ParisTech ESPCI PARIS PSL

RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

Field: Materials Science, Mechanics, Fluids

Subfield: Applied Physics and electrical engineering

Title: High spatial resolution space charge distribution measurement by electro-acoustic reflectometry (EAR)

ParisTech School: ESPCI Paris | PSL

Advisor(s) Name: Stéphane Holé
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Research group/Lab: Physics and Material Study (LPEM)
Lab location: ESPCI – 10, rue Vauquelin – 75005 Paris – France
(Lab/Advisor website):

Short description of possible research topics for a PhD:
Insulating materials should prevent electric charges from flowing. However, charges enter and become trapped resulting in damage to the system in which the material is included. This is particularly problematic to high voltage integrated devices, but existing measurement methods have not a sufficient spatial resolution for studying this problem.
LPEM has developed a new measurement method based on the material impedance variation due to electromechanical couplings. It allows to greatly increase the spatial resolution, but still needs to be improved to obtain even better resolution. This implies working with micro-wave techniques up to 10 GHz.

Required background of the student: (What should be the main field of study of the applicant before applying?)
The applicant should have skills in electronics, microwave and interested in advanced instrumentation.

A list of 5 (max.) representative publications of the group:

1. Hamidouche L., Holé S. and Géron E., An overview on the sensitivity of Electro-Acoustic-Reflectometry (EAR) method, IEEJ Trans. FM, vol. 139, pp. 99-104 (2019)
2. Hamidouche L., Géron E. and Holé, S., Physical investigation of the Electro-Acoustic-Reflectometry method for space charge measurements, Phys. Scr., vol. 94, pp. 115006-1-9 (2019)
3. Hamidouche L., Géron E. and Holé S., Very high spatial resolution space charge measurement using electro-acoustic reflectometry (EAR), IEEE Electrical Insulation Magazine, vol. 33, pp. 9-16 (2017)
4. Hamidouche L., Géron E. and Holé S., Electro-Acoustic Reflectometry, a new method toward very high spatial resolution space charge measurements, ICD, vol. 1, pp. 46-48 (2016)
5. Hamidouche L., Géron E., Ditchi T. and Holé S., High Frequency Spectroscopy for High Spatial Resolution Space Charge Measurements, ISE, p. IX.8, (2014)