平成 29 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 the 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.

Figure 1：Scheme of sub-systems

The telescope will 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.
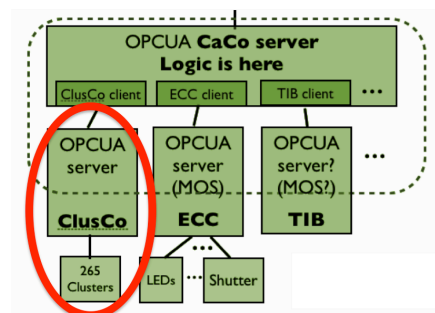
5.) First scientific data taking with the first LST.

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.) The tests with a small-scaled version of the LST camera consisting of 19 modules at ICRR were successful. Afterwards, ClusCo was ready to be integrated into CaCo.

3.) The integration of ClusCo into CaCo is done. Methods and algorithms using ClusCo can be launched through CaCo and calibration routines are being currently tested and debugged.

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 → Were done on the Canary Islands and finished as planed by end of June 2017. DONE!

- Final integration and tests with the whole camera in Barcelona. Afterwards the camera will be shipped to La Palma → The whole camera arrived at IFAE, Barcelona. Modules are installed now (Beginning of FY2018). In Figure 2 a picture of the camera with some modules already installed is shown.

- Commissioning of the whole telescope on La Palma → Mid of FY2018.

My project is within the schedule and makes good progress. The software is successfully running and was used for the Quality Control tests on the Canary Islands. Now it will be applied to the whole camera at IFAE where the final tests will be done.

Figure 2: Camera at IFAE, Spain