Investigation of the Charmless Decay $B^{\pm} \rightarrow K^{\pm}K^{\mp}K^{\pm}$ using a Dalitz Plot analysis at BaBar

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Abstract

Results of an amplitude analysis of the $B^{\pm} \to K^{\pm}K^{\mp}K^{\pm}$ Dalitz plot are presented. The analysis is made using an integrated luminosity of $210.6\,\mathrm{fb}^{-1}$, recorded by the *BABAR* detector at the PEP-II asymmetric B Factory. This dataset corresponds to 231.8 million $B\overline{B}$ pairs.

Branching fractions and 90% confidence level upper limits are calculated and averaged over charge conjugate states ($\mathcal{B}$). For those modes that have significant branching fraction measurements *CP* violating charge asymmetry measurements are also presented (A_{CP}). However the asymmetry for all modes is consistent with zero.

A feature is found around $1.5\,\mathrm{GeV}/c^2$ that corresponds to no known resonance. We measure it to be a scalar resonance of mass $(1.523^{+0.028}_{-0.020})\,\mathrm{GeV}/c^2$ and width $(175^{+32}_{-27})\,\mathrm{MeV}/c^2$. It is listed here as $(KK)^0_0$. The results from the nominal fit are summarised below:

$$\begin{aligned}
\mathcal{B}(B^{\pm} \to K^{\pm}K^{\mp}K^{\pm}\ \mathrm{Inclusive}) &= (35.1 \pm 1.3 \pm 2.1) \times 10^{-6} \\
\mathcal{B}(B^{\pm} \to K^{\pm}K^{\mp}K^{\pm}\ \mathrm{Non-resonant}) &= (18.6 \pm 3.4 \pm 1.8) \times 10^{-6} \\
\mathcal{B}(B^{\pm} \to \phi(1020)K^{\pm}; \phi(1020) \to K^{+}K^{-}) &= (4.3 \pm 0.6 \pm 0.3) \times 10^{-6} \\
\mathcal{B}(B^{\pm} \to f_0(980)K^{\pm}; f_0(980) \to K^{+}K^{-}) &= (8.7 \pm 3.1 \pm 1.4) \times 10^{-6} \\
\mathcal{B}(B^{\pm} \to (KK)^0_0K^{\pm}; (KK)^0_0 \to K^{+}K^{-}) &= (3.3 \pm 1.1 \pm 0.7) \times 10^{-6} \\
\mathcal{B}(B^{\pm} \to \chi_{c0}K^{\pm}; \chi_{c0} \to K^{+}K^{-}) &= (1.7 \pm 0.5 \pm 0.1) \times 10^{-6} \\
\mathcal{B}(B^{\pm} \to \phi(1680)K^{\pm}; \phi(1680) \to K^{+}K^{-}) &< 1.5 \times 10^{-6}
\end{aligned}$$

$$\mathcal{B}(B \to f_2(1270)K^{\pm}; f_2(1270) \to K^+K^-) \quad < \quad 1.1 \times 10^{-6}$$

$$\mathcal{B}(B \to f_2'(1525)K^{\pm}; f_2'(1525) \to K^+K^-) \quad < \quad 2.4 \times 10^{-6}$$

$$\mathcal{B}(B \to f_0(1710)K^{\pm}; f_0(1710) \to K^+K^-) \quad < \quad 3.3 \times 10^{-6}$$