

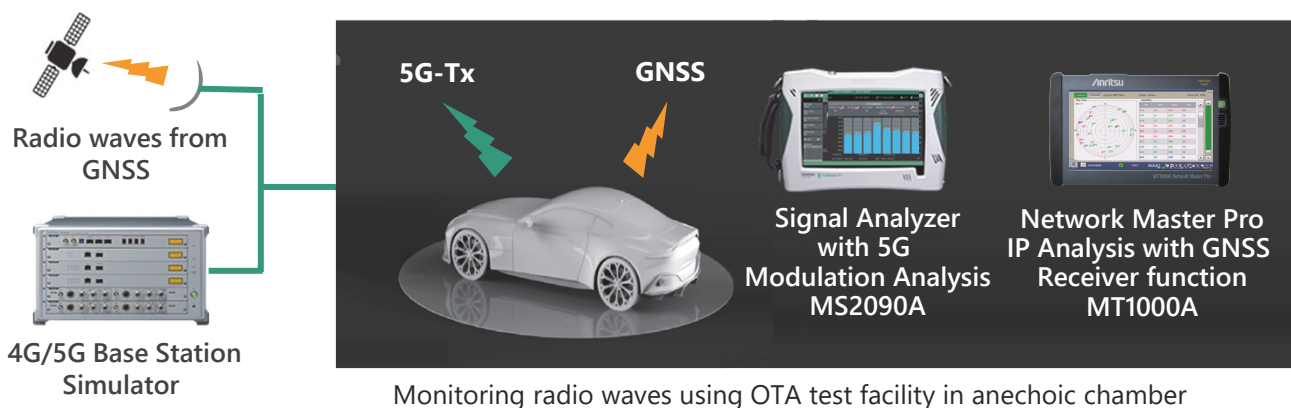


OTA Radio Wave Monitoring in an Anechoic Chamber

Challenge: Establishing an evaluation environment that enables visualization radio wave behavior at in-vehicle wireless devices

As connected vehicles become more widespread, modern vehicles incorporate multiple wireless systems, including cellular communications and GNSS. These systems operate under a wide range of environmental conditions, and any communication issues discovered after market release can result in significant costs. Therefore, it is important to evaluate the performance of in-vehicle wireless devices under conditions that closely replicate real-world usage. Over-the-air (OTA) testing in an anechoic chamber provides a controlled, noise-free environment that enables accurate and repeatable evaluation. Key performance metrics for wireless devices include received signal power and communication quality. However, visualizing radio wave behavior and correlating it with communication performance remains a challenge.

Solution: Evaluate in-vehicle wireless device performance by monitoring radio wave behavior in an OTA test environment in an OTA environment



• **MS2090A**

Its modulation analysis function simultaneously measures received power (RSRP) and communication quality (RSRQ and SINR), enabling identification of the root causes of throughput degradation in 5G wireless devices.

The low noise floor of the signal analyzer enables measurement of weak 5G and GNSS signals (−159 dBm at 9 GHz).

• **MT1000A**

Its GNSS Receiver function displays SNR for multiple GNSS signals from several regions, enabling performance evaluation and supporting optimization of in-vehicle GNSS terminals and antenna designs..

In-Vehicle Wireless Device Performance Evaluation Through Radio Wave Monitoring

Customer: Automotive manufacturer (Test Instruments: MS2090A and MT1000A)

■ Challenges before implementation:

Communication instability was observed during OTA evaluation in an anechoic chamber, including degradation in TP and SNR. These issues were caused by variations in radio wave angle of incidence and propagation distance when testing in-vehicle wireless devices using a 5G simulator and receiving GNSS signals.

To isolate and identify the root causes of these performance degradations, radio wave monitoring capable of simultaneously measuring received signal levels and communication quality was required.

* TP (Throughput) — communication data transfer speed

■ Result after implementation:

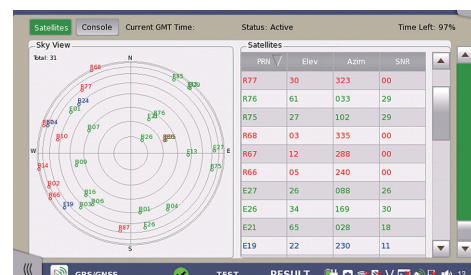
RSRP, RSRQ, and SINR were monitored using the MS2090A while varying the radio wave angle of incidence and propagation distance, together with measurement of TP variations using a 5G simulator. This approach provided high-quality data for isolating the root causes of 5G communication performance degradation.

In addition, comparative verification against SNR reference values measured by the MT1000A enabled accurate evaluation of in-vehicle GNSS reception performance, demonstrating its effectiveness for performance assessment and improvement.

Furthermore, the MT1000A Ethernet function proved useful for throughput verification, confirming its strong cost-effectiveness for in-vehicle wireless LAN network evaluation requested by another department.

MT1000A GNSS Rx Function

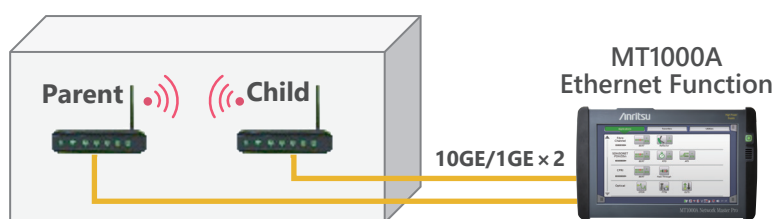
Supports simultaneous display of satellite ID, elevation angle, azimuth, and SNR across multiple GNSS constellations, including GPS, GLONASS, Galileo, BeiDou, and QZSS. This capability enables comparative performance evaluation of in-vehicle GNSS receivers.



Satellite constellation monitoring screen

MT1000A Ethernet Function

Ideal for measuring performance, including TP and packet loss, of wireless LAN devices in in-vehicle communications networks.



TP measurement of in-communication network