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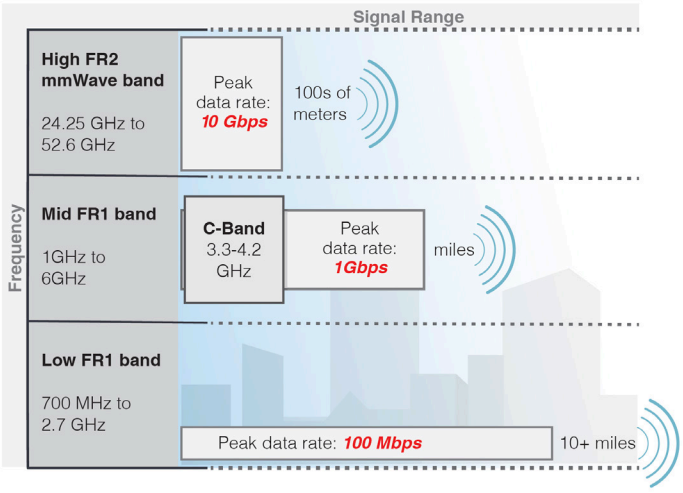
Steps For Retrofitting Macro Towers for C-Band 5G

Mid-band spectrum auctions are going to make existing macrocell wireless sites more desirable for 5G radios and services. For areas outside dense urban cores, carriers and tower companies can bypass many of the obstacles and costs involved in deploying large numbers of small cells across a geographic area. Yet, there are specific concerns around size, strength, thermal performance and concealment of the macrocell site that must be overcome. Expert engineering services can ensure suitability of macro sites and help achieve cost and time efficiencies of retrofitting an existing installation.

Mid-Band Spectrum Will Accelerate 5G Deployment

To date, many 5G deployments have used high-band millimeter wave (mmWave) spectrum (above 6GHz) that enables ultra-high-speed, gigabit-plus wireless connectivity, but that high-frequency bandwidth only works over very short connections. Other early 5G rollouts have used lower bands (below 2.5GHz) that offer wider coverage, but noticeably less bandwidth that does not meet the ultimate potential for 5G services.



The FCC has been working to make available mid-band spectrum in the 3.0 GHz to 4.5 GHz frequency range that offers an ideal balance of high speeds with solid signal propagation to help network operators expand 5G coverage. C-Band comprises a portion of this frequency range, and the FCC has auctioned 280 megahertz of C-Band spectrum, with the end result being 5,684 licenses awarded that are available for 5G. FCC Acting Chairwoman Jessica Rosenworcel is quoted as saying, “Now we have to work fast to put this spectrum to use in service of the American people.”

Macro Tower Sites Come Into Play

This new “5G land rush” has already begun and will accelerate 5G deployment in the coming years. Initial mmWave deployments focused on densely populated urban areas such as downtown plazas and areas surrounding convention centers, arenas, stadiums and airports where there is the potential for the most demand, and therefore most revenue, from high bandwidth 5G services. Low-band services are often focused in other urban areas to quickly expand 5G connections across the most people, even though low-band 5G does not offer a noticeable improvement over a good 4G LTE connection.

C-band 5G service is the pathway to bringing more customers a distinguishable improvement of 4G LTE across urban, suburban and—with a range of several miles—rural areas. These areas are already served by 4G LTE delivered by macro tower sites. These sites should be targets for C-Band 5G radios.

A macro cell site concealed within a water tower can provide 5G service across a non-urban location.

[1] *https://www.cnet.com/news/at-ts-low-band-5g-network-is-now-available-nationwide/*

There are several reasons why existing macro sites can be a cost-effective and fast way to expand 5G service coverage.

1. They have already been ideally sited to provide coverage for a specific population, so no new site analysis is required.

2. Carriers and tower companies already own or lease many of these sites, so they may not need to enter into new leasing agreements. Instead, they may just need permission to upgrade the site.

3. Similarly, electrical service and backhaul is already in place, although both may need to be upgraded for more radios and bandwidth.

