Contribution ID: 28

Type: not specified

Asymptotic grand unification in SO(10) with one extra dimension

Saturday, 19 April 2025 16:40 (20 minutes)

Asymptotic grand unification provides an alternative approach to gradually unify gauge couplings in the UV limit, where they reach a non-trivial UV fixed point. Using an economical and realistic particle content setup, we demonstrate that asymptotic grand unification can be achieved in SO(10) with one extra dimension. The top, bottom and tau masses are split, and the smallness of the neutrino mass is explained via seesaw mechanisms. One intermediate scale, the Pati-Salam symmetry breaking scale, is included below the compact-ification scale. Due to the restricted Higgs content, gauge couplings exhibit asymptotic safety and are thus asymptotically unified, regardless of their initial values. In contrast, Yukawa couplings exhibit asymptotic freedom, requiring explicit unification at the compactification scale if decomposed from the same couplings in SO(10). Asymptotic freedom of the 't Hooft Yukawa couplings is realized when the negative gauge contribution dominates over the positive Yukawa contribution in the competition within the beta functions. The widely-used 126-dimensional Higgs is not recommended in this asymptotic SO(10) GUT with one extra dimension.

Primary authors: FANG, Gao-Xiang (HIAS); Prof. ZHOU, Ye-Ling (School of Fundamental Physics and Mathematical Sciences, Hangzhou Institute for Advanced Study, UCAS); Prof. WANG, Zhi-Wei (School of Physics, The University of Electronic Science and Technology of China)

Presenter: FANG, Gao-Xiang (HIAS)

Session Classification: Plenary