Amplitude analysis of $D^0 \to K^-\pi^+\pi^+\pi^-$ and measurements of D two body decays

Yu Lu (luy@ihep.ac.cn)
Institute of High Energy Physics
(For BESIII Collaboration)
Charm 2016

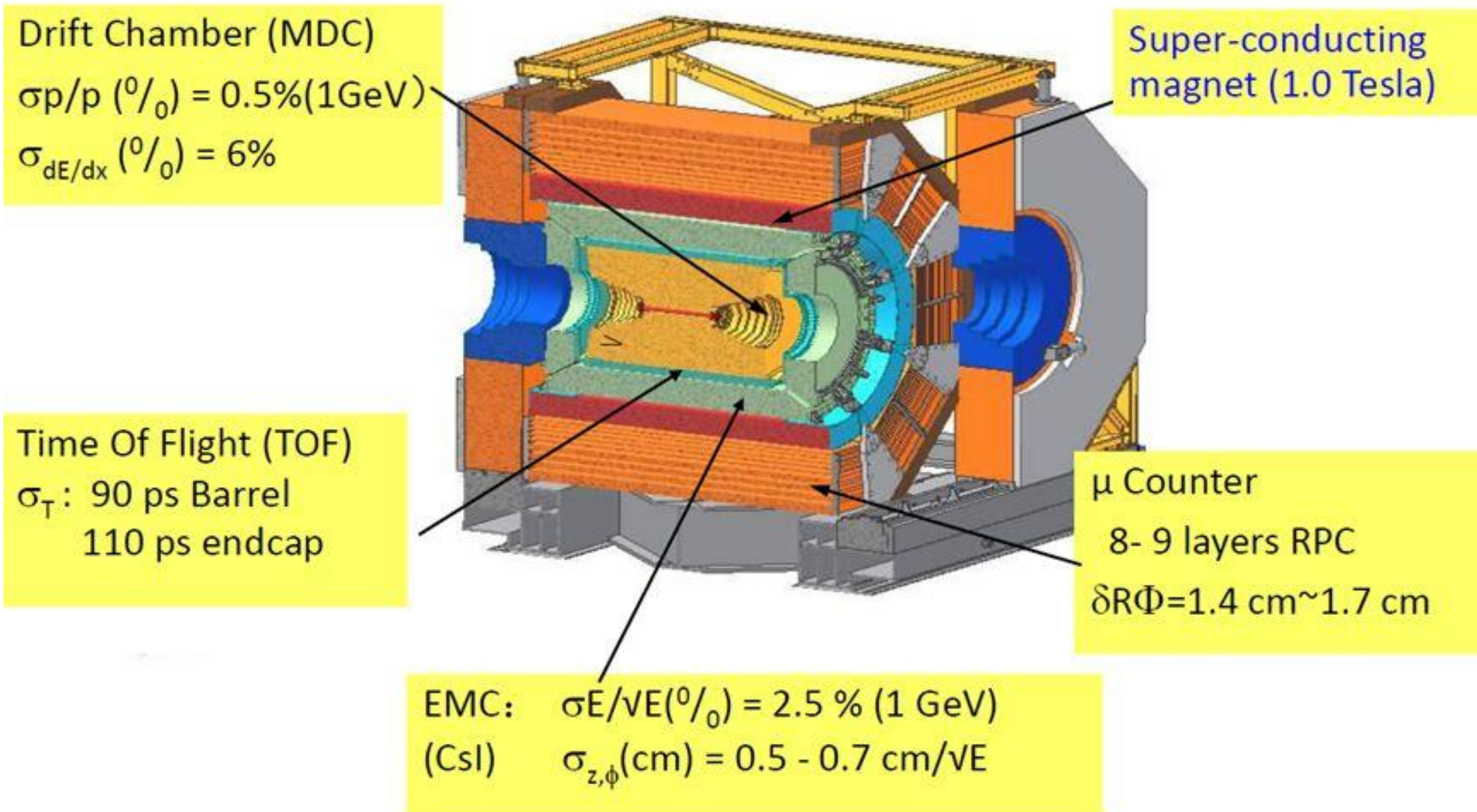
Outline

- Amplitude analysis of $D^0 \to K^-\pi^+\pi^+\pi^-$

- Measurements of branching fractions of some PP decays of D^+ and D^0

- Summary

- BESIII detector



- Hermetic.
- Excellent resolution and PID
- Large coverage

- Amplitude analysis of $D^0 \to K^-\pi^+\pi^+\pi^-$

Based on 2.93 fb^{-1} data taken @ 3.773 GeV

Motivation

This decay is one of three golden decay mode of D^0, the knowledge of intermediate process can be widely used in many measurements, such as:

- Branching ratio measurements,
- Strong phase measurement,
- CKM unitary triangle γ measurement.

Lacking the knowledge of intermediate processes leading a large systematic uncertainty in these measurements.

