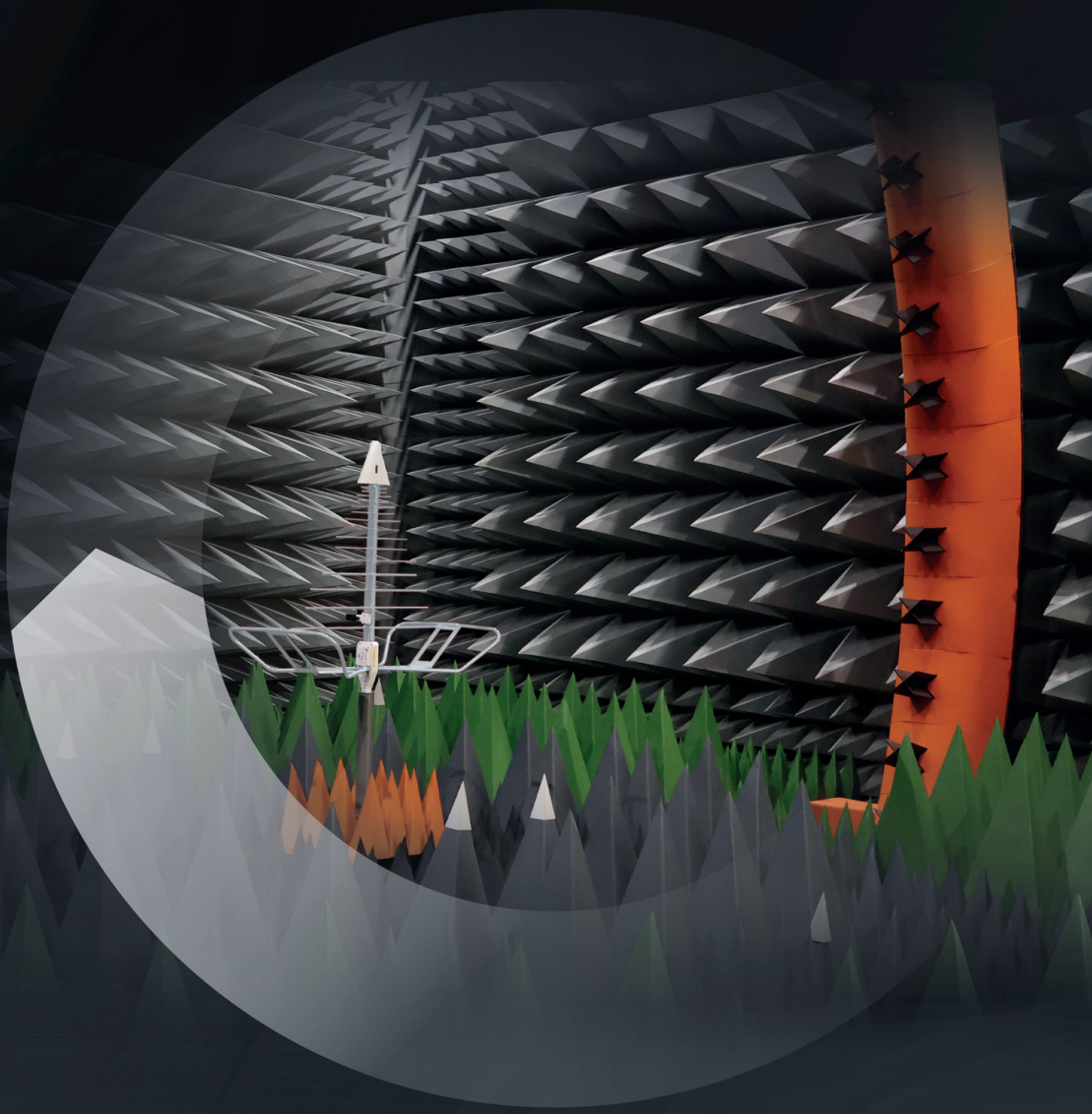
CASE STUDY

Pulsaart by AGC Combines Glass Antenna Know-how & MVG Antenna Test Chambers to Realize the Future of Automotive & Telecommunications Antennas

PULSAART by AGC



> **"In the anechoic chamber, we work as one to provide superior service and innovative, precise solutions, driving our productivity to new heights."**

"With the MVG chambers in-house, we've gained a year in development time and reduced physical tuning by 50% compared to our old process."

