

Development of high time resolution ion sensors (FPI-DIS) on MMS

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The NASA's Magnetospheric Multiscale (MMS) mission is scheduled for launch in October 2014. According to the in-situ observations of the recent spacecraft including GEOTAIL, Cluster, and Themis, it is essential to resolve the ion / electron scale phenomena in order to understand the driving mechanisms of the magnetic reconnection. The purpose of the MMS mission, consisting of four identically instrumented spacecraft, is to observe Earth's magnetosphere in order to study magnetic reconnection, a fundamental plasma-physical process. MMS will observe the diffusion regions using four satellites with high (millisecond order) time resolution low energy particle sensors. Four sets of low energy electron and ion sensors are installed on one satellite, which enables us to obtain 3-D data independent of the satellite spin motion.

In order to realize the low energy ion measurements on MMS, we are developing high time resolution ion sensors (FPI-DIS: Fast Plasma Instrument Dual Ion Sensors). FPI-DIS measures 3D ion flux distributions over the energy range between 1 eV/q and 30 keV/q with an energy resolution of 20%. The time resolution to observe 3-D ion distribution function using four DIS sensors is 150msec.

So far, we have completed calibration of all the flight model DIS sensors (16 DIS sensors / 4 spacecraft). We have confirmed that all the DIS sensors satisfy the required performance. We will report the expected observation performance of FPI-DIS based on the results of the calibration.

Keywords: MMS, FPI-DIS, reconnection, high time resolution ion sensor