Full-time postdoctoral position

Design of electrically small antennas using plasma discharges

Laboratory:

ISAE-SUPAERO
10 avenue Edouard Belin
BP 54032
31055 Toulouse Cedex 4
FRANCE

Context:

Antenna miniaturization is a major issue, especially when considering mobile platforms for which little space is available for their integration. Many techniques have been proposed to reduce the dimensions of an antenna by modifying, for example, its shape or its materials [1].

We have recently demonstrated that plasma discharges can also be used to develop electrically small antennas [2]. This antenna concept consists of an electrically small hemispherical plasma discharge positioned over a ground plane. The plasma discharge acts as a resonator with an intrinsic ability to radiate microwave energy. This phenomenon is known as the localized surface plasmon resonance (LSPR), and it has been widely studied at optical wavelengths [3,4].

Our demonstration was carried out in the VHF band so as to limit the technological constraints. This research project aims to design similar antennas but for frequencies above GHz.

[1] J. L. Volakis, C.-C. Chen, and K. Fujimoto, Small Antennas: Miniaturization Techniques & Applications, McGraw-Hill Professional, 2010.

[2] V. Laquerbe, R. Pascaud, A. Laffont, T. Callegari, L. Liard, and O. Pascal, *Towards antenna miniaturization at radio frequencies using plasma discharges*, Physics of Plasmas, vol. 26, no. 3, p. 033509, March 2019.

[3] S. A. Maier, Plasmonics: Fundamentals and Applications, Springer, 2007.

[4] V. Laquerbe, R. Pascaud, T. Callegari, L. Liard, and O. Pascal, *Analytical model to study the electrostatic resonance of sub-wavelength radially inhomogeneous negative permittivity spheres*, IEEE Antennas and Wireless Propagation Letters, vol. 16, pp. 2894-2897, 2017.

Position description:

The implementation of plasma-based electrically small antennas at frequencies beyond GHz requires significant progress on system encapsulation and plasma scaling. Therefore, the postdoctoral researcher will have to:

- Design and characterize miniature plasma sources
- Develop experimental setups to study the LSPR at GHz frequencies
- Design and measure plasma-based resonators and antennas

The main expected result concerns the experimental demonstration of the LSPR of a plasma discharge at frequencies above GHz and its use to antenna applications.

Qualifications:
The successful applicant is expected to hold or to be about to receive an internationally-recognized Ph.D.-equivalent degree in Electrical Engineering, Engineering Physics, or equivalent.
The expertise in antenna design, technology, and techniques are highly required. Besides, the successful applicant should have a proven experience in analysis, numerical simulations (Ansys HFSS), and measurements of microwave devices. Basic knowledge of plasma physics would also be of particular interest.

Application:
Full curriculum vitae including your relevant academic, professional, and other experiences and knowledges as well as a publication list.

First day of employment:
Review of applications will start immediately and will continue until the position is filled.

Duration of the contract:
Up to 36 months.

Contact:

Romain PASCAUD
Associate-Professor, ISAE-SUPAERO
Mail: romain.pascaud@isae-supaero.fr
Phone: 05-61-33-84-93

Marjorie GRZESKOWIAK
Associate-Professor, ISAE-SUPAERO
Mail: marjorie.grzeskowiak@isae-supaero.fr
Phone: 05-61-33-84-23