Université Lille Nord de France
Pôle de Recherche et d'Enseignement Supérieur

Ecole doctorale régionale Sciences Pour l'Ingénieur
Lille Nord-de-France - 072

Titre Thèse	Champs électro-magnétique et 5G	
(Co)-Directeur	Laurent Clavier	E-mail : laurent.clavier@univ-lille.fr
(Co)-Directeur	Davy Gaillot	E-mail : davy.gaillot@univ-lille.fr
(Co)-Encadrant	Joe Wiart (Télécom ParisTech)	E-mail : joe.wiart@telecom-paris.fr
Laboratoire	IRCICA	Web :
Equipe	CSAM/Télice	Web :
Financement prévu	Contrat Doctoral Etablissement	ULille ☐ UPHF ☐ Centrale Lille ☐ Yncrea ☐
	Région – Autre ☐	Contrat de recherche ☐ Préciser :
Financement acquis ? ☒	Contrats de Recherche ☐ Préciser	Autre ☒ Préciser : MEL

Résumé du sujet :

We live in a permanent electromagnetic (EM) field. As 5G is just starting, this raises many questions about the deployment of new equipment as well as for our own health. The difficulty is that these fields remain a concept impossible to visualize, that only some experts can apprehend. The technician who deploys a network, the one who checks the levels of fields to which we are exposed or the individual who fears for his health, all face an invisible adversary. This problem is even more complex with the arrival of 5G, with the ever increasing band used and the beamforming induced by massive MIMO. This PhD will address this questions, several locks remaining to be lifted.

The objective is to be able to reconstruct the EM field in space and time. Using measurements localized in some specific places, we will reconstruct the field at any point in space. One approach that can be used for the reconstruction is based on the recent works about Gaussian processes. Works on Quantile regression are also of interest if only, for instance, the 10% highest values are those we want to see. Another very promising approach is based on machine learning. The confrontation of these tools with the measures will require an adaptation of the method to increase the accuracy and take into account specific properties of the EM field. It should also be noted that the proposed statistical methods make it possible to manage sensors of different qualities. It is also possible to include mobile sensors to improve the reliability of the reconstruction. Consideration of the imprecision of the location of the sensors and of the temporal evolution also constitute challenges for research.