

2023 GUIDE

# What is an automotive-optimised antenna design?

Partnership with

**DigiKey**

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# Introduction

The wireless landscape and infrastructure for automotive designs is growing at a rapid pace. Vehicles are now expected to have a range of wireless capabilities; GNSS communications, Bluetooth connectivity, cellular/WLAN capacity for intelligent transport systems, and more for different designs.

In light of a growing wireless demand, automotive designers are seeking optimised antenna integration to not only ensure connectivity to all the necessary technologies, but have reliable communications without a detriment to the design cycle and manufacture.

In this guide, we dive into the challenges faced by antenna integration for automotive designs, and how they can be overcome to achieve maximum optimisation.

What are the challenges of antenna integration for automotive designs?

# Placement and performance

**Antenna placement is crucial for an antenna to perform optimally, no matter the design or application.**

For automotive designs, this becomes of greater importance due to the size of a vehicle and finding the optimal location that provides the maximum level of gain. For context, a simulation was performed on the Volkswagen Polo's radio antenna where it was pointed rearwards at an angle of 45°. The researchers discovered a "dead zone" in directivity levels and a lack of connectivity on the front side of the vehicle, requiring a reevaluation of antenna placement.

What are the challenges of antenna integration for automotive designs?

# Electromagnetic compatibility and interference

Similarly to placement, electronic device interference can have a detrimental effect on antennas and their performance.

Electromagnetic compatibility (EMC) refers to the **generation and susceptibility** of electromagnetic interference that all electronic devices emit; antennas can both fall victim to interference, but also cause interference for other devices if it fails to meet standards and regulations. One of these standards is **ISO 11452**, which focuses on narrowband radiated electromagnetic energy to ensure all the devices in an automotive design have EMC and can perform effectively alongside each other.

What are the challenges of antenna integration for automotive designs?

# Manufacturing repeatability

**Antenna placement, ensuring compliance with EMC standards and integration factors all have an impact on the design cycle and manufacturing repeatability of vehicles.**

Antennas that are intricate and difficult to integrate make achieving this manufacturing repeatability more difficult. At the same time, antenna integration adjustments with the goal to optimise repeatability can potentially impact antenna performance, such as with placement and electronic device interference as previously discussed.

# What antenna features provide automotive-optimised design?

## Compact and conforming

Compact and conforming embedded antenna solutions provide automotive designers with greater flexibility at different stages of antenna integration. Compact wireless solutions have more placement options and require smaller ground planes to fully radiate. Conforming antennas offer even greater choice of placement as they can conform to the shape of automotive designs, such as with [flexible PCB or FPC antennas](#). Both these choices of wireless solutions provide automotive-optimised design opportunities.

## High-performance and connectivity

Whether the wireless technology is GNSS, Bluetooth, cellular or any other, performance and connectivity is the key to automotive-optimised integration. Having wireless solutions that are reliable from the get-go provides vehicles with a holistic level of connectivity to the range of road infrastructure in intelligent transport systems. Moreover, it also provides designers with a level of flexibility with integration as they can select a placement that would otherwise be insufficient for lower performing antennas.

## Simple integration for large scale manufacture

Simple and effective antenna integration is vital for optimising automotive design. One of these factors comes from antennas that are easily tunable to ensure they are within compliance of EMC regulation. Additionally, selecting wireless solutions that have simple integration, such as pick-and-place SMD antennas, provides manufacturing repeatability and helps minimise the design cycle for vehicles.

# Optimise the wireless capabilities of your automotive design with Antenova.

**With the range of wireless technologies in modern automotive designs, integration optimization is a key factor that affects both manufacture and application.**

Antenna placement, performance and compliance all need to be considered, or risk a lack of connectivity to vital infrastructure.

At Antenova, we provide simple-to-integrate antenna solutions that exhibit impressive performance and form factor. Our range of embedded solutions provide conforming and compact options for different automotive designs. They are also easy to tune using a pi-matching circuit, ensuring compliance with ISO standards.

To find out more about our antenna solutions and how they can provide automotive-optimised antenna integration, **contact a member of our team today.**



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