A New Ultra-High Vacuum Facility for Plume Characterization and Neutralization Studies of FEEP and Colloid Thrusters

John K. Ziemer, Colleen M. Marrese, Juergen Mueller, James E. Polk
Jet Propulsion Laboratory, M/S 125-109
California Institute of Technology
4800 Oak Grove Drive, Pasadena, CA 91109
(818) 393-4582, John.K.Ziemer@jpl.nasa.gov

Abstract

A new ultra-high vacuum facility has been designed and built at JPL for measuring plume properties and studying the neutralization of field emission electric propulsion (FEEP) and colloid thruster ion beams. Housed in a class 10 clean room, the Microthrust UHV Test Facility is 2 m long and 2 m in diameter with a side mounted load-lock chamber to help maintain a background pressure of 10^{-9} with shorter turnaround time. The facility includes a sub-micronewton level thrust stand, electronic plasma probes for measuring ion current density and plasma potential, and quartz-crystal microbalances for studying contamination at various angles from the thruster. The facility is designed to test high-energy ion thrusters including FEEP (multiple propellant types) and colloid thrusters that will be useful for two upcoming NASA missions: ST-7 and LISA. Beam neutralization studies using both thermionic and field emission cathodes (include carbon nano-tube devices) will also be studied using this facility.