

DESIGN AND TESTING OF THE FIRST HELICON DOUBLE LAYER THRUSTER PROTOTYPE

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The Plasma Research Laboratory at the Australian National University (ANU) has developed the first prototype of the Helicon Double Layer Thruster (HDLT), a radically different space plasma engine for interplanetary travel (Mars) and attitude control of earth orbit satellites, in collaboration with the CRC for Satellite Systems and AUSPACE and funded by a DEST Innovation access grant. In April 2005, a testing campaign of the HDLT prototype has been carried out in a space simulation chamber at the European Space Agency development center (ESTEC, Holland). The HDLT is simple, has no moving parts, no electrodes and no need for a neutraliser. It is a new type of magneto-plasma thruster and its advanced concept is based on our recent discovery at ANU of a current free electric double layer in an expanding plasma: electric double layers are like cliffs of potential (like a waterfall) and can energise charged particles falling through them. We have measured the energy of the supersonic ions accelerated by the double layer and this ion acceleration can be used for thrust in a space craft. This new type of double layer probably exists in the plasma environment of the earth and the stars and can cause phenomena as diverse as aurorae (luminous draperies in the polar sky), electromagnetic radiation from rotating neutron stars called pulsars and ion heating in the magnetic funnels of the solar corona. The HDLT is one of the many applications of a new exciting piece of physics.

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