Problem Statement

One of the directions in applied electrodynamics, that studies interactions and undesirable influences between electronic devices is EMC. Modern vehicles, such as airplanes, cars etc. consist of many sensitive electromagnetic devices. Those devices are as wall sensitive to outside (external) Electromagnetic field at the same time. This effect is especially significant for bodies with cavities. It is well known, that the open cavities serve as good resonators for external incident electromagnetic waves that may lead to high local electromagnetic fields inside the car at the resonance frequencies. These fields may negatively affect not only the normal operation of the on-board sensitive electronic equipment, but also human, and must not exceed established safety limits. For this reason use of electronic devices is prohibited in certain environment, for example in airplanes. EMC has become the number one problem in design of modern vehicles. In case of resonance, field inside car increases, that due to the car frame. In this case electromagnetic properties of devices placed inside the car should be protected from the influence of this field. To received signals existence of high intensity electromagnetic background field nearby may cause unpredictable reaction of electric device. There was a case, when passenger used cellular phone in the car, while the onboard computer malfunctioned on received signals and made inappropriate decisions, namely, opened airbags.

In order to solve EMC problem for a car, it is necessary to study field distribution in it and find to places where EM field increases and overcomes established limits.

To comply with those limits, it is necessary to investigate the electrodynamic properties of semi-open objects with cavities made of thin metallic walls, partitions and enclosed dielectric objects. Experimental measurements for such investigations are expensive and time consuming. On the other hand, computer simulation is expected to be the efficient way to solve this problem. The problem of diffraction on presented 3-D structure can be solved using variety of methods, but all of them, according to their ideology, require huge computational resources and are very time consuming.