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In-orbit performance of the silicon tracker of DAMPE

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DAMPE (DArk Matter Particle Explorer) is a satellite-borne cosmic-ray and gamma-ray detector, designed to probe high-energy astro particle physics in GeV-100 TeV range. It was launched on December 17, 2015 and started its on-orbit operation on December 24, 2015. The main objectives of DAMPE are the identification of possible indirect signatures of particle Dark Matter annihilation or decay, a better understanding of the origin and of the propagation mechanisms of high energy cosmic rays, and gamma-ray astronomy. DAMPE consists of four sub-systems: a plastic scintillator strip detector (PSD) for the cosmic-ray charge measurement and for the veto signal for photon identification; a silicon-tungsten tracker-converter (STK); an imaging calorimeter made up of 14 layers of Bismuth Germanium Oxide (BGO) bars in a hodoscopic arrangement with a total thickness of 32 radiation lengths, for precise energy measurement and electron/proton separation, and a boron-doped plastic scintillator to detect delayed neutrons originating from hadronic interactions at high energies (NUD), to improve the electron/hadron separation. The STK is a crucial component of DAMPE which allows to determine the direction of incoming photons, to reconstruct tracks of incoming cosmic rays and estimate their charge. The STK consists of 768 silicon sensors assembled in 6 tracking double layers, with a total sensitive area of 6.6 m^2, interleaved with a three layers of tungsten for about one radiation length of material in the STK, to promote conversion of incoming photons into electron-positron pairs. Since the launch STK shows an excellent performance on-orbit, and a real-time commissioning and calibration of the tracker is done to fully profit of the STK capabilities, allowing it to play a key role in the first physics results of DAMPE. In this contribution, first we give a brief overview of construction and tests on ground of the STK and then we present the results of the on-orbit performance of the STK, including the noise behavior, the thermal and mechanical stability, the alignment and position resolution and the tracking efficiency.

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