

Development of a Carbon-fiber reinforced polymer-based mechanics for embedding ALPIDE pixel sensors in the High-Energy Particle Detector space module onboard the CSES-02 satellite.

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The mission CSES (China Seismo-Electromagnetic Satellite) will put into orbit satellites to study perturbations in the ionosphere, possibly correlated with the occurrence of seismic events. CSES-02, the second satellite of the constellation, will be supplied with a High-Energy Particle Detector (HEPD), composed by a tracker, a trigger system and a calorimeter, designed for the detection of electrons (protons) in the 3-150 (30-250) MeV energy range. The tracker is based on the innovative monolithic pixel sensors ALPIDE, developed for the ALICE experiment, at CERN. The adaptation of the ALPIDE technology to the use in space environments, demanded for ad-hoc solutions for the mechanics, as supporting structures have to withstand structural and vibrational stresses in a wide energy range, maintaining their capability to dissipate the heat generated by ALPIDE operations. This work presents the HEPD-02 tracker, consisting of 150 pixel sensors, supported by Carbon Fiber reinforced Plastic (CFRPs) and enclosed in an Aluminum frame, focussing on the little impact that devised solutions have on the physics performance. We report results from an intense campaign of qualification tests, conducted according to the space register and constituting an important premise for using monolithic active pixel sensors in future space cosmic ray experiments.

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