

Measurement of $B \rightarrow J/\psi$ Decay Modes at CDF

Barry Wicklund*

Argonne National Laboratory, Argonne, IL, USA 60439

E-mail: abw@anl.gov

ABSTRACT: This talk summarizes CDF measurements of multiparticle decay modes of the type $B \rightarrow J/\psi K^{(*)} \pi^+ \pi^-$, based on 110 pb^{-1} of $p\bar{p}$ collisions taken at the Fermilab Tevatron during 1992-1995.

1. Introduction

Capitalizing on the very large $b\bar{b}$ production cross section at the Tevatron collider, CDF collected a large inclusive sample of $B \rightarrow J/\psi + X$ decays during 1992-1995. This sample has been used for measurements of B -hadron lifetimes and CP asymmetry, using subsamples of 1000 $J/\psi K^+$, 460 $J/\psi K^{*0}$, and 395 $J/\psi K_S^0$. In the present analysis we have used the same inclusive sample to measure decay modes involving the same channels but with an additional $\pi^+ \pi^-$ pair in each case. Such decays involve creation of a $u\bar{u}$ or $d\bar{d}$ quark pair in addition to the basic $\bar{b} \rightarrow \bar{c}(c\bar{s})$ decay. The analysis is described in detail in [1]. Here we give a brief summary of the results.

2. Results

CDF has observed several decays of the type $B \rightarrow J/\psi K^{(*)} \pi^+ \pi^-$. For the self conjugate mode $B^0 \rightarrow J/\psi K^0 \pi^+ \pi^-$, we observe 21.0 ± 6.3 signal events and obtain the branching ratio

$$\text{BR}(B^0 \rightarrow J/\psi K^0 \pi^+ \pi^-) = (11.0 \pm 4.0 \pm 2.0) \times 10^{-4}. \quad (2.1)$$

We fit these to obtain the resonant substructure, assuming no interference, and obtain the partial branching fractions

$$\text{BR}(B^0 \rightarrow J/\psi K^0 \rho^0) = (5.8 \pm 3.1 \pm 1.2) \times 10^{-4} \quad (2.2)$$

$$\text{BR}(B^0 \rightarrow J/\psi K^{*+} \pi^-) = (8.3 \pm 4.4 \pm 1.7) \times 10^{-4}. \quad (2.3)$$

*Speaker.

It is possible that some of the $B^0 \rightarrow J/\psi K^0 \rho^0$ and $B^0 \rightarrow J/\psi K^{*+} \pi^-$ signals come from $B^0 \rightarrow K_1(1270)$.

We observe 40.4 ± 9.0 signal events in the channel $B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-$ and obtain the branching ratio

$$\text{BR}(B^+ \rightarrow J/\psi K^+ \pi^+ \pi^-) = (12.0 \pm 3.0 \pm 2.0) \times 10^{-4}. \quad (2.4)$$

We observe 36.3 ± 9.9 signal events in the mode $B^0 \rightarrow J/\psi K^{*0} \pi^+ \pi^-$ and obtain the branching fraction

$$\text{BR}(B^0 \rightarrow J/\psi K^{*0} \pi^+ \pi^-) = (8.0 \pm 2.2 \pm 1.5) \times 10^{-4}. \quad (2.5)$$

We do not see evidence for any significant resonant substructure in this channel, either in the $\pi^+ \pi^-$ system or in the $K^{*0} \pi^\pm$ or $K^{*0} \pi^+ \pi^-$ systems, although we cannot exclude higher mass resonances in the final state.

2.1 Acknowledgments

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References

- [1] T. Affolder *et al.*, A Study of $B^0 \rightarrow J/\psi K^{(*)0}$ Decays with the Collider Detector at Fermilab, FERMILAB-PUB-01/232-E, submitted to Phys. Rev. Lett.