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Parallel Universe, Dark Matter and Invisible Higgs Decays

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The existence of the dark matter with amount about five times the ordinary matter is now well established. There are now many candidates for this dark matter. However, dark matter could be just like the ordinary matter in a parallel universe. If both universes are described by a non-abelian gauge symmetries, then there will be no kinetic mixing between the ordinary photon and the dark photon, and the dark proton, dark electron and the corresponding dark nuclei, belonging to the parallel universe, will be stable. If the $(\lambda_{\text{QCD}})_{\text{dark}}$ in the parallel universe is five times that of (λ_{QCD}) , then the dark proton will be about five times heavier, explaining why the dark matter is five times the ordinary matter. However, the two sectors will still interact via the Higgs boson of the two sectors. This will lead to the existence of a second light Higgs boson, just like the Standard Model Higgs boson. This gives rise to the invisible decay modes of the Higgs boson which can be tested at the LHC, and the proposed ILC.

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