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Mixing-induced CP violation at BaBar

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While CP violation in the B-meson system has been well established by the B factories, there has been no direct observation of time-reversal violation in this system. Using 468 million B-Bbar pairs collected by the BABAR detector at SLAC, we measure T-violating parameters in the time evolution of neutral-B mesons by comparing the probabilities of B0 or anti-B0 transforming into definite CP final states and vice versa. The results lead to the first direct observation of Time Reversal non-invariance, independent of CP violation.

We present a new measurement of the time-dependent CP-asymmetry parameters S and C in the decay B0 −> D*D* decays using 467 million B-Bbar pairs collected with the BABAR detector at SLAC. The analysis makes use of the technique of partial reconstruction, resulting in high reconstruction efficiency and high statistics. From S and C we extract the CP-even components S_+ and C_+. Comparison of S_+ to the standard-model prediction based on measurements from b−>c cbar s decays constitutes a test for the presence of new physics contributions in this decay.

We present a measurement of the mixing-induced CP asymmetry for B0 mesons. Semileptonic B0−>D*lnu decays are selected with a partial reconstruction technique that allows for high selection efficiency and high statistics with precise determination of the background. The resulting precision is comparable with the measurements based on di-lepton tags performed at the B-factories.

B decays that proceed via penguin amplitudes are sensitive to new-physics contributions. Measurements of time-dependent CP violation in such decays have yielded results that were not fully consistent with those from the more precise b−> c cbar s decays. This warrants further studies with all possible decay modes, requiring in particular use of decays with multibody final states. We report updated time-dependent CP violation and Dalitz-plot analyses of the decays B0 −> Ks Ks Ks and B0−>K+K- Ks. The high Ks multiplicity in the first mode essentially precludes its study at the LHC at this time. We report the total branching fractions, contributions of intermediate resonances, and CP violation parameters. We report the first evidence for CP violation in B0 −> Ks Ks Ks, with CP conservation excluded at 3.8 standard deviations.

Primary author: Dr DE SANGRO, Riccardo (INFN Frascati (IT))

Presenter: Dr DE SANGRO, Riccardo (INFN Frascati (IT))

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