Proposition de sujet de stage expérimental M2 (2015) à l'Institut Pluridisciplinaire Hubert Curien (IPHC), Strasbourg

Search for associated production of Higgs boson with single top via FCNC at CMS

Key words : Higgs boson, top quark, CMS, LHC, FCNC, new physics

Physics searches in channels involving top quarks and Higgs boson are expected to be sensitive to new particles considered within various extensions of the Standard Model (SM), due to the large value of the coupling of a Higgs boson to a top quark. The analysis is aimed at a search for anomalous Flavour-Changing-Neutral-Current (FCNC) interaction involving a single top quark produced in association with a Higgs boson (tqg and tqH couplings). One of the possible signatures of such production is the final state with three b quarks, missing energy and exactly one charged lepton. To discriminate signal and background events, multivariate analysis techniques have to be exploited. In case of no observation of deviations from SM predictions, exclusion limits are set on FCNC anomalous couplings. The analysis will use simulated Monte Carlo (MC) events for the preparation of the data analysis collected at the LHC at the center-of-mass energy of 13 TeV.

Possible tasks will cover the study of kinematic properties in generation of signal and background events, definition of baseline selection criteria and study of discrimination variables for background suppression. The range of tools used for the analysis covers: CMS software based on C++ and python, CERN ROOT package, MC event generation software, multivariate analysis tools. The analysis will be carried out at IPHC in close collaboration with the CMS single top and Higgs analysis groups, with regular meetings held at CERN.

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