

PRL justification

Measurements of CP asymmetries in $B \rightarrow K\pi$ decays are inconsistent with expected relations between these quantities in the SM, based on isospin considerations. A key input to understanding this anomaly is the direct CP asymmetry in the decay $B^+ \rightarrow K^+\pi^0$. This letter presents the most precise measurement of $A_{CP}(B^+ \rightarrow K^+\pi^0)$ to date, a significant improvement on the world average and the first measurement of this quantity at the Large Hadron Collider. When included in the world average this measurement significantly strengthens the significance of the difference $A_{CP}(K^+\pi^0) - A_{CP}(K^+\pi^-)$ from 5.5σ to $> 8\sigma$ and the non-zero significance of the $A_{CP}(B^0 \rightarrow K^0\pi^0)$ prediction from 4.5σ to 5.5σ .