ABSORBER TYPE TES BOLOMETER FOR POLARIMETRY AT MILLIMETER AND SUB-MILLIMETER WAVELENGTH

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INTRODUCTION

Astronomical observations at millimeter and sub-millimeter wavelengths have proven to be a powerful probe of the early universe through the cosmic microwave background (CMB) radiation, of the star formation history of the universe through observations of dusty high redshift galaxies, and of the details of star formation through gas and dust observations in the local universe. Polarization sensitive detectors at these wavelengths are becoming increasingly important. At the frontier of CMB measurements is the goal of detecting or placing a stringent constraint on the polarization induced by inflationary gravitational waves created in the first instants of the universe. In the local universe, polarization measurements can be used to investigate the magnetic field believed to be critical to the process of star formation.

RESULTS

We have been developing polarization-sensitive bolometer detectors using superconducting Transition Edge Sensors (TES), with the goal of building large (of order 1000-pixel), dual polarization, multiband polarization sensitive focal planes for astronomical research. Here we report on an absorber coupled TES bolometer consisting of a polarization sensitive microwave absorptive metal grid and a Mo/Au bilayer TES detector fabricated photolithographically on a silicon nitride membrane. The electromagnetic design of the microwave absorbers, the heat transport analysis across the detector, and the thermal response of the TES will be presented. We will also report the results of laboratory tests of single pixel prototype devices, and compare with theoretical expectations.