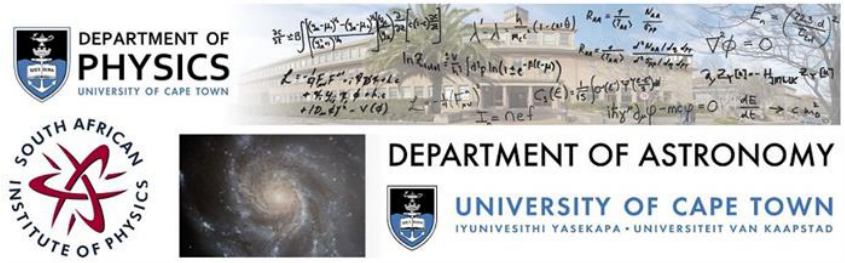

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The search for the Dark Vector Boson via the Higgs Portal

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

Abstract content
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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 ε. 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 → h_d→ Z_dZ_d → 4l. The results from ATLAS Run 1 and the further development of the search for Run 2 are presented.

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