PHASE AND AMPLITUDE ANTENNA MEAUREMENTS ON AN SIS MIXER FITTED WITH A DOUBLE SLOT ANTENNA AT 640GHZ

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For both the ALMA Interferometer and FIRST Mission a means of measuring accurately the phase and amplitude of horns and other antenna structure is required to ensure good alignment and high coupling efficiencies to the telescopes. This paper gives a means for making these measurements with a large dynamic range of greater than 60dB. The measurements that are shown were made at 640Ghz, which is the top of the HIFI band 1 and in the ALMA band 9, but they can be taken up to higher frequencies. Any type of antenna structure connected to a SIS mixer could be measured. For these measurements a quasi-optical antenna was chosen. The mixer, with its double slot antenna was aligned and fixed on to an elliptical lens and then mounted into a wet cryostat with a 1.2GHz to 1.7Hz IF. The Cryostat was aligned against far field antenna measurement range. The transmitter moves in an X-Y raster scan in front of the cryostat window. Movement in Z was also included for later measurements. The transmitter horn was a fundamental mode open ended waveguide. The local oscillator was injected onto the mixer by means of mylar beamsplitter. We will show a homodyne antenna range setup, which gives a dynamic range of over 60dB at 640Ghz. This uses two phase locked Gunn multiplier chains, one as the transmitter and the other as the local oscillator. These are combined to give an IF of 1.2GHz. This is amplified and filtered and then through to a second mixing stage and to a vector voltmeter.

The quasi-optical antenna polar diagram will be shown. Calculations of field coupling coefficient and power coupling coefficient will be given to show its Guassisity and efficiency. Comparison with theoretically predicted beam patterns will be made.

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