

DC Electric Field Sensor Design and Realization using the duality principle

Context:

The electronics team of the Greyc Laboratory develops sensors and devices based on functional oxides. Such oxides have properties depending on the electromagnetic field which can be used in different transduction mechanisms.

While commercial magnetic sensors use widely those different mechanisms, they are largely unexploited for the electric field, especially in the DC and very low frequency domain. Yet there are actual and numerous needs in this domain.

Along the last few years a new approach has been developed in the team and few technological blocking issues, like the lack of electric field reference sources, have been tackled and patents are being formalised.

Topic:

The proposed topic is to design, realize and characterize electrical field sensor devices using a measuring principle which is the dual of the one used in fluxgate magnetometers. Those developments will be based on the team work on the capture capacitor. The developed electric field sensor device will be directional, without contacts and will work from DC to several kHz.

The first step will be focused on demonstrating the working principle using ceramic bulk materials and an AC excitation derived from a high voltage source will be used.

Then functional oxide thin films of ferroelectrics, which are developed in the team, will be implemented to reduce the device size and subsequently the level of the voltage excitation.

The thesis aim at developing a prototype sensor whose valorisation would have to be considered.

Targeted profile:

The topic has a strong multidisciplinary component. A general education in electromagnetism, instrumentation and electronics is wished for. Some skills in clean room microfabrication techniques would be a plus.

As the selection process is selective, candidates' grades and rankings, and their university ranking will be important elements. These criteria will be used to sort candidate/subject couples at the laboratory level.

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Place : GREYC – Electronics team
Deadline for application : April 2017
Starting date: Autumn 2017