



TECHNOLOGY
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**5GHz Frequency Bandwidth:
A Platform for the Future**



Clear Com's newest wireless communications platform, FreeSpeak Edge™, is built around 5GHz technology and is a member of the FreeSpeak™ product family which includes the award-winning FreeSpeak II® wireless intercom system. FreeSpeak Edge represents a new technology experience for intercom users.

So, why 5GHz? What benefits does it bring? This article demystifies 5GHz and shows why it is an excellent and future-proof choice for production environment communications.

The 5GHz wireless spectrum is full of opportunity. It is a highly manageable resource, backed by mass market development and readily available deployment tools, that represents enormous potential for today and tomorrow. This is exactly why we selected 5GHz for the ground up development of our next generation wireless platform, FreeSpeak Edge.

Clear-Com's engineering team started with fundamental radio science and built a dedicated communications layer for reliable and secure real-time communications, fully optimized for the professional intercom user of today. Based on years of industry experience, a wealth of information from the massive user base of the best-selling FreeSpeak II, and cutting-edge engineering, FreeSpeak Edge is the most advanced intercom platform available, providing a unique toolset and the ability to grow with our users. It also adds to the existing capabilities of the FreeSpeak family and allows users to create a single system that exists on all three frequency bandwidths – 1.9GHz, 2.4GHz, and now 5GHz.

We designed FreeSpeak Edge from the ground up, unburdened by limitations of earlier technologies. We are headed into the future....



The 5GHz Advantage

5GHz matters because it's an entirely different landscape, where higher frequencies mean there's more bandwidth for data. More data means finer control, additional audio channels, more robustness, lower latency and, of course, better audio quality. Put simply: it's more dependable in critical live productions.

Benefits of our approach to 5GHz include:

- Elimination of multi-path issues
- Increased interference avoidance
- Superior audio quality
- Better performance in complex environments
- Massively increased scalability in many regions
- Lower latency

Crucially, Clear-Com's embodiment of 5GHz complies fully with industry best practices in Static Frequency Allocation, which improves performance for FreeSpeak Edge users as well as making Clear-Com a good neighbor for other spectrum users.

The 5GHz radio band has 25+ designated non-overlapping channels, depending on the region. The channels are wider (typically 20 MHz), and this allows for superior performance compared with legacy DECT technology and radio systems that use the crowded 2.4 GHz band - which is also populated by wireless consumer devices.

Remarkably, not only is FreeSpeak Edge resistant to problems caused by reflections (multi-path interference) but actually uses the phenomenon to reinforce its signals. So, it's ideal for challenging environments like stadiums, crowded urban spaces and architectural oddities like domed ceilings.

FreeSpeak Edge also provides multiple power attenuation for increased density and effective channel reuse when deploying a large roaming system.



It is not Wi-Fi

It's true that Wi-Fi also uses the 5GHz spectrum, but it works in a very different way to FreeSpeak Edge. Essentially, they use different methods across multiple layers of abstraction. What this means is that there's no danger of data from Wi-Fi "leaking" across to interfere with intercom traffic. It also means that FreeSpeak Edge systems are completely secure.

FreeSpeak Edge carries data wirelessly using a state-of-the-art radio technology called OFDM (Orthogonal Frequency Division Multiplexing). This is also used in Wi-Fi, but whereas Wi-Fi's priority is to maximize raw data throughput, Clear-Com's priority is audio performance and the robustness of the radio link. Clear-Com's radio technology is application specific, in other words, and therefore highly optimized, where Wi-Fi's purpose is generic.

With more spectrum available in 5GHz, there's room for additional non-overlapping channels. This makes it easier for the equipment to find free channels, and vastly improves scalability. Some configurations of FreeSpeak Edge can reach up to 100 beltpacks and 64 transceivers.

FreeSpeak Edge's core ability to coordinate frequencies allows it to designate and maintain dedicated channels that do not compete with other devices. The result is a highly scalable, deterministic intercom set-up that's stable and reliable.

