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Search for the dimuon decay of the Higgs boson with the ATLAS experiment

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The Standard Model Higgs boson Yukawa coupling to dimuons offers an opportunity to study the Higgs interaction with second generation fermions. The Standard Model branching fraction of the Higgs decay to $\mu^+\mu^-$ is 2.2×10^{-4}, much smaller compared to the decays to the third generation lepton/quark pairs $\tau^+\tau^-$ and $b\bar{b}$, and the second generation quark pair $c\bar{c}$. Despite the low branching fraction, this channel has the highest trigger and particle identification efficiencies of the other listed decays as well as a comparatively small background. This makes this channel an attractive way to study the Higgs Yukawa coupling. The background to this channel is a dominant irreducible dimuon production from the Drell-Yan process, $Z/\gamma* \rightarrow \mu^+\mu^-$, which is $\approx$ 1700 times the signal rate. To increase our detection sensitivity we use three categories to tag events by the Higgs production mechanism: gluon-gluon fusion (ggF), vector boson fusion (VBF), and vector boson associated production (VH). This talk presents the strategies of the analysis and summarizes the results from Run 1 and Run 2 data (2015-2016). The new developments in event categorization and the detection sensitivity for the expected 150 fb^{-1} data in Run 2 are also reported.

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