In 2012, the observation of the Higgs boson was announced by the CMS and ATLAS collaborations at CERN. Since the discovery, work has continued to measure the Higgs boson couplings and quantum numbers with greater precision. There are several production channels of the Higgs boson and we are searching for the production of the Higgs boson in association with a vector boson in the $H\to WW$ decay channel with the CMS experiment at the LHC. This measurement provides a direct probe of the Higgs boson coupling to vector bosons. The latest CMS results on the Higgs boson decay to a W boson pair are presented. The focus of the poster will be on the inclusive and STXS measurements performed for the VH leptonic channel with full Run 2 data which corresponds to an integrated luminosity of 137 fb$^{-1}$, collected by the CMS detector at LHC.

**Analysis Overview**

- Leptonic decay of associated boson ($W$ or $Z$) is considered.
- The selected leptons may be from prompt or nonprompt decays. The nonprompt lepton backgrounds originates from leptonic decays of heavy quarks, hadrons misidentified as leptons, and electrons from photon conversions.
- There are different challenges in each channel depending upon the dominating backgrounds, hence different approaches.

**Inclusive Results**

\[
\mu_{\text{WHSS}} = 1.85^{+0.35}_{-0.25} \quad (\text{stat}) +^{0.25}_{-0.20} \quad (\text{exp}) +^{0.15}_{-0.10} \quad (\text{theor})
\]

- Maximize — sensitivity of the measurements
- Minimize — theory dependence
- Not sensitive to all bins, due to limited statistical precision

The observed significance of the inclusive VH production cross section is 4.7σ, while the observed significance of the VH production cross section for $p_T > 150$ GeV for WH and ZZ is $4.7\sigma (1.8\sigma)$. WHSS and ZH3l: new added channels w.r.t previous publication. Improved results are shown for VH-leptonic channel with full Run 2 dataset as compared to results obtained with 2016 data.

**Summary**

The observed significance of the inclusive VH production cross section is 4.7σ, while the observed significance of the VH production cross section for $p_T > 150$ GeV for WH and ZZ is $4.7\sigma (1.8\sigma)$. WHSS and ZH3l: new added channels w.r.t previous publication. Improved results are shown for VH-leptonic channel with full Run 2 dataset as compared to results obtained with 2016 data.

**References**

- [arXiv:1806.05246](https://cds.cern.ch/record/2758367/files/HIG-19-017-pas.pdf)
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