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A new LHC search for dark matter produced via heavy Higgs bosons using simplified models

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Searches for dark matter produced via scalar resonances in final states consisting of Standard Model (SM) particles and missing transverse momentum are of high relevance at the LHC. Motivated by dark-matter portal models, most existing searches are optimized for unbalanced decay topologies for which the missing momentum recoils against the visible SM particles. In this work, we show that existing searches are also sensitive to a wider class of models, which we characterize by a recently presented simplified model framework. We point out that searches for models with a balanced decay topology can be further improved with more dedicated analysis strategies. For this study, we investigate the feasibility of a new search for bottom-quark associated neutral Higgs production with a $b\bar{b}Z + p_T^{\text{miss}}$ final state and perform a detailed collider analysis. Our projected results in the different simplified model topologies investigated here can be easily reinterpreted in a wide range of models of physics beyond the SM, which we explicitly demonstrate for the example of the Two-Higgs-Doublet model with an additional pseudoscalar Higgs boson.

Collaboration / Activity

DESY CMS/Theory

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