

Effective Field Theory interpretation of the search for Higgs boson pair production in the two bottom quarks plus two photons final state with the ATLAS detector

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Measuring Higgs pair production will give us information about the Higgs self coupling, which is key to determine the shape of the Higgs potential at higher order $O(3)$.

The leading production mode is gluon gluon fusion, with a cross section of 31.05 fb at a centre of mass energy of 13 TeV. Given the small cross section, Higgs pair production has not yet been observed. However, despite its low branching fraction, the search for Higgs boson pair production in the two bottom quarks plus two photons final state (HH->bbyy) exploits the great diphoton mass resolution of the ATLAS detector to set very competitive upper limits to the HH production cross section.

The search for HH->bbyy with 2015-2018 data recorded by the ATLAS detector sets observed (expected) upper limits to the HH cross section of 4.1 (5.5) times the SM cross section. These are the most stringent upper limits published by ATLAS up to date.

Assuming no new unknown particles are produced at the LHC energy, different interpretations can be used to measure deviations from the SM predictions due to new physics produced at much higher energies. These interpretations of the HH->bbyy search can help us to understand whether the observed result is best described by Higgs self-interaction or other processes that give similar signatures.

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