

Contribution ID: 811

Type: Parallel

Flavour hierarchies, extended groups and a composite Higgs

Monday 7 July 2025 08:45 (15 minutes)

We present a model that extends the electroweak gauge symmetry of the Standard Model in a non-universal way to $SU(2)'_L \times U(1)_X \times SU(2)^{q_3}_L \times SU(2)^{\ell^3}_R$. This symmetry is spontaneously broken to $SU(2)_L \times U(1)_Y$ near the TeV scale by a condensate of a new composite sector. Charging appropriately the fermionic degrees of freedom of the composite sector, anomaly cancellation enforces the Standard Model fermions to be charged in such a way that the extended gauge interactions respect a $U(2)_q \times U(2)_e \times U(3)_u \times U(3)_d \times U(3)_\ell$ accidental flavor symmetry.

In addition, from the same symmetry breaking, a composite Higgs boson emerges as a pseudo-Nambu-Goldstone boson of the strong dynamics of the new sector.

Due to the extended gauge and the specific flavor symmetry, leading Yukawa couplings between Higgs and fermions can only be written for the third generation and higher dimension operators generate suppressed light-family Yukawa couplings. Furthermore, CKM mixing angles between third and light families result naturally suppressed while the PMNS ones, anarchic.

The model thus provides a unified origin for the Higgs boson and the flavor hierarchies between third and light families.

Secondary track

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Track Classification: T09 - Beyond the Standard Model