

Dark Z model and Higgs Phenomenology

Friday, 26 July 2024 10:00 (35 minutes)

We consider the phenomenology of the Higgs bosons in the hidden sector model mediated by an additional $SU(2)$ scalar doublet. With the mediator scalar doublet, the Higgs sector of the model is extended to be that of the two Higgs doublet model of type I. The mediator scalar doublet is connected to the hidden sector with the hidden $U(1)$ gauge charge. Then the $U(1)$ gauge symmetry is spontaneously broken by the electroweak symmetry breaking and the hidden $U(1)$ gauge boson gets the mass to give rise to a dark Z boson. Using the programs `higgsbounds` and `higgsignals`, we incorporate current experimental limits from LEP, Tevatron, and LHC to examine the Higgs sector in our model and derive constraints on model parameters together with the electroweak processes. As a result, our model favors the light dark Z boson. We also investigate the implications of the model on the dark matter phenomenology when the hidden fermion is a dark matter candidate.

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Session Classification: Presentations