Arthur Romeijer
Measurement Expert, Pulsaart by AGC

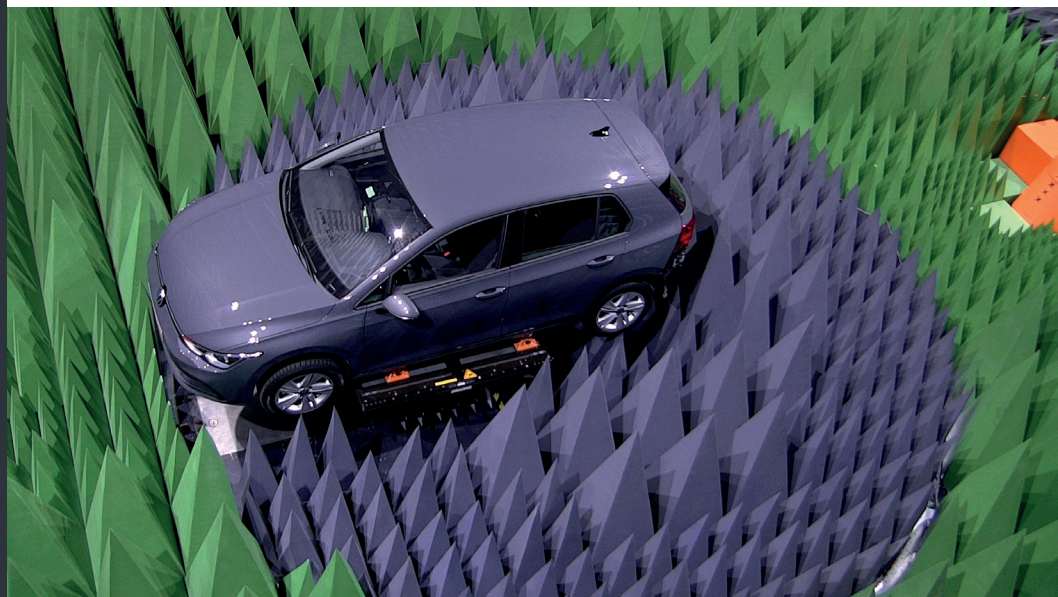
mvg Microwave Vision Group

INTRODUCTION

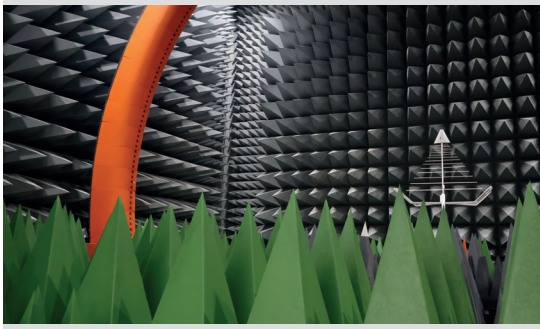
The automotive telematics market and automotive connected services have been in rapid growth in the past decade and are predicted to grow at a CAGR of 10.1% over the next decade[1]. New vehicle-to-everything (V2X) technology is now commonly enabling a variety of features short of fully autonomous self-driving, though this is likely on the horizon. Beyond the incredible convenience of autonomous technologies and the piece-of-mind enhanced safety features bring to automotive customers, new innovations in vehicle connectivity are also enabling advanced logistics and autonomous features for fleet vehicles and other transportation systems - such is the promise and expectation of advanced V2X technology. However, these innovative connected systems are ultimately constrained by the performance of the antenna systems that make these new technologies possible.

