

The FP420 Project and GasToF: A Picosecond Timing Detector

Thursday 16 July 2009 09:30 (15 minutes)

FP420 is an R&D project to assess the feasibility of installing proton detectors at 420m from the ATLAS and/or CMS interaction point(s) at the LHC, allowing the measurement, in high luminosity environment, of the spatial position and arrival time of protons scattered at very low angles with fractional momentum loss between 0.2% and 2%. This is expected to open a new program of electroweak, QCD and beyond-the-Standard-Model physics. The challenges of the project are presented, along with the solutions envisaged, notably for the detectors and the original moving mechanism to bring the detectors close to the beam, as recently reported in arXiv:0806.0302. The progress since then is discussed, in particular in the design and prototyping picosecond resolution time-of-flight detectors capable of accurate vertex reconstruction for background rejection at high-luminosities as well as in the in-situ calibration techniques.

GasToF - a Cerenkov detector filled with dense gas and readout by fast MCP-PMTs is proposed for very precise ToF measurements of forward-scattered protons at the LHC. The test beam results, cosmic ray measurements and detailed simulations are presented showing that the GasToF detectors reach the time resolution of several ps and high efficiency very close to its mechanical edge. Operation of GasToF in high luminosity conditions depends on the performance of MCP-PMTs at large event rates. Several studies were performed using a dedicated fast laser setup for testing two kinds of MCP-PMTs - the Hamamatsu R3809U-50 and the Photek 210, and the obtained results are reported.

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Session Classification: IV. Detectors (LHC and R&D) and Accelerators

Track Classification: Detectors (LHC and R&D) and Accelerators