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INFN Camera demonstrator for the Cherenkov Telescope Array

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The Cherenkov Telescope Array is a world wide project with the aim of exploring the highest energy region of the electromagnetic spectrum. With two arrays, one for each hemisphere, it will guarantee the full sky coverage in the energy range from few tens of GeV to hundreds of TeV, with improved angular resolution and a sensitivity in the TeV energy region better by one order of magnitude than the currently operating arrays. In order to cover this wide energy range, three different telescope types have been envisaged, with different mirror sizes and focal plane features. In particular, for the highest energies a possible design is a dual mirror Schwarzschild-Couder optical scheme, with a small focal plane. A silicon photomultiplier (SiPM) based camera is being proposed as a solution to match the pixel angular size of ˜ 0.17 degrees.
INFN is developing a camera demonstrator made by 9 Photo Sensor Modules (PSMs, 64 pixels each, total coverage ˜ 1/4 of the full focal plane) equipped with FBK (Fondazione Bruno Kessler, Italy) Near UltraViolet High Fill factor SiPMs and a Front-End Electronics (FEE) based on Target 7 ASIC, a 16 channels fast sampler (up to 2GS/s) with deep buffer, self-trigger and on-demand digitization capabilities specifically developed for this purpose. The pixel dimension of 6x6 mm2 leads to a very compact design with challenging problems of thermal dissipation.
A modular structure, made by copper frames hosting one PSM and the corresponding FEE inserted in an aluminum structure, has been conceived, with a water cooling system to keep the required working temperature. The actual design, the adopted technical solutions and the achieved results for this demonstrator are presented and discussed.

Collaboration

CTA

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293

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