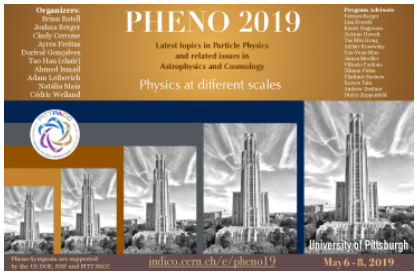

Contribution ID: **729** Type: **parallel talk**

A Portalino to the Twin Sector

Tuesday 7 May 2019 18:15 (15 minutes)

Extensions of the Standard Model are often highly constrained by cosmology. The presence of new states can dramatically alter observed properties of the universe by the presence of additional matter or entropy. Especially if those new states exist near the weak scale and thermal contact brings new particles into equilibrium. Without a means to deposit this energy into the SM, often these scenarios are excluded. Scenarios of ''neutral naturalness" especially, such as the Twin Higgs often suffer from this. However, the Portalino, a singlet fermion that marries gauge neutral fermion operators, can naturally help. Unfortunately, since the third neutrino mixing angle predicted in this scenario $|U_{\tau n}| \sim \mathcal{O}(v_h/f)$ is tightly constrained by the low energy experiments, it involves more concerns in model building. In this talk, based on the Portalino formalism I will show two simple extensions of the minimal Twin Higgs model, say the weak solution and the strong solution, to evade the aforementioned constraints. In the weak solution, an additional scalar $SU(2)_L$ doublet is introduced in each sector so that $U_{\tau n}$ is suppressed by the extra mass term of twin leptons. Meanwhile, flavor violating neutrino mass matrix is generated through the Zee mechanism at one-loop level in the SM sector. Alternatively, the strong solution lifts the twin particle masses via the vacuum expaction values of twin leptoquark and diquark. In this approach, both of the baryon number and strong gauge symmetry are spontaneously broken in the hidden sector while are preserved in the visible one. The collider signatures of this model include the leptoquark and diquark single/pair productions and decays which might be captured within the range of LHC.

Summary

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Session Classification: BSM IV