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ORIGINAL ARTICLE

An array of lens-coupled antennas for cosmic microwave background measurements in the 30 Ghz band

Angel Colin · David Ortiz · Enrique Villa · Edurado Artal · Enrique Martínez-González

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Abstract An array of bow-tie slot antennas coupled through an extended hemispherical lens is proposed to operate in the 30 GHz frequency band. The design includes a combination of three microstrip Wilkinson power dividers (WPD) and transitions to coplanar wave guides (CPW) to form the feeding antenna network. This configuration is suitable for the integration with heterodyne imaging detectors commonly used in radioastronomy. Measurements and simulation results exhibit a frequency range of operation from 20 to 40 GHz with a bandwidth of 24% achieved for −10 dB return loss at the central frequency. The measured radiation patterns show a maximum peak gain of around 13 dB with HPBW of 10° for the E-plane, and whose first side lobes are lower than 13 dB below the main lobe in both angular shift sides. The presented results will be considered as preliminary feasibility studies in the 30 GHz QUIJOTE-CMB Instrument, which is designed to study the anisotropies of the Cosmic Microwave Background (CMB).

Keywords Bow-tie slot antenna · Antenna-coupled · Lens · Cosmic microwave background (CMB)

A. Colin (✉)
Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC),
Campus UAB., 08193, Bellaterra, Barcelona, Spain
e-mail: angel.colin@imb-cnm.csic.es

D. Ortiz · E. Martínez-González
Instituto de Física de Cantabria (CSIC-UC), Av. Los Castros s/n.,
39005, Santander, Spain

E. Villa · E. Artal
Dep. Ingeniería de Comunicaciones, Universidad de Cantabria,
Plaza de la Ciencia s/n., 39005, Santander, Spain