Commentary

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Cars Must Be Tested For Electromagnetic Emissions

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Description

Different testing standards apply based on the country, and they must be followed to ensure that cars do not pose a risk to their drivers, passengers, or others due to electromagnetic emissions and their effects. Automakers risk losing a lot of money if their vehicles fail to meet EMC design minimums. They also face the risk of disappointing potential buyers who are eager to purchase. If appropriate EMC design decisions are not made at all phases of an electric vehicle's development, the vehicle may take longer to reach the market than planned. If it has major flaws, it may never be available for purchase at all.

As documented in a Green Car Reports article, the Rimac C Two is an example of a new electric car that had to satisfy regulators before hitting the market in early 2021. The ECE R10 standard of the European Union was used to test its electromagnetic emissions.

To ensure accurate results, the car was first placed in a semi-anechoic chamber to reduce external emissions interference. During the assessment, the vehicle was tested at different speeds on a dynamometer. It also received radiation ranging from 20 MHz to 20 GHz, with specific components, such as the lights and wipers, turned on.

This vehicle has two driving modes as well. The test must be performed in each one to ensure that the inverters and other gear are functioning properly. If a first trial exposes any flaws, the vehicle is entirely disassembled, and engineers will fix the defects before retrying the test.

Charging Options and EMC Design

Experts estimate that by 2030, the United States will have 18.7 million electric vehicles on the road. This is a significant rise from the about 1 million used in 2018. Consumers will be more likely to buy EVs if they believe they will get them where they need to go without running out of power. After all, finding a gas station is usually easier than finding an EV charging station. Various efforts are underway to increase the power infrastructure, though.

Researchers questioned if the Electromagnetic Interference (EMI) associated with electric vehicles could interfere with implantation pacemakers. They enrolled 104 patients who have those medical devices in a research to find out. All of the subjects were exposed to electromagnetic fields from four of the most common electric vehicle models. The EMI potential increases as the electromagnetic field becomes stronger, according to the study. The electromagnetic field is proportional to the motor's power.

Participants sat in the front seat of an automobile that was mounted on a dynamometer to simulate driving in one test phase. People followed directions to achieve maximal acceleration and deceleration rates, even though their pacemakers were within 5 centimeters of electromagnetic fields in some cases. Another part of the research had the test subjects plug and unplug the vehicles at a charging station and hold the cable. At the same time, scientists checked for any abnormal pacemaker or cardiac events.

Fortunately, driving or charging electric cars had no effect on pacemaker programming or functionality, according to the researchers. They did clarify, however, that the electromagnetic fields were highest when the car was being charged. They also noticed that high-current charging increased the field strength along the cable. As a result, the researchers advise that engineers continue to check for uncommon adverse events and proceed with caution as they look for faster ways to charge cars.

High-Quality EMC Design Supports Public Health

Many years ago, even before electric vehicles were becoming popular, people worried about whether electromagnetic fields could harm human health, such as raising cancer risks. Numerous studies show it's safe to drive and be around electric vehicles. However, certain changes to the car's structure could change magnetic field exposure levels.

A 2019 study investigated this matter by examining the Extremely Low Frequency (ELF) magnetic field exposure associated with electric cars. The researchers looked at statistics related to three such vehicles over two years. They measured the magnetic flux density in the front and rear seats of the automobiles during acceleration and when the cars' speed remained constant.

The researchers mentioned how EMC design considerations often require using certain cabin materials to affect the magnetic field distribution and utilizing shielding mechanisms to achieve the desired results.

The results showed that driving and regular maintenance did not significantly alter the magnetic flux density. However, having the cars undergo extensive changes, such as rebuilding projects after collisions, could cause larger changes that deserve attention. The authors recommended staying aware of ELF magnetic field exposure measurements throughout a car's entire life span.

However, the engineers who prepare EVs for the market could assist by mentioning specific precautions for people to take if replacing certain components. Perhaps an engineering team made a particular EMC design decision that a major alteration could negatively affect. In such cases, they might give guidance for repair personnel in the owner's manual or literature intended for repair shops.

This overview explains some of the many reasons why prioritizing EMC design in electric vehicles is essential for making those cars perform as they should. Taking the right steps to achieve electromagnetic compatibility means they are much less likely to behave unexpectedly and pose short- or long-term risks to users.

EMC design must stay at the center of new plans and technologies. Otherwise, what seems like a fantastic development could have unintended consequences that delay a new car's market release or erode public trust in its manufacturer.