Like modern smartphones, the latest vehicles now also support GPS, Wi-Fi, Bluetooth, 4G/5G Cellular, Ultra wideband (UWB), and others. With the growing number of wireless systems and the compounded issues of co-site and outside interference, developing wireless systems for automotive applications is becoming increasingly challenging. This is why there is such a burden on automotive manufacturers to ensure that the antenna systems and radios for these now-vital wireless systems work flawlessly.

This is the vision that gave rise to Pulsaart by AGC, which is a premier developer of on-glass antenna technology and has recently evolved into a complete end-to-end antenna system supplier. Part of the advantages that led to Pulsaart's rapid growth and success is the investment they made in 2019 purchasing several MVG test chambers: 2 multi-probe test systems, the StarLab and the SG 3000, and a single-probe gantry-arm system to measure full scale vehicles at higher frequencies. Purchasing these chambers has allowed the company to move away from testing off site at a contract test facility. And moving RF and antenna testing in house has enabled them to innovate faster, speed up testing capacity, and provide additional test services to select clients.

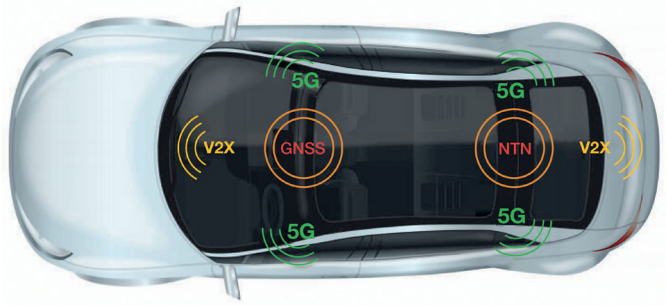


PULSAART TACKLES EMERGING AUTOMOTIVE ANTENNA TEST CHALLENGES & BEYOND



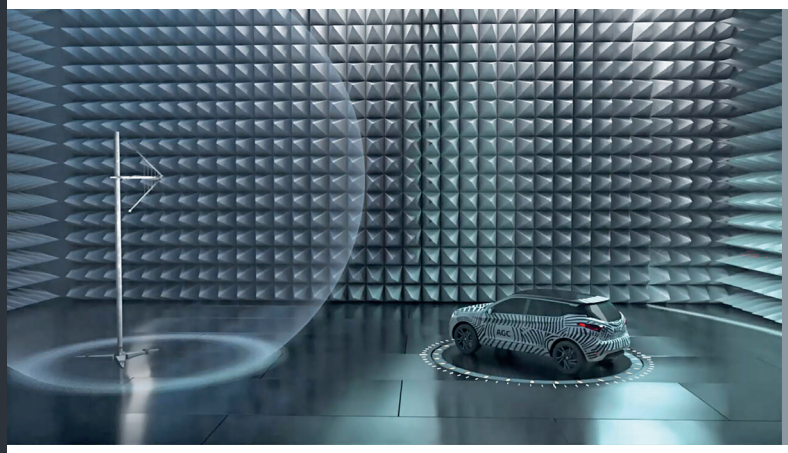
Pulsaart is a startup that spun-off from AGC in 2021 with the goal of developing on-glass antennas for the European automotive market. AGC's on-glass antenna origins may have begun with broadcast antennas, but AGC has been developing automotive on-glass antennas for decades. Their legacy of innovation with on-glass antennas kickstarted Pulsaart's success in the European market. In just a few short years, Pulsaart has expanded from on-glass automotive antenna systems to wider developments like those improving wireless connectivity for the rail industry. They have, in the meantime, also grown to offer full-scale connectivity test and measurements for automotive, telecom, aerospace applications, and more.

