

LARGE MILLIMETER TELESCOPE *ALFONSO SERRANO*

#1 Current Status & Operations Overview (30th Sept. 2020)

#2 U.S. Community Access to the LMT (16th Oct. 2020)

- Introduction to US LMT open access program
- Development history & summary of LMT infrastructure
- LMT user support

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David Hughes LMT Director - INAOE, Mexico
Pete Schloerb

#3 Call for Open-Time Observing Proposals & Instrumentation (30th Oct. 2020)

#4 Future Development: optimization of telescope performance, operational efficiency & scientific productivity (13th Nov. 2020)

Volcan Sierra Negra
altitude 4600 m



US Community Access to the Large Millimeter Telescope

*Opportunity funded by
US National Science
Foundation under MSIP*

- 15% of LMT Science Observation Time to be granted to astronomers at institutions in the United States of America.
 - Time allocation based on competitive review of proposals by the LMT TAC.
 - No requirements for collaboration with LMT astronomers and staff to get observing time.
- Observations in Queue-scheduled, Service Observing mode by LMT staff.
- Science ready data products produced by LMT staff and provided to LMT users
- An archive of all LMT data products will be produced for preservation of data and archival science projects.

Development history LMT & instrumentation Call for Proposals

David Hughes

LMT Director - INAOE, Mexico



LMT history milestones

1994

Binational agreement

CONACYT, INAOE, UMASS

1997

Site selection

Volcán Sierra Negra, Puebla, Mexico

1998

Construction begins

2006

LMT inauguration

Telescope structure
+ primary reflector segments 32-m

M2/hexapod, M3/mount
M1 actuators + alignment

2011

First light LMT 32-m

RSR + AzTEC

LMT *Alfonso Serrano*
M1 performance upgrade

2014

Shared-risk Early Science

LMT 32-m

RSR + AzTEC

2018

LMT 50-m

LMT 32m - 50m
upgraded M2 + hexapod

2017 - 2018 *EHT VLBI*

2018-S1 Open time
Mexico 70%, UMASS 30%
Security issues, COVID-19

SEQUOIA, B4R, VLBI+

2020

Call for Proposals

2021-S1

2021-S1 Open-time
Mexico 65%, Spain 5%, U.S. 15%, UMASS 15%

ToI/TEC

2021

2023

LMT Observatory

Large Millimeter Telescope (LMT)

- active 50-m diameter primary reflector
 - 688 actuators maintain **segment alignment & correct deformations (gravity & thermal) to enable night & daytime operations**
- operational wavelengths: 1.1 - 4 mm
- beam resolution (FWHM): 5 - 18 arcsecs
- field of view (ϕ): 4 arcmins
- offset pointing accuracy – approx 1 arcsec
- surface accuracy (**goal: 75 μm r.m.s.**)
 - LMT 32-m **85 μm r.m.s.**
 - LMT 50-m currently **98 μm r.m.s**
60% of opt. efficiency goal at 1.1mm
- large (100 m²) receiver (Rx) room
 - accommodate full suite of scientific instrumentation
- altitude 4600m (15000ft), latitude + 19 N



CURRENT STATUS

- Security issues

Increased security concerns since mid-April 2018 in local area close to LMT, led to reduced operational efficiency in 2019.

- requires development of new safety protocols, operational strategies & infrastructure to minimize risk to LMT staff and visiting researchers and return to full operational efficiency

- remote operation & observing support (TO/SS at INAOE/UMASS)
- oxygenated working & sleeping areas within LMT (reduce effective altitude to 2500 – 3000 m)

