

The diamond time of flight detector of the TOTEM experiment

This contribution describes the upgrade project of the TOTEM Collaboration to measure the time of flight (TOF) of leading protons in the vertical Roman Pots (RPs). The aim of the upgrade is to improve the ability of the experiment to tag and select Central Diffractive (CD) processes. The installation of a TOF detector inside the RP will allow to determine the position of the vertex where the CD protons are produced, thus allowing the protons' association with one of the vertices reconstructed by the CMS detectors. In this contribution the TOF detectors developed for this purpose, based on scCVD diamond sensors, will be presented. The detectors will measure the protons' TOF with ~ 50 ps time resolution. To achieve this performance, a dedicated fast and low-noise electronics for the signal amplification has been designed. Indeed, while diamond sensors have lower noise and faster signals than silicon sensors, the amount of charge released in the medium is lower. The ADC of the diamond signal is performed with the SAMPIC chip, which performs a sampling of the waveform up to 10 Gsa/s. The clock distribution system, based on the Universal Picosecond Timing System developed at GSI, is optimized to reduce the uncertainty on the TOF measurement to a negligible level. An overview of the control system which interfaces the timing detectors to the experiment DAQ is finally given together with the measurements performed in several test beams where satisfactory results were obtained.

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