

INTEGRATED AND MULTI-BAND VEHICULAR ANTENNAS

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ABSTRACT:

The increasing interest in microwave sensor technology for driver assistance or active safety systems and in wireless communication and infotainment services leads to a steadily growing number of antennas in vehicles. In modern premium class models assistance and safety systems are relying upon short and long range radar sensors (SRR, LRR) for environment recognition, they employ sensor data and wireless links for tire pressure or engine state monitoring or for wireless airbag triggering, and even DSRC or vehicle-to-vehicle communication systems are under development. And in modern cars we are used to driver entertainment and information systems like radio, TV, mobile communication (GSM, UMTS), GPS, satellite radio (SDARS), DAB, DVB-T, or additional wireless equipment like WLAN/Bluetooth, Keyless Entry/Go, and RFID systems.

With the growing spread of these systems there is an increasing interest and need in novel antenna solutions leading to a reduction of the number of antennas and antenna locations by using modular or multi-band approaches or new integration and packaging technologies which allow for a flat or even an invisible integration of antennas in different car body parts.

Beside the well known installation of antennas in car windows the radiating elements can be fitted in or below electromagnetic transparent interior or exterior car body parts like plastic trunk lids, roll bars, plastic or glass roof elements, or even in solar cell panels. Therefore novel solutions may be based on compact and versatile antenna modules using a multi-antenna carrier fitting into different models, thus reducing the number of variants. In this case the modules can be optimized not only with respect to mutual coupling and shadowing effects but also regarding the dielectric properties and requirements of available space even for maximum equipment rate. During production the final instalment can be carried out very flexible depending on the customer's request. Advantages of the above described approaches are manifold: Integrated or conformal antennas easily fulfil safety regulations (pedestrian protection), there is no or reduced need for corrosion prevention, there is a higher freedom of design, the antennas are not exposed to demolition in car wash plants or by vandalism, and the flat packaging of antennas below car body parts allows for compact integration of additional RF-components (e.g. amplifiers, filters, hybrids) in multi-layer assemblies.

The contribution will give an overview on state of the art antennas, antenna modules, multi-band antenna systems, and integration developments. The results include single and

multi-band antennas for navigation, satellite radio, and mobile communication systems integrated with car body parts made of glass or plastics.

Abstract for Session \"Frontend-Modules and Integrated Antennas\"