In the early years, while the antenna team was focused on on-glass automotive antennas, they quickly learned that developing a quality antenna product for automotive applications required physical testing to properly tune and refine the design. The frequencies in which automotive antennas operate result in complex interactions with the metal car bodies and other features of the automotive platform (i.e. wiring, other wireless systems, etc). "At those frequencies, the antenna is not just the wires on the glass, but also the entire car," shared Arthur Romeijer, measurement expert at Pulsaart, "It is very tricky to accurately simulate all of the interactions, as you don't typically include all of the parts of the car or the simulation becomes too complex." It is often necessary for antenna designers to simplify the simulation, which results in sacrificing accuracy for practical simulation times and complexity. Simulating these interactions accurately is therefore challenging and often impractical, calling for physical testing to ensure optimal antenna performance. This physical testing is vital not only for automotive antennas but for all complex systems.



Prior to 2019 and the initiative by the AGC Automotive Europe that created Pulsaart by AGC, the antenna team that became Pulsaart had been relying on outside antenna testing resources. This required the team to contract antenna test services by a third-party for all of their clients' testing needs as well as their in-house product development testing. As there were no suitable test chambers in Belgium for Pulsaart to use, the antenna team had to travel abroad to perform the testing. Naturally, this was a cumbersome process where they needed to secure test chamber time, which was increasingly in demand, and had to follow the time schedules and accessibility of outside contract test chamber services. "With an external test service, you have to add a lot of additional billable hours for the customer, not to mention travel, and it all costs much more and extends the project schedule," said Arthur Romeijer, Measurement Expert, Pulsaart.

"With connected car technology, the antenna system is not just a few integrated antennas or the wires on the glass, it incorporates the entire car architecture. This adds a layer of complexity that makes full scale vehicle testing essential.



PULSAART BRINGS ANTENNA & RF TESTS IN HOUSE

With the desire to grow the antenna team and the influx of more projects in Europe, there was a clear need for Pulsaart to have test chamber facilities in house. In 2019, Pulsaart purchased several MVG test chambers, including a customized single-probe spherical test system used particularly for automotive broadcast antenna tuning, and which was specially designed to test down to 64 MHz to accommodate Japanese radio frequencies. In the lot was also a Starlab multi-probe spherical near-field system to cover frequencies from 650 MHz to 18 GHz. This system is being used for internal fast prototyping, advanced research projects, component-level tests, and for external customer testing services. Pulsaart's third anechoic chamber houses another multi-probe system by MVG, the SG 3000, which has been validated to operate well down to 50 MHz and up to 6 GHz. This system has been serving them well for testing antenna systems at the component or full-scale vehicle levels both for internal development and external customer measurement services.

"In Europe, we initially didn't have an antenna chamber available, and the team would have to travel abroad to perform testing at external test sites, which was expensive," concluded Romeijer, "Building the chambers brought a lot of good things and has allowed us to drastically reduce the time needed to perform antenna tuning." Without having to travel abroad and plan projects remotely, the team's time management significantly improved, realizing reduced cost and development times. "The anechoic chambers and state-of-the-art test systems were built to enhance productivity," declared Romeijer, "With the test chambers on site and everyone working together, we are able to provide a better service for our customers, and propose better solutions quickly and accurately."

The Pulsaart team had a variety of antenna test chambers to choose from but decided on MVG for several reasons. "MVG is quite well known for their innovative spirit, and providing customized test solutions," shared Romeijer, "The key differentiator was the strong benefits of measurement speed and accuracy that come with the MVG multi-probe systems."

