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Search for Di-Higgs Signals Decaying into 4 b-jets Produced in Association with Two Forward Jets in pp collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector

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ATLAS has an extensive search program studying di-Higgs signatures. These searches are interesting for their potential to find not only new resonances decaying to pairs of Higgs bosons, but also for their sensitivity to otherwise difficult to measure couplings of the Higgs boson, such as the self-coupling. Using 127 fb^{-1} of Run 2 pp collisions at $\sqrt{s} = 13$ TeV, the ATLAS experiment recently performed a new search for di-Higgs production in association with two forward jets, which is sensitive to the Vector Boson Fusion production mode. The analysis uses the decay channel with the largest branching ratio, the 4b mode, and triggers on b-jets. No excess over the SM expectation is found, and the world's first limits on di-Higgs production in association with two forward jets are set; in addition, the first limits on the quartic coupling of two vector bosons and two Higgs bosons are set. Future directions include extensions to the other decay modes available and a broader interpretation of the data in the space of Higgs boson couplings.

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