SEARCH FOR LINEAR POLARIZATION OF THE COSMIC BACKGROUND RADIATION

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ABSTRACT

We present preliminary measurements of the linear polarization of the cosmic microwave background (3°K blackbody) radiation. These ground-based measurements are made at 9 mm wavelength. We find no evidence for linear polarization, and set an upper limit for a polarized component of 0.8 m°K with a 95% confidence level. This implies that the present rate of expansion of the Universe is isotropic to one part in 10^6, assuming no re-ionization of the primordial plasma after recombination.

The observed cosmic microwave background radiation is generally thought to be a relic of the hot, dense initial phase of the Universe. This radiation should then have characteristics which reflect its thermal origin and the geometry of the early Universe. The simple hot Big Bang model predicts that this radiation has a blackbody (Planckian) spectrum, is unpolarized, exhibits the statistical properties of blackbody radiation[1], and is isotropic in a reference frame co-moving with the expansion of the universe.

The spectrum of this radiation has been extensively investigated.[2] The best experiment to date is that of D. Woody and P. Richards.[3] Although their results qualitatively follow a blackbody spectrum, they report a 5σ deviation from the best fit blackbody curve. There have also been many measurements of the angular distribution of this radiation with recent reports of a 3.5 ± 0.4 m°K amplitude first-order (cosine) anisotropy[4,5]. It is thought