

RAYCAP ARTICLE

4G/5G Small Cell Options That Fit the Big Cities

Deployment of 4G/5G wireless services is proving more challenging than it was for prior generations. To provide continuous coverage for fixed wireless access (FWA) and mobile applications, 4G/5G small cell sites must be lower to the ground and significantly closer to one another than previous wireless sites mounted high up on macro towers. In fact, the 4G/5G wireless infrastructure will comprise between six to 12 times more cell sites than earlier generations, deployed on nearly every city block.

If you can make it in NYC, you can make it anywhere

Moreover, service providers will need to locate more small cells where there is the most need for densification—in the busiest streets, plazas and neighborhoods. That means they will likely be mounted on or within current street furniture, impacting urban aesthetics and utility operations, and complicating installation. Moreover, a city will have a great variety of infrastructure - a large one can have dozens of types of streetlight poles, wood and metal. One site design will not fit all. Satisfying a matrix of coverage requirements, municipal regulations and city agencies across so many sites is a monumental undertaking.

But if you can make it in New York City, you can make it anywhere.



Raycap InvisiWave Topper installed on a small cell pole in St. Louis MO

The critical role for concealment

With a high density of 5G small cell sites needed for FWA and mobile services in highly trafficked areas, concealment will be an important element to meeting municipal aesthetic requirements. Cities want small cells to blend in with existing architecture and structures, and reduce the anxiety certain citizens may have about the proximity of radio equipment. Fortunately, there are now materials that can cover 4G and 5G radios, as well as antennas, with very little or no impact on performance. Raycap's InvisiWave® is a unique patent-pending concealment material that works with 5G mmWave bandwidth and gigabit speeds while minimizing dB loss. It has passed extensive testing at the 24GHz, 28GHz and 39GHz bands — even as high as 100GHz. It is also fully backwards compatible with all commonly used sub-6GHz frequencies, so radios from different generations can be combined within the same InvisiWave enclosure.

InvisiWave technology works today in pole toppers, surrounds and radomes on integrated pole configurations, as well as in panels composing chimneys, cupolas, screen walls, and other rooftop concealments. Its smooth, hydrophobic surface can be painted to city specifications and has the necessary durability to stand up to environmental extremes.

As part of its recent acquisition of Apelio, Raycap has combined InvisiWave with a number of pole-topper and pole-mounted shrouds to offer a portfolio of 4G/5G small cell solutions for dense urban environments. In fact, the products in the portfolio have either been approved by the New York City Department of IT and Telecommunications (NYC DoITT) or are currently awaiting approval. An examination of this portfolio can help carriers, tower companies and A&E firms understand how to approach any major city market.

Pole-mounted shrouds gain InvisiWave for more open areas

Raycap's small cell portfolio has its roots in the DoITT 4G Shroud that is used extensively in the NYC tri-state area and approved by NYC DoITT. This pole-mounted enclosure solves challenges in urban locations where — due to lack of space, permit restrictions or even a costly installation of power or connectivity — all active equipment must be mounted off the ground, on the side of an existing light pole, wall or other structure. The key to making this an acceptable solution includes full integration of electronics, thermal engineering and management using an improved intake louver design, and color matching. This enclosure supports single and multi-carrier configurations and is deployed throughout NYC.

To extend this approach for 5G service, Raycap has introduced a second enclosure built following strict NYC DoITT specifications. It incorporates InvisiWave technology combined with an offset bracket (to prevent the light pole blocking the main lobes) for optimal 5G coverage. This

New York City Pole Mounted Shroud



enclosure is a single-tenant solution that can hold 4G and 5G radios and supporting electronics, and all radios and components can be individually dismantled and replaced for future upgrades. Like the DoITT 4G-Only Shroud, it uses enhanced thermal management to optimize operation during New York's weather extremes.

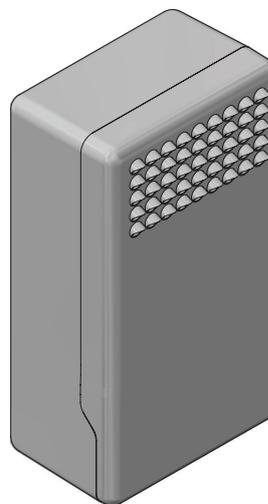
Pole mounted enclosures like these are often the first consideration by carriers, as they are a relatively simple solution for open city areas when the "comms zone" on the pole provides adequate line of site. In addition, a mid-pole mounted solution puts less strain on the pole when wind load potential is high, such as in New York where poles must be capable of withstanding hurricane-force winds.

