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 The Next Steps (A4)  
 SETI 1: SETI Science and Technology (1)

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ASTROBIOLOGY WITH THE LARGE MILLIMETER TELESCOPE

**Abstract**

The Large Millimeter Telescope (LMT) is a bi-national collaboration between Mexico and the USA, led by the Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE) and the University of Massachusetts at Amherst, to construct, commission and operate the largest millimeter-wave radio telescope, a 50m-diameter dish located on the summit (4600m) of Volcan Sierra Negra, an extinct volcano in the Mexican state of Puebla. The LMT has been successfully operating since 2013 with its inner 32m. Scientific results so far have shown that the telescope and its initial suite of instrumentation already conform a very competitive infrastructure for studying the formation of structures across the Universe and for testing the most fundamental laws in physics. In this talk we will provide a summary of the LMT status and the near-term plans for the telescope completion. We will elaborate more on the expected capabilities of the LMT to contribute to the field of astrobiology by searching the traces of organic molecules in our Solar system, in nearby exo-planetary systems, in the interstellar medium of the Milky Way and in other galaxies. This superb ground-based facility will complement the discoveries of (mainly) space based missions such as KEPLER, in finding other worlds similar to ours.

The millimeter wavelength region is particularly rich in spectral lines of molecules that are part of the chemical networks leading to more complex molecules, but also contains transitions from complex organic molecules per se. The LMT-50m, equipped with wideband, high spectral resolution, receivers will be able to provide a census of the chemical composition in a variety of objects within our Galaxy and with that, information on the precursors and conditions that allows for life to emerge in planetary systems. In addition to astrochemistry, the millimeter region is also promising for the detection of signals from extraterrestrial civilizations. Benefits from this range for the directed transmission in the mid-section of the cosmic microwave background have been proposed, and observations of some markers at short millimeter wavelengths have been attempted in other large single-dish millimeter telescopes on the ground, but also proposed for space telescope missions. A combination of astrochemistry and SETI projects, both

requiring sensitive high spectral resolution receivers, can benefit from the collective area of the largest single-dish millimeter telescope, with the corresponding impact in the astrobiology community. All these millimeter science and technology topics will be discussed in our contribution.