SIMULATION OF A FM BAND SELF-STRUCTURING ANTENNA IN AN AUTOMOBILE ENVIRONMENT

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Antennas are often placed in environments where their interaction with surrounding objects effects their overall performance. Some are deployed in environments where the designer is unsure of the effect on the performance of the antenna. This is especially true in automotive applications where the car body, as well as other components of the vehicle, play a role in the functionality of the antennas. Self-structuring antennas (SSAs) are subject to this uncertainty during their design and analysis. For this reason, a simulation-based assessment of a self-structuring antenna placed in the rear window of an automobile was undertaken.

Using GA-NEC, a software package developed by John Ross & Associates, the states of the self-structuring antenna are chosen by way of a genetic algorithm. Chromosomes used in the GA consist of the states of switches residing on the self-structuring antenna template. Variations in the switch states give rise to changes in the electrical shape of the antenna, as described in previous work on the subject of SSAs. Analysis is done using NEC in the FM band (88-108MHz). Performance criteria such as input impedance, VSWR, and gain are used in the determination of the fitness of a certain SSA state.

The simulation of SSAs presented here is meant to provide a cost effective approach to the design of self-structuring antennas in environments that are not optimal for performance of an antenna. This study helps to provide a framework for a simulation-based approach to the study of self-structuring antennas in various environments, including automotive applications. As a specific example, an SSA placed in the upper rear window of a vehicle is considered. The results are compared to the simulation of a passive backlight antenna placed in the same environment.