SU(5) x SU(5) Unification Revisited

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The heterotic string theory can embeds the crossed gauge group SU(5) x SU(5). Here we investigate the string unification in this framework and the concerning problems. We show generically that only a very constrained parameter space is allowed for new particles, mostly due to the gauge coupling constant α_1^{-1}. One possible but unfavourable solution is given by the introduction of three fermion generations of SU(5)_L-adjoint representation. Only the low-scale decompositions of SU(5)_L with vanishing hypercharge ((1,3)_0 triplets and (8,1)_0 octets) of both fermionic and bosonic types can be included to circumvent the problem. The triplets must live in TeV region and could be accessible at colliders. We also show that non-supersymmetric scenario is exclusively compatible with the introduction of additional color-SU(2)_L-triplet field while supersymmetry is only possible at high-energy scale. All these intermediated thresholds are easily incorporated into the called Adjoint SU(5) schemes