
DRF: Thesis SL-DRF-21-0105

RESEARCH FIELD

Particle physics / Corpuscular physics and outer space

TITLE

Z boson precision physics with the Atlas detector at LHC

ABSTRACT

The thesis will start in Autumn 2021. ATLAS, one of the major experiment at the LHC, is preparing for the expected increase of luminosity for Run3 and HL-LHC. The first part of the thesis is dedicated to a qualification task that could either consist in participating to the commissioning of the new muon detectors which are integrating the experiment, or taking part in the muon momentum calibration effort in view of Run3, that will start in 2022. Both options are closely related to the main thesis subject. The thesis will be followed by a measurement of precision physics in the field of the Z boson with ATLAS data.

The subject is focused on electroweak precision physics in ATLAS. The aim is to measure with the best possible precision the electroweak mixing angle, as well as the mass of the Z boson, using Run2 and Run3 data. The explored channel is that of the Z boson decaying into a muon-antimuon lepton pair. The student will work on muon momentum calibration using the J/Psi resonance as a standard candle, and will also reduce, through advanced fitting methods, the uncertainties related to the parton distributions functions (PDFs). These measurements should lead to a high improvement in the electroweak fit and thus significantly constrain the Standard Model, as well as Beyond Standard Model physics.

The CEA ATLAS group is part of the Department of Particle Physics (DPhP) of the Institute of Research into the Fundamental Laws of the Universe (IRFU) at CEA Paris-Saclay.

DPhP comprises about 110 physicists. DPhP scientific themes include elementary components of matter at the highest energies at the CERN LHC collider, R&D for future accelerators, study of antimatter, neutrino physics, gamma ray astronomy, study of gravitational waves, observational cosmology and instrumentation for medical applications. The group has a world-leading expertise in electroweak physics, namely with measurements of Z, W and Higgs boson cross sections and measurement of the W boson mass, achieved for the first time at the LHC. It builds on competences in muon reconstruction and muon spectrometer alignment and electron/photon identification.

LOCATION

Institut de recherche sur les lois fondamentales de l'univers
Service de Physique des Particules
Groupe Atlas (ATLAS)
Place: Saclay
Start date of the thesis: 01/09/2021

CONTACT PERSON

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