The Weak Mixing Matrix

VIC DANNON, ROBERT LEVINE — We show that the Weak Mixing Matrix,
\[
\begin{pmatrix}
U_{ud} & U_{us} & U_{ub} \\
U_{cd} & U_{cs} & U_{cb} \\
U_{td} & U_{ts} & U_{tb}
\end{pmatrix},
\]
is not equal to the product of rotations, and in particular, it is not equal to the KM, or the PDG Matrices. At most, we may find an approximating matrix for the Weak Mixing Matrix that is based on the rotation matrices.

We show that one such approximating matrix for the Real part of the Weak Mixing Matrix is
\[
\begin{pmatrix}
\cos \theta_C \cos \theta_C^3 & \sin \theta_C \cos \theta_C^3 & \sin^3 \theta_C \cos \theta_C^3 \\
-\sin \theta_C \cos \theta_C^3 & \cos \theta_C \cos \theta_C^3 & \sin^2 \theta_C \\
-\cos \theta_C \sin^3 \theta_C & -\cos \theta_C \cos \theta_C^3 \sin \theta_C & \cos \theta_C^3 \cos \theta_C^3
\end{pmatrix},
\]

where $\theta_C$ is the Cabbibo angle.

The approximating matrix depends on $\theta_C$ alone, and predicts the Real part of the Weak Mixing Matrix to a high degree of accuracy.

We establish, with a Chi-Squared Goodness-of-Fitness-Test, that our approximating matrix can be used with extremely high level of statistical confidence.

Vic Dannon

Date submitted: 03 Sep 2009

Electronic form version 1.4