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Search for Higgs boson pair production in the $b^- b^+ \gamma$ final state from 13 TeV $p p$ collision data with the ATLAS detector

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A search for di-Higgs boson production in the $b b \gamma \gamma$ final state is presented, using data collected by the ATLAS experiment during the second data-taking period (Run 2) of the LHC, amounting to an integrated luminosity of 140/fb. Searching for Higgs boson pairs provides an excellent handle for understanding the fundamentals of the Higgs mechanism, and in particular for measuring the trilinear Higgs boson self-coupling λ_{HHH} , which is still largely unconstrained. In the new

$HH \rightarrow b b \gamma \gamma$ analysis discussed here the two dominant HH production modes (via gluon-gluon Fusion and Vector Boson Fusion) are probed. Moreover, the Vector Boson Fusion production mode constitutes a unique probe to the quartic interaction between two vector bosons and two Higgs bosons (namely, HHVV). This analysis sets upper limits on the di-Higgs production cross-section, and derives exclusion intervals on the Higgs self-coupling λ_{HHH} and the strength of the HHVV interaction.

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