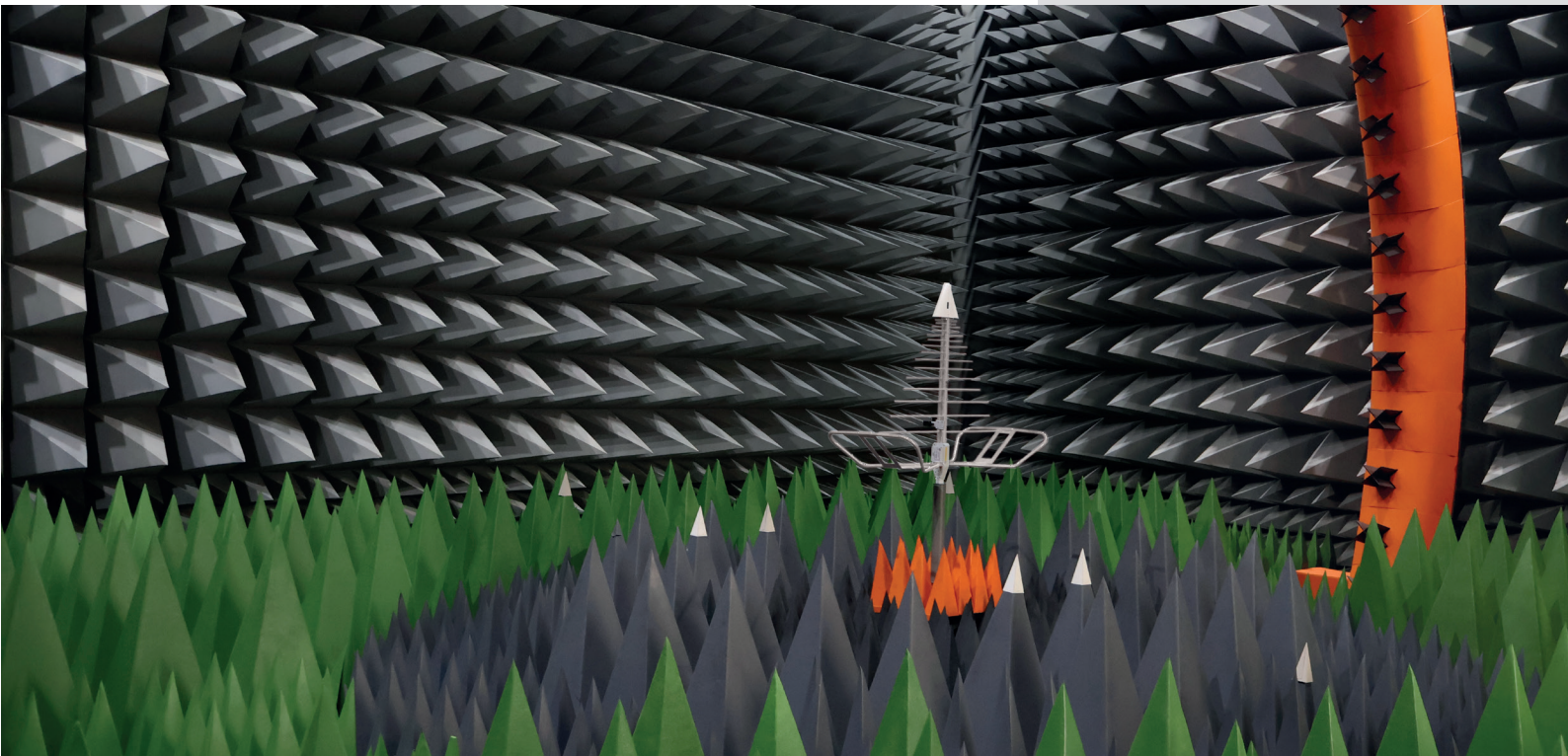
"With the test chambers on site and everyone working together, we are able to provide a better service for our customers, and propose better solutions quickly and accurately."

The Pulsaart team also appreciates the host of software options that work as a turn-key solution with MVG's test chambers. The software suite's specific features have enabled Pulsaart to expand their business activities beyond internal testing and offer sophisticated testing reports to many satisfied customers.

THE LEGACY OF CHOOSING MVG FOR PULSAART

With a much faster development cycle enabled by the rapid testing capability with in-house MVG test chambers, Pulsaart has been meeting customer needs at a dramatically faster pace. "Our classic antenna development tuning phase used to take a certain amount of time, limited by our ability to iterate tests with a remote, external test facility," shared Romeijer, "With the MVG chambers in house, we've gained an entire year in development time! With these systems, time necessary for physical tuning has been cut in half compared to our old process." This time gain has empowered the Pulsaart team to turn their extra test chamber resources into a new revenue stream, offering antenna measurement and connectivity testing services to wireless technology manufacturers.

