

The front-end and DAQ system of the Terzina instrument onboard the NUSES space mission

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The Terzina instrument has the scientific goal of detecting Ultra High Energy Cosmic Rays (UHECRs) surpassing 100 PeV and producing atmospheric showers (EAS). For that purpose, the instrument will be installed onboard a LEO (Low Earth Orbit) sun-synchronous orbit satellite in a space mission called NUSES, developed by a collaboration between universities, research institutes and private companies. Another challenging goal of the instrument is the detection of Earth-skimming neutrinos with energies above ~10 PeV. In order to detect such rare events, the SiPM (Silicon Photomultiplier) sensor technology has been chosen to cover the foreseen dynamic range of the Cherenkov radiation (~320 to 550 nm). In this contribution we will focus on the innovative and custom front-end (FE) electronics and data acquisition (DAQ) system developed for the readout of the SiPM's output signals in Terzina. The FE electronics is based on a configurable 64-channel ASIC implemented in commercial 65 nm CMOS technology. The ASIC is able to sample and digitise pulses at 200 MHz rate by using Wilkinson-type ADCs (Analog-to-Digital Converters). A custom DAQ, entirely based on FPGAs, is used to control the ASIC configuration, process L1 trigger information and read the ASIC output data, that is, the SiPM events. A data concentrator was also designed, with a SoC FPGA, to perform, among other tasks: event building, event timestamp with accuracy in the order of a few nanoseconds, monitoring and SiPM HV compensation.

Collaboration

NUSES

Role of Submitter

I am the presenter

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