

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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DEVELOPMENT, INTEGRATION AND TEST OF POWER ELECTRONIC EQUIPMENTS FOR
CONTROLLING THRUSTERS IN THE MICRO-NEWTON RANGE**Abstract**

Different electrical propulsion thrusters in the micro-Newton range such as Field Emission Electrical Propulsion thrusters (FEEP) and Radio-Frequency Ion Thrusters (RIT) have experienced, in these last years, considerable progress both in development and qualification activities so that significant amount of missions in space application requiring very high controllability in the micro-Newton range (e.g. for drag-free experiments, fine pointing/attitude control or formation flying) are today really feasible. It is demonstrated that the electronic package (hereafter recalled as Power Control Unit; PCU), effectively contributes to the micro-propulsion performances in term of resolution, accuracy, controllability as well as noise. Accordingly, the development of a PCU based on standard functions and recurring modules so as to cope with the different needs of different micro-propulsion technologies has become a key matter. Now, not limiting the landscape to the family of Ion Thrusters, the recent years welcomed the milestone achievements of “cold gas” thrusters also in the micro-Newton range, with accuracy and controllability not expected before, thanks to the developments of Thales Alenia Space – Italy (TAS-I) for GAIA (ESA project). Following the transfer of technology that took place between the Finmeccanica Companies (TAS-I, participated 33

From this perspective, this paper is presenting: • An overview of the main features of the Power Control Unit for FEEP already developed, qualified and delivered by SELEX Galileo (SG) and its adaptability to a different Ion thruster technology (micro-RIT technology) • The outcome of the activities performed by SG under development in the frame of LISA Pathfinder with the aim to implement a detailed design of a PCU for Mini-RIT • The main findings of the integration and test campaign performed between an SG built Mini- RIT PCU Elegant Bread-Board (EBB) and the main constituent of a Mini-RIT S/S (i.e. Thruster, Radio-Frequency Generator and Neutraliser) in the frame of LISA Pathfinder under the leadership of LISA Pathfinder Prime – Astrium Ltd – and in cooperation with Astrium GmbH (Lampoldshausen) and the Giessen University • An overview of the main features and possible applications of the Micro-Propulsion Electronic (MPE) for “cold-gas” thrusters.