

# SEFERE: “Simulation of Electromagnetic Field Exposure in Resonant Environments”

A four-year collaborative research project supported by the UK DTI under the Technology Programme technology priority “Design, Simulation and Modelling” (DTI reference: TP/3/DSM/6/I/15266)

## EXECUTIVE SUMMARY

### Background

Wireless communication is a key element of many schemes to reduce the environmental impact of transport or to provide the pervasive network access needed for future urban environments (including vehicle passengers). However, field exposure issues associated with mobile telephone handsets and base stations continue to generate considerable concern amongst many sectors of the general public, and similar negative publicity regarding human field exposure at low frequencies has also been a significant issue for the power distribution industry. Consequently, ensuring electromagnetic safety is an increasingly important issue for the design, operation and public acceptability of such systems.

Existing recommendations and limits for human field exposure do not readily apply to resonant environments such as vehicles and buildings. Furthermore, the field distributions that arise in these structures are so complex that reliable assessment of the exposure threat by measurement alone may not be a practicable solution. However, simulation techniques offer the potential to investigate these issues, and to avoid many of the limitations of measurements.

### Objectives and expected results

This project addresses the development and experimental validation of large-scale simulations to assess the characteristics and safety of fields due to radio transmissions in resonant environments. The project will use both car and aircraft test cases, and aims to:

- develop strategies for simulating the fields within partial cavities at high frequencies;
- characterize the high frequency properties of typical materials used in furnishings;
- construct a low disruption, scanning field measurement system for use in vehicles;

- validate the simulation results against reliable measurement data;
- investigate the effects of furnishings and personnel on the field distribution;
- develop understanding of the field distributions resulting from a wide range of communication systems and source types (eg. external, vehicle-mounted, personal);
- investigate possible mitigation measures to limit field exposure levels.

Although the project uses car and aircraft test cases, selected as widespread examples of resonant electromagnetic environments, the same issues and solutions are also relevant to other environments of this nature where wireless communications will be much more widely deployed in future.

### Consortium

The consortium includes organisations with expertise in electromagnetic modelling, antenna engineering and associated measurements techniques, as well as end-users from the automotive, aerospace and building industries. The composition of the consortium is detailed in the table below:

Partner	Role	Country
MIRA	Coordinator (industry)	UK
Sheffield University	Partner (academic)	UK
Harada Industries	Partner (industry)	UK
PITO	Partner (government)	UK
BAE Systems	Partner (industry)	UK
Ove ARUP	Partner (industry)	UK
Jaguar Cars	Partner (industry)	UK
Volvo Cars	Partner (industry)	Sweden

### Project schedule

The project started in February 2006, and is due to complete in January 2010.