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The CMOS pixel sensors particle tracker for the CSES-02 space experiment

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The CSES (China Seismo-Electromagnetic Satellite) mission will put into orbit satellites to study perturbations in the ionosphere, possibly correlated with the occurrence of seismic events. The first satellite is successfully operated since 2018, and the launch of the second is scheduled for the end of 2022. CSES-02 will be supplied with a High-Energy Particle Detector (HEPD), designed for the detection of electrons (protons) in the 3-150 (30-250) MeV energy range.

Its tracker is based on the innovative monolithic pixel sensors ALPIDE, developed for the ALICE experiment, at CERN. This technology has never been used in the space environment. This talk will describe the spatialisation process carried out by the HEPD-02 tracker team, which has adapted the operation mode of the ALPIDE sensor to build a modular and compact particle detector. The tracker is made of 5 turrets, each one containing 3 stacked sensitive planes. All of 150 ALPIDE sensors are interconnected with wire bonds to Flex Printed Circuits, used to transmit power, control, and readout data. The mechanical support consists of Carbon Fiber Reinforced Plastics structures, to which the chips are glued. We describe in detail the HEPD-02 tracker project, demonstrating the possibility of using MAPS in space and manifesting the pioneering nature of the project for next-future larger size space missions.

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