Investigation of Electromagnetic Field Coupling from DC-DC Buck Converters to Automobile AM/FM Antennas

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Abstract

DC-DC buck converters are widely used in modern automotive applications due to their high power efficiency. However, they are also a major cause of electromagnetic emissions due to the nature of the fast switching voltages and currents. In modern automobiles there are as many as 24 antennas [2015], and the number will continue to increase in coming years. The close proximity of electronic modules and antennas create a complex electromagnetic environment. Hence computational electromagnetic field simulation tools are required to predict the EM interactions early in the product development phase. This paper examines the electromagnetic interaction of 500 kHz buck converter with AM band antenna by measurement and simulation. Vehicle level interference in the AM band resulting from the buck converter is measured and analyzed. A mitigation technique achieving more than 27 dB of EMI noise suppression is suggested and numerically examined.

Bio:

Patrick DeRoy completed his B.S. and M.S. (2012) degrees in Electrical Engineering from the University of Massachusetts Amherst. His Master's work focused on cable shielding and transfer impedance modeling using CST STUDIO SUITE and validating simulation results with measurements. He is an Application Engineer at CST of America, supporting customers modeling EMC problems including ESD, radiated emissions and BCI, among others. He is also interested in the simulation of PCBs and mitigation of EMI for such structures.