Finally, 5GHz has the space to allow FreeSpeak Edge to provide best-in-class audio quality - up to 12kHz with a very low noise floor.

Frequency Coordination

Broadcast productions and live events have become more sophisticated, and hence more complex. This represents both technical and creative progress - and it often offers a more compelling experience for the audience, too.

But it creates a challenge.

A decade ago, only the personnel who were absolutely key to a production would have access to a wireless intercom. But wireless systems have proven to be so incredibly useful that everyone, understandably, wants to have one. The issue is that it's not just production teams that use wireless; there's a multitude of other users from security to medical staff, all of which can lead to a fog of active radio channels.

This is a situation that needs to be proactively managed, and with FreeSpeak Edge that is possible through the use of frequency coordination. By allocating dedicated channels for each aspect of the production, including wireless intercom,

interference can be virtually eliminated. With FreeSpeak Edge there's no longer any need to compromise performance with time division or geographical separation to keep essential users connected.

In addition to the frequency coordination allowed by the 5GHz frequency band, it is possible to utilize multiple frequencies (1.9GHz, 2.4GHz, and 5GHz) with the various FreeSpeak products, functionally partitioning different user groups to the system that best matches their requirements.

This allows for larger teams, better production efficiency, faster set-up times and higher-quality, dedicated audio links between production crews.

FreeSpeak Edge and 5GHz

FreeSpeak Edge has been designed from the ground up around 5GHz. So, the features and capabilities of the new digital intercom system are native to the higher frequency band. FreeSpeak Edge is a completely new platform and not an evolution of a current design. This is the new generation.

A sharp eye will note that many of FreeSpeak Edge's most compelling features hinge on the capacity for greater data transfer and having more space to work in, resulting in better sound quality, lower latency, configurable space and more robust transmission.

FreeSpeak Edge has two high capacity, low latency, encrypted 5GHz radios in each beltpack and four radios in each transceiver. These provide redundancy, capacity and great potential for future enhancements. The radios each use a 20 MHz channel with a proprietary protocol implementation optimized for a robust and reliable connection between FreeSpeak Edge devices.

5GHz devices typically have a shorter range compared to 2.4GHz. The outdoor range range is around 900ft compared to 1200ft offered by 2.4GHz. Similarly, the indoor range, which is 300-600ft with 2.4GHz is 200-500ft with 5GHz. This does allow for easier reuse of frequencies, which is ideal for high density applications. In the relatively few cases where this might be an issue, Clear-Com's FreeSpeak range of products includes FreeSpeak II, which uses lower frequency bands that can be run simultaneously to form a single, unified communications system.



FreeSpeak Edge Product Comparison Based on Frequency Band

	FS II 1.9 GHz	FS II 2.4 GHz	FS Edge 5 GHz
Available Non-Overlapping Channels	5-10	3-4	25+
Total Available Spectrum	10-20 MHz	83.5 MHz	420 – 600 MHz
Outdoor range	1200 ft	1200 ft	900 ft
Indoor range	300-600 ft	300-600 ft	200-500 ft
Multi-path and reflection	Harms propagation	Harms propagation	Helps propagation
Interference by other devices	None	Severe	None if frequency coordinated

5GHz is not a replacement for 1.9 GHz and 2.4GHz frequency bands. The table above is a comparison of the main characteristics of each spectrum block. Each has its own strengths, but as productions become more ambitious - and more technically challenging - the advantages of a natively 5GHz intercom platform become compelling.

Building a new digital, wireless intercom system is a huge undertaking. FreeSpeak Edge is the culmination of years of engineering effort and experience. It's a platform for the future: scalable, robust and with outstanding performance. Based on worldwide standards for ease of use but with extra layers of features and customization available for the specialized needs of intercom users.

It's simply the most advanced wireless intercom system on the market.