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Geometrical Origin of CP Violation and CKM and MNS Matrices in SU(5) x T'

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: We propose the complex group theoretical Clebsch-Gordan coefficients as a novel origin of CP violation. This is manifest in our model based on SUSY SU(5) combined with the double tetrahedral group, T', as the family symmetry. Due to the presence of the doublet representations in T', there exist complex CG coefficients, leading to explicit CP violation in the model, while the Yukawa couplings and the vacuum expectation values of the scalar fields remain real. The tri-bimaximal neutrino mixing matrix arises from the CG coefficients of T'. In addition to the prediction for theta_13 ˜ (1/(3sqrt(2))) theta_c, the model gives rise to a sum rule, tan2(theta_sol) ˜ tan2(theta_sol_TBM) + (1/2) theta_c cos(delta_ell), which is a consequence of the Georgi-Jarlskog relations in the charged fermion sector. The predicted leptonic Dirac CP phase, delta_ell, gives the correct value of the solar mixing angle, and the predicted CP violation measures in the quark sector are consistent with the current experimental data. With flavor effects included, sufficient amount of baryon number asymmetry can be obtained through leptogenesis. Since the Dirac CP phase is the only non-vanishing phase predicted in the lepton sector, there is a connection between leptogenesis and low energy leptonic CP violating processes in our model.

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