

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

Author: Dr. michele coletti
University of Southampton, United Kingdom, coletti@soton.ac.uk

A TWO-STAGE HFB-PPT FOR CUBESAT APPLICATION

Abstract

Pulsed Plasma Thrusters (PPTs) are electric propulsion thrusters that are reliable, relatively simple, highly scalable and low cost. One of the most important PPT limitations is their low efficiency and one of the reasons for this is the so-called “late time ablation” that produces a low speed gas and macro particles that does not contribute significantly to produce thrust. The concept of a two stage PPT (TS-PPT) has been introduced in previous papers [1]. This PPT presents two sets of electrodes, the first set is in contact with the propellant (like in a conventional PPT) the second one is placed downstream. The first set of electrodes, is responsible for ablating the propellant and provides it with a preliminary acceleration. The second stage provides the main acceleration force to the propellant ablated during the first discharge and to the propellant produced by the late time ablating. A TS-PPT has been realized for the Unisat 5 satellite of the University of Rome. In this paper the Unisat 5 TS PPT will be firstly analyzed theoretically adapting the models present in the literature to a two-stage PPT and then experimentally tested to determine its main functional parameters: ablated mass, discharge current profiles and impulse bit. The results will be discussed and the improvements with respect to a conventional PPT highlighted and quantified.

[1] R. Intini Marques, S.B. Gabriel, F. Costa, “High Frequency Burst PPT Research at the University of Southampton”, IEPC-2007-300, 30th International Electric Propulsion Conference, Florence, Italy