The branching ratios of intermediate processes such as $D^0 \to \bar{K}^{*0}\rho^0$, can be used to check the calculate of LQCD or effective theories.

Previous measurements (fit fractions) have performed by Mark III and E691, respectively:

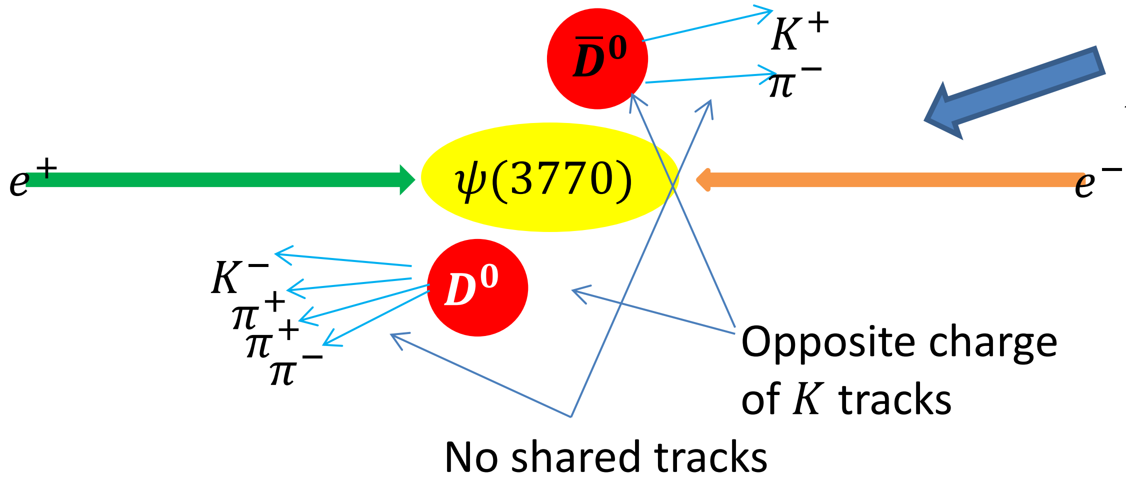
Decay mode	Mark III	E691
$D^0 \to K^- a_1^+(1260)$	$0.492 \pm 0.024 \pm 0.08$	$0.47 \pm 0.05 \pm 0.10$
$D^0 \to \bar{K}^{*0}\rho^0$	$0.142 \pm 0.016 \pm 0.05$	$0.13 \pm 0.02 \pm 0.02$
$D^0 \to K_1^-(1270)\pi^+$	$0.066 \pm 0.019 \pm 0.03$	
$D^0 \to \bar{K}^{*0}\pi^-\pi^+$	$0.140 \pm 0.018 \pm 0.04$	$0.11 \pm 0.02 \pm 0.03$
$D^0 \to K^-\pi^+\rho^0$	$0.084 \pm 0.022 \pm 0.04$	$0.05 \pm 0.03 \pm 0.02$
$D^0 \to$ 4-body non-resonance	$0.242 \pm 0.025 \pm 0.06$	$0.23 \pm 0.02 \pm 0.03$

Much more precise results are expected with the 2.93 fb^{-1} $\psi(3770)$ data at BESIII.

