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The anomalous production of multi-leptons and its impact on the measurement of Wh production at the LHC

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Anomalies observed in several Standard Model (SM) results, with multiple leptons in the final state from the ATLAS and CMS experiments at the LHC, are interpreted in the context of new physics in Refs. arXiv:1711.07874 and arXiv:1901.05300. This new hypothesis extends the SM considering the presence of additional bosons through the production of a heavy boson, H, decaying into a SM Higgs boson, h, and a singlet scalar, S, which is treated as a SM Higgs-like boson. In this work the impact of the new physics on measurements of the SM Higgs boson produced in association with a W boson using Run 1 and Run 2 datasets by the LHC experiments is studied. The Higgs decay modes considered here include $h \to WW, \tau\tau, \gamma\gamma$ and the associated vectorial boson enriches the studied final states with leptons or hadrons. The overall combination of the observed measurements results in a signal strength of 2.51 ± 0.43 which corresponds to a deviation from the SM value of unity of $3.5\,\sigma$. This result is consistent with the previous observed discrepancies in final states with multiple leptons and further supports the possible existence of new physics at the LHC.

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