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The High Energy Particle Detector for the second China Seismo-Electromagnetic Satellite

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The CSES (China Seismo-Electromagnetic Satellite) is a multi-instrumental scientific space program devoted to study the near-Earth electromagnetic, plasma and particle environment to understand the seismo-associated disturbances in the ionosphere-magnetosphere transition zone. In particular, the mission aims at confirming the existence of possible temporal correlations between the occurrence of medium and large magnitude earthquakes and the observation in space of electromagnetic perturbations, plasma variations and precipitation of bursts of high-energy charged particles from the inner Van Allen belt.

The first satellite (CSES-01) was launched in 2018, while the second one (CSES-02) is currently under development and its launch is expected by 2022. One of the instruments on board the satellites is a particle detector (HEPD-02, High-energy Particle Detector). This high-precision particle detector measures electrons in the energy range between 3 and 100 MeV, protons between 30 and 200 MeV, as well as light nuclei in the MeV energy window.

The HEPD-02 detector will be composed of a tracker made of Monolithic Active Pixel Sensors and a double layer of crossed plastic scintillators for trigger. The actual calorimeter will be constituted by a tower of plastic scintillator and two-segmented planes of inorganic LYSO crystals. The calorimeter is surrounded by five scintillator planes used as a veto system.

This contribution describes the new architecture and the main characteristics of HEPD-02, with a focus on the choices made to meet the challenging scientific objectives of the mission.

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