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SUBJECT: Measurements of Inclusive Cabbibo-Favoured $\bar{K}^{*0}$ and Cabbibo-Suppressed K^{*0} Decay branching Fractions of Charged and Neutral D Mesons[1]

Abstract

We report a *first* measurement of inclusive Cabbibo-Favoured $\bar{K}^{*0}$ and Cabbibo-Suppressed K^{*0} decay branching fractions of neutral and charged D mesons. The inclusive decays of the D mesons have been studied using reaction $e^+e^- \to D\bar{D}^*, D^*\bar{D}^*$ at $\sqrt{s} = 4.03$ GeV. A total of 226.3 ± 26.6 inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay events and 39.0 ± 22.2 inclusive Cabbibo-Suppressed K^{*0} decay events has been observed in the recoiling system against 9160 ± 279 tagged neutral and charged $\bar{D}$ mesons. These lead to the charged and neutral D mesons inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of $BF(D^+ \to \bar{K}^{*0}X) = (27.5^{+13.7}_{-13.0} \pm 4.2)\%$, $BF(D^0 \to \bar{K}^{*0}X) = (12.1^{+4.3}_{-4.3} \pm 2.8)\%$ and an average inclusive Cabbibo-Favoured $\bar{K}^{*0}$ and Cabbibo-Suppressed K^{*0} decay branching fractions of the combined neutral and charged D mesons together to be $BF(D \to \bar{K}^{*0}X) = (15.8 \pm 1.9 \pm 0.8)\%$ and $BF(D \to K^{*0}X) = (2.7 \pm 1.6 \pm 0.8)\%$, respectively.

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[1]This D physics analysis MEMO is only for the use of the BES Collaborators for sole purpose of reviewing the analysis described in preparation for submission to "Physical Review Letter". Please send your corrections and comments on the MEMO to Gang Rong at address of "rongg@bepc5.ihep.ac.cn".

1 Introduction

During the last two decades a lot of progress in heavy flavour physics have been made. Up to now more and more precise measurements of exclusive decay branching fractions and inclusive semileptonic decay branching fractions of charmed and bottom measons have been performing. These make one understand the decay mechanism of heavy flavor mesons better and better. However, the measurement of inclusive $\bar{K}^{*0}$[2] decay branching fractions of charmed mesons is not available[1]. These inclusive decay branching fractions may be served as an independent check for a sum of exclusive decay modes containing a $\bar{K}^{*0}$ meson in final states, which can be used to lead one to search for some new decay modes containing the $\bar{K}^{*0}$ in final states and help one understand the decay mechanism better. The values of the decay branching fractions may also be needed as inputs to more precisely simulate the charm decay in accurate measurements of B physics in experiments such as LEP, CDF and B factories, and could be useful for subtracting background in measurements of inclusive $\bar{K}^{*0}$ decay branching fractions of B mesons. Further more the values of inclusive Cabbibo-Favoured and Suppressed K^{*0} decay branching fractions of charmed mesons can provide the valuable information in understanding the weak decay mechanism better.

This paper reports on a first measurement of the inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of the charged and neutral D mesons based on an analysis of the data collected with Beijing Spectrometer (BES) in e^+e^- annihilation at $\sqrt{s} = 4.03$ GeV.

2 The Beijing Spectrometer and Data Sample

BES is a conventional cylindrical magnetic detector[2] operated at the Beijing Electron Positron Collider (BEPC)[3]. A four-layer central drift chamber (CDC) surrounding the beam pipe provides event trigger. A forty-layer main drift chamber (MDC) located just outside the CDC performs charged track reconstruction and ionization energy loss (dE/dx) measurement with a solid angle coverage of 80% of 4π for a charged track.

[2]Through the paper, reference to a particular charge configuration implies reference to the charge conjugate configuration as well.

Momentum resolution of $1.7\%\sqrt{1+p^2}$ (p in GeV/c) and dE/dx resolution of 8.5% for Bhabha scattering electrons are obtained for the data taken at $\sqrt{s}=4.03$ GeV. A array of 48 scintillation counters surrounds the MDC and measures the time of flight (TOF) of the charged track with a resolution of about 350 ps for the electrons. Surrounding the TOF is a 12-radiation-length, lead-gas barrel shower counter (BSC) operated in limited streamer mode, which measures the energies of electrons and photons over 80% of the total solid angle, and has energy resolution of $\sigma_E/E = 0.22/\sqrt{E}$(E in GeV), spatial resolutions of $\sigma_\phi = 4.5$ mrad and $\sigma_Z = 2$ cm for the electrons. Outsiding the BSC is a solenoidal magnet which provides a 0.4 T magnetic field in the central tracking region of the detector. Three double-layer muon counters instrument the magnet flux return, and serve to identify muons of momentum greater than 500 MeV/c. They cover 68% of the total solid angle with longitudinal (transverse) spatial resolution of 5 cm (3 cm). End-cap time-of-flight and shower counters extend coverage to the forward and backward regions.

The analysis is based on a total integrated luminosity of 22.3 pb^{-1} data which was collected in e^+e^- annihilation at $\sqrt{s}=4.03$ GeV at BEPC during the 1992, 1993 and 1994 runs.

