

The scintillating fiber tracker of the NUSES-Ziré pathfinder satellite

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NUSES is a pathfinder satellite that will be deployed in a low Earth orbit, designed with new technologies for space-based detectors. The satellite will host two payloads, Terzina and Ziré. Terzina is dedicated to space-based detection of ultra-high-energy extensive air showers, while Ziré focuses on measuring electrons, protons, and light nuclei ranging from a few to hundreds of MeV, as well as sub-GeV gamma rays. Ziré will consist of a Fiber TracKer (FTK), a Plastic Scintillator Tower (PST), a calorimeter (CALOG), an AntiCoincidence System (ACS) and a Low Energy Module (LEM).

The PST and CALOG subdetectors will be based on scintillators with Silicon Photomultiplier (SiPM) readout. The FTK is based on thin scintillating fibers readout by SiPM arrays. We assembled a prototype of Ziré (Zirettino) with a single FTK layer, a reduced number of PST layers and a CALOG with a portion of instrumented surface. A preliminary version of the Ziré custom Front-End Board (FEB), developed by Nuclear Instruments, featuring the on-the-shelf ASIC CITIROC by Omega/Weeroc, was used for the readout. We carried out a beam test campaign at the CERN PS and SPS facilities as well as the BTF at INFN-Frascati with beams of pions, nuclei and electrons respectively. The preliminary results of these tests will be presented and discussed.

Prior to the assembly of Zirettino, we also built several FTK prototypes exploring different fiber diameters and SiPM readout pitches. For the sensor readout we developed a custom flexible FEB featuring the on-the-shelf ASIC PETIROC 2A by Omega/Weeroc. These FTK prototypes were characterized with laboratory and beam test measurements, which will be illustrated in this contribution. They have also served as external tracking and trigger systems for Zirettino in the beam test campaign.

Primary author: PILLERA, Roberta (Universita e INFN, Bari (IT))

Presenter: PILLERA, Roberta (Universita e INFN, Bari (IT))

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