

Plasma properties of the space plasma operation chamber at NCKU in Taiwan

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The space plasma operation chamber (SPOC), a research facility designed to calibrate and test satellite/rocket-borne instruments and study space plasma processes, is constructed at NCKU in 2009. It is a cylindrical chamber of 2m in diameter and 3m in length. Plasma is produced by two back-diffusion type sources installed at the center of both chamber sides. The sources produce ions of controllable drifting energy from a few ten to several hundred eV and density up to 10^6 cm^{-3} . These ions are neutralized by thermal electrons emitted from Nickel cathodes, and collide with neutral molecules in the chamber of pressure $\sim 2.2 \times 10^{-4}$ Torr, and a plasma environment with ion temperature $\sim 300\text{K}$ and electron temperature $\sim 1000\text{-}3000\text{K}$ is formed in the chamber. This paper presents measurement results of a retarding potential analyzer (RPA), an electron temperature and density probe (TeNeP) and a Langmuir probe installed on the 2-axis moving system in SPOC. The thermal and beam component ion energy distributions at different distances from the ion source and the electron temperature/density spatial distributions in the SPOC will be presented. The collision process of ions with neutral molecules will also be discussed.

Keywords: Plasma properties, space plasma operation chamber, back-diffusion plasma source, retarding potential analyzer, electron temperature and density probe, Langmuir probe