3 Method of combining D^+ and D^0 double tags together

At $\sqrt{s}=4.03GeV$ the charm mesons are produced as

$$\begin{aligned} e^+e^- &\to D_s^+D_s^-, D^+D^-, D^0\bar{D}^0, \\ &\to D^\pm D^{*\mp}, D^0\bar{D}^{*0}(\bar{D}^0D^{*0}), \\ &\to D^{*\pm}D^{*\mp}, D^{*0}\bar{D}^{*0}. \end{aligned}$$

Since the $D^{*\pm}$ can decay to $\pi^+D^0(\pi^-\bar{D}^0)$ and $\pi^0(\gamma)D^+(\pi^0(\gamma)D^-)$, it is impossible to know whether a $D^+(D^-)$ or $D^0(\bar{D}^0)$ appears in recoiling side against a tagged $\bar{D}(D)$ meson. But, if one combines single and 'double' tags for the two mesons to measure their inclusive particle 'P' decay branching fractions together, he can obtain values of the decay branching fractions independently.

Suppose one wants to measure inclusive particle P decay branching fractions of the D^0 and D^+, he should search for the particle P and count the numbers ($N^P_{D^0_{tag}}$ and $N^P_{D^+_{tag}}$) of the particle P appeared in the recoiling side against the tagged D^0 and D^+,respectively. The $N^P_{D^0_{tag}}$ is related to $N^{D^-}_{D^0_{tag}}$ and $N^{\bar{D}^0}_{D^0_{tag}}$, which respectively are numbers of D^- and $\bar{D}^0$ produced in the recoiling system against the tagged D^0 sample, by

$$N^P_{D^0_{tag}} = \epsilon_1 N^{D^-}_{D^0_{tag}} BF(D^- \to PX) + \epsilon_2 N^{\bar{D}^0}_{D^0_{tag}} BF(\bar{D}^0 \to PX), \tag{1}$$

where ϵ_1 and ϵ_2 are detection efficiencies for the particle P, $BF(D^- \to PX)$ and $BF(\bar{D}^0 \to PX)$ are decay branching fractions to be measured. Similarly, for D^+ tags one has

$$N^P_{D^+_{tag}} = \epsilon_1 N^{D^-}_{D^+_{tag}} BF(D^- \to PX) + \epsilon_2 N^{\bar{D}^0}_{D^+_{tag}} BF(\bar{D}^0 \to PX), \tag{2}$$

The $N^{D^-}_{D^+_{tag}}$ and $N^{\bar{D}^0}_{D^+_{tag}}$ are the numbers of D^- and $\bar{D}^0$ produced in the recoiling system against the tagged D^+. A Monte Carlo study shows that the detection efficiencies are nearly the same, which allow to take the $\epsilon \approx \epsilon_1 \approx \epsilon_2$. By using the numbers ($N_{D^0_{tag}}$ and $N_{D^+_{tag}}$) of the D^0 and D^+ single tags, the numbers of the $\bar{D}^0$ and D^- produced in the recoiling side against the single tags can be calculated as following

$$N^{\bar{D}^0}_{D^0_{tag}} = (1-\eta) N_{D^0_{tag}}, \qquad N^{D^-}_{D^0_{tag}} = \eta N_{D^0_{tag}},$$

$$N^{\bar{D}^0}_{D^+_{tag}} = \beta N_{D^+_{tag}}, \qquad N^{D^-}_{D^+_{tag}} = (1-\beta) N_{D^+_{tag}},$$

where the η and β are the probabilities of D^- and $\bar{D}^0$ appeared in the recoiling side against the tagged D^0 and D^+, respectively. By using the values of D^*D^* and D^*D production cross section measured by the BES experiment[4], the probabilities are obtained to be $\eta = 0.1768 \pm 0.0175$ and $\beta = 0.5460 \pm 0.0622$.

Combining the equation (1) and (2) together by inserting the $N^{\bar{D}^0}_{D^0_{tag}}$, $N^{D^-}_{D^0_{tag}}$, $N^{\bar{D}^0}_{D^+_{tag}}$, and $N^{D^-}_{D^+_{tag}}$ into them, the inclusive particle 'P' decay branching fractions of $\bar{D}^0$ and D^- are given by

$$BF(\bar{D}^0 \to PX) = \frac{1}{\epsilon(1-\beta-\eta)}((1-\beta)\frac{N^{PX}_{D^0_{tag}}}{N_{D^0_{tag}}} - \eta \frac{N^{PX}_{D^+_{tag}}}{N_{D^+_{tag}}}) \tag{3}$$

and

$$BF(D^- \to PX) = \frac{1}{\epsilon(1-\beta-\eta)}((1-\eta)\frac{N^{PX}_{D^+_{tag}}}{N_{D^+_{tag}}} - \beta \frac{N^{PX}_{D^0_{tag}}}{N_{D^0_{tag}}}). \tag{4}$$

4 Data Analysis

4.1 Event Selection

For each event it is required that at least 2 (but not more than 10) charged tracks were well reconstructed in MDC with good helix fits. Each track is required to have impact parameter less than 1.2 cm in the xy plane and 15.0 cm in the Z direction. Further more, the track is required to have a normalized chsquare of less than 9 per degree of freedom. In addition, in order to optimize the momentum resolution and charged particle identification, a geometry cut ($\mid cos\theta \mid \leq 0.8$, where the θ is polar angle of the track) is applied. For the charged particle mass assignment, one (or two) level(s) of particle identification is (are) applied. First a combined particle confidence level calculated using the dE/dx and TOF measurements is required to be greater than 1% for $\pi(K)$ hypothesis; then a normalized likelihood ratio $LR(K) > 50\%$ is required for the K hypothesis. If the track pass the particle identification cuts, the $\pi(K)$ mass is assigned to the track.

