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Investigating electronic pedestals of the analogue front-end boards of the upgraded High-Energy Stereoscopic System (H.E.S.S.-I) cameras

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The High-Energy Stereoscopic System (H.E.S.S.) is an array of five imaging atmospheric Cherenkov telescopes located in the Khomas Highland in Namibia, dedicated to very-high-energy (VHE, 100 GeV - 100 TeV) gamma-ray astronomy. It consists of four identical 12 m diameter telescopes (H.E.S.S.-I) which started operating in 2003 and a large 28 m diameter telescope (H.E.S.S.-II) which was brought online in 2012.

The H.E.S.S.-I camera upgrade project was aimed to increase the stability and performances of the camera operation by replacing the 13 years old camera electronics with modern-day technologies. The most delicate parts of the upgraded electronics are the readout boards of the drawers, which have been upgraded with a new analog memory. A significant level of cross-talk has been observed in the analog front-end boards of the H.E.S.S.-I camera upgrade. The observation of such level of cross-talk motivated a deeper study of the electronic pedestals of the upgraded H.E.S.S.-I cameras, as pedestal studies could help to understand the origin of such a cross-talk. The cameras require a low level of noise in their electronics in order to capture the faint light and individual Cherenkov photons. Also, a low level of noise in the camera electronics improves the accuracy in the interpretation of the data which in turn leads to better results from the data taken with these cameras.

A C++ code written in ROOT modular scientific software framework has been developed for the analysis of the data taken with a drawer on the Test bench at DESY in Zeuthen, Germany. So far, from the computation of the auto-correlation function and Fourier transform of the electronic pedestals, no characteristic patterns have been found to explain the level of cross-talk observed. The investigations of the noise level of the rear part of the electronic boards will be continued.

Summary

The abstract discusses the front-end electronics of the cameras of the H.E.S.S.-I Cherenkov telescopes after the upgrade. The work investigates the possible reasons for cross-talk between several detector channels, mainly through a time and periodicity analysis. No systematic repetition or periodicity of the studied electronic pedestals nor any reason for the cross-talk has been found.

Apply to be considered for a student award (Yes / No)?

Yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

Main supervisor (name and email) and his / her institution

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**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

Yes

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