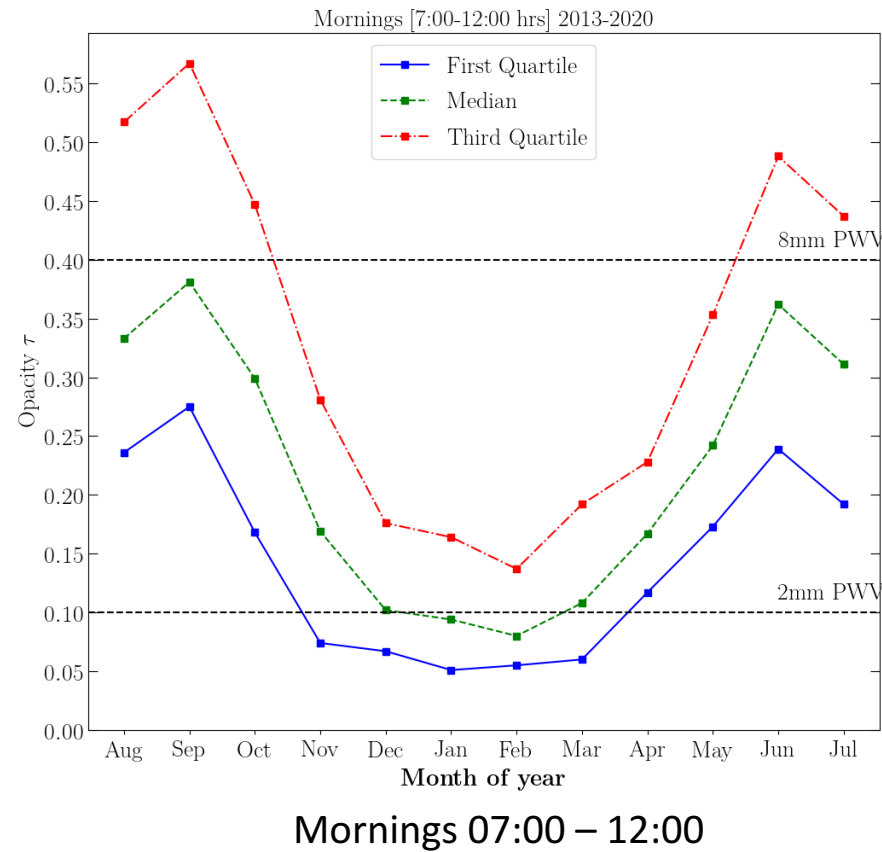
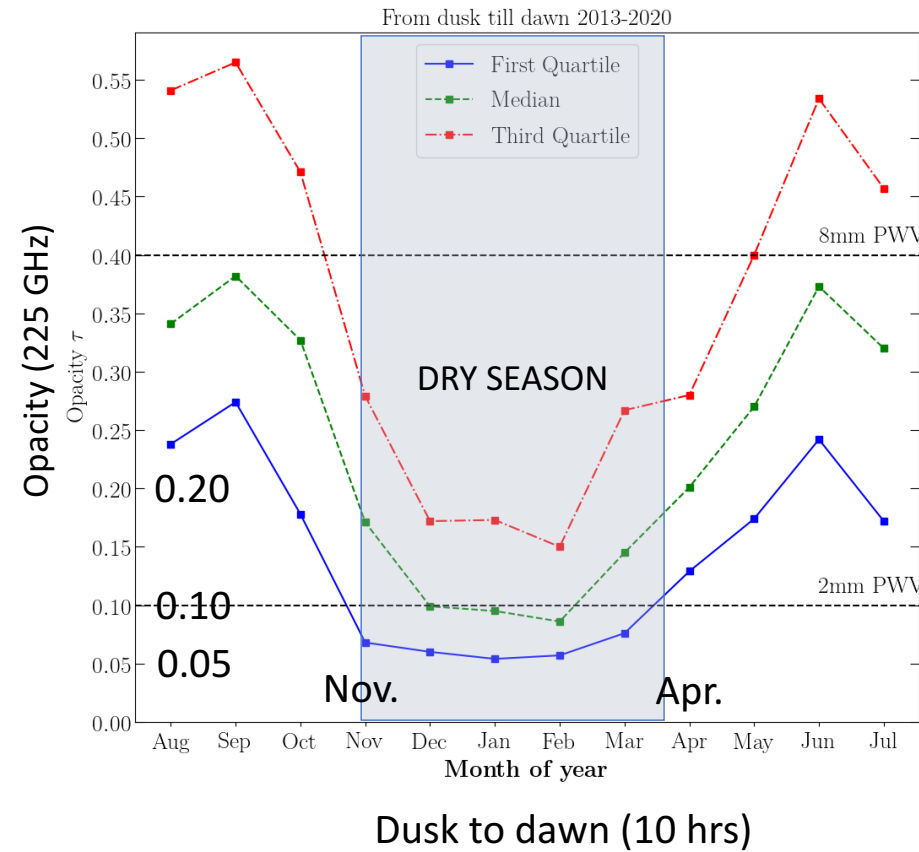
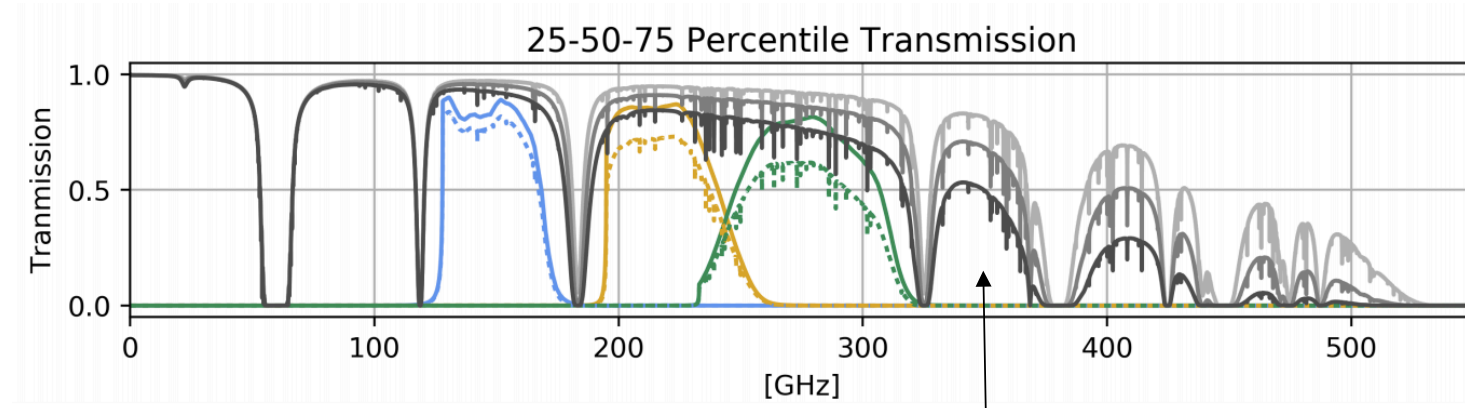
- COVID-19

