Proposition d'un Projet de Recherche en Laboratoire

Titre : Studies of the Higgs boson in the ditau final state with data collected by the CMS experiment

Laboratoire d'accueil : LLR

Résumé : The Higgs boson, the most recently-confirmed particle in the standard model of particle physics, was discovered by the CMS and ATLAS experiments at the CERN Large Hadron Collider (LHC) in 2012. Understanding all of the properties of this remains a cornerstone of the LHC physics programme. LLR is a founding member of the CMS experiment, and a large part of the analysis activities of the CMS group at the laboratory focusses on studies of the Higgs boson, in the ZZ, bb and di-tau lepton final states. In 2022 the LHC has started its third physics run, with collisions now taking place at a record centre-of-mass energy of 13.6 TeV. These data are being reconstructed by the CMS experiment and can already be analyzed.

In this project we propose to study the Higgs boson, in its decay channel to a pair of tau leptons, using the data collected by the CMS experiment during the third LHC physics run. Comparisons of the data collected at the CMS experiment to simulated collision events will be made as part of this project, to help gain an understanding of the data that are being collected by the experiment.

In particular, a study of different simulation software programmes will be performed, comparing the kinematical properties of the simulated Higgs bosons between different programmes which simulate the Higgs bosons with different levels of accuracy. This study will help to understand which of the simulation programmes provides the best description of the collision data collected by the experiment, and may lead to a new, higher-accuracy simulation being adopted within the CMS experiment for Higgs boson measurements in the remainder of Run 3.

Mots clés : LHC, Higgs boson, simulation, data analysis

Nature : The project entails the analysis of data collected at the LHC, and as such is numerical and experimental in nature

Accueil d'un binôme possible : Oui

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