4.2 Single tag of $D^0(\bar{D}^0)$ and $D^{\pm}$

After the particle mass assignments, the invariant masses of different $Kn\pi$ (n=1 or 2 or 3) combinations for the three weak hadronic decay modes $\bar{D}^0(D^0) \to K^{\pm}\pi^{\mp}$, $K^{\pm}\pi^{\mp}\pi^{\mp}\pi^{\pm}$ and $D^{\mp} \to K^{\pm}\pi^{\mp}\pi^{\mp}$ are calculated using corrected momenta components for a small value of shift of magnetic field and ionization loss of the particle in the material interior to the MDC gas.

Figure 1a-c shows the distributions of the momenta of the $K^{\pm}\pi^{\mp}$, $K^{\pm}\pi^{\mp}\pi^{\mp}\pi^{\pm}$ and $K^{\pm}\pi^{\mp}\pi^{\mp}$ combinations whose invariant masses are within ± 87, ± 51 and ± 65 MeV/c^2 ($\sim \pm 3\sigma_{M_D}$ cut) of the D^0 and D^+ nominal masses, respectively. In the figure the three lowest peaks correspond to the D mesons from the $D^*\bar{D}^*$; the peaks in the middle respect to the D mesons from the $D\bar{D}^*(D^*\bar{D})$ and the peaks at high momentum position reflect the D mesons from the $D\bar{D}$. In order to reduce combinatorial background for accumulating the single tagged D meson sample, a 3σ cut on the momenta is used. In the analysis only the D mesons from the $e^+e^- \to \bar{D}D^*(D\bar{D}^*), D^*\bar{D}^*$ reactions are selected. Figure 2a, 2b and 2c show the invariant mass distributions for events of which the combinations passed the momentum cuts for the three hadronic decay modes, respectively. Using a binned