Analysis method

D^0 reconstruction:

If there is a D tagged, there must be a $\overline{D}$. ==> Double tag method



Double tag method:
$D^0\overline{D}^0$ **fully reconstruction**

$$M_{BC} = \sqrt{E_{beam}^2 - |\vec{p}_D|^2},$$

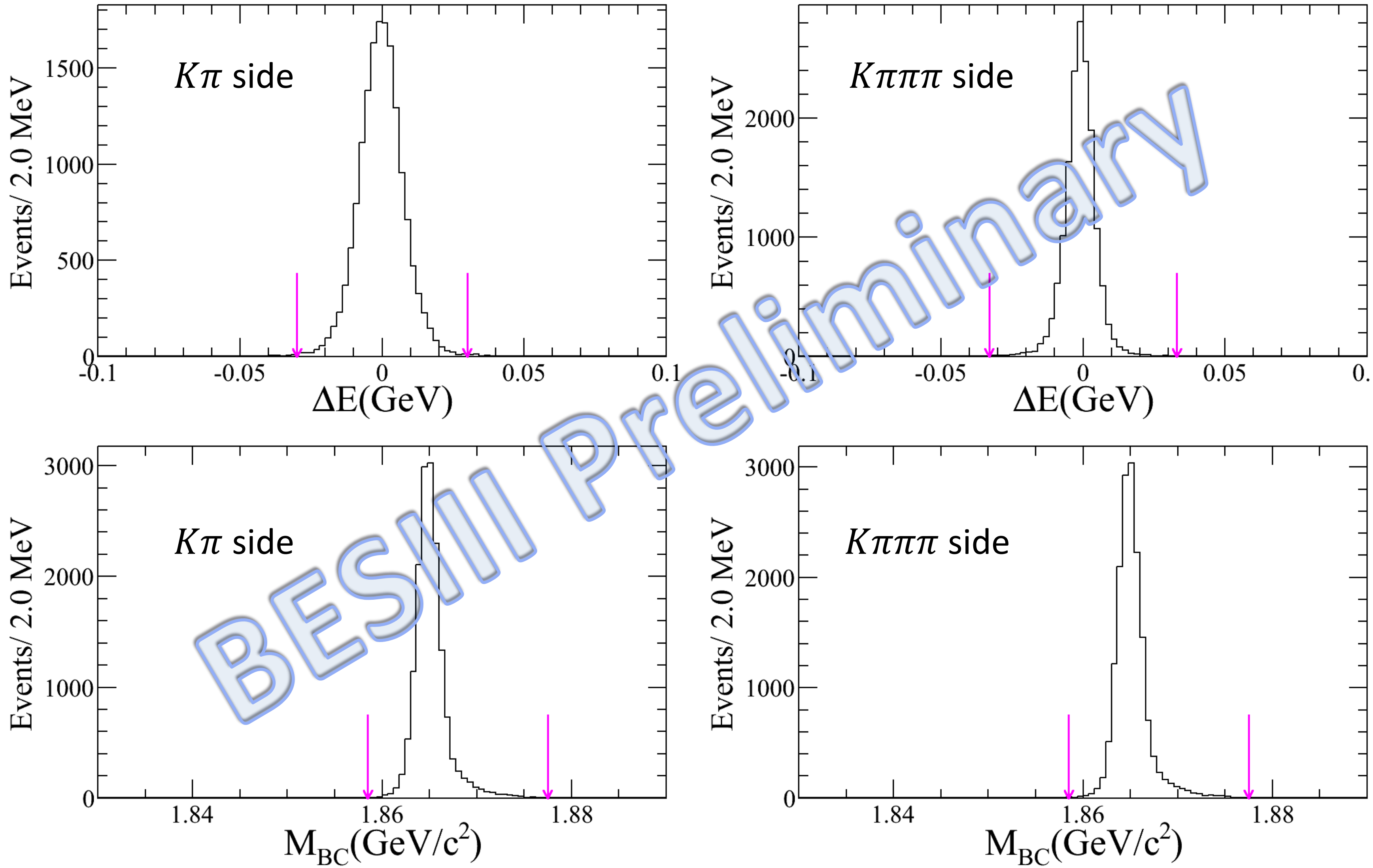
$$\Delta E = E_{beam} - E_D$$

K_S veto: Suppress the peaking background $D^0 \to K_S^0 K^- \pi^+$.

