

FCPPL-CSC PhD proposal - 2015

Thesis title: Measurement of the WWW production and Higgs boson property studies in pp collision recorded with the ATLAS detector at LHC.

Type of proposed PhD diploma: French Chinese French & Chinese X (tick correct answer)

French host laboratory: CPPM (*Center for Particle Physics Marseille*)

Chinese laboratory (if applicable): USTC – Department of Modern Science

Thesis advisor(s) and email(s): monnier@cppm.in2p3.fr

Planned date of start of stay in French lab: 1/09/2015

Planned duration of stay in French lab (months): 24 months

Expected date of thesis defense: 09/2017

Detailed description of the thesis subject:

The Large Hadron Collider (LHC) at CERN is today the only energy frontier machine in the world. ATLAS is one of the two general purpose experiments installed at the LHC that discovered in 2012 a Higgs boson, key piece for the understanding of the fundamental interactions and the origin of elementary particle mass. Its physics program extends beyond Higgs property measurements to the search for signs of physics beyond the Standard Model of particle physics.

In 2015, the LHC will restart its data taking at the new record 13 TeV center of mass energy. The record energy and high luminosity provided in the next three years will allow precise studies of the Higgs boson and its coupling properties in particular through multiboson final states or ttH final states. These key measurements, would allow confirming that the observed boson is the Standard Model Higgs boson, or could reveal New Physics.

The PhD thesis goal is to study the multiboson production in leptonic final states in the standard model and with an emphasis on the Higgs property studies. The new data taking conditions at the LHC (proton-proton collision center of mass energy increased to 13 TeV, high luminosity), which will resume data taking in spring 2015, will be particularly suited for this measurement. The sensitivity to the sub-dominant Higgs production modes will be increased, allowing for refined measurements of the Higgs couplings. During the thesis, detector performance studies will also be conducted especially linked to lepton identification with the ATLAS calorimeter system, key component of these multiboson studies.

Candidates' requested qualifications: Particle physics

Tentative timeline of the PhD preparation

The candidate will contribute to the ATLAS data taking produced by the pp LHC accelerator in fall 2015 (13 TeV) and 2016(14 TeV) and will analyse those data to extract the Higgs properties in the WWW final state channel and search for new physics phenomena.

Publications related to the PhD subject:

Observation and measurement of Higgs boson decays to WW* with ATLAS at the LHC:

<https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/CONFNOTES/ATLAS-CONF-2014-060/>

Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC: <http://www.sciencedirect.com/science/article/pii/S037026931200857X>

20/01/2012