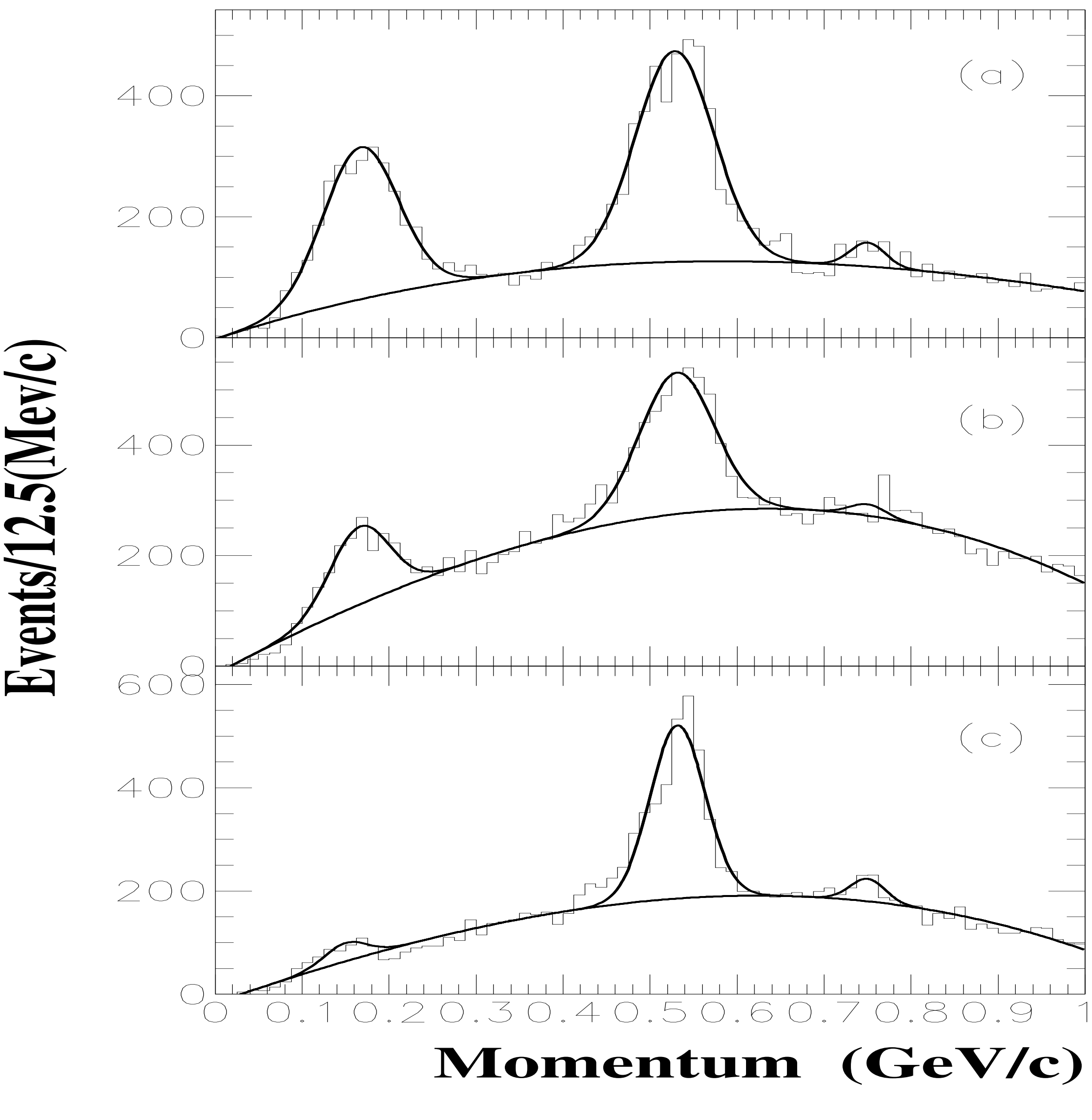

Figure 1: Momentum distribution of (a) the $K^{\mp}\pi^{\pm}$, (b) the $K^{\mp}\pi^{\pm}\pi^{\pm}\pi^{\mp}$, and (c) the $K^{\mp}\pi^{\pm}\pi^{\pm}$ combinations for events of which the charged tracks passed selection criteria and mass cuts mentioned in the text.

Table 1: Results fitted to mass spectra of the neutral and charged D mesons

Decay Modes	Mass GeV	σ_{M_D} GeV	No. of D observed	Pure No. of D
$K^{\pm}\pi^{\mp}$	1.863	0.028	4904 ± 299	4207 ± 196
$K^{\pm}\pi^{\mp}\pi^{\mp}\pi^{\pm}$	1.863	0.017	3228 ± 188	2716 ± 158
$K^{\pm}\pi^{\mp}\pi^{\mp}$	1.868	0.021	2352 ± 127	2234 ± 120
In Total			10384 ± 322	9160 ± 279

maximum-likelihood fit to these three mass distributions with one Gaussian function and three order polynomial background give the measured masses, widths and observed numbers of D mesons reconstructed in the three hadronic decay modes. Table I lists the fitted results for the three mass spectra. A total of 10384 ± 322 single tagged events is obtained. After subtracting double counting tags per event, a total of 9160 ± 279 charged and neutral D mesons are selected. These yield 2241 ± 70 $D^{\pm}$ and 6919 ± 217 $D^0(\bar{D}^0)$ mesons appeared in the recoil.

4.3 Double Tagged Events

4.3.1 Candidates of $\bar{K}^{*0}$ production in decays of D mesons

The mass regions from 1.7 to 2.1 GeV, but outside $\pm 3\sigma_{M_D}$ of the fitted D^0 and D^+ masses for each of the three tag modes as shown in figure 2, are defined as sideband background control regions. The inclusive $\bar{K}^{*0}$ meson is reconstructed in its $\bar{K}^{*0} \to K^-\pi^+$ mode in the recoil system against both the $\bar{D}$ tags and the $\bar{D}$ sidebands. Figure 3c shows distribution of the subtracted-sideband-backgroud invariant masses of the $K^-\pi^+$ pairs selected in the recoils. The mass distribution reflects the net events from the recoils of the tagged $\bar{D}$. Breaking down the events in the figure 3c into two groups and histograming them for the neutral and charged $\bar{D}$ tagged events separately, we obtained figure 3a and 3b. After correcting to double counting tags per event, we obtained 226.3 ± 26.6 inclusive Cabbibo-Favoured $\bar{K}^{*0}$ events from the total $\bar{D}$ tags, 159.7 ± 21.7 inclusive Cabbibo-Favoured $\bar{K}^{*0}$ events from the neutral $\bar{D}$ tags and 66.6 ± 15.4 inclusive Cabbibo-Favoured $\bar{K}^{*0}$ events from the charged $barD$ tags.

Figure 4a shows the inclusive $K^+\pi^+$ invariant mass distributions for the events of

