ACCURATE GAIN CALIBRATION OF LARGE ANTENNAS AT 86 GHZ

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The effective aperture of one of the BIMA (now CARMA) 6m mm-wave interferometer antenna elements has been measured at 86 GHz with an accuracy of about 1of aperture only a few square centimeters. It was possible to compare signals from these, which differ in power by 1e5, with an accuracy of 1horn as an element of the interferometer. The horn and the large antenna to be calibrated were alternated into the array and the visibility amplitudes compared. The correlator is able to measure a voltage ratio of 300 with the requisite accuracy. Interferometry eliminates traditional problems such as ground pickup in sidelobes since only correlated signals are recorded. With a 1 GHz bandwidth, the correlation length is small, and so inaccuracy due to multipath and reflection is greatly reduced. A bright celestial target (Venus) was used as the signal source. Antenna surface figure and pointing were stable to within the required tolerance. The gain-calibrated large antenna was then used in a single dish experiment to measure the flux of Venus and Jupiter at 86 GHz, also to an accuracy of about 1

An ambient temperature receiver incorporating a waveguide transfer switch was used to alternate the signals from the reference horn and the large antenna. Since such switches are not available for higher frequencies, as for example most of the ALMA bands, it is desired to find a method that doesn't require them. Accordingly, a method to determine the source flux directly by means of an visibility amplitude closure relationship was tested and compared with our first method. No mechanical switches are required for this technique, although knowledge of atmospheric opacity is required continuously over a period of hours. Methods, difficulties, results will be presented.

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