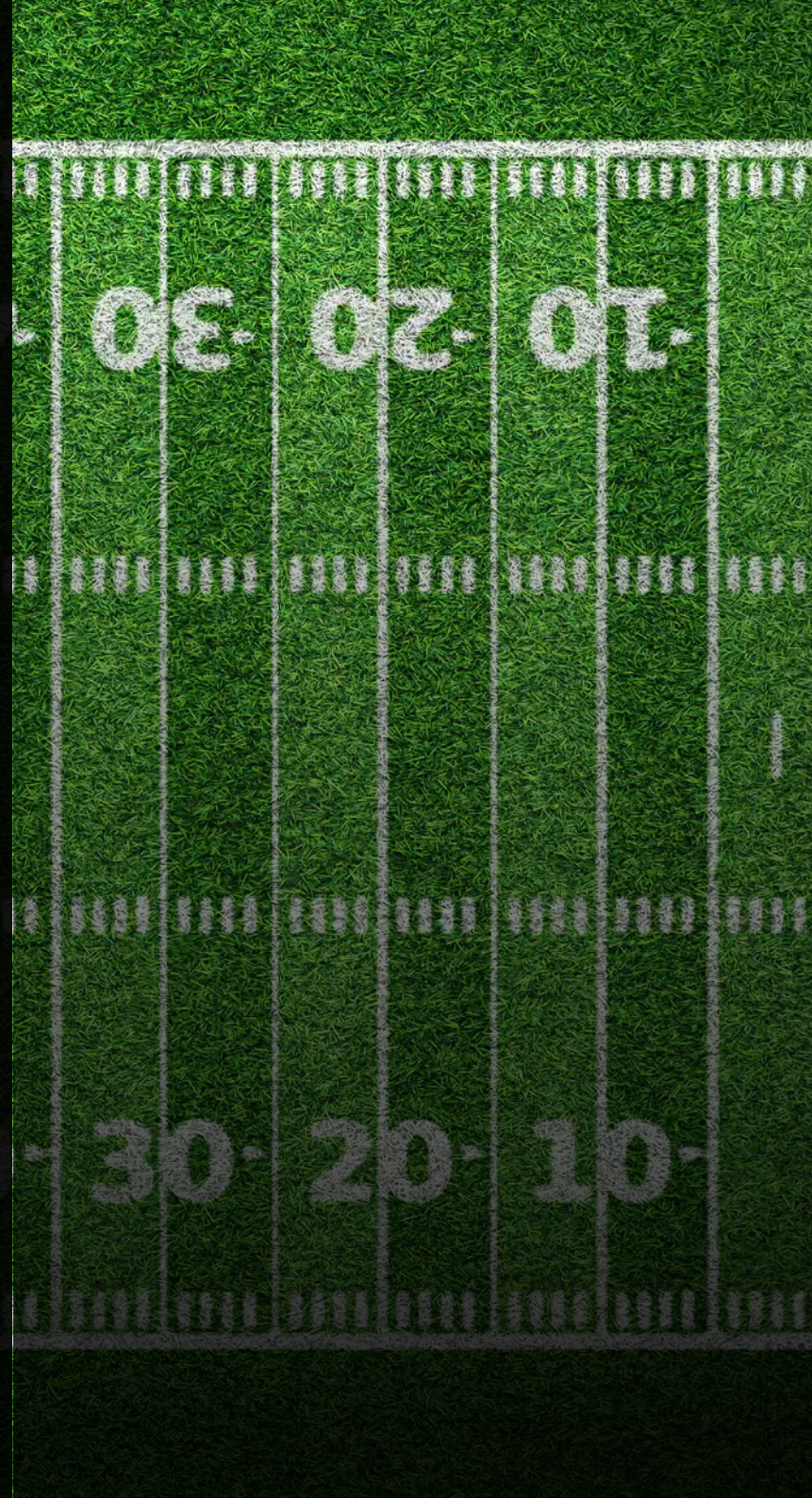
Think of these user groups as Tier 3.

Then comes Friday evening.

Only certain users are allowed on the field for game night, and everyone else must stand aside.

The marching band is like Tier 2: they have the field to themselves for the halftime show, with no interference from Tier 3.

Three tiers of access



Three tiers of access

But when the football team is ready to return, the band must leave the field.

