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Hypothesising the effects of Higgs portal dark matter in particle colliders

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Abstract content
   (Max 300 words)
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The Higgs field mass term in the Standard Model is exceptionally unique. While all of the other interaction terms in the Standard Model are associated with strictly renormalisable dimension 4 operators (and therefore having marginal couplings), the Higgs field mass term has a coupling of dimension 2. This allows us to explore the possibility of the Higgs boson having decay channels consisting of particles being $SU(3) \times SU(2) \times U(1)$ singlets, meaning that they do not interact with any Standard Model particles apart from the Higgs. We could treat these particles as candidates in a field of study which is now being known as Higgs portal dark matter. In order to test this possibility, a model independent theory has been developed in the form of a Lagrangian consisting of extensions to the Standard Model: a heavy Scalar H and a non-interacting dark matter scalar chi, along with associated trilinear and quartic couplings. The implications of this model are considered where a Monte Carlo study has been performed on the process $gg \rightarrow H \rightarrow h\chi\chi$, in order to obtain results which can be directly linked to experimental observations.

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Level for award
 (Hons, MSc,
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MSc

Main supervisor (name and email)
and his / her institution

Prof. Bruce Mellado, bmellado@mail.cern.ch, University of the Witwatersrand

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Primary author: Mr VON BUDDENBROCK, Stefan (University of the Witwatersrand)

Co-authors: Prof. CORNELL, Alan (NITheP); Prof. MELLADO, Bruce (University of Wisconsin - Madison); Dr KUMAR, Mukesh (University of the Witwatersrand)

Presenter: Mr VON BUDDENBROCK, Stefan (University of the Witwatersrand)

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