

R005-03

B会場：9/24 PM1 (13:45-15:30)

14:15~14:30

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Development of 1U-size impedance probe for cube satellite missions

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Impedance probe has been used for measurements of the electron number density of the ionospheric and magnetospheric plasma in many sounding rocket experiments and several satellites missions. Its accuracy within several percent in the electron number density measurement is a clear advantage with respect to other observation methods. It has not been, however, applied yet in cube satellite missions which are increasing recently.

A small satellite mission for demonstrative experiments of wireless power transmission from Low Earth Orbit (LEO) satellites to the ground started in Dec. 2022. In the experiments planned in 2025, in addition to the performance of the power transmission, the effects of power transmission to the background plasma are required to be evaluated. So, the plasma monitor instruments such as impedance probe, Langmuir probe, and plasma wave receiver are also planned to be installed not only on mother satellite but also 6U-size daughter satellite, which is ejected from the mother satellite for additional power transmission experiments between two satellites in space. The impedance probe for previous sounding rockets (e.g. SS-520-3 NEI/PWM) would be applicable as is to the mother satellite. However, for installation to the daughter satellite, downsizing of the impedance probe instrument to 1U size is required.

Downsized impedance probe is also required in another mission: PCUBE (Probing, Controlling, and Understanding of radiation Belt Environments). The purpose of PCUBE is to investigate the contributions of the density ducts in the magnetosphere on the loss processes of the radiation belt electrons on the basis of observation with LEO cube satellite, and to make suggestions for future active experiments controlling density ducts and radiation belt electrons. In order to measure the precipitating electrons and density structures of the ducts, electron analyzer and impedance probe are planned to be installed on the cube satellite. The launch of the cube satellite is planned in 2026.

For two cube satellite missions mentioned above, development of 1U-size impedance probe has been started since Dec. 2022. In addition to the downsizing of electric circuit unit, shorter probe than the current one (1.2 m) would be preferable in order to avoid the limitations in attitude control of cube satellites. Plasma measurements test with shorter probes (0.3m and shorter) is planned using Space Chamber Laboratory of JAXA/ISAS in Sept. 2023.