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CP violation in three-body $B^{\pm}$ phase space (15' + 5')

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The formation of CP violation (CPV) constrained by CPT invariance is affected by resonances and final state interactions (FSI). Starting from the CPT constraint, we propose a generalized CP asymmetry formula including resonances and FSI. A simple B decay model is elaborated with the ρ and $f_0(980)$ resonances plus a non resonant background including the $\pi\pi \to KK$ scattering amplitude. Performing the fit of the CP asymmetry for the charmless three-body $B^{\pm}$ decay channel $B^{\pm} \to \pi^{\pm}\pi^{+}\pi^{-}$, the formula presents fair agreement with the high statistics
LHCb data in the mass region below 1.6 GeV and we obtain as outcome the $B^{\pm} \to \pi^{\pm}K^{+}K^{-}$ for $\pi\pi$ channel asymmetry. Analogously, the CP asymmetry of the $B^{\pm} \to K^{\pm}\pi^{+}\pi^{-}$ decay is also described, obtaining the $B^{\pm} \to K^{\pm}K^{+}K^{-}$ channel as
output. We also found agreement with LHCb experimental data, as in the previous case.

The new LHCb release of the 2011/2012 CPV two-body distributions in all three-body channels, with light charged pseudo-scalars, shows all the previous features for two-body invariant masses below 2 GeV, discussed above, in addition presenting new sources of CPV in the high KK, $\pi\pi$, $K\pi$ invariant masses around 4 GeV. In this contribution, the model described above is extended to study the CP violation in this high mass energy region. The CPV occurring in this sector of the phase space could be associated with the final state interaction coupling the pair of light pseudo-scalars to double charm B decay channels, as suggested long ago by Wolfenstein. We will explore this idea in the context of our previous CPT invariant B decay formalism with final state interaction and study the CPV data of the new LHCb release in the invariant two-body mass region around 4 GeV.

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