Adding pole toppers for greater coverage in dense areas

While side-mounted enclosures may be the simplest solution, they may not provide the best 5G performance. Given the sensitivity of mmWave frequencies to physical obstacles such as buildings, trees and other street-level structures, the top of a streetlight pole typically has the best line of sight for maximum small cell coverage. That's why, in busier or more cluttered environments, a pole topper is a better location for 5G radios and antennas.

Raycap has developed a 4G/5G solution that combines a 5G pole topper using InvisiWave mmWave friendly material with the 4G pole-mounted shroud capable of single or multi-carrier configuration. The pole topper can contain and conceal multiple 5G radios and 4G antennas in different configurations to optimize flexibility for multi-tenant sites. The companion shroud integrates and conceals multiple 4G radios and associated electronics.

APELIO



Apelio 4G/5G Pole Mounted Shroud Design

NYC DoITT approval for this combination solution is in progress. The solution includes all the necessary integration services and pre-cabling to minimize installation time.

This small cell solution opens up a much wider selection of streetlight poles for 5G small cell sites. The 5G antennas can provide improved coverage around street-level obstacles, while remaining out of sight. The deployment process includes matching up the hardware with numerous styles of light poles: New York City alone has 13 metal pole designs. Moreover, streetlight pole dimensions can change as the poles are repaired or serve other purposes besides lighting.

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At the same time, antenna manufacturers continue to refine their products to meet new frequency and performance requirements. Starting with a portfolio of enclosures and pole toppers, carriers and their contractors can expect to need a range of antenna mounting solutions to fit every antenna to its pole. They should also plan for the need for regular engineering adjustments to small cell hardware to satisfy real-world variances. In fact, even though the Apelio manufacturing facility has rolled out many antenna mounting products, some installations succeed only after a fast-turn adjustment from their local engineering staff.

Antenna replicas and integrated poles serve to meet future needs

While existing streetlights will be the backbone of 5G deployment in established neighborhoods, new construction offers new opportunities to “design in” 5G small cell coverage. Carriers and tower companies will want to establish optimal locations in current construction projects for future coverage plans. Raycap offers a new replica antenna shroud designed specifically for NYC as a placeholder for future 4G and/or 5G applications. They use InvisiWave material and a form factor engineered to ensure future radio technology can work within the enclosure. Carriers can install them now, since they have approved designs and color options to satisfy city regulations, and outfit them with 5G equipment later for an expedited rollout.

For developments that are installing new street lighting, a fully integrated streetlight pole may be the best option. It places 5G antennas inside an InvisiWave pole topper for optimal coverage and integrates and conceals all the 4G radios and electronics inside the pole. In other words, the fully operating small cell site “disappears” into the street architecture. While not currently approved for use in NYC, Raycap integrated poles are an approved option for deployment in cities from Miami to Los Angeles.

The building blocks for 5G in the big city

5G small cell sites will be ubiquitous on the streets of urban areas to provide sufficient coverage to deliver 5G FWA and mobile services for consumers, business and government. Carriers, tower companies and A&E firms will need options to deploy small cell sites that provide performance and coverage while blending in with the aesthetics of city architecture and meeting approval of street lighting committees who represent constituent interests. Raycap’s portfolio of 4G/5G small cell wireless solutions and engineering services demonstrate the kinds of building blocks that can build 5G wireless solutions that fit dense urban environments.

Learn more about Raycap's solutions for small cell concealment at www.raycap.com or sales@raycap.com



InvisiWave[®]
5G-READY SOLUTION

STEALTH 4G/5G, multi-tenant pole topper design

About Raycap

Raycap is a solutions provider and manufacturer of telecommunications infrastructure products for mobile and broadband networks with operations throughout Europe and North America. Raycap has a large installed base including connectivity and lightning protection solutions for telecommunications infrastructure and RF concealments. In June 2018, Raycap acquired STEALTH® Concealment Solutions, the pioneer in concealment solutions for RF antenna equipment, and in 2019 it acquired APELIO Integrated Industries, a manufacturer of custom enclosures and mounting solutions for the next generation of wireless networks. As a known and trusted vendor for Tier-1, Tier-2 & Tier-3 carriers, Raycap products can be found in a wide variety of telecom sites with more than 400,000 site installations across North America alone.

Raycap has the small cell experience, technology and the reputation for understanding customer needs and delivering the right products on-time for smooth product installation.

*Talk to Raycap about integrated
small cell concealment options.
Contact us today at info@raycap.com*

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