

Measurements of the Higgs potential at the LHC

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The overabundance of matter over antimatter in the universe today is one of the major unanswered questions in modern physics. Several mechanisms for generating this asymmetry have been theorized but not all are testable at current particle physics facilities. If beyond the Standard Model (BSM) physics enters in the Higgs sector that modifies to the electroweak phase transition, electroweak baryogenesis is a compelling explanation for the matter-antimatter asymmetry. Measurement of the Higgs self-coupling provides information on the local shape of the Higgs potential, which can reveal imprints of relevant BSM effects. The best probe of the Higgs self-coupling is through searches for double-Higgs production in the $b\bar{b}\gamma\gamma$ final state. In this talk, I will present the ATLAS search for HH production in this channel using the full Run 2 dataset and interpretations in effective field theories. I will conclude with a brief discussion of a new graph neural network momentum regression algorithm being developed to improve the resolution of $H \rightarrow b\bar{b}$ decays, which will improve the sensitivity to all the leading HH channels at the LHC.

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Primary author: BULLARD, Brendon (SLAC National Accelerator Laboratory)

Presenter: BULLARD, Brendon (SLAC National Accelerator Laboratory)

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