

OBSERVATIONS OF THE CMB ON SCALES OF 2° TO 15°

The Tenerife experiments

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Beamswitching has been used at 10, 15 and 33 GHz to map the microwave background over the Declination range 30° to 45°, covering more than one steradian of the sky. The beamwidth is 5° and the beam-throw is $\pm 8^\circ$ at each frequency. The three data sets are used to separate Galactic emission from intrinsic CMB emission. For the scan at Dec = 40° the intrinsic fluctuation level is $\Delta T_{\text{rms}} = 48_{-15}^{+21} \mu\text{K}$ on a coherence scale of 4°; the equivalent analysis for a Harrison–Zeldovich model gives a power spectrum normalisation of $Q_{\text{rms}} = 22_{-6}^{+10} \mu\text{K}$. The value of the fluctuation amplitude calculated from the likelihood analysis of the two-dimensional data set is $\Delta T_{\text{rms}} = 54 \pm 13 \mu\text{K}$ at 10 GHz and $39_{-7}^{+8} \mu\text{K}$ at 15 GHz.

A short baseline interferometer has been operating at 33 GHz. The spacing of the two low-spillover horns is 17λ (152 mm). The bandwidth is 3 GHz giving an rms noise of 200 μK in 2 minutes. With a primary beamwidth of $5^\circ \times 2.5$ the interferometer lobe size is $1.7^\circ \times 2.5$. The interferometer is largely unaffected by atmospheric water vapour. Data at Dec = 41° show significant structure at high signal-to-noise. The section from RA = 08 – 19 hr shows CMB structure at an rms level of $\sim 20 \mu\text{K}$; this corresponds to a sky $\Delta T_{\text{rms}} \sim 100 \mu\text{K}$, at an angular scale of 2°, when corrected for dilution; a value significantly larger than found in our beamswitching experiments on a 5° – 15° angular scale. This work is now being extended in the *Very Small Array, Tenerife*, a collaboration between our three groups. This has 14 antennas operating at baselines up to 2 m in the frequency range 26–36 GHz. The sensitivity will be $\Delta T/T \sim 2 \times 10^{-6}$ in several months, in the range $l = 100 - 1000$. Observations will begin in 1999.