



Contribution ID: 104

Type: Oral Presentation

## The search for the Dark Vector Boson via the Higgs Portal

Friday, 8 July 2016 14:40 (20 minutes)

**Abstract content** &nbsp; (Max 300 words) <a href="http://events.saip.org.za/getFile.py?target=\_blank">Formatting & Special chars</a>

The Standard Model (SM) is known to be incomplete. The introduction of a Dark Sector via an additional  $U(1)_D$  gauge symmetry added to the SM Lagrangian provides a mechanism to introduce much needed new physics without perturbing the already excellent agreement between the SM theoretical description and the Electroweak Precision Observables (EWPO) experimental constraints. The model has a dark vector boson  $Z_d$  which can mix with the hypercharge gauge boson with the coupling  $\epsilon$ . 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  $s$  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, described by the Higgs mass mixing parameter,  $k$ . 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:  $H \rightarrow h_d \rightarrow Z_d Z_d \rightarrow 4l$ . The results from ATLAS Run 1 and the further development of the search for Run 2 are presented.

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

No

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

N/A

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

Yes

**Please indicate whether this abstract may be published online (Yes / No)**

Yes

**Primary author:** Prof. CONNELL, Simon (University of Johannesburg)

**Presenter:** Prof. CONNELL, Simon (University of Johannesburg)

**Session Classification:** Nuclear, Particle and Radiation Physics (1)

**Track Classification:** Track B - Nuclear, Particle and Radiation Physics