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# Combination of Searches for HH Production with ATLAS Run 2 Data

*Saturday, 9 April 2022 13:40 (20 minutes)*

Searches for di-Higgs production are some of the most exciting new results at the LHC. This talk will present the latest ATLAS HH combination results with the full Run 2 dataset of 139/fb at $\sqrt{s} = 13$ TeV. By combining results from three different complementary search channels, bbγγ, bbττ, and bbbb, the HH combination has high sensitivity in both non-resonant and resonant interpretations.

In the non-resonant interpretation, bbγγ and bbττ channels are combined to produce limits on the Standard Model (SM) HH production cross-section and the Higgs boson self-coupling. Although no evidence for a signal was observed, the observed (expected) upper limits on SM HH production cross-section at 95% confidence level are 91.44 fb (92.10 fb). The combination of both channels also provides strong observed (expected) limits on Higgs self-coupling modifier, , between −1.0 6.6 (−1.2 7.2).

For the resonant interpretation, bbγγ, bbττ, and bbbb, are combined to search for a heavy scalar decaying into two Higgs bosons with masses between 251 GeV - 3 TeV. Upper limits on the observed (expected) production cross-section are set ranging between 1.1 and 595 fb (1.2 and 393 fb).

## Career stage

Graduate student

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