

OFFICIAL ABSTRACT and CERTIFICATION

Improving the Detector Fitting Algorithm for the TolTEC Camera and Characterizing its Thermal Behavior

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TolTEC is an astronomical camera being constructed for installation on the Large Millimeter Telescope (LMT) with a mapping speed 100 times faster than its predecessor, AzTEC. It is implemented with a cryogenics system containing 7000 kinetic inductance detectors (MKIDs) that reach temperatures of .1K, representing a drastic improvement from the Aztec's 144 detectors. The temperature of the sensors needs to be monitored through thermometers placed in the system's cryostat; since, the system must maintain a constant working temperature. TolTEC's thermometers provide a constant stream of thermometry data to monitor temperature. The thermometry data is normalized through manipulation in Python to create a "health monitor" for TolTEC that will alert operators of any malfunctions. A stable, "healthy" temperature must be established before the MKIDs can function. The MKIDs are used to detect the optical power between 1.1- and 2-millimeter wavelengths. Before TolTEC is commissioned at the LMT, the MKIDs must be extensively analyzed to ensure proper function. The detector fitting algorithm was developed and improved to detect false, duplicate, offset, normal, and nonexistent detections. Without working MKIDS, TolTEC would be blind to the outside world. Overall, the construction of TolTEC will revolutionize the field of millimeter wavelength astronomy.

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