

The First Telescope on a Cherenkov Telescope Array Site Makes its Debut

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Completed LST-1

La Palma, Canary Islands, Spain – On Wednesday, 10 October 2018, more than 200 guests from around the world gathered on the northern array site of the Cherenkov Telescope Array (CTA) to celebrate the inauguration of the first prototype Large-Sized Telescope (LST). The telescope, named LST-1, is intended to become the first of four LSTs on the north site of the CTA Observatory, which is located on the existing site of the Instituto de Astrofísica de Canarias' (IAC's) Observatorio del Roque de los Muchachos located in the municipality of Villa de Garafía on the island of La Palma. The plan for the site also includes 15 Medium-Sized Telescopes (MSTs).

It was on 9 October 2015 that the first stone-laying ceremony took place for the LST-1. After the telescope foundation was completed in January 2017, the team moved swiftly and steadily toward its next major milestones: installation of the center pin and rails (September 2017), mounting of the dish (December 2017). In 2018, the LST-1 structure was completed in February and the camera support structure was installed in June. The final step, the camera installation, was completed on 25 September 2018.

The LST team consists of more than 200 scientists from ten countries: Brazil, Croatia, France, Germany, India, Italy, Japan, Poland, Spain and Sweden. In this truly international effort, the design and management leadership was shared among LAPP, Annecy, France; Max Planck Institute for Physics, Munich, Germany; INFN, Italy; ICRR, University of Tokyo, Japan; and IFAE, Barcelona and CIEMAT, Madrid, Spain.

In addition to the LST, two other classes of telescope are required to cover CTA's full energy range from 20 gigaelectronvolt (GeV) to 300 teraelectronvolt (TeV): Medium-Sized Telescopes and Small-Sized Telescopes. Because gamma rays with low energies produce a small amount of Cherenkov light, telescopes with large mirrors are required to capture the images. Four LSTs will be arranged at the centre of both the northern and the southern hemisphere arrays of the Observatory to cover the low-energy sensitivity of CTA between 20 and 150 GeV.

The LST has a 23-metre diameter parabolic reflective surface, which is supported by a tubular structure made of reinforced carbon fibre and steel tubes. A reflective surface of 400 m² collects and focuses the Cherenkov light into the camera, where photomultiplier tubes convert the light in electrical signals that can be processed by dedicated electronics. Although the LST-1 stands 45 metres tall and weighs around 100 tonnes, it is extremely nimble, with the ability to re-position within 20 seconds to capture brief, low-energy gamma-ray signals.

The LSTs will expand the science reach to cosmological distances and fainter sources with soft energy spectra.

Both the re-positioning speed and the low energy threshold provided by the LSTs are critical for CTA studies of transient gamma-ray sources in our own Galaxy and for the study of active galactic nuclei and gamma-ray bursts at high redshift.

The prototype is foreseen to become the first LST telescope of CTA, and, in fact, the first telescope on a CTA site, to be operated by the CTA Observatory (CTAO). As any other technical delivery in the large, multinational CTA project, the LST-1 will need to undergo a critical design review to verify that the design complies with CTA science goals, operational needs, safety standards, etc. before it is formally accepted by CTAO.