Tag yields is 15912 with a purity of 99.4%!

Analysis method

The ΔE and M_{BC} plots for $K\pi$ side and $K\pi\pi\pi$ side.



Amplitude analysis method

Amplitude construction

The total decay amplitude is the function of final particle four momenta p_j and can be modeled as a coherent sum over all the amplitudes:

$$M(p_j) = \sum_n \rho_n e^{i\phi_n} A_n(p_j),$$

where ρ_n and ϕ_n is the magnitude and phase of the n^{th} amplitude. $A_n(p_j)$ describe the relative contribution and dynamics of the n^{th} amplitude and given by

$$A_n(p_j) = P_n^1(m_1) P_n^2(m_2) S_n(p_j) F_n^1(p_j) F_n^2(p_j) F_D^2(p_j).$$

Propagators of intermediate resonances

Spin factors
Constructed with covariant tensor formalism

Blatte-Weisskopf barriers

Spin factors are constructed with covariant tensor formalism (PRD 48, 1225 (1993)).

For $K^*(892)$ and $a_1(1260)$, RBW with a width depends upon the momenta and angular momenta of the daughter is used.

For $\rho(770)$, GS formula is used (PRL 21, 244(1968)).

For $K_1(1270)$, RBW with a constant width is used.

For $K\pi$ S-wave, we use the parameterization used in the Dalitz plot analysis of $D^0 \to K_S^0\pi^+\pi^-$ of BABAR (PRD 78, 034023).

Amplitude analysis method

Fit Fractions

Magnitudes ρ may vary with the choice of normalization or formalism convention, so we use fit fraction (FF) instead of ρ, which is given by

$$FF(n) = \frac{\int |\tilde{A}_{\mathbf{n}}(p_j)|^2 R_4(p_j) dp_j}{\int |M(p_j)|^2 R_4(p_j) dp_j},$$

where $R_4(p_j)dp_j$ is the standard element of four-body phase space.

The integrals are performed with MC integration:

$$FF(n) = \frac{\sum_k^{N_{MC}} |\tilde{A}_{\mathbf{n}}(p_j)|^2}{\sum_k^{N_{MC}} |M(p_j)|^2}.$$

