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# MAXIMA-1: A MEASUREMENT OF THE COSMIC MICROWAVE BACKGROUND ANISOTROPY ON ANGULAR SCALES OF 10′ TO 5°

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## ABSTRACT

We present a map and an angular power spectrum of the anisotropy of the cosmic microwave background (CMB) from the first flight of MAXIMA. MAXIMA is a balloon-borne experiment with an array of 16 bolometric photometers operated at 100 mK. MAXIMA observed a 124 deg$^2$ region of the sky with 10′ resolution at frequencies of 150, 240 and 410 GHz. The data were calibrated using in-flight measurements of the CMB dipole anisotropy. A map of the CMB anisotropy was produced from three 150 and one 240 GHz photometer without need for foreground subtractions. Analysis of this CMB map yields a power spectrum for the CMB anisotropy over the range $36 \leq \ell \leq 785$. The spectrum shows a peak with an amplitude of $78 \pm 6$ $\mu$K at $\ell \simeq 220$ and an amplitude varying between $\sim 40$ $\mu$K and $\sim 50$ $\mu$K for $400 \lesssim \ell \lesssim 785$.

*Subject headings:* cosmic microwave background - cosmology: observations

## 1. INTRODUCTION

Measurements of the anisotropy of the cosmic microwave background (CMB) can discriminate between cosmological models and determine cosmological parameters with high accuracy (Kamionkowski & Kosowski 1999, and references therein). Inflationary dark matter models, for example, predict a series of peaks in the angular power spectrum of the anisotropy. The collected results from many experiments show the existence of a first peak at angular scales corresponding to the spherical harmonic multipole number $\ell \sim 200$. These results have been interpreted as evidence for a flat universe (de Bernardis et al. 2000; Lange et al. 2000; Dodelson & Knox 2000; Tegmark & Zaldarriaga 2000; Pierpaoli, Scott, & White 2000). Additional observations probing a broad range of angular scales would greatly increase confidence in these results and further constrain cosmological parameters.

MAXIMA is a balloon-borne experiment optimized to map the CMB anisotropy over hundreds of square degrees with an angular resolution of 10′. In this paper we report results from the MAXIMA-1 flight which took place on August 2, 1998. These include a 100 square degrees map of the CMB anisotropy and the resulting power spectrum over the range $36 \leq \ell \leq 785$, which is the largest range reported to date. Despite several common team members, the data analysis was independent of that leading to the recently reported BOOMERANG results (de Bernardis et al. 2000). A companion paper, Balbi et al. (2000), discusses the cosmological significance of the MAXIMA-1 results.

## 2. INSTRUMENTATION

Lee et al. (1999) gives a detailed description of the MAXIMA system. It is based on a well-baffled, underfilled, off-axis Gregorian telescope with a 1.3 m primary mirror, mounted on an attitude-controlled balloon-borne platform. A well-baffled liquid-Helium-cooled optics box is lined with absorbing material (Bock 1994) and con-

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