R006-17
A 会場 ：9/26　AM1 （9:00-10:30）
9:00〜9:15

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A New Technique for Space Plasma Measurements Using Floating-mode Avalanche Photodiode Combined with Electrostatic Energy Analyzer

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A novel type of instrumental development based on a “floating-mode” avalanche photodiode (APD) combined with an electrostatic energy analyzer was conducted toward future space plasma exploration missions. A “cusp-type” electrostatic analyzer (MEP-e: Medium-energy particle experiments-electron analyzer) with normal-mode (non-floating-mode) APD onboard the ERG (Arase) satellite for the geospace exploration was able to cover an energy range up to ˜87 keV and a wide angular coverage with a 360-deg. field-of-view (FOV). Although the original lowermost energy of MEP-e is ˜7 keV, the combination of the floating-mode APD with the cusp-type analyzer could lead us to more comprehensive and accurate electron measurements in a much wider energy range from a few eV to hundreds of keV. While this measurement concept was originally initiated before the ERG mission formally started, our recent experimental results verified that this “combination” technique could drastically improve both the quality and quantity of the space plasma observations, firstly in terms of the electron energy analyses. While a high voltage power supply of ˜+5 kV, depending on the APD performance, is needed for the floating mode, several APD properties, represented by rough energy analysis capability for noise reduction by double energy discriminations, low dark count, compact dimension, and lightweight, could be valuable and promising also in the floating-mode APDs combined with electrostatic analyzer. When this advanced type of in-situ measurement technique is employed, for instance, in a small satellite mission under stringent resource restrictions, wide-energy/angular distributions of electrons in space could be captured by a single sensor head on a spin-stabilized satellite. It, moreover, would be possible to detect energetic ions beyond 5 keV/q and discriminate He2+ of the solar wind origin from H+ as the major ion species of the space plasma when the polarities of high voltages to the floating-mode APD and the inner shell of the electrostatic analyzer could be switched to be negative in the identical sensor head. The measurement technique developed in our experimental activities indicates that the single sensor head is alternately available for both electron and ion measurements in space.