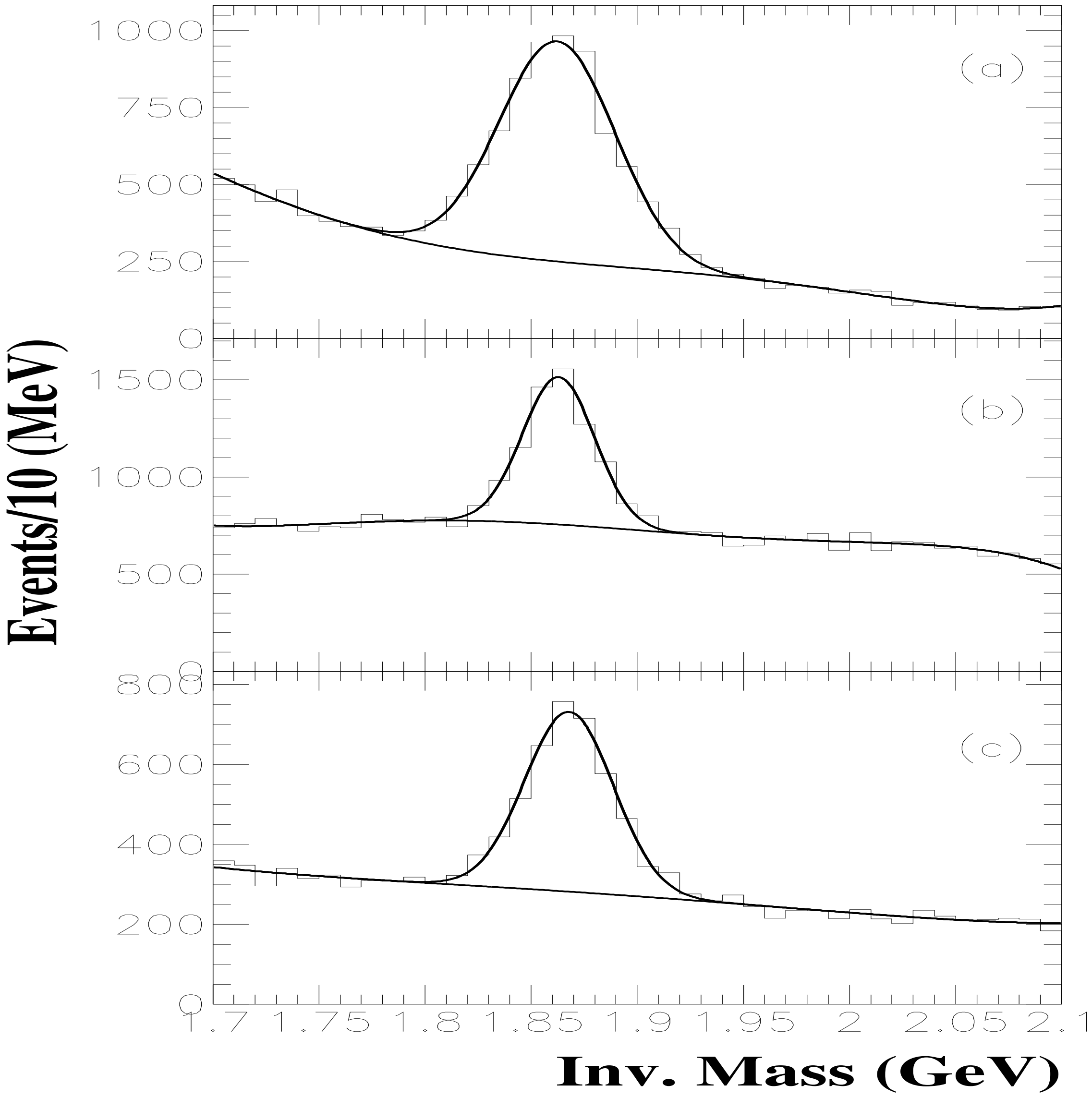

Figure 2: Distribution of invariant masses of selected (a) $K^{\mp}\pi^{\pm}$, (b) $K^{\mp}\pi^{\pm}\pi^{\pm}\pi^{\mp}$, and (c) $K^{\mp}\pi^{\pm}\pi^{\pm}$ combinations.

