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The Zirè experiment onboard the NUSES space mission

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NUSES is a new space mission aiming to test innovative observational and technological approaches related to the study of low energy cosmic and gamma rays, high energy astrophysical neutrinos, Sun-Earth environment, Space weather and magnetosphere-ionosphere-lithosphere coupling (MILC). The satellite will host two payloads: Terzina and Zirè.

Zirè will perform measurements of electrons, protons and light nuclei from a few up to hundreds MeV, also testing new tools for the detection of cosmic MeV photons (e.g. for GRBs). For these purposes the Zirè instrument will include a Fiber TracKer (FTK), a Plastic Scintillator Tower (PST), a calorimeter (CALOg) and an AntiCoincidence System (ACS). Particle energies will be measured by the range and/or the total deposit, while particle identification will be provided by the DeltaE-E technique. The CALOg will also be used to measure cosmic photons at MeV energies exploiting dedicated windows in the satellite platform. Sensitivity to lower energy electrons will be provided by a dedicated Low Energy Module (LEM).

Innovative technologies for space-based particle detectors will be adopted and tested thus increasing the corresponding Technology Readiness Levels (TRL) of the adopted solutions. The light readout system (from plastic scintillators and crystals) will be entirely provided by Silicon Photo Multipliers (SiPMs), thus ensuring a compact and light design. The satellite will operate on a low-Earth and sun-synchronous polar orbit. For this reason, particular attention has been paid to the evaluation of radiation doses that will be integrated by the sensors and their effects on detector efficiency, dark currents and power budget. In this work, a general overview of the Zirè payload will be given , together with a focus on detector figures and science goals.

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