

Research Report

ICRR Inter-University Research Program 2021

Research Subject: Engineering runs of the first Large Size Telescope of CTA and construction of LST2-4 in La Palma Canary Islands, Spain

Principal Investigator: MAZIN, DANIEL

Participating Researchers:

Daniel Mazin, Masahiro Teshima, Daniela Hadasch, Koji Noda, Juan Cortina, Carlos Diaz, Thomas Schweizer, Holger Wetteskind, Carlos Delgado, Riccardo Rando, Takayuki Saito, Armand Fiasson

Summary of Research Result :



Figure 1: Completed LST1 in La Palma in October 2018.

The purpose of the project is to commission the first Large Size Telescope (LST, see Figure 1) of the CTA project in La Palma, Canary Islands, Spain. In FY2021 the goal was to improve the sensitivity of the instrument and to increase the availability of the telescope to the one required by CTA to be above 95% over a longer period of time.

Status of the commissioning: Several commissioning goals have been achieved in FY2021. In particular, **automatic follow up of Gamma Ray Bursts** has been introduced and successfully tested. Moreover an

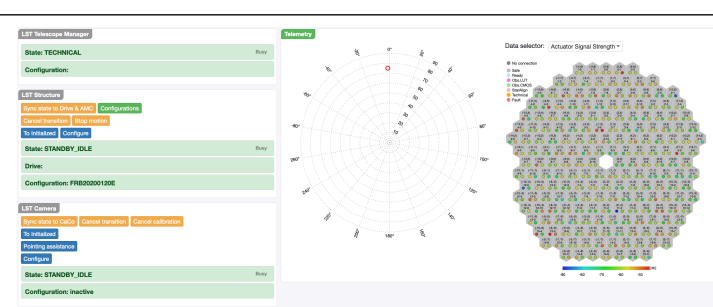


Figure 2: GUI of the Central Control software of LST1

automatic follow up of MAGIC telescopes has been prepared to be implemented in FY2022. LST1 is operated from remote and locally onsite thanks to the IT and security upgrades

performed in FY2021. The status of the central control software, dubbed Telescope Control Unit (TCU, see Figure 2), progressed very well and it is now exclusively used to operate the telescope. This replaces the need to operate the telescope through

individual engineering semi-expert interfaces.

Eruption of a volcano in La Palma. A volcano erupted in La Palma, about 20km from

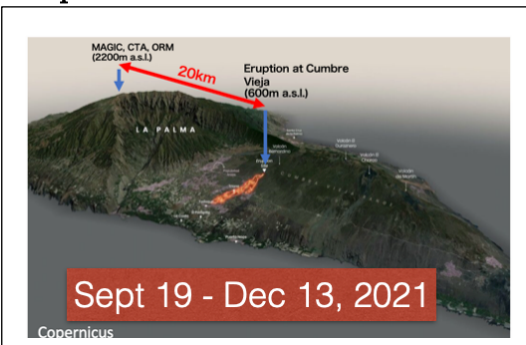


Figure 3: Volcano eruption in FY2021

the observatory on 19 September 2021 (see Fig. 3). The eruption continued until 13 December 2021 and was the longest known eruption in La Palma. The volcano destroyed more than 3000 buildings and forced more than 10% of the island population to be evacuated from the affected zone. LST1 operation has been

stopped during the volcano eruption, sensible parts have been packed in plastic and a regular ash cleaning has been organized. After the eruption stopped, a thorough check of all systems was done revealing no damage. LST1 operation has been restarted in Feb.

Results from technical runs Scientific results obtained with LST1 in FY2021 look very promising. LST1 detected a new TeV γ -ray source, nova RS Ophiuchi, see Fig.4. Another highlight was a detection of a large TeV flare from a known TeV gamma ray source the blazar BL Lac ($z \sim 0.5$) down to 20 GeV, see Fig. 5.

The LST1 collaboration is now working on publication of several physics results, with a targeted submission to a refereed journal in FY2022. LST1 is taking regular data together with the two MAGIC telescopes and stereoscopic analysis, which is led by ICRR, has been developed and first stereoscopic detection of a gamma-ray source using a CTA telescope has been achieved.

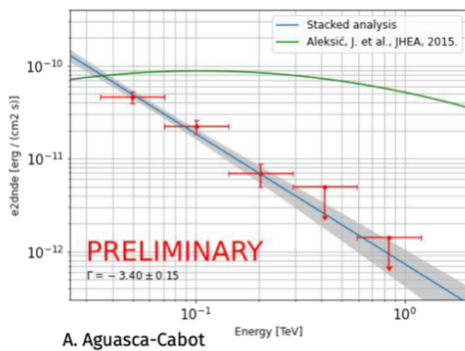


Figure 4: Spectral Energy distribution of Nova RS Ophiuchi as measured with LST1 (preliminary).

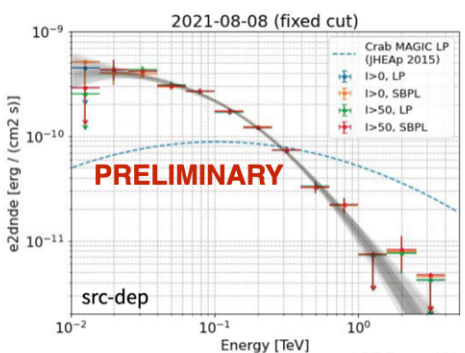


Figure 5: Spectral energy distribution of Bl Lac in August 2021 as measured with LST1 (preliminary).