# HEPP-CPV-project

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## I. INTRODUCTION

Short intro here

## II. $\hat{P}$, $\hat{C}$ AND $\hat{C}\hat{P}\hat{T}$

## III. CP VIOLATION

CP violation was first observed in the mixing of neutral K-mesons by Christenson, Cronin, Fitch and Turlay in 1964 [1]. They observed the $\hat{C}\hat{P} = -1$ state $K_L^0$ decaying to 2 pions, a state with $\hat{C}\hat{P} = 1$. Although the fraction of $K_L^0$ decays violating $\hat{C}\hat{P}$ in this way is tiny, the discovery was significant.

## IV. CPV IN D-MESON SYSTEM

The quark constituents of the $D^0(1865)$ and $\bar{D}^0(1865)$ mesons are $(c\bar{u})$ and $(u\bar{c})$, respectively. This system is unique as it is the only system which undergoes mixing and contains an up-type quark. As opposed to the $K^0$ and $B_s$ (CHECK!)

The first stage in detecting CPV in any system is to find mixing between a particle and its anti-particle. Clear evidence for mixing between these states was announced in 2007 and published in 2008 by the BaBar collaboration, followed shortly by the Belle collaboration [11][12]. Results from both experiments show a small amount of $D^0$ mixing with 3.9 $\sigma$ certainty, at a level of 1%, which is consistent with SM predictions. However, measured CP violating parameters were consistent with zero, and thus with no CPV. A different experimental method was used by both experiments, here we discuss the method used by BaBar.

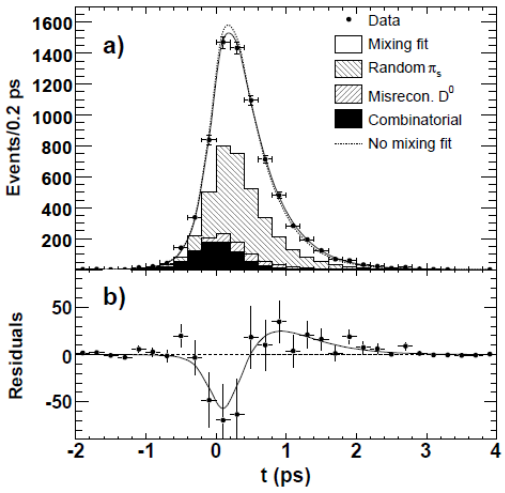


FIG. 1:

## APPENDIX A: APPENDIX

Difficult calculations in here.

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