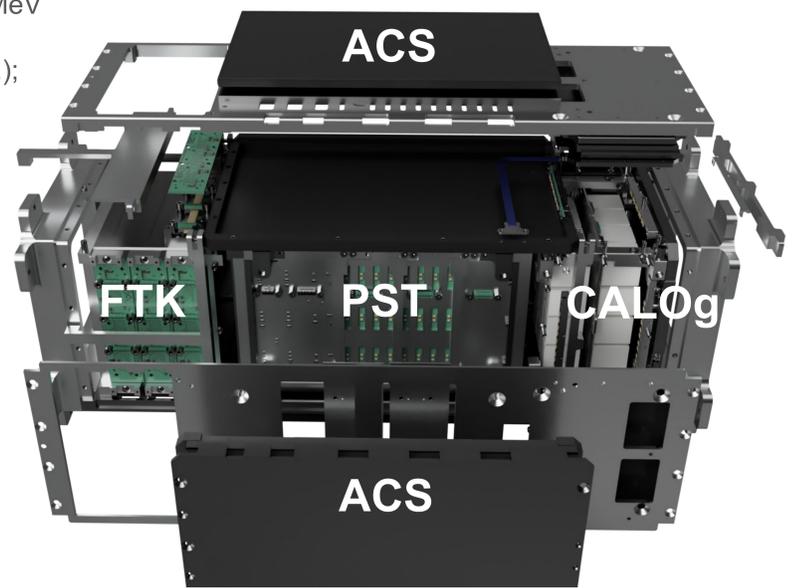




Science Goals

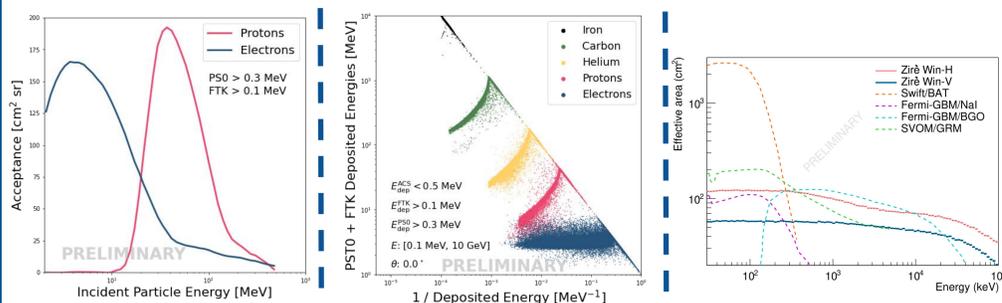
- Measuring the flux of cosmic electrons, protons (and nuclei), of solar/galactic origin, below ~300 MeV
- Detection of 0.1 - 50 MeV photons for **study of transient and stable gamma sources**
- **Study of the cosmic radiation variability** (Van Allen belt system, effects on space missions, etc.);
- Paving the way for future applications of **new technology** (SiPM only);

Zirè Detector Design



Fiber TrackKey (FTK): 3 double layer XY modules of fibers to be used for track identification.
Plastic Scintillator Tower (PST): Tower of 32 Plastic Scintillator layers. Each layer is composed by 3 bars.
Anti-Coincidence System (ACS): 9 Plastic Scintillator layers surrounding the detector.
Calorimeter (CALOg): Matrix 4x4x2 of GAGG crystals. Precise measurement of the deposited energy.

Monte Carlo Simulations & Performances



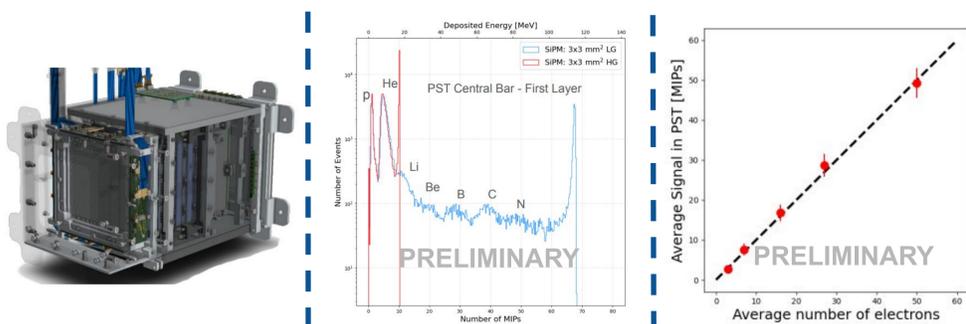
GEANT4 toolkit used to simulate incident particles. The trigger condition considered is an **energy deposit above 0.1 MeV and 0.3 MeV in the FTK and the first layer of PST (PS0)** respectively.

Particle Identification by studying the correlation between the energy deposit inside FTK+PS0 and the inverse of the total energy deposition in the whole detector.

CALOg will be also used for the study of **low energy γ -rays** between 30 keV and 50 MeV.

Two windows surrounding the CALOg are included for this purpose.

