

Search for a resonance decaying to a scalar particle and a Higgs boson in the final state with two bottom quarks and two photons in proton-proton collisions with the ATLAS detector

A search for the resonant production of a heavy scalar χ decaying into a Higgs boson and a new lighter scalar χ' , through the process $\chi \rightarrow \chi'(\chi\chi)(\chi\chi)$, where the two photons are consistent with the Higgs boson decay, is performed. The search is conducted combining an integrated luminosity of 140 fb^{-1} of proton-proton collision data at a centre-of-mass energy of 13 TeV, and 58.6 fb^{-1} of proton-proton collision data at a centre-of-mass energy of 13.6 TeV, recorded with the ATLAS detector at the LHC from 2015-2018, and 2022-2023 respectively. Similarly to the previous iteration of this search, it is performed for $170 \leq m_{\chi} \leq 1000 \text{ GeV}$ and $15 \leq m_{\chi'} \leq 500 \text{ GeV}$ and parameterised neural networks are used to enhance the signal purity and to achieve continuous sensitivity in a domain of the $(m_{\chi}, m_{\chi'})$ plane.

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