



**NOAA Satellite and Information Service  
Deep Space Climate Observatory (DSCOVR)  
PLASMA-MAGNETOMETER (PlasMag)**

**Background**

The Plasma-Magnetometer (PlasMag) measures solar wind activity to provide highly accurate and rapid warning of geomagnetic storms with lead times of up to one hour.

The PlasMag instrument suite is a comprehensive science and space weather package that includes a fluxgate vector magnetometer, a Faraday Cup solar wind positive ion detector and a top-hat electron electrostatic analyzer. This instrument cluster provides high time resolution measurements in real time and represents the next generation of solar wind monitors.

The PlasMag will measure the magnetic field and the velocity distribution functions of the electron, proton and alpha particles (Helium nuclei) of solar wind with higher time resolution than existing instruments.

The PlasMag was developed at NASA's Goddard Space Flight Center (GSFC) and the Massachusetts Institute of Technology (MIT) and optimized for small size, low power, simplicity and a dynamic range.

**Benefits**

Measurements of solar wind are central to better determining how solar events affect Earth and its near-space environment, and will help the National Weather Service Space Weather Prediction Center issue warnings for spacecraft and manned space flights.

This instrument will help monitor solar weather to provide early warnings of solar events that may cause damage to power grids and satellites, and impact GPS and communications. The PlasMag suite of instruments will provide the information needed to issue warnings to protect electrical equipment on Earth and satellites in orbit.

**Key Measurements**

The PlasMag consists of three parts: (1) a flux-gate magnetometer to make a vector measurement in 30 to 40 milliseconds, (2) a Faraday cup to measure the three-dimensional distribution function of proton and alpha components of solar wind plasma with a time resolution (repetition rate) of 90 milliseconds, and (3) a "top-hat" analyzer to give 3-D electron velocity distribution functions in 800 ms (480 points).

The magnetometer is a triaxial-fluxgate magnetometer that will measure the three-dimensional magnetic field vector of the solar wind with a sensitivity level of better than 0.1 nanoTesla at a very high time resolution of 0.02 seconds.

The Faraday cup will provide very high time resolution (0.5–2.5 second) solar wind bulk properties in three dimensions, which coupled with magnetic field data (50 vectors per second) will allow the

**PlasMag Instrument-at-a-Glance**

**Purpose: Measures solar wind activity to provide rapid warning of solar events.**

**Instrument Contractor: Faraday Cup built by MIT; magnetometer and electron electrostatic analyzer built by NASA GSFC**

**Key Specs:**

Time Resolution:

MAG: 0.02s

PLASMA: 4s

ELECTRONS: <1s

**Website:**

<http://www.nesdis.noaa.gov/DSCOVR/spacecraft.html>

investigation of solar wind waves and turbulence at unprecedented time resolution. This will allow new insights into basic plasma properties to understand the nature of coronal heating. The use of multiple collectors will allow for the full range of solar wind deflections to be detected.

The “top-hat” electron electrostatic analyzer, recalibrated and relocated on the spacecraft in 2013 using NASA Heliophysics funding, will provide high time resolution ( $< 1$  s) solar wind electron observations and measure the electron distribution between 3 eV and 2 keV in time periods as short as 800 ms. The instrument will allow for the continual observation of the 3-D electron distribution function for various solar wind conditions and will provide the closest link to the formation of solar wind in the upper corona.