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First space application of Monolithic Active Pixel Sensors for particle tracking: the High Energy Particle Detector onboard the CSES-02

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We report on the tracker of the High Energy Particle Detector, to be launched on board the second China Seismo Electromagnetic Satellite in mid 2022. The tracking module will be made of ALPIDE Monolithic Active Pixel Sensors, a 3.0x1.5 cm^2 ASIC, fabricated with a 180 nm CMOS process. The use of Monolithic Active Pixel Sensors is unprecedented in space applications and demands for specific solutions to limit the power consumption and ensure robustness against the mechanical and thermal stresses that the module has to withstand during the launch and in operation.

We describe the process of qualification that we have carried out in the last two years, detailing the tracker layout, the operation mode, the control and the readout. Results from tests at space qualification facilities and from beam tests are provided, demonstrating the effectiveness of Monolithic Active Pixel Sensors for space applications and the performance of ALPIDE for the HEPD scientific case.

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