

Performance and upgrade of the Precision Proton Spectrometer and performance of proton reconstruction with the CMS experiment

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The PPS (Precision Proton Spectrometer) detector system consists of silicon tracking stations as well as timing detectors to measure both the position and direction of protons and their time-of-flight with high precision. They are located at around 200 m from the interaction point in the very forward region on both sides of the CMS experiment. PPS is built to study Central Exclusive Production (CEP) in proton-proton collisions at the LHC, including the photon-photon production of W and Z boson pairs, high-mass diphoton and dilepton production, high- p_T jet production, as well as searches for anomalous couplings and new resonances.

In this presentation the PPS operation, commissioning and performance are discussed. The PPS detector has taken data at high luminosity while fully integrated to the CMS experiment. The total data collected correspond to around 100 fb^{-1} during the LHC Run 2. The detectors are placed in movable Roman pot stations within few mm from the LHC beam, and operate under highly non-uniform irradiation. The tracking detectors consist of 3D pixel sensors, bump bonded to the PSI46dig ROC and the timing detectors of scCVD diamond sensors. Ultra-fast silicon detectors have also been operated during Run 2. The upgrade of the timing system for the LHC Run 3 aims for a timing resolution better than 30 ps.

The full proton reconstruction chain has been developed and deployed for data analysis. It relies on the alignment and calibration of the tracking and timing sensors, and a parametrisation of the LHC magnet lattice, calibrated from the data. The proton reconstruction, alignment and calibration methods are discussed and performance results with the data collected are presented.

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Author: SOLANO, Ada (Univ. di Torino e Sez. dell'INFN)

Presenter: SOLANO, Ada (Univ. di Torino e Sez. dell'INFN)

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