

Search for Resonant and Non-Resonant VHH Production

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After the Higgs Boson, with a mass of 125 GeV, was discovered in 2012, studies of single Higgs boson production have largely confirmed that this particle has similar properties to the Higgs boson predicted by the Standard Model (SM). However, it is clear that physics beyond the SM is required to explain many observed phenomena in nature, and there remains the possibility that the Higgs Boson can act as a portal for BSM physics. Studies of Higgs boson pair production (HH) represent the next crucial step to constraining the Higgs sector and allow for the chance to explore resonant HH production as well as refining measurements of the Higgs boson self-coupling. While previous searches have focused on the HH production in the gluon-gluon and vector-boson fusion modes, this analysis documents a new search, with 136 fb^{-1} of pp collisions at $\sqrt{s} = 13 \text{ TeV}$ collected by ATLAS in LHC Run 2, for both resonant and non-resonant HH production in association with a vector boson (VHH). Three different channels are considered, corresponding to either $ZllHH$, $Z\nu\nu HH$, or $Wl\nu HH$, in order to have good coverage over the different final states. Only $H \rightarrow b\bar{b}$ is considered for simplicity and for the sake of high-statistics. The analysis benefits from small backgrounds and attempts to set limits for the first time on VHH production. Analysis techniques and expected significance will be presented.

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