

The SiPM-based Cherenkov cameras developed for the ASTRI-Horn and ASTRI Mini-Array gamma-ray projects

Monday, 27 May 2024 16:10 (20 minutes)

The interaction between gamma-ray photons and the Earth atmosphere generates air showers composed of very high-energy particles which, moving through the air, generate Cherenkov light flashes. These flashes can be detected to study astronomical sources emitting very high-energy gamma rays in the TeV energy range. Here, we present the camera design adopted for the nine innovative dual-mirror imaging atmospheric Cherenkov telescopes of the ASTRI Mini-Array. The Italian National Institute for Astrophysics (INAF) is leading the project. The telescopes are hosted at the Observatorio del Teide (Tenerife, Spain) to observe at high sensitivity and angular resolution the gamma-ray Universe in the 1 –200 TeV energy band. The cameras currently being implemented in the ASTRI Mini-Array are the result of the industrial evolution of the system that has been operational at the ASTRI-Horn telescope since 2016. This telescope is located at the INAF observing station “M.C. Fracastoro” on the Etna in Sicily, Italy. The ASTRI-Horn telescope has been developed as a pathfinder telescope and enabled us to gain valuable experience in performing gamma-ray observations using the air-Cherenkov technique with dual-mirror telescopes and cameras based on multipixel Silicon Photo Multiplier (SiPM) photodetectors. The new ASTRI cameras are also based on SiPM, making use of fast-acquisition electronics peak detectors, characterized by low power consumption. The thermal control and calibration subsystems of the focal plane, embedded into the envelope, make these cameras very effective, reliable, and easy to install during the observation session. These characteristics are fundamental to maintaining a fully operative array with many telescopes to be operated. In this contribution, we present the main features of the ASTRI Mini-Array cameras. Moreover, we will discuss the development phases and results of the first camera realized with the new layout, which is being installed on the first of the nine ASTRI telescopes.

Collaboration

Role of Submitter

I am the presenter

Primary author: SOTTILE, Giuseppe (INAF IASF PA)

Co-authors: SANGIORGI, Pierluca (INAF - IASF Palermo, Via Ugo La Malfa 153, 90146, Palermo, Italy); Dr GARGANO, Carmelo (INAF IASF PA); Dr LO GERFO, Fabio (INAF IASF PA); Dr CORPORA, Mattia (INAF IASF PA); CATALANO, Osvaldo (IASF Palermo/INAF); IMPIOMBATO, Domenico (INAF OAPD); MOLLICA, Davide (INAF IASF PA); CAPALBI, Milvia (INAF IASF PA); MINEO, Teresa (INAF IASF PA); CONTINO, Giovanni (INAF IASF Palermo); RUSSO, Francesco (INAF IASF PA); MACCARONE, Maria Concetta (INAF IASF PA); LA ROSA, Giovanni (INAF IASF PA); GIARRUSSO, Salvatore (INAF IASF PA); LETO, Giuseppe (INAF-Osservatorio Astrofisico di Catania); GRILLO, Alessandro (INAF OACT); GAROZZO, Salvatore (INAF OACT); MARANO, Davide (INAF OACT); CONFORTI, Vito (INAF OAS); GIANOTTI, Fulvio (INAF OAS); SCUDERI, Salvatore (INAF-IASFMI); PARESCI, Giovanni (INAF-Osservatorio Astronomico di Brera); TOSTI, Gino (UniPG); ABBA, Andrea (Nuclear Instruments); CUSIMANO, Alberto (Nuclear Instruments); CAPONIO, Francesco (Nuclear Instruments); TINTORI, Carlo (CAEN S.p.A.); LIPPI, Maurizio (CAEN S.p.A.); VIVALDI, Franco (CAEN S.p.A.); SPINOLA, Matteo (EIE Group s.r.l.); COLOVINI, Alessandro (EIE Group s.r.l.); MARCHIORI, Giampietro; PEREZ, Florent (Weeroc); AHMAD, Salleh (Weeroc); CIZEL, Jean-Baptiste (Weeroc); FLUERY, Julien (Weeroc)

Presenter: SOTTILE, Giuseppe (INAF IASF PA)

Session Classification: Photo Detectors and Particle ID - Oral session

