A MC template-based search for dimuon decays of the Higgs boson in the VBF production mode DMITRY KONDRATYEV, Purdue University, CMS COLLABORATION COLLABORATION — The CMS collaboration recently published their result of the search for the Higgs boson decay to two muons using the full LHC Run 2 data set (137fb^{-1}). In comparison with previous searches, the analysis sensitivity was substantially enhanced by splitting the data into four exclusive channels, corresponding to different Higgs production modes. The channel targeting the vector boson fusion (VBF) mode used a Monte-Carlo (MC) based strategy, not previously implemented in $H \rightarrow \mu\mu$ searches. In this approach, the background and expected signal were predicted from MC simulation, and a deep neural network (DNN) was trained to maximize the signal-background separation. The signal strength was then extracted by fitting the MC templates of the DNN output score to the observed data. The VBF category significantly contributed to the overall sensitivity of the analysis, with the observed (expected) excess of data corresponding to 2.4 (1.8) standard deviations. A combination of this result with other channels allowed to achieve observed significance of 3.0 standard deviations, which presents the first evidence of the Higgs boson decay to muons.

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