HORIZON 2020

Towards an Atacama Large Aperture Submillimeter Telescope

Results in Brief

Scanning the universe with submillimetre astronomy

The design of a state-of-the-art telescope will help astronomers answer some key questions about the universe – while addressing energy demand and local community needs.

SPACE

© Diogo José/stock.adobe.com

The submillimetre wavelength range (sub-mm) enables astronomers to probe objects and matter that are invisible at other wavelengths. This includes cold and dense molecular gas – the material that stars are made from – as well as dust at different scales that absorb optical and ultraviolet light.

“Sub-mm observations allow us to study regions in the universe from where new stars will emerge,” explains AtLAST project coordinator Claudia Cicone from the University of Oslo in Norway. “They also enable us to precisely measure the position of very distant galaxies and determine their physical characteristics.”

Next-generation astronomical observatory

The AtLAST project was launched to advance sub-mm astronomy, through the design of a next-generation 50-metre single-dish astronomical facility with a wide field of view of 2 degrees. Powered largely by renewable energy, this will be built on the Chajnantor Plateau in northern Chile.

“One issue was finding a way of reliably supplying renewable energy to this infrastructure, located at 5 000 m altitude in a remote desert location,” says Cicone. “This involved understanding the specific power needs, the harsh conditions of the site, power storage, resource usage, and the need to engage with the local community of San Pedro de Atacama.”

Dialogue with local communities formed a central element of the project. “We collaborated with the EU-funded project RENAISSANCE to investigate the possibility of sharing AtLAST’s energy system infrastructure and know-how with San Pedro de Atacama, and with other observatories on the Chajnantor Plateau,” adds Cicone.

Energy efficiency, resource dependency and water use

The project successfully delivered an innovative and ambitious optical and mechanical design for the AtLAST observatory. Once built, the new facility will provide astronomers with a pioneer instrument to help answer some of the most pressing questions regarding the universe.

“We also identified two potential sites on the Chajnantor Plateau,” says Cicone. “On both sites, we installed 24-metre-high weather towers to simultaneously measure the wind speed and wind gusts, which can have an impact on telescope structure. The preferred site is located inside the Atacama Astronomical Park.”

Other results include the production of an operations plan. This built on the lessons and experiences of similar infrastructures such as the Atacama Large Millimeter/submillimeter Array, currently the largest sub-mm telescope in the world.

In terms of energy, it was found that using primarily solar power would enable cost savings of up to 40 %, compared to using only diesel generators. However, including a small amount of diesel generation would help to reduce mineral resource depletion and water use by around a quarter.

Transformational science and sustainability

This work is being continued through a new EU-funded project, AtLAST2. “This project will be carried out by a significantly expanded consortium, involving key new partners from Europe, Japan and Africa,” notes Cicone.

The aim is to improve the technical readiness of several components of the AtLAST telescope design and its energy system, and to expand the user base of the AtLAST facility. A full life-cycle assessment of the infrastructure will be carried out to reduce

its environmental impact.

“The AtLAST project has shown that pursuing transformational science can go hand in hand with a more sustainable approach,” adds Cicone. “Sustainability also means engaging local communities in the decision-making process, to understand what their needs and priorities are.”

Keywords

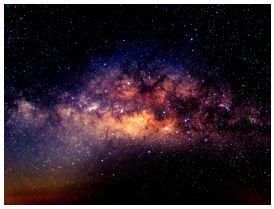
AtLAST, universe, astronomy, telescope, Chile, Atacama

Discover other articles in the same domain of application

Two more EU-funded researchers honoured for outstanding achievements in astrophysics

Discovering the black hole needle in the galactic haystack

Rewriting the book on gamma-ray bursts



Dust clouds shed light on the Milky Way's evolution

Project Information

AtLAST

Grant agreement ID: 951815

Project website

DOI
10.3030/951815

Project closed

EC signature date
3 July 2020

Start date
1 March 2021

End date
31 August 2024

Funded under
EXCELLENT SCIENCE - Research Infrastructures

Total cost
€ 3 519 461,25

EU contribution
€ 3 519 461,25

Coordinated by
UNIVERSITETET I OSLO
Norway

Last update: 3 January 2025

Permalink: https://cordis.europa.eu/article/id/455711-scanning-the-universe-with-submillimetre-astronomy

European Union, 2025