平成 28 年度共同利用研究・研究成果報告書

研究課題名　和文：CTA 大口径望遠鏡一号機スローコントロール統合運用

英文：Integration and Commissioning of the Slow Control Program for Camera of the first Large Size Telescope of CTA in La Palma, Spain

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研究成果概要

The next generation observatory for very high energy γ rays will be the Cherenkov Telescope Array covering energies from 20 GeV to 300 TeV with unprecedented flux sensitivity. Four Large Size Telescopes (LSTs) of 23 m diameter will be arranged at the center of the array. The first LST will be a fully functional prototype that is installed directly in La Palma, Spain. The telescope will

Figure 1 : Scheme of sub-systems

become fully operational at the end of FY2017. The purpose of my project is the development of a program CLUSCO to control and monitor the photomultiplier tube (PMT) modules within **the camera control program** for the LST, which is the essential part of the telescope control.　My project consists of 5 steps:

1.) Development of multi thread program for the PMT Cluster Control (ClusCo) written in C language at ICRR in Japan.

2.)　Testing of complete program on a small-scaled camera in the laboratory at ICRR.

3.) Integrate ClusCo into the Camera Control (CaCo) at the construction site on La Palma, Spain.

4.) Commissioning of CaCo and the whole data taking system under real conditions on La Palma, Spain.
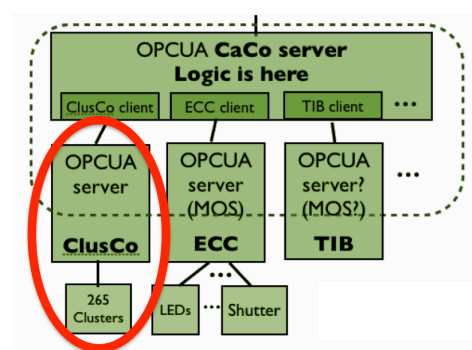
5.) First scientific data taking with the first LST.

I made good progress that is summarized in the following:

1.) The structure of the ClusCo software is developed, the interfaces and the implementation of the different sub-systems of the modules is finished. On larger scale, I developed together with IFAE (Spain) the structure of CaCo, where ClusCo has to be integrated to. The scheme is presented in Figure 1. The red circle represents the part I am particular responsible for.

2.) We designed a small-scaled version of the LST camera at ICRR. With this so-called mini-camera consisting of 19 modules we performed several tests on software as well as on hardware. The tests were successful and ClusCo is ready to be integrated into CaCo. A photo of the mini-camera is shown in Figure 2. ClusCo is furthermore already in use by several teams within the CTA LST collaboration to steer their test modules.

3.) The integration of ClusCo into CaCo is ongoing. Before going to the real construction site as much integration as possible will be done in the lab. Certain methods and algorithms using ClusCo can be launched through CaCo already and calibration routines are being currently developed.

4.) Stress tests of the software and hardware are being performed in the laboratory:

- Tests in Madrid with a camera of 35 modules → DONE!

- Quality control of all modules to be used in the final LST camera → Undergoing on the Canary Islands and will be finished by end of June 2017.

- Final integration and tests with the whole camera in Barcelona. Afterwards the camera will be shipped to La Palma → Mid of FY2017.

- Commissioning of the whole telescope on La Palma → End of FY2017.

My project is within the schedule and makes good progress. The software is successfully running and used for the Quality Control tests we are performing at the moment on the Canary Islands.

Figure 2: Mini Camera at ICRR

整理番号　E 07