LMT closed since late March 2020. Hope to reopen by end 2020.

- maintenance & recommission telescope infrastructure & instruments
- optimize surface alignment (photogrammetry)
- install & commission next-generation instruments (ToI TEC, MUSCAT)

Sierra Negra 225 GHz atmospheric opacity

- opportunities for extended day-time observations
- submm-conditions in winter months



LMT instrumentation

Instrument	Description	Frequency	Status
<i>Continuum</i>			
TolTEC	7000 pixel imaging polarimeter, 3-band simultaneous imaging	275 GHz 215 GHz 145 GHz	Expected 2021
<i>Ultra-wideband Spectroscopy ($\Delta v = 100$ km/s)</i>			
Redshift Search Receiver (RSR)	Dual-beam, dual polarization – instantaneous coverage over full band (30 MHz resolution)	74 – 111 GHz	Active
<i>Spectroscopy ($\Delta v = 0.03$ km/s – 1.4 km/s)</i>			
SEQUOIA ^[1]	16-element array (MMIC)	85 – 115 GHz	Active
B4R ^[2]	1 pixel dual-polarization SIS	125 – 163 GHz	Active
1mm Receiver ^[1]	1 pixel dual-polarization SIS	210 – 280 GHz	Active
OMAYA ^[1]	16-element SIS array	210 – 280 GHz	Expected 2021

[1] – spectrometer has 3 modes: 800 MHz BW 2048 channels; 400 MHz BW 4096; 200 MHz BW 8192.

[2] – B4R is not fully supported by LMT and requires collaboration with instrument team

LMT Call for Proposals

Mexico (65%), UMASS (15%), U.S. Community (15%), Spain (5%)

