Protecting 5G Infrastructure

The Internet of Things and Industry 4.0 have created information sharing demands requiring a new wireless technology. 5G networks support higher bandwidth allowing greater volumes of data to be shared across networks. This will provide enhanced smart phone applications, but there are many other beneficiaries. Manufacturers can become more efficient with real time data and remote operations and logistics. Healthcare providers may perform surgeries from miles away. Autonomous vehicles can operate safely with optimal data input and city engineers can reduce deadlock with improved traffic control.

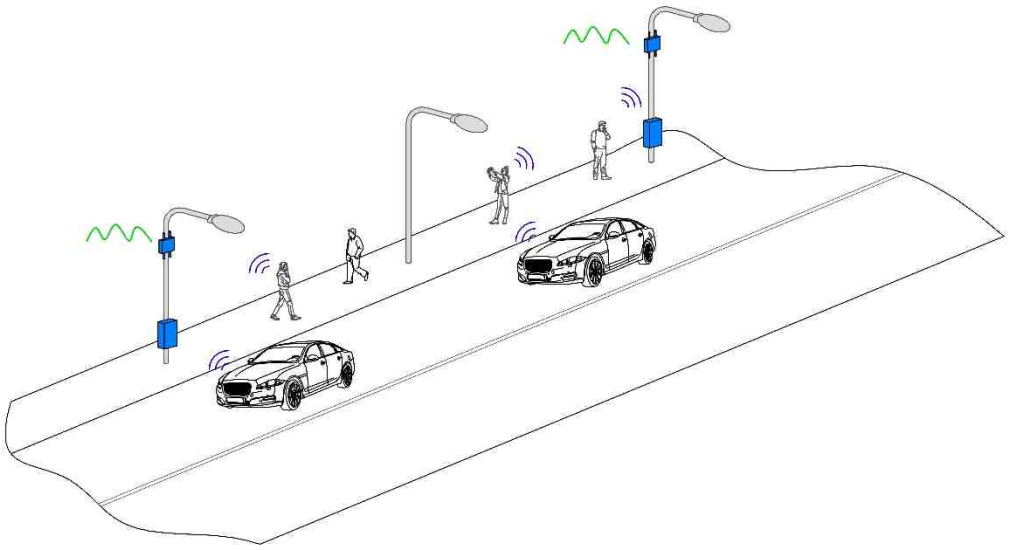

Figure 1. Example of 5G utilization

The rollout of the 5G standard requires upgrades to existing infrastructure, but also many new installations in rural, suburban and urban areas. Each of these areas require a different application. Most people are familiar with the large towers, sporting various antennae that handle our current cell phone traffic. The new 5G will operate at frequencies >24GHz, which create range issues. This results in smaller cells and more towers for suburban and rural coverage. In urban areas, providers can take advantage of existing infrastructure like power poles, street lights, rooftops and other building structures that can support an antenna.

With the implementation of this new technology, people will begin to depend on this service for many daily functions. Each installation should be well thought out and designed for uninterrupted operation. As antenna, these sites will be susceptible to lightning strikes and other induced transients that could damage the tower and create data blackouts resulting in serious safety concerns. This is true for both large tower and urban applications. Urban installations may take advantage of existing power distribution and could experience regular transients found daily on these lines.

Let's look at how we can provide a level of protection for a new tower installation. These will likely have power supplied from a high voltage source and then converted into the desired DC or AC voltages to operate the wireless circuits. We can start with the incoming power and provide some protection against lightning induced transients as well as other line transients present on the distribution power line. Surge Protective Devices (SPD) in this area are classified as Type 1 and designed to withstand large current transients.

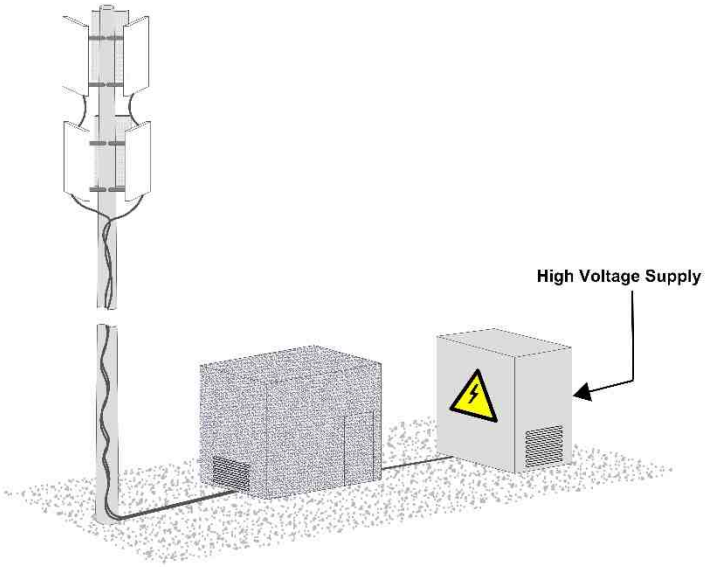

Figure 2. Typical tower configuration

The incoming power is typically connected to a distribution panel where the SPDs are inserted and provide protection of the downstream components. Maida Development offers our TPHE Series in DIN Rail packages that are conveniently designed into the distribution panels. These are thermally protected MOVs with voltages ranging from 150 to 680VAC.

Figure 3. DIN rail package for TPHE Series

Urban installations can use existing infrastructure, like a street light. These can be connected to the existing power supplied to the light and coupled to multiple antennae in an area.

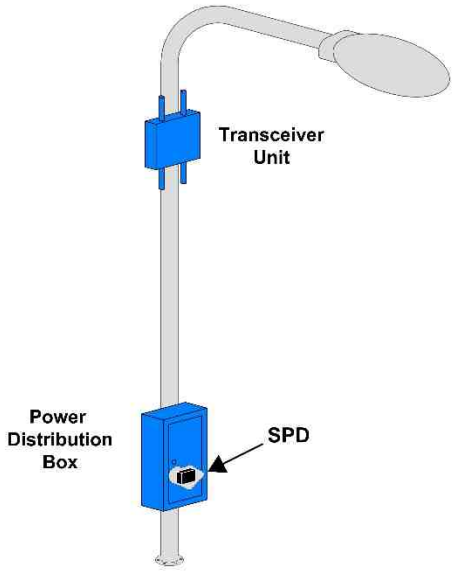

Figure 4. Example of small cell installation.

The existing power supplied to these installations can carry transients that could damage individual sites or whole networks. These transients can be of significant magnitude and reliable protection of these circuits can be provided by installing a Surge Protective Device on the incoming power. Maida Development offers our MPD and MPDS Series Surge Protective Devices. These are thermally protected SPDs in an IP65 enclosure designed for indoor and outdoor use, with voltages of 120, 277,347 and 480VAC.

Figure 5. MPD Series Surge Module.

Figure 6. MPDS Series Surge Module

References:

1. “Understanding the RF Path”, CommScope, https://www.commscope.com/globalassets/digizuite/3221-rf-path-ebook-eb-112900-en.pdf
2. “5G and Beyond”, Focus on Materials, Materials Research Institute Bulletin, https://indd.adobe.com/view/d2b153c8-f1d4-42c3-920c-ca4eb9bb87a3