

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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PARTICLE IN CELL SIMULATION OF FEEP THRUSTER PLUME

Abstract

The particle-in-cell PICPlus code, developed at Alta, has been used to investigate FEEP thruster plume features in the framework of the Lisa Pathfinder Program activities. Accurate numerical rebuilding of the plume has been possible thanks to the experimental data obtained from the LIF test carried out by ONERA, and the extensive beam scan measures taken at Alta during firing tests. Cesium propellant has been treated as a gas, and at this stage the possible presence of macro-droplets has not been modelled. The simulations made it possible to obtain useful information both for the internal and external thruster region

After the assessment of numerical results through correlation with test data, the beam dynamics inside and outside the thruster was analysed. The aim of the study was to investigate particles dynamics within thruster electrodes, to analyse the thruster electrodes contamination due to neutral cesium or CEX ions, to evaluate thruster material sputter and redeposition, and finally, on a larger scale, to evaluate possible satellite contamination effects.

The analyses were carried out using both 2D and 3D geometry models of the thruster.