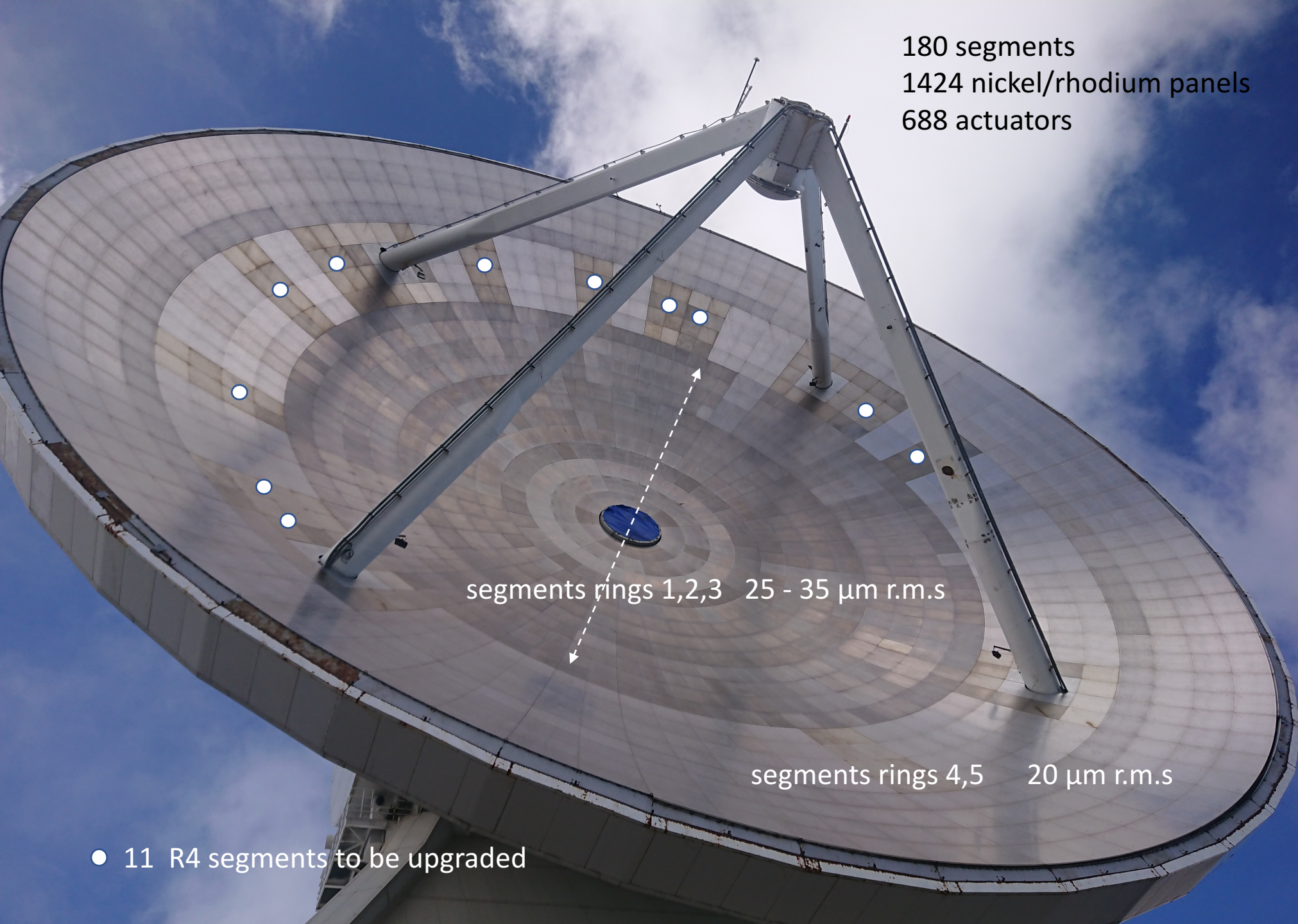
Schedule	2021 – S1 (6 months)	2021 – S2 (12 months)
Observing season	March 15 th 2021 - September 14 th 2021	September 15 th 2021 – September 14 th 2022
Open call	November 2 nd 2020	April 15 th 2021
Close call	December 15 th 2020	May 31 st 2021
Conclude review & announcement of results	March 1 st 2021	August 15 th 2021
Instruments	SEQUOIA, RSR, B4R, 1mm SIS	SEQUOIA, RSR, B4R, 1mm SIS, TolTEC

Shared-risk: dates subject to change



Future LMT User Community Webinars

- #3 Call for Open-Time Observing Proposals & Instrumentation
30th Oct. 2020
- #4 Future Development: optimization of telescope performance,
operational efficiency & scientific productivity
13th Nov. 2020



180 segments
1424 nickel/rhodium panels
688 actuators

segments rings 1,2,3 25 - 35 μm r.m.s

segments rings 4,5 20 μm r.m.s

- 11 R4 segments to be upgraded

