

ATMOSPHERIC EFFECTS ON THE METROLOGY SYSTEM
FOR THE LARGE MILLIMETER TELESCOPE

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Abstract Submission Form
1999 National Radio Science
Meeting

Reference # 0000
Session 0.00

The Large Millimeter Telescope (LMT) is a 50m diameter astronomical instrument for use primarily at $\lambda 1300 \mu m$ (230 GHz). The resulting technical specifications for observations at these wavelengths are very stringent. The overall rms surface specification is $74 \mu m$ in winds up to $10 m/s$, with a goal of $69 \mu m$.

At a wavelength of $1300 \mu m$, the LMT beamwidth is 6 arcsec. The rms pointing specification for the LMT contractor is < 2 arcsec for absolute pointing. The LMT Project is responsible for the Precision Pointing System with a stability of < 0.6 arcsec over 2 hours, within 10° of an astronomical calibration source.

The metrology system to achieve the 0.6 arcsec pointing stability has four major components. The first laser system measures the overall figure of the 50m diameter primary to determine its orientation and deformations from the desired parabola. The orientation of the parabola will be determined to < 0.4 arcsec or < 2 parts-per-million. The second laser system aligns the 2.5m diameter secondary and the receiver optics with respect to the primary. In order to limit the contribution of the secondary misalignments to the pointing error budget, the secondary must be laterally positioned to $\pm 17 \mu m$ and the tilt of the secondary restricted to ± 1.7 arcsec. The third system is an optical and near-infrared guide telescope for use at night and possibly during the day on the brightest stars. The fourth system is a laser system to relate the primary orientation with respect to the ground and would be used when the guide telescope is not usable.

Atmospheric effects such turbulence and temperature gradients will limit the effectiveness of these laser metrology systems. Measurements of these atmospheric effects and an analysis of their influence on the overall pointing error budget, as well as preliminary evaluations of the guide telescope concept will be presented.

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Date received: 23 May 95
Formatted: October 1, 1998
Form version: 1.0