The structure of neutrino mass matrix

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Abstract

We reconstruct the Majorana mass matrix of neutrinos in flavor basis, using all available experimental data on neutrino masses and mixing. We consider the absolute values of the matrix elements $m_{\alpha\beta}$, $\alpha, \beta = e, \mu, \tau$. We study the dependence of $m_{\alpha\beta}$ on the three CP violating phases δ (Dirac), ρ and σ (Majorana), on the mixing parameter $\sin\theta_{13}$ and also the dependence on the absolute mass scale, m_0, for both normal and inverted mass hierarchy (ordering). The contours of constant mass in the $\rho - \sigma$ plane have been constructed for all $m_{\alpha\beta}$. All the possible structures of the mass matrix have been analyzed. We identify regions of parameters in which the matrix has (i) a structure with dominant $\mu\tau$-block, (ii) various hierarchical structures, (iii) structures with special ordering or equalities of elements, (iv) the democratic form. Perspectives to further restrict the structure of the mass matrix in future experiments, in particular in the $\beta\beta_{0\nu}$-decay searches, are discussed.