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## Search for a heavy Higgs boson decaying into a Z boson and another heavy Higgs boson in the $llbb$ final state in 13 TeV pp collision with ATLAS detector

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In this talk a search for a Higgs boson cascade in the context of the two-Higgs-Doublet Model is presented. In this cascade, a heavy Higgs boson  $A$  decays to  $ZH$ , where  $H$  is another heavy Higgs boson with mass  $> 125$  GeV. Subsequently, the  $Z$  boson decay leptonically and the  $H$  boson into a  $bb$  pair. The search is motivated by the mechanism which generates the matter-antimatter asymmetry in the context of extended Higgs sectors, known as electroweak baryogenesis. In the context of 2HDM, this mechanism requires large mass splitting between the two heavier Higgs bosons. The search uses a data sample corresponding to an integrated luminosity  $36.5 \text{ fb}^{-1}$  from proton-proton collision data at a center-of-mass of 13 TeV recorded in 2015 and 2016 by the ATLAS detector at the LHC.

The  $A$  boson is assumed to be produced via gluon-fusion and  $b$ -associated production in the mass range 230-800 GeV and to decay to the  $H$  boson in the mass range 130-700 GeV, which is preferred by electroweak baryogenesis models. The dominant backgrounds of this analysis are expected to be Standard Model  $Z +$  heavy flavour jets and top-pair production. Monte Carlo samples are data driven method are used to develop methods to estimate the backgrounds and improve the sensitivity of the analysis.

The result of the search has been published in 2018 [Phys. Lett. B 783(2018)392]. No evidence for the production of an  $A$  boson is found. Considering each production process separately, 95% confidence-level upper limits on the  $pp \rightarrow A \rightarrow ZH$  production cross-section times the branching ratio  $H \rightarrow bb$  are reported to be in the range  $14\text{-}830 \text{ fb}^{-1}$  for the gluon-gluon fusion process and  $26\text{-}570 \text{ fb}^{-1}$  for the  $b$ -associated production process for the corresponding mass ranges of  $A$  and  $H$  bosons. The results are also interpreted in the context of two-Higgs-doublet models.

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