Design and Performance of a Novel Full-Waveguide Band Orthomode Transducer

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ABSTRACT

At millimeter and submillimeter wavelengths, cryogenically cooled receivers based on SIS and HEB technologies are approaching the quantum limit in noise temperature. Further increase in sensitivity can be obtained by using dual-polarized operation. One of the principal components of a dual-polarization receiver is a polarization diplexer or orthomode transducer (OMT). Traditionally the OMT used in radio astronomy receievers is the wire grid , which can be large and bulky. A waveguide based OMT, on the other hand, can be integrated with the mixer blocks and cryogenicaly cooled thereby reducing ohmic losses. A waveguide based OMT also lends itself well to integration into focal-plane array receivers. In this paper, we present the design of a novel OMT that can be constructed using conventional split-block techniques. The design is based on the proposed *B**f**ifot* OMT by Wollack [1], but has been considerably modified to (a) make it easy to fabricate, and (b) make it scalable to ~1 THz. The return loss is 20 dB or better over a full waveguide-band (~ 40% bandwidth), and the cross-polarization isolation is better than 40 dB. Design details and the measured performance of a W-band OMT will be presented.

References:
[1] E. Wollack, "A Full Waveguide Band Orthomode Junction", Electronics Division Internal Report, National Radio Astronomy Observatory, Green Bank, WV, no. 303, May 1996.

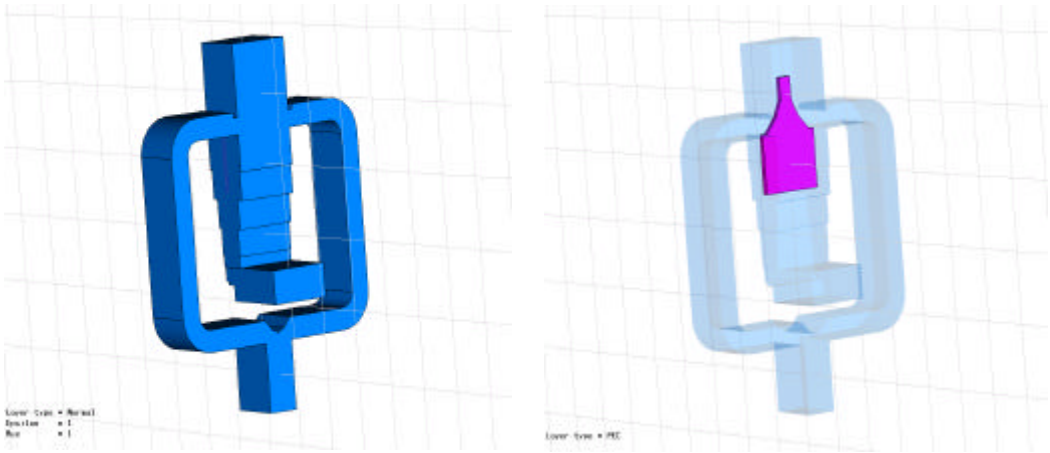

Figure 1: Outside and inside views of a W-band OMT. The inside view shows a septum that lies in the split-block plane.