Training Opportunity for Portuguese Trainees

Reference	Title	Duty Station
PT-2019-TEC-EFE(5)	High power phenomena in microwave components: multipactor, Corona and PIM	ESTEC

Overview of the Unit missions:

The RF Payloads & Technology Division is responsible for RF payloads, instruments and technologies for space and ground applications, including all equipment having a RF space/ground interface and its associated laboratories. The Division supports the definition, specification and development/procurement of laboratories either for ESA projects and technology programmes or external customers.

Within the Division, the RF Equipment and Technology Section provides functional support to ESA projects and carries out technological research (R&D) in the fields of RF equipment and building blocks, active and passive components, technologies and related design and characterisation tools.

Overview of the field of activity proposed:

This trainee opportunity is divided in different parts covering several high power RF aspects such as Corona and Multipactor.

Corona

Corona prediction has achieved a good level of maturity with respect to simulation tools and testing. However, in both cases, a CW excitation signal is considered. The impact of the signals (modulated, multicarrier, pulsed, chirp, etc.) into the Corona threshold has not been studied yet. This trainee will assess Corona discharge when considering realistic excitation signals.

Multipactor

Currently the prediction of high power RF breakdown is performed considering:

- Unmodulated signals: in most of the cases a continue wave signal is used in the prediction. Amplitude and frequency modulations could modify the threshold.
- Standard Secondary Emission data: including strong assumptions with respect to low energy particles or incident angle. The impact of these assumptions into the threshold has not been adequately addressed yet.

This part of the study will be focused on the multipactor prediction in 3D structures considering arbitrary signals (modulated, multicarrier, pulsed, chirp, etc.) and the impact of assumptions during the modelling regarding Secondary Emission Yield.

Passive Intermodulation Products

Passive intermodulation, PIM is a form of intermodulation distortion produced by passive components. PIM can occur in a variety of areas from coaxial connectors to cables, waveguide flanges or any joint where dissimilar metals occur. Third order PIM is normally the most critical odd PIM product in terms of interfering power. As a result, it tends to be the most measured PIM term in order to evaluate the practical performance of RF assemblies. Its testing is normally carried our using two high power carriers in order to simplify measurement test-bed. However, real systems operate in multicarrier modulated scenarios. This study will cover the theoretical and practical evaluation of PIM when considering more than 2 carriers and, additionally, when considering modulated signals. Additionally, and it can be seen as complementary, techniques to identify the PIM location inside the RF chain will be studied and experimentally validated.

Required Education:

Applicants should have just completed a University course at Masters Level (or equivalent) in an Engineering or scientific field, with emphasis on electromagnetics or physics.

Good skills with simulations tools (MATLAB, CST, HFSS, FEST) will be highly beneficial.

Applicants should have good interpersonal and communication skills and should be able to work in a multi-cultural environment, both independently and as part of a team.

Applicants must be fluent in English and/or French, the working languages of the Agency. A good proficiency in English is required.