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Combination of searches for Higgs boson pairs in pp collisions at 13 TeV with the ATLAS experiment (12'+3')

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This report presents a combination of searches for Higgs boson pairs using up to 36.1 fb^{-1} of proton-proton collision data at a centre-of-mass energy $\sqrt{s} = 13 \text{ TeV}$ recorded with the ATLAS detector at the LHC. The combination is performed using three analyses searching for the $HH \rightarrow b\bar{b}b\bar{b}$, $HH \rightarrow b\bar{b}\tau^+\tau^-$ and $HH \rightarrow b\bar{b}\gamma\gamma$ decay channels. Results are presented for both non-resonant and resonant Higgs boson pair production modes. The combined observed (expected) limit on the non-resonant Higgs boson pair cross-section is 0.22 pb (0.35 pb) at 95% confidence level, which corresponds to 6.7 (10.4) times the predicted Standard Model cross-section. The ratio of the Higgs boson self-coupling to its Standard Model expectation ($\kappa_\lambda = \lambda_{HHH}/\lambda_{HHH}^{\text{SM}}$) is observed (expected) to be constrained at 95% confidence level to $-5.0 < \kappa_\lambda < 12.1$ ($-5.8 < \kappa_\lambda < 12.0$). Exclusion limits are also set on resonant Higgs boson pair production, probing a model with an extended Higgs sector based on two doublets, as well as a Randall-Sundrum bulk graviton model.

Authors: BOKAN, Petar (Uppsala University (SE), Georg-August-Universitaet Goettingen (DE)); FERRARI, Arnaud (Uppsala University (SE))

Presenter: BOKAN, Petar (Uppsala University (SE), Georg-August-Universitaet Goettingen (DE))

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