Test Beam Results

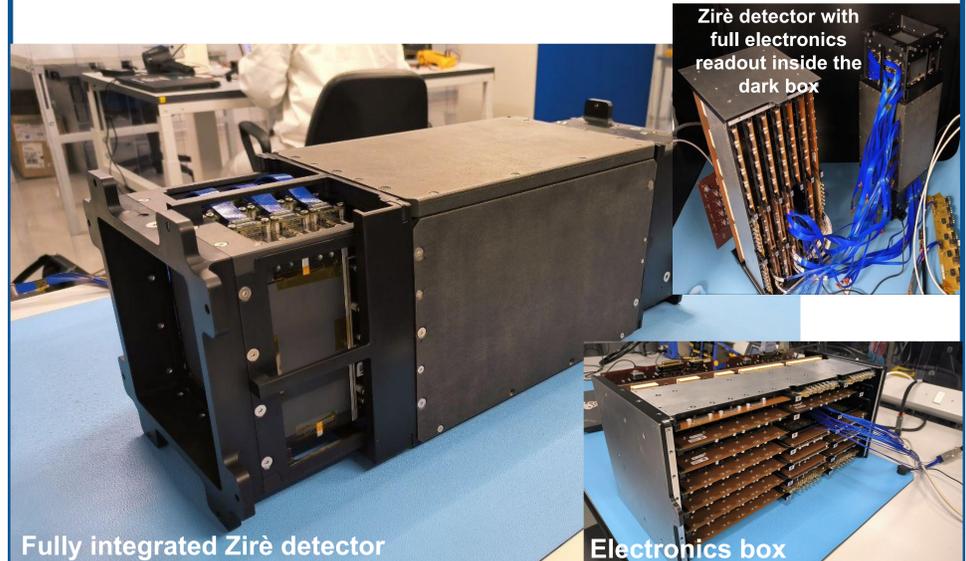


Ziretino is a Zirè smaller prototype used in Test Beams For Calibration and characterization of the full detector.

Preliminary tests done using a ion beam, show that the detector is sensitive to light nuclei and can measure Z up to nitrogen.

Preliminary tests done on an electron beam, show that the detector is sensitive to a large multiplicity beam, and can measure a particle beam composed by ~50 particles.

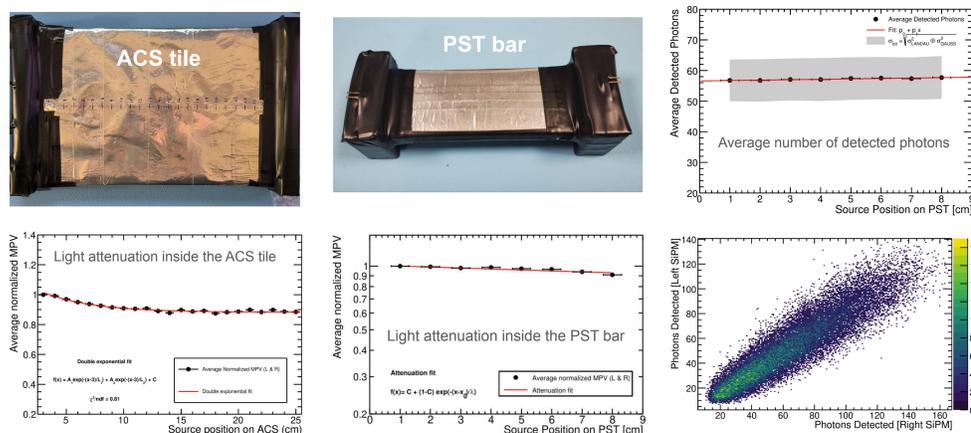
Payload Integration at the GSSI Lab in LNGS



Fully integrated Zirè detector

Electronics box

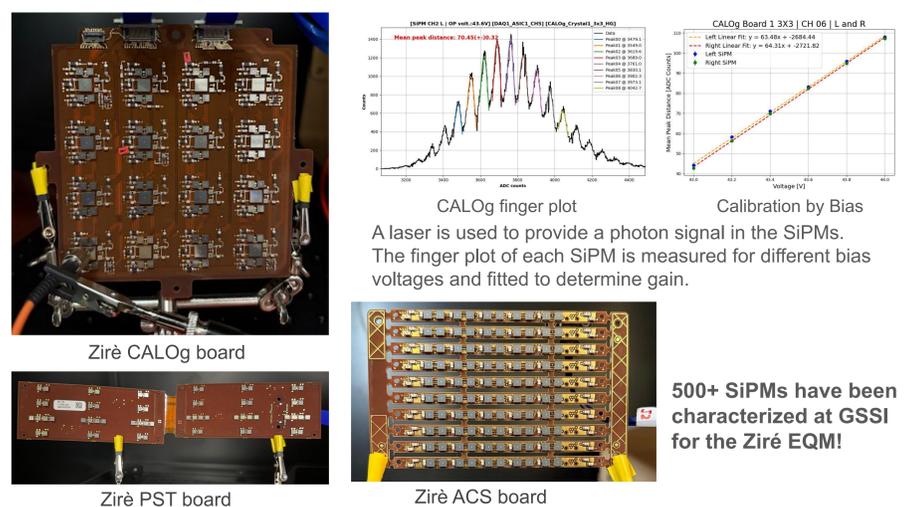
PST and ACS Tests with Radioactive Sources



The tests were performed on single PST and ACS prototypes with Hamamatsu 3x3 mm² SiPMs. **Only 10% light attenuation is evident in PST and ACS setups.**

Number of photons detected by Left/Right SiPMs at the same source position

SiPM Characterization



Zirè CALOg board

Zirè PST board

Zirè ACS board

CALOg finger plot

Calibration by Bias

A laser is used to provide a photon signal in the SiPMs. The finger plot of each SiPM is measured for different bias voltages and fitted to determine gain.

500+ SiPMs have been characterized at GSSI for the Zirè EQM!