

Fake GUT based on $SU(5) \times SU(3)$

lundi 30 mai 2022 16:10 (20 minutes)

It is remarkable that the matter fields in the Standard Model (SM) are apparently unified into the $SU(5)$ representations.

A straightforward explanation of this fact is to embed all the SM gauge group into a simple group containing $SU(5)$.

Recently, however, a new framework “fake GUT” has been proposed.

In this new framework,

the apparent matter unification can be explained by a chiral gauge group $\mathbb{R} \times SU(5)$.

We emphasize that the SM matter fields are not necessarily embedded into the chiral representations to explain the apparent unification.

In the previous work,

a concrete model based on a non-simple group, $SU(5) \times U(2)$, has been studied.

In this paper, we extend the model to the one based on a semi-simple group, $SU(5) \times SU(3)$.

With this extension, we can successfully explain the charge quantization, avoiding the Landau pole problem in the original model.

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Classification de Session: Parallel session 3