Comment on "On one parametrization of Kobayashi-Maskawa matrix"

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Abstract

A recent arXiv paper [0912.0811] claims that the Wolfenstein parametrization for the Kobayashi-Maskawa matrix has a serious flaw. This is not the case.

In "On one parametrization of Kobayashi-Maskawa matrix" [1] the claim is made that the Wolfenstein parameterization of 3×3 unitary matrices is faulty, and that this parameterization is unable to describe a unitary matrix with amplitudes having magnitude $\sqrt{1/3}$. In fact, setting

$$\begin{array}{rcl} \lambda &=& \sqrt{1/2}, \\ A &=& \sqrt{2}, \end{array} \quad , \quad \begin{array}{rcl} \rho &=& 0, \\ \eta &=& \sqrt{4/3}, \end{array} \tag{1}$$

gives

$$\begin{array}{rcl} \beta &=& \arcsin(\sqrt{1/3}), \\ \theta &=& \arcsin(\sqrt{1/2}), \end{array} \quad , \quad \begin{array}{rcl} \gamma &=& \arcsin(\sqrt{1/2}), \\ \delta &=& \pi/2 \end{array} \tag{2}$$

and thus

$$\begin{array}{rcl} s_{13} &=& \sqrt{1/3}, \\ c_{13} &=& \sqrt{2/3}, \end{array} \quad , \quad \begin{array}{rcl} s_{12} = c_{12} &=& \sqrt{1/2}, \\ s_{23} = c_{23} &=& \sqrt{1/2}, \end{array} \tag{3}$$

which defines a unitary matrix with all magnitudes equal:

$$\sqrt{1/3} \begin{pmatrix} 1 & 1 & -i \\ iw & iw^* & 1 \\ iw^* & iw & 1 \end{pmatrix}, \tag{4}$$

where $w = \exp(2i\pi/3)$.

References

[1] Petre Dita, "On one parametrization of Kobayashi-Maskawa matrix", 0912.0811.