ELECTROMAGNETIC COMPATIBILITY

AUBEVOYE'S UNIT

Electronics and computer technology play increasingly important parts in the automobile. To function properly they should not be affected by electromagnetic radiation. Nor should cars cause emissions that pollute the electromagnetic environment. **Since the beginning of 2006 the Aubevoye Technical Centre has enjoyed highperformance measuring facilities for testing electromagnetic radiation.**

PHILIPPE STROPPA

When a car travels along the road it can be assailed by multiples sources of electromagnetic pollution. Radio, television, and cell phone transmitters emit particularly intense radiofrequency radiation. High voltage power transmission lines can also cause strong electromagnetic interference, while thunder and lightning during storms release veritable explosions of electromagnetic energy. Passengers' electronic devices like cell phones, portable gaming consoles, laptop computers, and multimedia players, can emit radiofrequency waves inside the car itself. Conversely a vehicle can also generate electromagnetic interference. The interference suppressors of some motorcycles disrupt radio and television signals, and the same is true of the interference suppression systems of cars, unless special care is taken. Another source of interference is on-board computers. At the same time they are particularly sensitive to electromagnetic disturbance. We have all experienced computer crashes due to power surges, for example. It is, however, unthinkable that an onboard computer should crash or that it should interfere with passengers using a cell phone, laptop, or other PDA. Automobiles must meet two kinds of electromagnetic radiation requirements: immunity (i.e. they do not react) and quietness (i.e. they do not generate interference).

IN SHORT

ON-BOARD AUTOMOBILE COMPUTERS MUST BE ABLE TO WORK SMOOTHLY WITHOUT BEING AFFECTED BY AMBIENT ELECTROMAGNETIC RADIATION. CONVERSELY, AN AUTOMOBILE SHOULD NOT EMIT ELECTROMAGNETIC "POLLUTION" WHICH RISKS SCRAMBLING RADIO AND TELEVISION PROGRAMMES AND CELL PHONE CALLS. THE EMC UNIT'S THREE FARADAY CAGES AT THE AUBEVOYE TECHNICAL CENTRE ARE DESIGNED TO TEST, OPTIMIZE, AND VALIDATE THE SOLUTIONS CHOSEN BY RENAULT.

RENAULT

Special technology is required both to test a car's electromagnetic immunity at levels of radiation far higher than anything it will encounter in reality, and to track any interference it may emit.

For 20 year Renault used the resources of the aerospace industry and the Technical Union of Automobiles and Motorcycles (UTAC, French benchmark in industrial testing and metrology).

It has installed three Faraday cages at its EMC centre in Aubevoye. Their level of performance, and the quality and speed of their results are unrivalled worldwide.

HOW DOES IT WORK?

The EMC unit at the Aubevoye Technical Centre operates three Faraday cages – testing rooms of spectacular size that are totally shielded from electromagnetic radiation in the outside world.

The purpose of the first cage is to test and validate vehicle electromagnetic immunity, i.e. ensure that extreme electromagnetic radiation does not prevent onboard computers from running smoothly. Vehicles are submitted to electromagnetic fields of 100 volts per meter in a frequency range extending from 100KHz to 3GHz – far more intense than the radiation in the proximity of the most powerful transmitters. Such radiation levels also rule out any human presence in a vehicle during tests. Pneumatic robots manipulate equipment and operate the pedals in the car to verify that the computers are all working smoothly. The floor of the Faraday cage is equipped with four independent rollers to simulate real-life driving conditions. Engine performances and the operation of the ABS, ESC, and robotized gearbox, for example, are tested and monitored in an environment that is heavily polluted with electromagnetic radiation. To control the direction, intensity, and location of radiation emissions the walls, floor and ceiling are coated with a material that absorbs waves. This is to prevent the waves from bouncing off surfaces, which could produce effects that would impair the precision of readings. The Faraday cage is insulated primarily to protect the test bench from the radiation emissions it generates. Otherwise the radiation would cause interference that would disrupt radio and television programmes and cell phone calls for kilometres around.

The second Faraday cage measures a vehicle's intrinsic electromagnetic missions and determines their impact on the good quality of radio and GPS reception. The Faraday cage shields against any emissions from the outside world seeping in – an indispensable condition for measuring how much radiation actually comes from the car.

The third Faraday cage can establish 3D maps of a vehicle's "intentional" sources of electromagnetic radiation. To perform mapping, the vehicle is mounted on a rotating platform beneath a 12-meter wide arch fitted with 132 probes (purpose-designed antennae). The installation is reversible, with the probes turning into transmitters and directing very localized electromagnetic radiation at the car. This third Faraday cage helps determine the precise location of the antennae for the tyre pressure monitoring system, hands-free card, car radio antennae, and GPS (see on-board digital television). Reception will thus be optimized, while other benefits could include, for example, validating the paths of cable ducts. Finally the technology used and the computing power dedicated to the cage can produce 3D diagrams of the car's electromagnetic radiation in less than two hours, whereas it once took two hours for a twodimensional diagram.

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