

Measurement in the CMS experiment of the boson polarisation in gauge boson pairs produced in proton-proton collisions.

The thesis should be concerned with the problematic of the Electroweak Symmetry Breaking (EWSB) and in particular the study of the behavior of the scattering of the longitudinal component of the gauge bosons in their scattering ($W_L W_L$, $W_L Z_L$ or $Z_L Z_L$). In Standard Model (SM)-like theories the gauge bosons acquire a longitudinal component via the Higgs mechanism and the scattering behavior of gauge bosons is regularized by the virtual exchange of a Higgs Boson associated with the Higgs field responsible for spontaneous EWSB.

Should the Higgs boson be discovered or not in the near future the study of the gauge bosons scattering will be central in the understanding of the EWSB phenomenon. A key ingredient to perform this characterization is the measurement in the final state of the polarization of the scattered bosons.

We propose to prepare this fundamental study by performing a measurement of the polarisation of the Z boson produced in association with a W in events with 3 leptons (e or μ) and missing transverse energy. The polarisation state of the Z boson characterized by the angular distribution of the leptons coming from the Z will be compared to the theoretical distribution of the same quantity and will imply a perfect mastering of the lepton reconstruction. The work will be carried in the CMS team at the LLR which is strongly involved in the search of the Higgs boson in channels with multilepton in the final state. We propose to include all the channels where at least one e or μ lepton is found in the final state (from W, Z).

The internship and the thesis will be conducted at the LLR with frequent stays at CERN. The thesis work will also include a contribution for ECAL L1 trigger and HLT Trigger performance studies.

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