

Abstract Submitted  
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**Probing off-shell Higgs portals at colliders** MAXIMILIAN RUHDORFER, TU Munich, ENNIO SALVIONI, CERN, ANDREAS WEILER, TU Munich — We present the reach of current and future colliders on the vector boson fusion production of invisible scalars through an off-shell Higgs boson. The two leading Higgs portals, *renormalizable* and *derivative*, are discussed and their sizeable differences highlighted. We consider a variety of future high-energy lepton and hadron colliders, emphasizing the unique potential of a multi-TeV muon collider to probe this nightmare scenario for new physics. The impact on strongly motivated theoretical models is assessed, including pseudo-Goldstone WIMP dark matter, electroweak baryogenesis, and neutral naturalness. Based on arXiv:1910.04170 [hep-ph] (published in SciPost Physics 8 (2020) 027), and work in progress.

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