Initial Results from the Microwave Anisotropy Probe

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The Microwave Anisotropy Probe (MAP) is a NASA sponsored Medium Class Explorer mission designed to produce full sky maps of the cosmic microwave background (CMB) radiation. MAP simultaneously observes in five frequency bands, spanning 20 - 106 GHz. Twenty differential microwave radiometers observe the sky in two orthogonal linear polarizations, allowing reconstruction of maps in Stokes I, Q, and U parameters. The satellite operates from a Lissajous orbit around the second Earth-Sun Lagrange point (L2) that keeps the Earth, Moon and Sun far from the telescope boresites. The radiometers are built with high electron mobility transistor (HEMT) amplifiers and utilize passively cooled input stages to reduce radiometer noise. The broad frequency coverage allows separation of the CMB signal from foreground emission based on their differing spectral properties. Angular resolutions are different in each frequency band and range from $0.^{\circ}82$ to $0.^{\circ}21$ in the lowest and highest frequency bands respectively. MAP has completed the first of four years of planned science observations.

In this talk I review the instrumental and observational aspects of the MAP mission, stressing the characteristics required for high quality CMB observations. Design features and analysis techniques used to minimize and assess systematic error levels are discussed. On-orbit characterizations of the radiometer performance, including sensitivity, short term and long term stability are presented. The characterization of the optical system, including main beam and sidelobe response, is given, derived from a combination of pre-launch and on-orbit measurements.

I also review the publicly available data products, comprising intensity maps at five frequencies, calibrated time ordered data, and beam and radiometer bandpass characteristics. Derived data products, including the angular power spectrum of the CMB, values of cosmological parameters, and maps of foreground emission components, are also presented.