

WHITEPAPER

LTE Cat1: A custom antenna for a small gateway device

Introduction

Antenova faced a challenge when a customer with a tight development schedule sought to launch a compact LTE-Cat1 gateway for use in large spaces. The device needed to be no larger than 115x115x20mm and meet stringent carrier requirements, particularly at the lowest frequency bands. Despite the difficulty, Antenova's expertise enabled them to not only meet but exceed carrier benchmarks at higher bands. This successful solution allowed the customer to launch the device on schedule with minimal complications, showcasing Antenova's proficiency in addressing connectivity challenges in the North American market.

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Wireless for the next generation

Antenova is a leading innovator in wireless technology solutions. With a passion for connectivity, we specialize in designing and manufacturing high-performance antennas and radio frequency (RF) modules for a wide range of applications. Our mission is to empower the Internet of Things (IoT), providing seamless and reliable connectivity for smart devices, wearables, and more. At Antenova, we combine cutting-edge engineering expertise with a commitment to customer success, delivering compact, efficient, and reliable wireless solutions that enable the next generation of connected devices. **Join us on the journey to make the world more connected, efficient, and smarter.**

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The challenge

There are a number of gates an LTE device must pass in order to launch, unlike any other wireless technology. Antenova's customer required the device to operate well at 700MHz, the lowest band, which is typically required by Verizon and AT&T (T-Mobile operates even lower). However, the ground plane requirements at these lower bands expand in direct correlation with the frequency. For example, a device operating on T-Mobile's 617MHz band will typically require more than 121.47mm of ground plane length.

For Antenova's customer, the device needed to be small, and therefore an innovative solution was required to create an antenna that met this ground plane requirement. This solution would also need to be relatively inexpensive to manufacture, perform well and reliably, as well as passing the wireless carrier certification.

As many product engineers do, Antenova's customer sought an off-the-shelf solution. In the first instance, Antenova's customer integrated a high performance FPC antenna that performs well at low bands. The only issue was that the FPC was located too close to the host PCB, which was loading the antenna. This meant the device would be 6dB away from meeting carrier requirements. A new, more custom solution was required to ensure the device could perform well.





The solution

Antenova's RF engineers created a bespoke antenna mockup by modifying a standard Antenova antenna evaluation board. The Antenna's ground plane was designed as a 'folded' up track on the side of the device, while the rest of the ground plane was affixed at right angles to the antenna.

While this option provided the performance required, and, indeed, was an innovative solution, there were some commercial concerns: the solution would require an FR4 and a good length of FPC that would need to have been soldered. In a device this small, and with the low price point, this solution would not solve the complete problem.

With that, Antenova's international engineering team collaborated to produce a second bespoke antenna, this time, it would meet both the commercial requirements, as well as the performance brief.

This time, Antenova created a new blade-like antenna that could be soldered onto the product's shield with a solid FR4 circuit connected to the PCB via a coaxial cable.

The result

Throughout the development of this custom antenna, Antenova's RF engineers frequently assessed the performance of the antenna using a network analyzer, plus they could assess the wireless performance using the company's own anechoic facilities.

Ultimately, this resulted in a device that surpassed the requirements of carriers at higher bands and met the benchmarks at the lower band.

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