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Higgs decay via the dark vector boson to four leptons

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The Standard Model (SM) is known to be incomplete (it cannot explain dark matter, dark energy, gravitational waves, matter-antimatter asymmetry, etc). The introduction of a Dark Sector via an additional $U(1)_{D}$ gauge symmetry added to the SM Lagrangian could be the long-awaited solution. In this model there is a dark vector boson Z_d which can mix with the SM hypercharge gauge boson. This opens the Hypercharge Portal which can mediate the fluctuation of a Z to a Z_d , or the decay of the Z_d to SM leptons. If a dark Higgs singlet also exists, this then breaks the $U(1)_D$, opening the Higgs portal and also allowing for Higgs mass mixing between the SM and dark sectors. Including dark fermionic fields in the Lagrangian allows for long-lived cold Dark Matter candidates. The various connections between the Dark and SM sectors allow descriptions of many key astro-physical phenomena. The Model is therefore a fascinating candidate for new physics beyond the SM. It becomes crucial to search for experimental signatures of this model. This contribution discusses a search for the dark force boson Z_d using its production via the Higgs Portal and its decay back to SM leptons: $H \rightarrow h_d \rightarrow Z_d \rightarrow 4l$.

Apply to be considered for a student award (Yes / No)?

yes

Level for award (Hons, MSc, PhD, N/A)?

MSc

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

SH Connell
University of Johannesburg

Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

yes

Primary author: Mr NTSOELE, Phineas (University of Johannesburg)

Co-author: COLLABORATION, ATLAS (University of Johannesburg)

Presenter: Mr NTSOELE, Phineas (University of Johannesburg)

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