Contribution ID: **29** Type: **not specified**

bootsted ttH analysis in full hadronic final state

The discovery of the Higgs boson in 2012 was a major success for the Large Hadron Collider (LHC) at CERN. With higher luminosity in stages of Run2 and Run3, the precise measurements of Higgs boson properties are possible, which play an important role in the complement of SM and the search for the BSM. In the 13 TeV proton-proton collision at LHC, the Higgs boson can be produced via various modes, e.g., gluon-gluon fusion (ggF), vector boson fusion (VBF), association production with a pair of top quarks (ttH), etc. In particular, the ttH production allows a direct measurement of the top Yukawa coupling, which is a very large coupling in SM due to the large top quark mass. For probing the Higgs boson, its decay products are explored, the most favourable decay mode is H->bb, with an SM BR of 58.4%.

The analysis aims at the search of the fully hadronic ttH(bb) signal, where the Higgs boson decays into a pair of b-quarks and the two top quarks decay hadronically. This process has a challenging 4b final state, in the typical resolved analysis, they are reconstructed as small radius (R=0.4) jets and identified with the dedicated b-tagging algorithm in ATLAS. In the special boosted area where the Higgs boson carries a larger transverse momentum (typically higher than 300 GeV), the two b-jets become collimated and can be reconstructed as a large radius (R=1) jet. Such kind of boosted Higgs boson signal is important for BSM searches since many BSM theories predict potentially increased sensitivity at large pt. Besides, the analysis results can be interpreted with the effective field theories framework, where the BSM physics effects are parameterized with high dimensional operators.

In this program, the student is supposed to work on the application of the large radius jet reconstruction algorithm to identify boosted Higgs decaying into a pair of b-quarks, the exploration of the signal-enhanced phase space and the optimization of the event selection. The dominant background in this analysis is the ttbb process, one can test the performance of the large radius jet reconstruction on the background and investigate possible dependence of the algorithm on the event topology.

Field

B1: Particle physics analysis (software-oriented)

DESY Place

Hamburg

DESY Division

FH

DESY Group

ATLAS

Special Qualifications:

Experience with one of the items, Boosted algorithms or B-tagging, would be beneficial.

Primary author: KATZY, Judith (ATLAS (ATLAS Top Physics))

Co-author: GUO, Linghua (None)