4. With good mechanical design, an upgrade to an existing site may not require aesthetic review by the local municipality, a process that can slow down the installation of 5G small cell sites.

With all these advantages, carriers and tower companies need to be aware that adding equipment to an existing macro site requires considering and meeting important engineering challenges.

Evaluate Physical Size, Mechanical Strength And Thermal Properties

In any site, adding new services typically involves installing new radios, but not removing existing ones. Wireless carriers will layer new services on top of existing ones (e.g. 5G on the same location as 4G LTE) to continue to service customers while offering them higher 5G speeds.

The operator of the macro site must plan to add 5G radios to existing 4G radios and support electronics. The 5G radios for will have different formats to support “multi-element” antenna arrays that could grow larger to implement advanced beamforming and other techniques for high-bandwidth. In short, close cooperation with wireless carriers is required to understand what radio equipment they plan to use, and in what orientation, to determine needed changes to any physical enclosure.

Likewise, the frame that supports the radios, associated electronics and enclosure walls needs to be evaluated and possibly upgraded to reliably support the entire assembly.

In addition to physical size, more radios in a given space can increase the challenge of controlling temperature. Not only do the new radios generate heat, but their configuration can have an effect on air flow. Thermal analysis is recommended for the new assembly. Where passive cooling was once sufficient, active cooling may be needed to ensure the larger number of radios stay within safe operating temperatures.

Check Concealment Materials For 5G Compatibility

Perhaps the most challenging part of upgrading a macro tower to C-Band 5G is the material that makes the enclosure. When most macro sites were built, little consideration was needed for the impact of materials on signals. Sub-GHZ signals can propagate through most concealment materials (particularly fiberglass) already used in macro cell sites. In fact, some installers may have used commodity fiberglass panels that are not rated for use in wireless sites at all.

The situation is much different for C-band and mmWave 5G signals. Existing frame and/or concealment materials are likely to impact and impede the propagation of GHz-level signals. While some macro towers do not conceal the radios, the need for concealment may grow as the macro site adds more radios, supporting cabling and electronics.

Rooftop macro cell sites are potentially good candidates for 5G radios.

When considering adding C-band 5G to existing macro sites, therefore, carriers and tower companies should consider retrofitting the site with materials tested for GHz-level and mmWave signals. Raycap’s InvisiWave® (seen above) for example, is the result of extensive research and testing on signals ranging from 700MHz, through the C-band and all the way up the mmWave spectrum to 100GHz. Not only is it a solution for upgrading macro sites for C-band, it ensures performance and futureproofs for upgrades down the line.

Consult With Experts In 4G/5G Site Engineering

Retrofitting macro sites for C-band 5G is considered the quickest path to rolling out high levels of service to wireless customers. But it requires proper application of electrical, mechanical and thermal engineering expertise to make sure the retrofit is successful now and going forward. Raycap has experience working with tier-1 carriers and top tower companies to design, engineer and manufacture enclosures and hardware to satisfy the constraints of wireless sites across the U.S. With expert design and engineering consulting, carriers and tower companies can deploy mid-band 5G services more quickly and efficiently by retrofitting existing macro sites.

Macro cell sites concealed in steeples may be retrofitted to accommodate C-band 5G.

About Raycap

Raycap is an international manufacturer and technology leader with decades of experience providing innovative infrastructure solutions for customers in the telecom, energy, defense, transportation, and other industrial markets. Its solutions protect mission-critical applications and ensure the best possible system availability. The company's product portfolio includes lightning and surge protection technologies, structured cabling and connectivity solutions, power management systems, custom enclosures, cabinets, and wireless network concealments. Since its founding in 1987, the company has experienced continuous growth. Its engineering expertise, extensive patents and IP, test laboratories, and multiple manufacturing facilities guarantee quality, reliability, and innovation. Product design, testing, and approval processes comply with all international safety standards. Raycap operates in the United States, Germany, Greece, Cyprus, Slovenia, and Romania.

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