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Search for a resonance decaying to a scalar and a Higgs boson in the final state with two bottom quarks and two photons in proton-proton collisions at 13 TeV

A search for the resonant production of a heavy scalar X decaying into a Higgs boson and a new lighter scalar S , through the process $X \rightarrow S(bb)H(\gamma\gamma)$, where the two photons are consistent with the Higgs boson decay, is performed. The search is conducted using 140 fb⁻¹ of LHC Run 2 data recorded by ATLAS. The search is performed for $170 \text{ GeV} \leq m_X \leq 1000 \text{ GeV}$ and $15 \text{ GeV} \leq m_S \leq 500 \text{ GeV}$. Parametrized Neural Networks are used to enhance the signal purity and to achieve continuous sensitivity in the (m_X, m_S) mass plane.

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