

In Flight Calibration of the Magnetospheric Multiscale Mission Fast Plasma Investigation

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The Fast Plasma Investigation (FPI) on the Magnetospheric Multiscale mission (MMS) combines data from eight spectrometers, each with four deflection states, into a single map of the sky. Any systematic discontinuity, artifact, noise source, etc. present in this map may be incorrectly interpreted as legitimate data and incorrect conclusions reached. For this reason it is desirable to have all spectrometers return the same output for a given input, and for this output to be low in noise sources or other errors. While many missions use statistical analyses of data to calibrate instruments in flight, this process is difficult with FPI for two reasons: 1. Only a small fraction of high resolution data is downloaded to the ground due to bandwidth limitations and 2: The data that is downloaded is, by definition, scientifically interesting and therefore not ideal for calibration. FPI uses a suite of new tools to calibrate in flight. A new method for detection system ground calibration has been developed involving sweeping the detection threshold to fully define the pulse height distribution. This method has now been extended for use in flight as a means to calibrate MCP voltage and threshold (together forming the *operating point*) of the Dual Electron Spectrometers (DES) and Dual Ion Spectrometers (DIS). A method of comparing higher energy data (which has low fractional voltage error) to lower energy data (which has a higher fractional voltage error) will be used to calibrate the high voltage outputs. Finally, a comparison of pitch angle distributions will be used to find remaining discrepancies among sensors.