

SPACE PROPULSION SYMPOSIUM (C4)  
Electric Propulsion (4)

Author: Mr. Alex Bennet  
Australian National University (ANU), Australia

Dr. Kazunori Takahashi  
Tohoku University, Japan

Dr. Christine Charles  
Australia

Mr. Andrew Bish  
Australian National University (ANU), Australia

Prof. Rod Boswell  
Australia

Prof. Akira Ando  
Tohoku University, Japan

Prof. Robert Georges  
Université de Rennes, France

Dr. Abdessamad Benidar  
Université de Rennes, France

THE MINI-HELICON PLASMA THRUSTER FOR ‘CUBESAT’ NANO-SATELLITES: EXPERIMENTS  
AND SIMULATIONS**Abstract**

Commercial space companies and space agencies are responding to society’s growing interest in access to space, i.e. satellites on low or geostationary Earth orbits and long term exploratory missions to moons, planets or asteroids. Radiofrequency electrode-less neutralizer-free plasma engines are good candidates for providing extended lifetime, power scaling and broad choice of propellant (including use of spacecraft systems’ residues and of ‘green’ and safe propellants). Obtaining good performance within a small volume and mass is challenging both for new and mature technologies (such as ion gridded thrusters, Hall effect thrusters, arcjets). Here the development of the Mini-Helicon Plasma Thruster (MiniHel) will be presented with particular emphasis on the role of the geometric and magnetic nozzle. Testing of various configurations (plasma cavity size and shape) is carried out in the WOMBAT vacuum chamber equipped with a range of diagnostics (thrust balance, optical and electrostatic probes) and newly developed technologies (miniaturized frequency variable matching system, Oregon Physics broadband radiofrequency amplifier). The results are used to develop computer simulations aiming at a better understanding of the physics and thrust generation in the nozzle.