RAYCAP ARTICLE

The Case for Modernizing Aging Infrastructure: Paving the Way for 5G and Beyond

With the rollout of 5G services, carriers and tower companies will want to make the most of existing macro sites for fast, efficient deployment. These sites will need to be examined to see if they need structural upgrades to support new C-band radios and signal propagation. Engineers will also want to ensure the electrical service, surge protection and backhaul are adequate when adding a new generation of radios.

Existing macro sites are important for expanding 5G coverage

C-band radios are driving many 5G deployments because they provide the signal range and bandwidth that allow carriers to achieve the optimal balance between speed and geographical coverage. They make it possible to provide data rates up to 1Gbps over several miles and this represents the optimum combination for carriers to serve densely populated metropolitan and urban areas.

C-band is being rolled out as an addition to existing cellular services (3G/4G LTE) and ideally, carriers would like to co-locate their new 5G radios within existing macro cell sites (such as the concealed tower example in Figure 1), since these already have electrical and wired communications infrastructure available and are in locations that can provide the required levels of signal coverage.

Figure 1. Example fully concealed macro cell site

Updating physical infrastructure for C-band radios

While adding an extra radio might appear to be a relatively straightforward task (assuming there is sufficient space), many existing macro sites have an inherent drawback that impacts their suitability to host 5G radio equipment.
Concealment materials being used to hide radios and antennas so they blend into local architecture may degrade 5G signals. Fiberglass has long been a common material for concealment purposes, yet it has a particularly detrimental effect on 5G signal propagation.

This may make it necessary to retrofit many sites with concealment materials that do not interfere with 5G signals. Tests have shown that the insertion loss on C-band transmissions caused by different types of fiberglass far exceeds the 0.5dB limit considered acceptable by engineers (Figure 2). With the potential for losses as high as 2.5dB, these materials have a significant impact on C-band signals, thereby increasing the likelihood of latency and jitter problems.

Insertion losses can be significantly reduced by using the Stealthskin™ and InvisiWave™ materials from Raycap, that also can be manufactured into custom shapes and textures and painted to closely match existing architectures for aesthetic purposes.

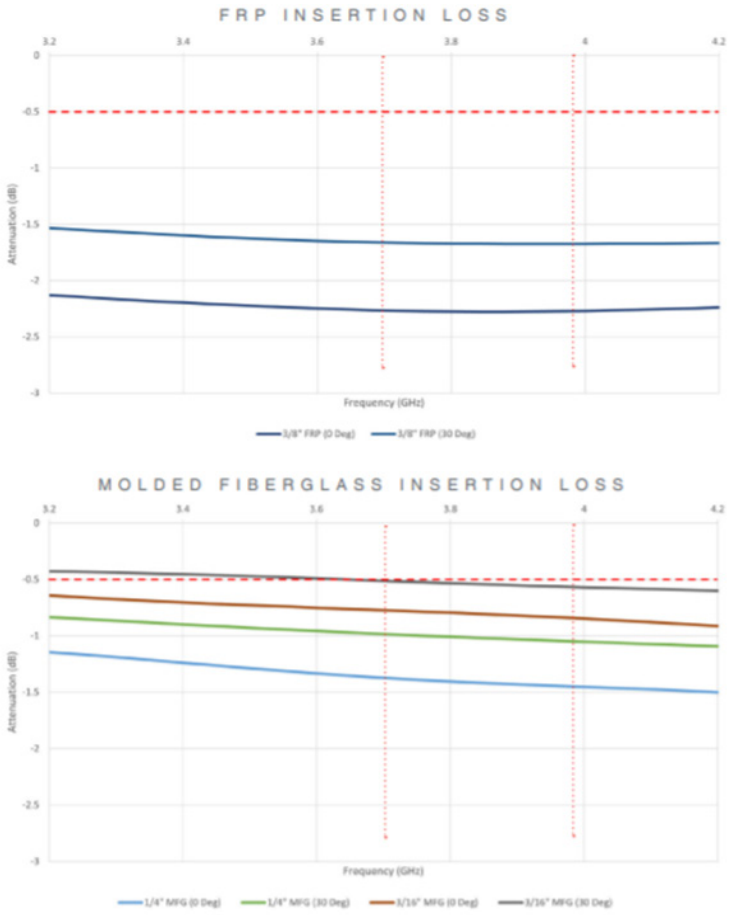

Figure 2. C-band insertion losses caused by fiberglass

Ensuring adequate power and connectivity

5G equipment operates at higher frequencies than those used in previous generations of mobile telecommunications. Consequently, these radio transmitters require higher power levels, making them more vulnerable to the effects of voltage surges caused by lightning and from other sources. It is important for carriers to ensure that they have a surge protection strategy which provides adequate protection (Class I) for their equipment, especially since many macro cells are situated on the rooftops of buildings and at the top of poles, making them more susceptible to damage from a direct lightning strike.

Figure 3. Lighting strikes create electrical surges that may damage 5G equipment

Class I surge protection devices (SPD) are designed to protect against “a direct or partial direct lightning discharge” and are tested to withstand the discharge energy typically encountered by structures located in exposed areas. Raycap’s Strikesorb® technology (Figure 4) offers Class I+II surge protection in a single solution and can survive lightning currents (rated at up to 25kA 10/350) while keeping residual voltage levels close to 100V, making it ideal to protect all types of 5G radios against electrical surges.

Figure 4. Two of the Strikesorb SPDs from Raycap

Figure 5. Raycap's pole topper and side mounted shroud small cell solution

Small cells may also need upgrading

Apart from using existing macro cells, carriers are also seeking to take advantage of existing pole-mounted 4G/LTE small cells as they roll out their 5G services. Pole-mounted enclosures are commonly used in densely populated urban locations (such as New York City.) In these environments, space is at a premium, planning restrictions hamper the building of new macro cells, and the installation of new power connections or communications connectivity upgrades may be cost prohibitive. Active equipment is typically mounted off the ground, on the side of existing light poles or on a wall. As carriers attempt to install new 5G antennas at these sites, it may become necessary for them to upgrade the existing enclosures (because they are either too small or insertion loss is too high). Either way, many new pole toppers will be required to accommodate the number of antennas necessary for full 5G service provision.

The Raycap shrouds 4G/5G multi-carrier pole topper solution (Figure 5) offers flexible mounting options that can help simplify installation. Small cells are typically installed at locations less likely to suffer direct lightning strikes, but where surges due to induced currents are more likely. These require Class II surge protection which is also provided by Raycap’s Strikesorb SPD.

Engineering analysis up front saves time and problems down the road

When it comes to concealment materials and protection against electrical surges, 5G equipment has very specific requirements that may require alterations or additions to many existing macro and small cell sites. As they roll out their 5G infrastructure, carriers are quickly discovering that it pays for them to work with a vendor that has lots of experience in cell site infrastructure upgrades. With expertise in the areas of concealment materials and surge protection, Raycap has all the credentials they are looking for.

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, 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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