Customer Success Story: Serve Robotics

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Matt Holland
Director of Electrical Engineering at Serve Robotics

About Serve

Reduced air pollution. Cost savings. Improved road safety. Fewer traffic jams. On-time deliveries. Increased productivity. These are all the benefits to businesses, cities and people that Serve's little four-wheeled courier bot brings.

Serve Robotics, the leading autonomous sidewalk delivery company, aims to make delivery affordable, sustainable, safe and convenient by using AI to deliver products right to consumers' front doors. They can deliver small to midsize goods such as food orders at a much smaller cost (including to the environment) than a 2-ton car. These little bots pack a serious punch and can handle all aspects of driving without human intervention, including rerouting if they face obstacles or obstruction. They can also predict driver inattention and avoid collisions on their own.

The Challenge

Serve Robotics is backed by industry giants Uber, Nvidia, and other world-class investors and is deploying its self-driving robots in multiple markets across the U.S. As the company continues to grow exponentially, building a more extensive robot fleet, they must be able to meet the delivery demands of their partners.

Global Navigation Satellite Systems (GNSS) and other localization technologies have made it possible to accurately locate objects in almost real-time. However, in industries like autonomous delivery robotics, simply identifying obstacles is insufficient; knowing the precise position is crucial, and they need to be able to determine their surrounding space in seconds. By creating a virtual geofence and mapping the surrounding space, these robots can determine the spatial boundaries of a specific area and identify physical obstructions nearby.

Geofencing relies on two essential technologies: Real-Time Kinematic (RTK) positioning and dead reckoning (DR). RTK corrects common errors found in current satellite navigation (GNSS) systems, improving positional accuracy

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down to the centimeter level. However, these technologies add further complexities and challenges to antenna design. Selecting an ultra-high precision GNSS antenna solution and receiver and optimal integration are crucial to deliver a high level of accuracy and are the difference between the Serve bot ending up on the wrong side of the street or not. In addition, Serve's bot relies on LTE connectivity for remote monitoring and teleoperation. The team at Serve Robotics knew they needed quality antennas to ensure high reliability for GNSS and Cellular connectivity.

The Solution

At the beginning of the company's journey, Serve Robotics didn't have the internal wireless expertise they needed to get their early prototypes rolling, so they needed an antenna partner they could trust. Technical antenna and RF engineering testing and design services, alongside customer support, were crucial to get their early prototypes up and running.

Serve Robotics turned to Taoglas as their trusted antenna supplier of choice. Taoglas also offered design support to allow Serve's bot to achieve even greater positional accuracy (cm level) by testing the antennas in its state-of-the-art anechoic chambers and in an open sky view environment to simulate the expected values that an end-user may expect in a field test.

Working alongside the Taoglas Engineering team, the Serve Robotics team chose Taoglas' AGPSF.36G, an active, embedded stacked patch, GNSS antenna supporting both constellations at L1 and L2 bands. The AGPSF.36G is manufactured and tested in our TS16949 first-tier automotive-approved facility, making it the safest choice for robotics applications that require the assurance of high-accuracy positioning, safety and durability. Tuned and tested on a 70*70mm ground plane, the AGPSF.36G operates at GPS L1, 1575.42 MHz and L2, 1227.6MHz, and can offer genuine cm-level positional accuracy.

In addition, Serve's team chose several antennas from Taoglas' Maximus range: the FXUB66, FXUB63 and the FXP522 – each flexible wideband antenna is designed to cover all working frequencies in the 600-6000 MHz spectrum, including all

Cellular, NB-IoT, Cat-M, Wi-Fi, ISM and GNSS bands and were chosen for their reliable performance. These antennas are ultra-thin and weigh between 2-8g, making them extremely compact and suitably lightweight – so they don't add additional weight to the bots load. Additionally, the antennas are assembled by a simple "peel and stick" process – making the installation quick and easy.

Taoglas follows rigorous quality standards and policies and recognizes that safety and durability are crucial when designing robotic applications. That's why, to meet challenging environmental requirements, Taoglas antennas are put through extensive vibration and shock, temperature and humidity tests to conform with the TS16949 standards.

Taoglas can scale connectivity solutions by providing high-performance cable assemblies that are Engineered to last in the harshest environments and provided the Serve Robotics team with world-class custom cabling solutions. Taoglas' cabling solutions are quality tested before leaving their facilities, and their design and test facilities are IATF 16949 qualified.

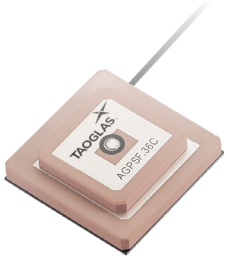
Featured Taoglas Product

AGPSF.36G

A compact, economical, yet high performance GNSS antenna with excellent performance on the L1 and L2 bands.

Dimensions:
35*35*11.1mm

Datasheet

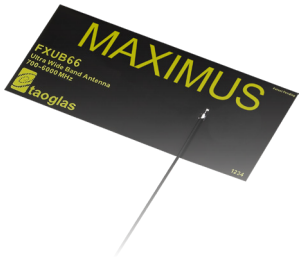


FXUB66

Flexible wideband antenna has been designed to cover all working frequencies in the 600-6000 MHz spectrum with high efficiency of over 60%.

Dimensions:
120 x 50 x 0.8mm

Datasheet



The Outcome

Since 2017, Serve Robotics has designed, developed, manufactured and operated their autonomous delivery robot in two major U.S. cities. It also became the first autonomous vehicle company to complete commercial deliveries at Level 4 autonomy and has won recognition from Time's 100 Best Inventions of 2019 and Fast Company's 2019 Innovation Design Awards.

"Taoglas played a crucial role in the success of Serve Robotics, and we've really enjoyed working alongside their engineering, sales and customer service teams. They've been instrumental in guiding Serve Robotics on the RF and wireless engineering aspect of our device development, particularly in the early days of our company's journey, when we didn't have the in-house RF and wireless capabilities. The initial support they provided, including chamber testing of our early prototypes gave us confidence around antenna selection and assembly location."

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