# Research Report
# ICRR Inter-University Research Program 2021

Research Subject: Set-up and Commissioning of the onsite data center for CTA North in La Palma, Spain

Principal Investigator: HADASCH, Daniela

Participating Researchers: SAITO, Takayuki; MAZIN, Daniel; TESHIMA, Masahiro; NODA, Koji

Summary of Research Result：

The next generation observatory for the very high energy gamma-rays will be the Cherenkov Telescope Array (CTA) covering energies from 20 GeV to 300 TeV with unprecedented sensitivity. It will be built on two sites: one in the Northern hemisphere (La Palma, Canary Islands, Spain), the other one in the Southern hemisphere (Paranal, Chile). Four Large Size Telescopes (LSTs) of 23 m diameter and 28 m focal length will be arranged at the center of both arrays to lower the energy threshold and to improve the sensitivity of CTA below 200 GeV. The first LST was inaugurated in Autumn 2018 and is now in the commissioning phase.

The CTA onsite data center in La Palma (procured by the University of Tokyo) is the central analysis facility for the data and Monte Carlo studies. The system consists of 2000 cores and 3PB disk space. This cutting edge technology allows us to process data directly onsite in a very short time. Starting from April 2018 the onsite data center is operated by the ICRR. I am responsible for this data center, i.e. the correct set-up, the coordination and management of the users and the commissioning of the IT center. During the last year we set up the IT center successfully. In particular the following points were achieved:

- Installation of additional disk space: We purchased and installed additional disk space in collaboration with Fujitsu. The file system FEFS capacity is now 4.3PB (expanded from 3.4PB).
- Installation of 4 additional servers: Inside the so-called Drive container we installed new 4 servers (lst101-104) to allow operation in “local mode” (see Fig. 1). That means if we loose the connection to the IT cluster, we can still steer and monitor the telescope directly without passing through the IT.

- Fine-tuning of the SLURM job submission system: Since the number of users of the IT center is growing, more batch jobs are submitted. In order to avoid disruption of the data processing, which has highest priority, we improved the settings of the job submission system SLURM. After a trial period we can conclude that all users can make the best usage of the system without problems now.
- Installation of a 10G Lambda connection: The connection and configuration of the 10G Lambda connection from the IT center in La Palma to the data center (PIC) in Barcelona, Spain, finished successfully. This connection should be used exclusively for fast data transfer to PIC.
- LST guidelines for developers: We created a document for a more centralized organization:"LST telescope control software deployment and execution guidelines". The guidelines cover the user policy, structure of software installation, software repositories, back up procedures. The sub-systems needed to steer and monitor the telescope are distributed over 7 machines at the moment. The implementation to unify them on one single machine (lst101) is ongoing. The new server is installed and prepared. The sub-systems are now migrated successively.

| No. | E05 |
|---|---|

Figure 1: