Training Opportunity for Lithuanian Trainees

Reference	Title	Duty Station
LT-2018-TEC-EPG	In-orbit data processing for solar array design optimization	ESTEC

Overview of the unit's mission:

The Power Systems, EMC and Space Environment division (TEC-EP) is responsible for all aspects of power systems required for ESA spacecraft and payloads. The division's activities cover power generation, power management, electromagnetic compatibility, energy storage and space weather. The power generation section provides specialist support in photovoltaic power generation to current ESA missions and development projects. The section is also responsible for ESA R&D activities in the power generation domain, working on internal activities as well as collaborating with industry and academia throughout Europe developing future solar cells technologies. The work of the section is supported by the Solar Generator Characterization Facility on site at ESTEC.

Overview of the field of activity proposed:

In-orbit data of solar array for different ESA missions are a huge, valuable tank of information to verify and optimize the electrical design rules for the solar array. Oversize due to redundancy and reliability rules is a common practis when a solar array network is designed, but excessive margins risk to unreasonably increase mass and dimensions of solar panels, resulting in more production costs. In view of improving the solar array design, starting from the comparison with the solar array available in-orbit data, the proposed study try to identify which margins can be modified on each of the several parameters responsible of the design (calibration, mismatch, random losses, UV and micrometeoroids, radiation losses and so on) in order to optimize the design with respect to the requirements.

A tool that is under development within the solar generator section is the solar generator simulator module, with which the power generation can be calculated for various input parameters. This module is programmed in EcoSim Pro. However its finalization is still to be achieved and most recent data, e.g. future solar cells or thermal parameters of solar arrays, need to be incorporated and maintained.

Apart from the already existing module in EcoSim Pro, a more detailed model of the solar cell can be implemented. Such a model, would allow to simulate anomalous operation conditions of the solar cell, among others reverse operation and performance under uncompensated light spectrum. These simulations are fundamental for understanding the behavior of the cell under non-ideal conditions potentially leading to a damaging situation either during the performance or testing.

In detail, the activity will cover the following tasks:
- Modelling and characterization of solar array design electrical network
- In-orbit data processing of flying ESA missions
- Simulation in ECOSIM ambient
- Re-visiting of solar array design rules and possible implication on technology to enhance space craft system studies and allow rapid troubleshooting.

Required education:

The applicant should have completed higher study programme in electronics and electro-technique, preferably in aerospace engineering or physics. A solid knowledge of ECOSIM ambient simulation would be an asset.