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The Large Submillimeter Telescope: Overview and revised requirements for science cases

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The Large Submillimeter Telescope (LST) [1] is expected to open discovery space in millimeter to submillimeter-wave astrophysics. LST will have unprecedentedly high survey capabilities in space and frequency domains, which are implemented by the proposed large aperture of the telescope (50-m), a wide field-of-view (FoV >0.5-degree diameter). Next-generation focal plane instruments that fill the wide FoV and/or cover a large instantaneous bandwidth (>100 GHz) will also be crucial to realizing such superb survey capabilities. LST will have strong synergies with ALMA by providing new targets for ALMA and by being combined within ALMA as an element of the array, which results in an increase in observing efficiency for point sources. A concept of a wavefront sensor that allows real-time sensing of the primary reflector surface, i.e., the millimeter adaptive optics (MAO), has been proposed [2]. A prototype wavefront sensor for MAO was installed on the Nobeyama 45-m telescope to demonstrate the performance of the system, and the measured accuracy of the radio path length reached 8 μm r.m.s., which is already promising for the application to LST. To implement its wide FoV, the sub-reflector size must become large, which causes difficulty in implementing a chopping secondary. A novel idea to conduct spectroscopy observations without such off-position measurements has been proposed and demonstrated [3]. Another challenge is how to detect astronomical signals efficiently from the huge amount of acquired noisy data that will be produced by the combination of LST and next-generation large-format detectors and receivers. The data rate of the proposed imaging spectrograph KATANA, which exploits the integrated superconductor spectrometer (ISS) technology, may reach ~Peta Byte per year. Data-scientific approaches to automated signal-and-noise separation will be crucial for such next-generation data analysis [4]. Currently, more than 90 researchers in the community are working to develop science cases for LST. We plan to publish the LST science white paper, which summarizes the science requirements for LST based on scientific demands. The revised requirements for the LST from the elaborated science cases will be discussed. To fulfill a broad range of scientific demands and overcome technical challenges, discussions are now underway to join The Atacama Large Aperture Submillimeter Telescope (AtLAST)[5] and LST. A plan to collaborate with the community in Taiwan (ASIAA) is also discussed.

References

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