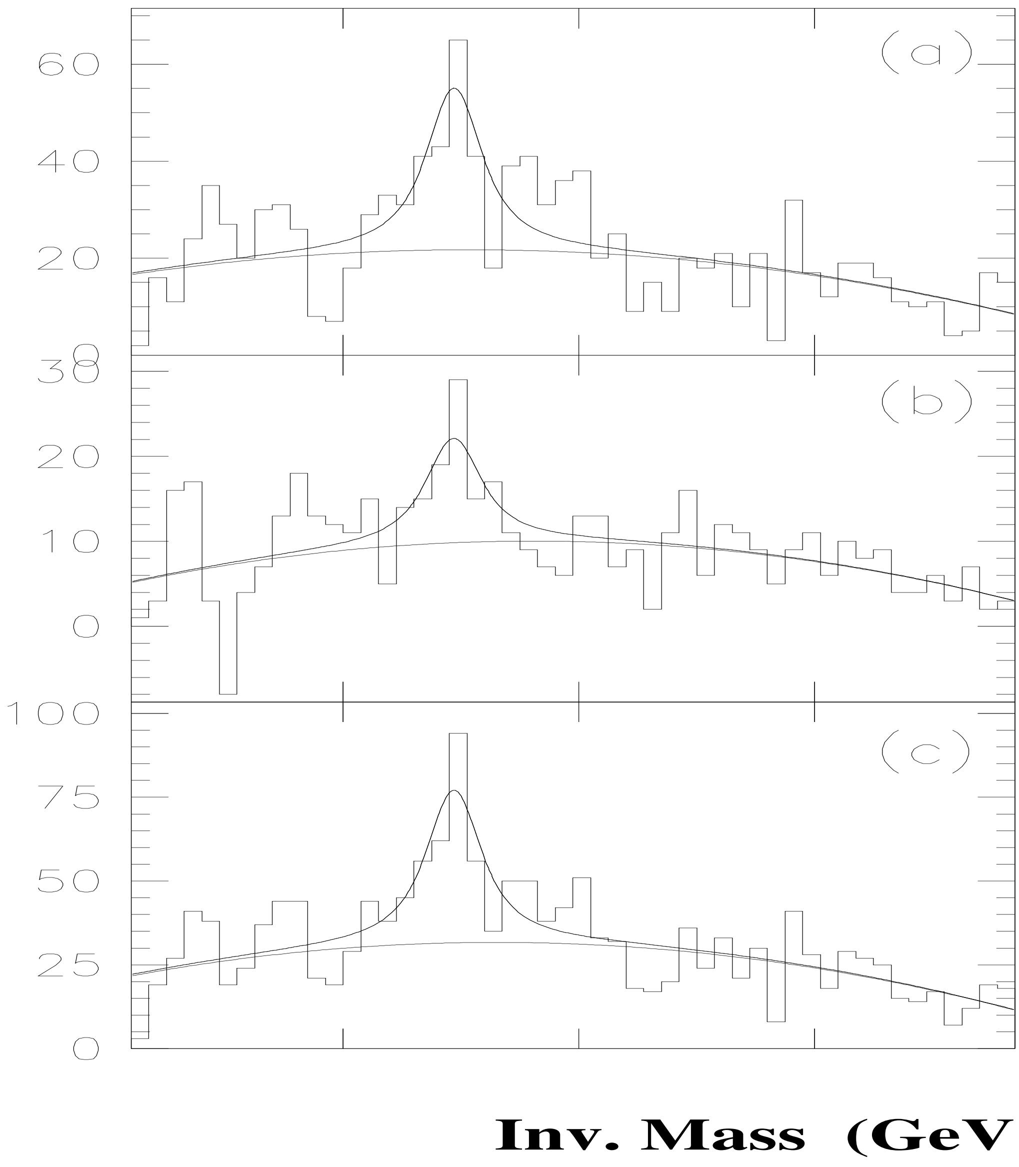

Figure 3: Distributions of the invariant masses of $K^-\pi^+$ combinations for Cabbibo-Favoured decay modes of the D mesons from the recoiling system against the tagged (a) neutral $\bar{D}$, (b) charged $\bar{D}$, and (c) combined the neutral and charged $\bar{D}$ mesons together.

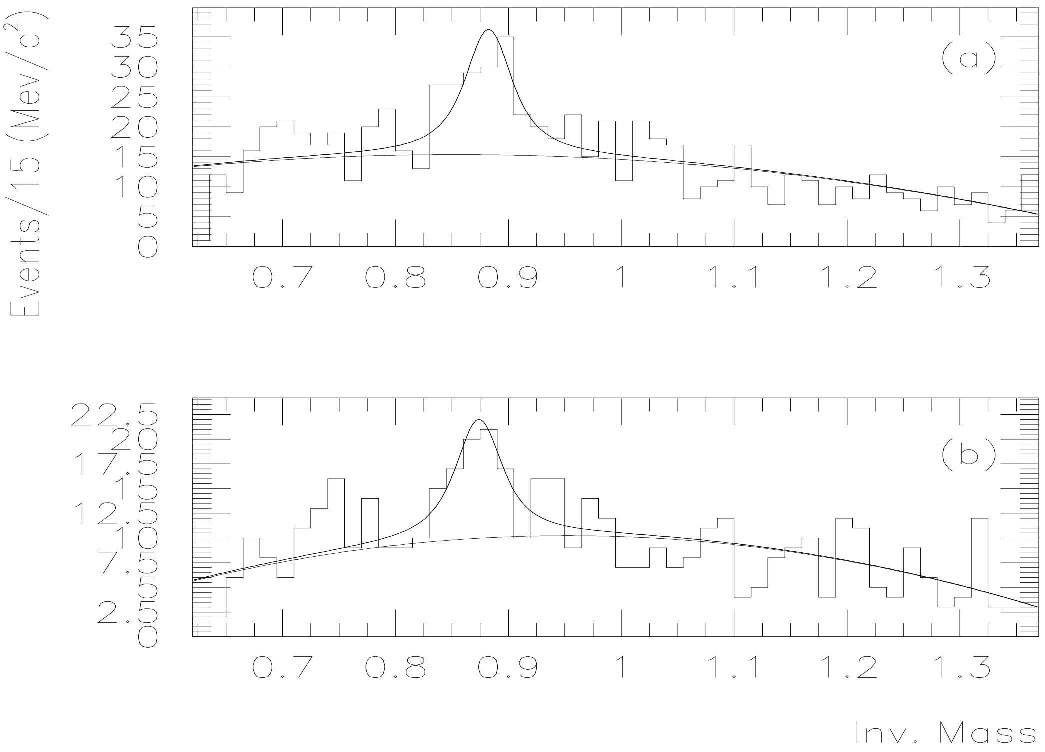

Figure 4: Distributions of the invariant masses of $K^+\pi^-$ combinations for Cabbibo-Suppressed decay modes of the D mesons from the recoiling system against the tagged neutral and charged $\bar{D}$ mesons together.

which the tagged $\bar{D}$ mesons observed in the tag side. We totaly observed 100.9 ± 18.7 inclusive K^{*0} events. Figure 4b shows the inclusive $K^+\pi^-$ invariant mass distributions for the events of which the $Kn\pi$ invariant mass within the $\bar{D}$ sideband were observed in the tag side. There are 58.0 ± 14.6 inclusive K^{*0} events. After substracting these sideband background and correcting to double counting per event, we obtained 39.0 ± 22.2 inclusive Cabbibo-Suppressed K^{*0} signal events in total.

