

Search for Higgs boson pair production in the $b\bar{b}\tau^+\tau^-$ final state with the ATLAS detector

Marisilvia Donadelli

Institute of Physics, University of Sao Paulo

April 4, 2022

In this talk we present results on the search for Higgs boson pair production (HH) in the $b\bar{b}\tau^+\tau^-$ final state. The search uses 139 fb^{-1} of pp collision data recorded by the ATLAS experiment between 2015-2018 with a center of mass energy of $\sqrt{s} = 13 \text{ TeV}$. This amount represents only 4% of the collision data expected to be available during the LHC lifetime, and opens up a new avenue for probing the exact nature of the Higgs mechanism and electroweak symmetry breaking, through the measurement of Higgs boson pair production. Considering the collision data foreseen for the next periods, we also report a study of the projected sensitivity of the $b\bar{b}\tau^+\tau^-$ final state at the High Luminosity LHC (HL-LHC). At the LHC, by means of the dominant gluon-gluon fusion process, pairs of Standard Model Higgs bosons can be produced via the Higgs self-interaction and the destructively interfering top-quark loop diagrams. In the search for beyond Standard Model physics, new hypothetical particles can directly decay to final states including one or more Higgs bosons, or produce the Higgs bosons in ways not allowed by the Standard Model. In the $b\bar{b}\tau^+\tau^-$ search, the resonant signal corresponds to a narrow-width scalar with a mass in the range 251-1600 GeV. Additionally, results for seven interpretations of $HH \rightarrow b\bar{b}\tau^+\tau^-$ in the framework of Higgs Effective Field Theory (HEFT) are also presented.