STAI

SEMINARS ON TECHNOLOGICAL ADVANCES AND INNOVATION

tifr
tata institute of fundamental research

DEVELOPMENT OF SiPM BASED CAMERA FOR A 4-M CLASS ATMOSPHERIC CHERENKOV TELESCOPE

Sandeep Duhan

tifr
tata institute of fundamental research

TATA INSTITUTE OF FUNDAMENTAL RESEARCH
MUMBAI

MAR | 21ST | 2024

TIFR H Auditorium 11:30 AM

Development of SiPM based camera for a 4-m class atmospheric Cherenkov telescope

SANDEEP DUHAN
TIFR MUMBAI

Imaging Atmospheric Cherenkov Technique (IACT) is the most widely used method for ground-based observations of very high-energy gamma rays from astronomical objects. The IACT based telescopes utilize Cherenkov light emission in extensive air showers produced by very high-energy gamma rays entering the Earth's atmosphere. Photomultiplier tubes (PMTs) have dominated the choices as photon sensors for cameras in IACT based telescopes. However, with technological advances in solid-state physics, Geiger mode Avalanche Photo Diodes (GAPDs), also known as Silicon Photomultipliers (SiPMs), have become a possible replacement candidate for PMTs in such cameras, as they offer many advantages over them.

Our group at TIFR Mumbai has developed a 256-pixel SiPM-based imaging camera for the 4m-class Cherenkov imaging telescope. It uses SiPM as a camera pixel photo sensor. A modular approach was chosen to design the camera data acquisition system, allowing for rapid development and easy maintenance. Front-end electronics preconditions the pixel signals and provide load and temperature compensated bias voltage to the camera pixels. The pre-amplified pixel signals are routed to back-end electronics for sampling, trigger generation, digitization, and data storage to event builder PC for offline analysis. The pulse digitization system uses the DRS4 analog sampler chip for ultra-fast sampling of pixel signals. The camera operation is handled by a set of firmware and software programs developed in-house. The talk will discuss the design of the camera data acquisition system, the software scheme, and some performance results.

MAR | 21 ST | 2024

TIFR H Auditorium 11:30 AM