



ID de Contribution: 2

Type: Poster

Electroweak Higgs Sector of Brane Worlds and Extra Dimensions

In the Standard Model (SM) of Particle Physics, the electroweak (EW) symmetry breaking pattern is the less known and understood. With the discovery of a Higgs-like boson by the Large Hadron Collider (LHC) experiment in 2012, the Brout-Englert-Higgs (BEH) mechanism, which involves a new scalar field to break the EW gauge symmetry, seems to be at work in Nature. Nevertheless, the origin of the BEH field remains a mystery and it suffers from a technical naturalness puzzle: why the Higgs boson is so light compared to the quantum gravity scale? The Higgs sector can also play an important role to understand the open questions of the SM, like the flavour landscape, the masses of the neutrinos, the dark components of the Universe, the inflation... My PhD subject involves studying models with spatial extra dimensions, which could solve some of these questions. Several scenarii are present in the literature: brane worlds, warped and/or magnetized extra dimensions, Gauge-Higgs Unification (GHU). In practice, I develop models using some of these frameworks, from which I dig out the first phenomenological consequences.

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