

Searching for the $t\bar{t}H(Hbb)$ and $t\bar{t}bb$ signal with novel techniques at CMS



Marco Harrendorf, KIT - IEKP

In the last ten years we have experienced the start and the first triumphs of the Large Hadron Collider (LHC) located at CERN in Geneva, Switzerland. Surely, the discovery of a Standard Model-like Higgs boson in 2012 stands out within this context. But even though, that further major findings like Physics beyond the Standard Model eluded us so far, the quest for understanding our elementary nature is ongoing under full steam. One of the outstanding important checks is the determination if the Higgs boson is really the Higgs boson predicted by the Standard Model. An important puzzle piece in this aspect will be the discovery of the $t\bar{t}H$ signal process providing us with a direct measurement of the Top-Higgs-Yukawa coupling. The search for $t\bar{t}H$ in the $b\bar{b}$ decay channel benefits from the large branching fraction of 58% for the Higgs to $b\bar{b}$ decay. At the same time, the large irreducible $t\bar{t}+bb$ background poses a major challenge and requires the use of advanced analysis techniques. A further crucial ingredient is the estimation and modelling of the $t\bar{t}+bb$ background via MC event generators which is still afflicted with large theoretical uncertainties.

This talk will discuss the work on the upcoming $t\bar{t}H(Hbb)$ analysis covering the 2016 LHC data set and ongoing work to reduce the uncertainties related to the $t\bar{t}+bb$ background. Furthermore, the talk will deliver a glimpse in the future of experimental particle physics by interspersing examples of novel techniques used in the analysis, e.g. the application of Neural Networks as a classifier, Continuous integration as an improvement of the analysis workflow, and NLO event generation for obtaining more accurate simulation data.

Tuesday

April 25

4:00 P.M.

Rm 415 NSH