

# Towards an Atacama Large Aperture Submillimeter Array (AtLAST)

*Tuesday 1 December 2020 21:00 (25 minutes)*

Astrophysical observations at (sub-)mm wavelengths ( $\lambda$  from  $\sim 300\ \mu\text{m}$  to  $\sim 3\text{mm}$ ) allow us to study the cold and dense material in the Universe, hence probing the formation of stars and planets, and the interstellar and circumgalactic medium of galaxies across all cosmic times. The current generation of 10-meter-class single dish telescopes has delivered some of the first surveys at (sub-)mm wavelengths, allowing us to go far beyond the previously optical-biased view of the Universe. Follow-up observations with interferometers then revealed in exquisite detail the morphology and kinematics of such (sub-)mm sources, enabling tests and revisions of theoretical models for the formation and evolution of planets, stars, and galaxies. However, it is now clear that without a transformative change in the capabilities of single-dish facilities in the 2030s, interferometers (like the ALMA observatory) will soon become source-starved. The current generation of 10-m class single dish telescopes, with their limited fields of view, spatial resolution, and sensitivity, can only reveal the ‘tip of the iceberg’ of the (sub-)mm source population, both for Galactic and extragalactic studies. These limitations cannot be compensated for by interferometers, which are all intrinsically affected by a low mapping speed and by the loss of diffuse extended signals.

The Atacama Large Aperture Submillimeter telescope (AtLAST) project is a concept for a 50 meter diameter single dish observatory to be built near the ALMA site. With its extremely large field of view (the goal is  $\sim 2$  degrees), spatial resolution (up to  $\sim 1.5''$  at  $350\ \mu\text{m}$ ), and sensitivity to both point sources and large-scale structures, AtLAST will be transformational for all fields of Astronomy in the 2030s. Here we will describe the recently approved EU Horizon2020 project to deliver a comprehensive design study for such a next-generation single-dish facility. Beyond the EU, AtLAST would welcome an international consortium, and is beginning to garner broad support, with support from the Japanese 50-meter Large Submm Telescope community as well as many US Astro2020 decadal and Canadian Long Range Plan 2020 science case submissions.

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**Session Classification:** 6. methods: instrumentation 2