GOAL 3 : Intelligent, safe and secure mobility
TASK 3.2 : Intelligent infrastructure and vehicle
SUBTASK 3.2.6 : Measuring devices in EMC for safety and reliability of embedded electronic devices

Post doctorate position

Metamaterials for shielding applications in onboard transport systems

The generation of high and low frequency signals by on-board electronic equipments and the subsequent change in the electromagnetic (EM) transport environment (railway, road,…) results in an increasing need of protection from EM pollution sources. Protecting electronic equipments from external EM radiation or conversely preventing EM pollution generated by these equipments to couple to the external environment is often dealt with by the engineering of shielding structures.

During the design process of a system, early-level specifications to account for EMC constraints can prove to helpful to reduce EM interference and pollution. However, in practice in any complex system, each equipment is connected to one another by means if cables; slots are necessary to provide necessary access to the equipment and to allow heat dissipation… To engineer immunity, the EMC engineer needs to have several high performance shielding solutions. Current shielding solutions include the use of material with different thicknesses and having a high electrical conductivity or magnetic permeability.

Novel technological solutions are nowadays possible through the tailoring of particular or specific electromagnetic properties using metamaterials. Metamaterials are metal-dielectric composites which can be designed to present desired EM properties for given applications; they can also provide functions that cannot be engineered using only natural materials.

First results have been obtained for the theoretical and numerical design rules of subwavelength cavities. Subwavelength cavities are cavities for which the resonance frequencies can be tailored to be independent of the physical dimensions but only on the material parameters of the cavity walls. These results have been applied in the context of a reverberation chamber (RC) in order to decrease the operating frequency thus overcoming one of the limitations of RCs. However the experimental validation is rather difficult due to large testing metamaterial which has to be designed. Indeed, the next step should be the design of smaller cavities which can actually also be tested for the shielding efficiency if they were to be used as shielding cavities. In this post doctoral research work, the theoretical and numerical analysis on resonance of subwavelength cavities previously performed should first be extended to consider shielding properties and then applied to smaller size cavities in order to allow experimental validation which could in turn be used for the validation of reverberation chamber properties at low frequencies.

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Employment
Gross monthly wages : 2500 €
Duration :12 months
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