Contribution ID: **1305** Type: **Talk**

Effect of SiPM correlated noise and Photon Detection Efficiency into Imaging Atmospheric Cherenkov Telescopes

Friday 16 July 2021 19:18 (12 minutes)

Silicon Photomultiplier SiPM detectors have become the preferred photosensors for many applications in high-energy particle and astroparticle physics, LIDAR and medical imagining. Due to robustness, low working voltage, ability to work during moon light and high photon detection efficiency the SiPM devices are good choice for cameras of Imaging Atmospheric Cherenkov Telescopes (IACTs) as pioneering works of FACT and SST-1M demonstrated. However, the overvoltage (difference between applied and breakdown voltages) effects almost all device parameters like gain, PDE, uncorrelated and correlated noise. In particular, by increasing the overvoltage the high PDE of 60% can be reached. On the other had high overvoltage leads to higher correlated noise what affects image reconstruction.
In this work we study the effect of SiPM correlated noise and PDE into IACT in therm of charge resolution. With the goal to find the optimal overvoltage value which provides the best balance between PDE and correlated noise. The study was done with Monte Carlo simulation (i.e. sim_telarray –simulation of the imaging atmospheric Cherenkov technique) and validated with measurements at laboratory with calibrated light sources (one to mimic Cherenkov light and another for night sky background NSB). The studies were performed for SiPM devices produced by Hamamatsu: S13360-3050, S14520-3050 and FBK HD-NUV. The studies were performed at different NSB levels from 3MHz up to 1 GHz of photons per sensor at room temperature (T = 25 C).

Keywords

SiPM, Cherenkov Telescopes, Cross-talk, photon detection efficiency, night sky background

Collaboration

other Collaboration

Subcategory

Experimental Methods & Instrumentation

Primary authors: NAGAI, Andrii (University of Geneva, DPNC); Prof. MONTARULI, Teresa (University of Geneva); DELLA VOLPE, Domenico (Universite de Geneve); HELLER, Matthieu (University of Geneva); Dr DALCHENKO, Mykhailo (DPNC, University of Geneva); Mr MEDINA MIRANDA, David (DPNC - University of Geneva)

Presenter: NAGAI, Andrii (University of Geneva, DPNC)

Session Classification: Discussion

Track Classification: Scientific Field: GAI | Gamma Ray Indirect