

Search for the Higgs boson decaying to b quark pairs in the W/Z associated production channels with ATLAS

In 2012, the ATLAS and CMS experiments at CERN discovered a Higgs-like boson in LHC pp collisions at $\sqrt{s} = 7$ and 8 TeV with an approximate mass of 125 GeV.

More recent experimental results, exploring the complete Run1 dataset, indicate that the observed boson is consistent with the Standard Model Higgs Boson within uncertainties. The results include spin and parity properties and couplings to the other SM particles and are mostly based in bosonic channels.

Despite the increasing experimental knowledge about the Higgs boson, its couplings to down-type quarks have still to be proven. The SM 125 GeV Higgs boson decays to b quark pairs with a branching ratio of 58% but the bb production cross-section in $\sqrt{s} = 8$ TeV pp collisions is 7 orders of magnitude greater than the Higgs production cross section, making this decay one of the most challenging to search for at the LHC. In the associated production in which the Higgs is produced with a W/Z boson, one can use the leptonic decay of the W/Z to trigger the event and substantially reduce the backgrounds.

This poster presents the ATLAS Run I search for the $H \rightarrow bb$, describing the analysis methods and the results with the combination of the $ZH \rightarrow \nu\nu bb$, $ZH \rightarrow ll bb$ and $WH \rightarrow lv bb$ search channels. The data set used correspond to integrated luminosities of 4.7 fb⁻¹ at $\sqrt{s} = 7$ TeV and 20.3 fb⁻¹ at $\sqrt{s} = 8$ TeV. The observed (expected) deviation from the background only hypothesis corresponds to a significance of 1.4 (2.6) standard deviations and the ratio of the measured signal yield to the Standard Model expectation is found to be $\mu = 0.52 \pm 0.32$ (stat) ± 0.24 (syst) for a Higgs boson mass of 125.36 GeV.

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