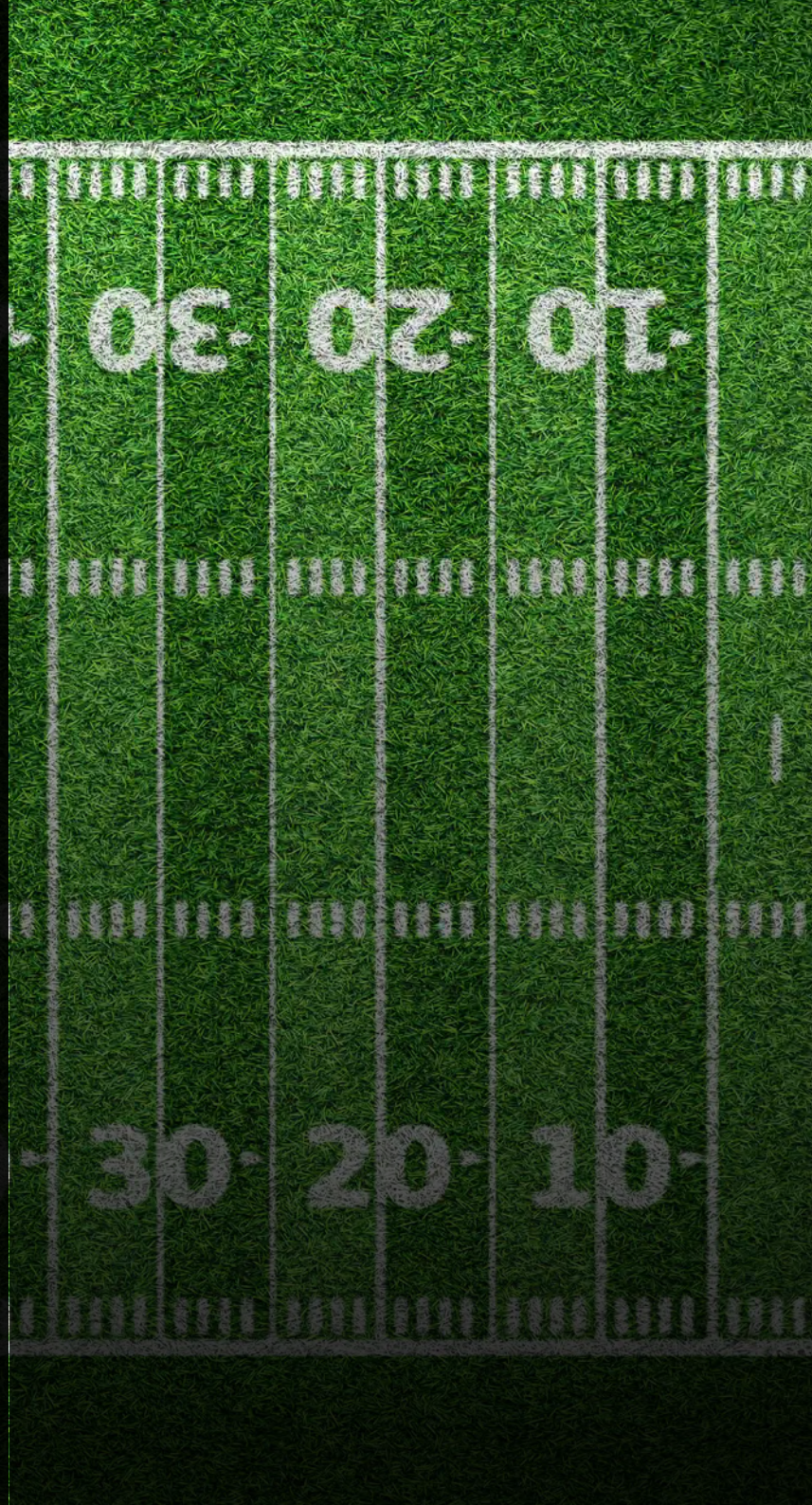
The football team is Tier 1. When it's game time, they are the only users allowed on the field and they are protected from interference from Tiers 2 and 3.

And who protects the tiers from interference? The referee.

CBRS access and operations will be managed by a network of Spectrum Access Systems (SAS). Each SAS will manage operations between users across the three tiers of authorization.

Each SAS essentially plays referee for spectrum allocation and usage to ensure the users are following guidelines and the upper tiers receive preferential spectrum allocation as needed.

Three tiers of access



A huge 5G milestone

The release of CBRS spectrum in the US is certainly a huge milestone in the path to a fully realized 5G experience. With more mid-band spectrum available for consumption, consumption, businesses, industries, and consumers should begin to benefit from the faster speeds 5G promises and more 5G use cases and applications will, in turn, emerge.

Contact us at
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to learn more about CBRS and
find real-world data on its impact and
effectiveness, or visit
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Impact on 5G