With the antenna development team, production, and testing all in-house, Pulsaart has experienced a renaissance in innovation and product development. "We now have all the tools needed to boost evolution in our products," shared Romeijer, "We have moved from developing single antennas to antenna systems, and creating something more custom and innovative with varying levels of integration within automotive and/or other platforms." This is especially critical as the automotive industry - and aerospace, telecom, and rail - moves to integrate more wireless technology. "With these integrated antenna systems, testing scenarios are now increasingly more complex," said Romeijer," We can't just test the antennas in isolation anymore, we have to test the entire system. Testing the full antenna system therefore has become extremely time consuming, but MVG's multi-probe chambers are fast and make this kind of testing much more feasible. It gives Pulsaart a huge edge in complex antenna testing."



PULSAART LOOKS TO THE FUTURE

Experts on the Pulsaart team are seeing the trends with automotive and antenna system technologies for other mobile platforms, and they are looking to the future for ways to enhance their testing capabilities. The Pulsaart team is currently investigating upgrades to their multi-probe chamber to raise the test frequency to 10 GHz and add the capacity to test OTA. Pulsaart is currently testing up to 18 GHz with the single-probe test chamber in house, but the benefits in speed of the multi-probe system are attractive enough to invest in having higher frequency multi-probe and OTA testing capabilities combined. “We want to enable OTA testing for CV2X and higher frequency communication protocols of 5G, WiFi, GNSS, UWB, and more,” said Romeijer, “Demands are evolving, and we wish to remain at the forefront for our growing customer base. We are convinced that OTA testing is key to improving product quality, accelerating time to market, and ensuring customer satisfaction.”

Pulsaart is dedicated to staying at the cutting edge of antenna development for automotive, other mobility platforms, and even 5G/6G antennas on-glass in dense urban environments. “Before it was all automotive, now the number and types of customers and our activities are growing,” shared Romeijer,” These MVG chambers are enabling us to be up to date with the market and give us access to more business opportunities we might otherwise miss.”

Reference:

(1) https://www.marketsandmarkets.com/Market-Reports/automotive-telematics-market-245073008.html?gad_source=1&gclid=CjwKCAjwnqK1BhvEiwAi7o0X-VTY38ax-qOPLgNb-PVv_wCHXFdxwknXuGyh5ZE4PyZtEF_mKR9GJRoCcUQQAvD_BwE

ABOUT MVG TEST SYSTEMS

StarLab

The StarLab is a compact and portable all-in-one multi-probe near-field spherical test system. The StarLab at Pulsaart tests frequencies from 650 MHz to 18 GHz.

Passive measurement capabilities:

- Gain
- Directivity
- Beamwidth
- Cross polar discrimination
- Sidelobe levels
- 3D radiation pattern
- Radiation pattern
- Antenna efficiency

With OTA capabilities, active measurements possible:

- TRP, TIS, EIRP and EIS

SG 3000

The SG 3000 is a multi-probe spherical near-field measurement system to perform full-scale vehicle antenna measurements. Pulsaart's SG 3000 tests frequencies from 50 MHz to 6 GHz.

MVG - Testing Connectivity for a Wireless World

The Microwave Vision Group offers cutting-edge technologies for the visualization of electromagnetic waves. Enhancing the speed and accuracy of wireless connectivity testing, as well as the performance and reliability of anechoic and EMC technologies, our systems are integral to meeting the testing challenges of a fully connected world.

WORLDWIDE GROUP, LOCAL SUPPORT

Our teams, in offices around the world, guide and support you from purchase, through design, to delivery and installation. Because we are local, we can assure speed and attention in project follow through. This includes customer support and maintenance once the system is in place. For the exact addresses and up-to-date contact information:
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