

THE CT-PPS EXPERIMENT AT THE LHC

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The CMS-TOTEM precision proton spectrometer [1] focuses on the study of rare central diffractive (CD) states, which can be produced at the LHC by photon-photon ($\gamma\gamma$) or Pomeron-Pomeron and γ -Pomeron collisions. In particular, it will put new constraints on the anomalous quartic gauge coupling of the Standard Model vector bosons and measure the exclusive production of $\gamma\gamma$, WW and ZZ bosons with a superior precision with respect to the results obtained by CMS or ATLAS without the proton tagging (see fig. 1).

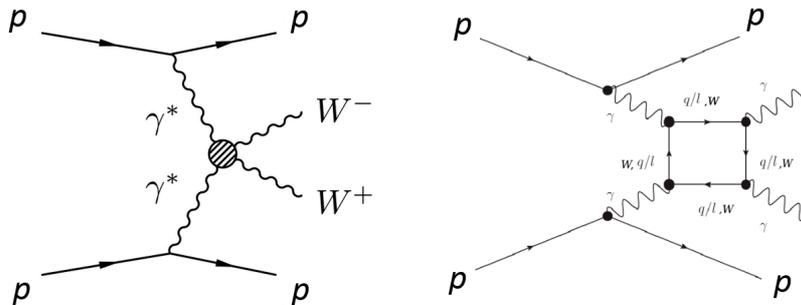


Figure 1: exclusive central diffractive WW (left) and $\gamma\gamma$ (right) production.

For each side of the interaction point, the spectrometer consists of two tracking stations equipped with silicon 3D pixels, and one timing station equipped with scCVD diamonds and UFSD planes. The stations will intercept protons produced in CD events with masses from ~ 300 GeV up to ~ 2 TeV. For the first time, timing detectors are used at a collider to measure the time of flight of the protons, with an ultimate precision down to 10 ps. Timing detectors are indeed necessary to reconstruct the longitudinal position of the diffractive protons, which can be associated unambiguously to one of the vertex reconstructed by the CMS central detectors even in high pileups runs. The experiment started to take data in June 2016 by using the silicon strip detectors of the TOTEM experiment and collected about 15 fb^{-1} of data. The diamond detectors, consisting of four planes of scCVD diamond sensors [2], collected 2 fb^{-1} for commissioning. The data sample collected already constitutes the largest hard CD sample ever collected in high energy physics. Several analyses are currently ongoing as the searches of exclusive dileptons or $\gamma\gamma$ and the measurements of CD events with large missing masses.

[1] CMS and TOTEM Collaborations, CMS-TOTEM Precision Proton Spectrometer (Technical Design Report), CERN-LHCC-2014-021; TOTEM-TDR-003; CMS-TDR-13G, <https://cds.cern.ch/record/1753795>.

[2] G. Antchev et al. (TOTEM Collaboration), CERN-EP-2016-317, arXiv:1701.05227.