M2R training, year 2017-2018

Search for new heavy Higgs bosons with the ATLAS experiment at LHC

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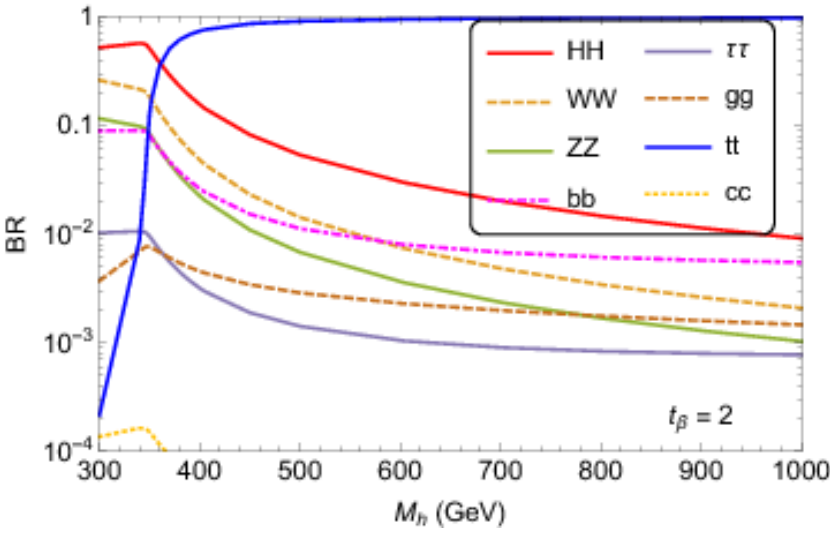
Subject

Our understanding of the infinitely small is based on the Standard Model of Particle Physics. However, there are weakness in this model that various "extensions" propose to fill. Some of them (supersymmetry, extradimensions,...) predict new particles decaying into pairs of top quarks. This internship, within the ATLAS-LPC team, proposes to use this remarkable signature to train the student in data analysis.

Branching ratio of an heavy Higgs into $t\bar{t}$ (blue line) for a 2HDM model.

from « Maximally Symmetric Two Higgs Doublet Model with Natural Standard Model Alignment », P. S. Bhupal Dev et al., JHEP 1412 (2014) 024



ATLAS is one the four experiment recording the collisions provided by the LHC collider at CERN. Thanks to its general-purpose design, the ATLAS detector is an excellent tool either for the search for new physic phenomena or for precision measurements.

The ATLAS-LPC team has deep understanding of the top-quark physics and in particular of $t\bar{t}$ final state. Within this team, the student will test the implementation of new analysis techniques, such as Machine Learning or the impact of a new particle reconstruction algorithm (ParticleFlow) recently implemented in ATLAS. These studies could have a major impact on the strategy for analyzing the 120 fb-1 of data to be collected by the end of 2018.

A PhD topic will be proposed as a continuation of this internship. The general orientation of the PhD topic (precision measurement or search of new physics) will be discussed with the student.