5 Results

5.1 Inclusive $\bar{K}^{*0}$ decay branching fractions of the charged and neutral D mesons

The values of the inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of the neutral and charged D mesons were obtained by means of a maximum likelihood fit. A joint likelihood function is constructed to fluctuate the numbers of the inclusive $\bar{K}^{*0}$ and K^{*0} events observed. It is a product of two Gaussian distributions ($P^{\bar{K}^{*0}}_{D^-_{tag}}$, $P^{\bar{K}^{*0}}_{\bar{D}^0{}_{tag}}$) describing the probabilities of observing the inclusive $\bar{K}^{*0}$ events in the recoils of the tagged neutral and charged D mesons:

$$L(BF, n^{\bar{K}^{*0}}_{D^-_{tag}}, n^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}) = P^{\bar{K}^{*0}}_{D^-_{tag}} \times P^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}$$

where the $N^{\bar{K}^{*0}}_{D^-_{tag}}$ and $N^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}$ are numbers of the inclusive $\bar{K}^{*0}$ events observed; the $n^{\bar{K}^{*0}}_{D^-_{tag}}$ and $n^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}$ are parameters for the $N^{\bar{K}^{*0}}_{D^-_{tag}}$ and $N^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}$; and the $\sigma_{N^{\bar{K}^{*0}}_{D^-_{tag}}}$ and $\sigma_{N^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}}$ are standard deviations of the $N^{\bar{K}^{*0}}_{D^-_{tag}}$ and $N^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}$, respectively. Using the relations of decay branching fraction (3) and (4), the numbers of the inclusive $\bar{K}^{*0}$ events observed in the recoil side, the number of the charged and neutral D tags, the efficiency $\epsilon = 0.156 \pm 0.0078$ estimated by Monte Carlo simulation, and the probabilities η and β, for a given value of the decay branching fraction, the likelihood function L is maximized by varying the two parameters $n^{\bar{K}^{*0}}_{D^-_{tag}}$ and $n^{\bar{K}^{*0}}_{\bar{D}^0_{tag}}$ for both cases of the charged and neutral tagged D mesons, respectively. Figure 5a and 5b show the likelihoods L as functions of inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of the neutral and charged D mesons, respectively. Figure 5c shows the dependence of likelihoods on the decay branching fractions of the two mesons combined together.

By integrating the likelihoods from two sides of the peak positions to $\pm 1\sigma$ values corresponding to 68.3% (unshaded areas as shown in the figures) of the total areas below and above the peak positions, the statistical errors are obtained. Finally we obtained the inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of the neutral and charged D mesons to be

$$BF(D^0 \to \bar{K}^{*0} X) = (12.1^{+4.3}_{-4.3} \pm 2.8)\%$$

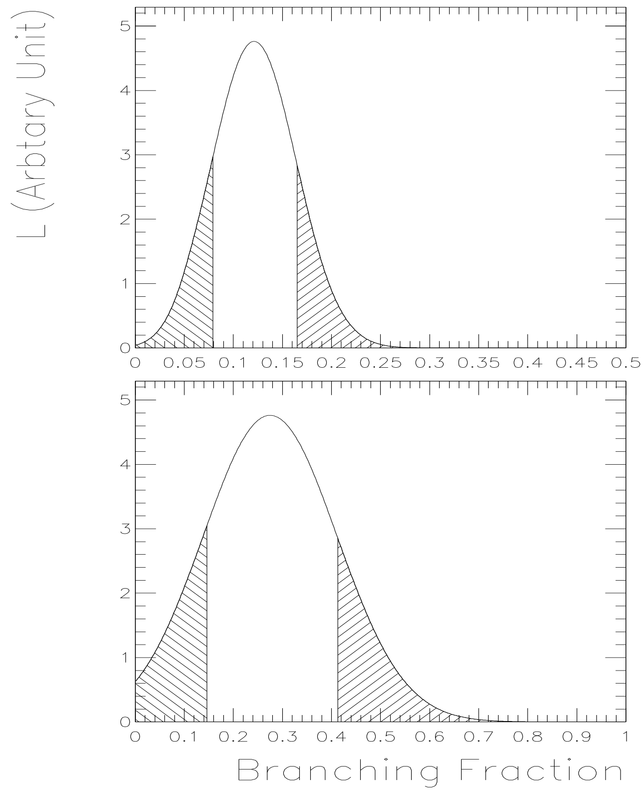

Figure 5: Likelihoods as functions of the inclusive $\bar{K}^{*0}$ decay branching fractions of the neutral (a) and charged (b) D mesons; the unshared areas correspond to the one standard deviation errors described in the text.

and

$$BF(D^+ \to \bar{K}^{*0}X) = (27.5^{+13.7}_{-13.0} \pm 4.2)\%.$$

In order to obtain the average inclusive Cabbibo-Favoured $\bar{K}^{*0}$ and Cabbibo-Suppressed K^{*0} decay branching fraction of the neutral and charged D mesons combined together, the 226.3 ± 26.6 and 39.0 ± 22.2 events from the 9160 D decays have to be corrected with the efficiency $\epsilon = 0.156 \pm 0.0078$. We obtained the average inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fraction of

