

3-D computer experiments on charging process of plasma emitting spacecraft

Hideyuki Usui[1], Hayato Tashima[2], Hiroshi Matsumoto[1], Yoshiharu Omura[1], Ikkoh Funaki[3]

[1] RASC, Kyoto Univ., [2] RASC, Kyoto Univ., [3] Insti. of Engineering Mechanics and Systems, U. of Tsukuba

For the assessment of the spacecraft with active plasma emission and its surrounding plasma environment, we are planning to propose a plasma experimental space platform for the JEM (Japan Experimental Module) exposed unit of the international space station (ISS). By using this platform, we will be able to examine the transient processes in non-steady interference with plasma and charging/discharge in association with turn-on/off or unexpected failure of the plasma emission facility. In order to design the new platform, we started testing the charging process of a floating body with active ion emission in a vacuum chamber.

In parallel to the ground experiment, we also started performing computer simulations with Particle-In-Cell (PIC) model in order to examine the detail of the charging process. In the simulations, we particularly focus on the transient response of a floating ion-emitting body in a situation where a neutralizer which emits electrons from the body is abruptly turned off by accident. In the present paper, in addition to the brief introduction of the concept of plasma experimental module for JEM, we will show some results obtained in the PIC simulations and discuss the body charging process, the spatial distribution of emitted ions and the response of the background plasma.