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Characterization and commissioning of the SST-1M camera for the Cherenkov Telescope Array

The Cherenkov Telescope Array (CTA), the next generation very high energy gamma rays observatory, will consist of three types of telescopes: large (LST), medium (MST) and small (SST) size telescopes. The SSTs are dedicated to the observation of gamma-rays with energy between a few TeV and few hundreds of TeV.
The SST array is foreseen to have 70 telescopes of different designs.
The single-mirror small size telescope (SST-1M) is one of the proposed telescope designs under consideration for the SST array It will be equipped with a 4 m diameter segmented mirror dish and with an innovative camera based on silicon photomultipliers (SiPM).
The challenge is not only to build a telescope with exceptional performance but to do it foreseeing its mass production. To address both these challenges, the camera adopts innovative solutions both for the optical system and the readout parts.

The photodetector plane (PDP) of the camera is composed by 1296 pixels, each made of a new hollow, hexagonal light guide coupled to a hexagonal SiPM designed by the University of Geneva and Hamamatsu. The SiPM area is 94 mm^2 read with 4 summed channels with total capacitance of 3.4 nF.
As no commercial ASIC would satisfy the CTA requirements when coupled to such a large sensor,dedicated per- amplifier electronics have been designed and their performance will be presented.

The readout electronics also uses an innovative approach in gamma ray astronomy by going fully digital.
All signals coming from the PDP are digitized in a 250 MHz Fast ADC and stored in ring buffers waiting for a trigger decision to send them to the pre-processing server where calibration and higher level triggers will decide for their storage.
The latest generation of FPGAs are used to achieve high data rates and also to exploit all the flexibility of the system as for instance each event can be flagged according to its trigger pattern.
All these features have been demonstrated in laboratory measurements on realistic elements and the results of these measuremenets will be presented in this contribution.

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