Contributed Talk

Feedhorn-coupled, Dual-polarization TES-based Sensors Operating at 40 GHz

David Chuss (NASA Goddard Space Flight Center)

Co-Authors: D.T. Chuss, E.J. Wollack, K.L. Denis, K. Rostem, S.H. Moseley, T.R. Stevenson, T.A. Marriage, C.L. Bennett, T. Essinger-Hileman, J.R. Eimer, L. Zeng, A. Ali, D. Towner, E. Crowe, F. Colazo, N.P. Lourie

We have designed, fabricated, and tested feedhorn-coupled bolometers operating at 40 GHz. These devices independently couple two orthogonal linear polarizations to on-chip transmission lines over a broad (60%) bandwidth by utilizing a symmetric planar broadband orthomode transducer (OMT). The band definition is flexible and is controlled by a combination of on-chip filtering and integrated shielding of stray light that is accomplished via careful design of the sensor. The integrated stray light control operates over a frequency range of more than 10:1. The dielectric employed in the microstrip circuit is monocrystalline silicon. This material provides a highly uniform dielectric constant that results in excellent circuit uniformity. In addition, the monocrystalline silicon enables high efficiency due to its extremely low loss. With all filtering integrated, the efficiency of the devices has been measured to be ~90% for each polarization. This architecture is readily scalable within the frequency range 30-300 GHz and is a highly efficient means of measuring the polarization of the cosmic microwave background to search for evidence for inflation.