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A Model for Large theta13 Constructed using the Eigenvectors of the S4 Rotation Matrices

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A procedure for using the eigenvectors of the elements of the representations of a discrete group in model building is introduced and is used to construct a model that produces a large reactor mixing angle, sin^2(theta13)=2/3 sin^2(pi/16), in agreement with recent neutrino oscillation observations. The model fully constrains the neutrino mass ratios and predicts normal hierarchy with the light neutrino mass, m1~25 meV. Motivated by the model, a new mixing ansatz is postulated which predicts all the mixing angles within 1sigma errors.

Summary

The symmetries represented by a discrete group are related to the eigenvectors of the group elements. We develop a notation to uniquely identify the eigenvectors and use it to assign vevs for the flavons. An orthonormal set of eigenvectors define the fermions'flavour states. The model thus constructed predicts the reactor mixing angle: sin^2(theta13) = 0.025, as well as the ratios of the neutrino masses: m1 : m2 : m3 = 0.945 : 1 : 2.117. The Triphimaximal versions of the model provide solutions for theta23 in the first octant, sin^2(theta23) = 0.387, as well as in the second octant, sin^2(theta23) = 0.613. The Triphimaximal as well as the Trichimaximal versions give sin^2(theta12) = 0.342. A new mixing ansatz, VS_(i^n)(alpha), is introduced which gives reduced values for theta12 . The ansatz also predicts various values for delta_CP .

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