$$BF(D \to \bar{K}^{*0}X) = (15.8 \pm 1.9 \pm 0.8)\%$$

and Cabbibo-Suppressed K^{*0} decay branching fraction of

$$BF(D \to K^{*0}X) = (2.7 \pm 1.6 \pm 0.8)\%.$$

In the values of the decay branching fractions, the first errors are statistical and second systematic. The systematic errors arise from uncertainties ($\pm 0.1\%$, $\pm 1.2\%$, $\pm 0.06\%$ and $\pm 0.06\%$) in the numbers of single tagged D mesons due to uncertainty in background, uncertainties ($\pm 1.3\%$, $\pm 2.9\%$, $\pm 0.8\%$ and $\pm 0.8\%$) in the efficiency and uncertainties ($\pm 2.5\%$, $\pm 3.0\%$, $\pm 0.0\%$ and $\pm 0.0\%$) of η and β which are due to uncertainties in values of production cross section measured (for neutral, charged, the total neutral and charged D mesons for Cabbibo-Favoured and Cabbibo-Suppressed decays, respectviely.). The combined effect of these sources is obtained by adding in the uncertainties in quadrature, which yields a total systematic errors of $\pm 2.8\%$, $\pm 4.2\%$, $\pm 0.8\%$ and $\pm 0.8\%$ for the each case. For estimate of the systematic errors, the uncertainty in luminosity is also taken into account (in η and β).

5.2 Discussion of the results and comparison with that measured by other experiments

Table II summarizes the sums of all decay branching fractions, quoted from PDG96[1], for the exclusive decay modes containing a $\bar{K}^{*0}$ in the final states, yielding two sums of decay branching fractions of $(22.0 \pm 2.0)\%$ for D^+ and $(7.4 \pm 1.1)\%$ for the D^0. Our measured most probable values of the inclusive $\bar{K}^{*0}$ branching fractions of the D^0 and D^+ mesons are consistent with the sums within 1σ errors.

Table 2: Decay branching fractions of the charged and neutral D to final states containing a $\bar{K}^{*0}$ meson. The upper limits are set at 90% CL.

Decay Mode	Branching Fraction (%)	Sum (%)
$\bar{K}^{*0}e^+\nu$	4.8 ± 0.5	22.0 ± 2.0
$\bar{K}^{*0}\mu^+\nu$	4.5 ± 0.6	
$\bar{K}^{*0}\pi^+$	1.92 ± 0.19	
$\bar{K}^{*0}\pi^+\pi^0$	6.7 ± 1.4	
$\bar{K}^{*0}\pi^+\pi^+\pi^-$	1.02 ± 0.27	
$\bar{K}^{*0}K^+$	0.42 ± 0.05	
$\bar{K}^{*0}K^{*+}$	2.6 ± 1.1	
$\bar{K}^{*0}\pi^0e^+\nu$	< 1.2	< 1.2
$\bar{K}^{*0}\pi^0$	3.1 ± 0.4	7.4 ± 1.1
$\bar{K}^{*0}\pi^+\pi^-$	2.3 ± 0.5	
$\bar{K}^{*0}\pi^+\pi^-\pi^0$	1.8 ± 0.9	
$\bar{K}^{*0}K^+\pi^-$	0.17 ± 0.12	
$\bar{K}^{*0}e^+e^-$	$< 1.4 \times 10^{-4}$	< 0.142
$\bar{K}^{*0}\mu^+\mu^-$	$< 1.18 \times 10^{-3}$	
$\bar{K}^{*0}e^\pm\mu^\mp$	$< 1.0 \times 10^{-4}$	
$\bar{K}^{*0}\pi^-e^+\nu$	$---$	$---$

If we take the summed decay branching fractions of D^+ and D^0 to calculate an average-weighted decay branching fractions weighted in $\frac{2241}{9160}$ for D^+ and in $\frac{6919}{9160}$ for D^0, respectively, we obtain the average-weighted decay branching fraction to be $(11.0 \pm 1.0)\%$. Our measured value of the averaged inclusive $\bar{K}^{*0}$ decay branching fraction, $BF(D \to \bar{K}^{*0}X) = (15.8^{+1.9}_{-1.9} \pm 0.8)\%$, is 2.3σ larger than the average-weighted decay branching fraction of the D^+ and D^0 mesons.

6 Conclusion

In summary, the inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of the charged and neutral D mesons, Cabbibo-Favoured $\bar{K}^{*0}$ and Cabbibo-Suppressed K^{*0} decay branching fractions of the neutral and charged D mesons combined together have been presented.

Based on a single tagged D sample of 9160 ± 278 D^0 and D^+ events in total, 226.3 ± 26.6 $D \to \bar{K}^{*0}X$ (159.7 ± 21.7 events of "D^0_{tag} VS $\bar{D}^0(D^-) \to K^{*0}X$", and 66.6 ± 15.4 events of "D^+_{tag} VS $D^-(\bar{D}^0) \to K^{*0}X$"), 39.0 ± 22.2 $D \to K^{*0}X$ events are observed. These lead to the measured inclusive Cabbibo-Favoured $\bar{K}^{*0}$ decay branching fractions of the neutral, charged, combined the neutral and charged D mesons together and inclusive Cabbibo-Suppressed K^{*0} decay branching fractions of combined the neutral and charged D mesons together to be

$$BF(D^0 \to \bar{K}^{*0}X) = (12.1^{+4.3}_{-4.3} \pm 2.8)\%,$$

$$BF(D^+ \to \bar{K}^{*0}X) = (27.5^{+13.7}_{-13.0} \pm 4.2)\%,$$

$$BF(D \to \bar{K}^{*0}X) = (15.8^{+1.9}_{-1.9} \pm 0.8)\%,$$

and

$$BF(D \to K^{*0}X) = (2.7 \pm 1.6 \pm 0.8)\%.$$

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