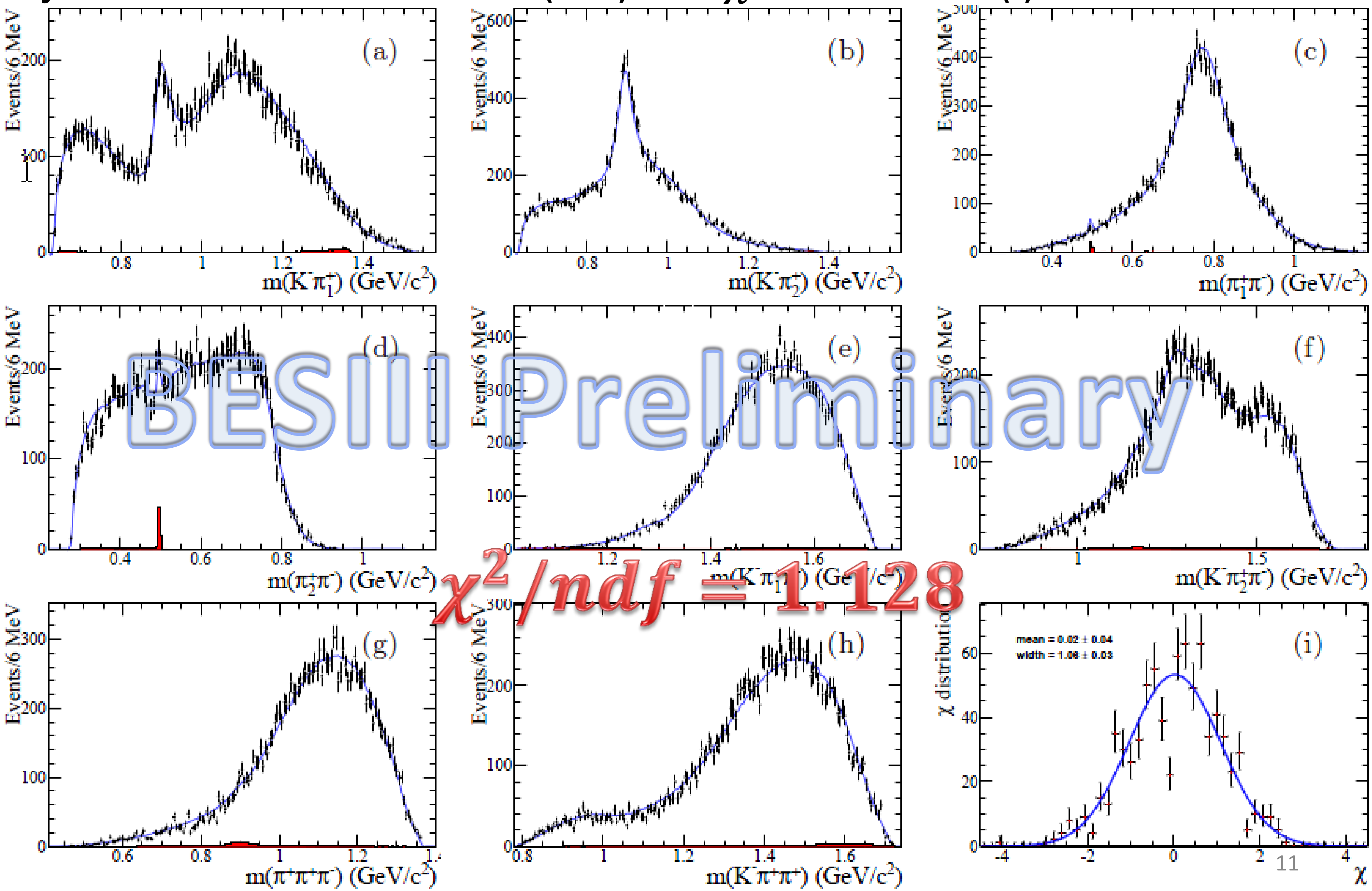
Where N_{MC} is the number of MC sample events used to calculate fit fractions, $\tilde{A}_{\mathbf{n}}(p_j)$ is either the $\mathbf{n}^{th}$ amplitude ($\tilde{A}_{\mathbf{n}}(p_j) = \rho_n e^{i\phi_n} A_n(p_j)$) or the $\mathbf{n}^{th}$ subset (component) of coherent sum of amplitudes ($\tilde{A}_{\mathbf{n}}(p_j) = \sum_{n_l} \rho_{n_l} e^{i\phi_{n_l}} A_{n_l}(p_j)$).

Results

Amplitude	ϕ_i	Fit fraction (%)
$D^0[S] \to \bar{K}^*\rho^0$	$2.35 \pm 0.06 \pm 0.18$	$6.5 \pm 0.5 \pm 0.8$
$D^0[P] \to \bar{K}^*\rho^0$	$-2.25 \pm 0.08 \pm 0.15$	$2.3 \pm 0.2 \pm 0.1$
$D^0[D] \to \bar{K}^*\rho^0$	$2.49 \pm 0.06 \pm 0.11$	$7.9 \pm 0.4 \pm 0.7$
$D^0 \to K^- a_1^+(1260)$, $a_1^+(1260)[S] \to \rho^0\pi^+$	0(fixed)	$53.2 \pm 2.8 \pm 4.0$
$D^0 \to K^- a_1^+(1260)$, $a_1^+(1260)[D] \to \rho^0\pi^+$	$-2.11 \pm 0.15 \pm 0.21$	$0.3 \pm 0.1 \pm 0.1$
$D^0 \to K_1^-(1270)\pi^+$, $K_1^-(1270)[S] \to \bar{K}^{*0}\pi^-$	$1.48 \pm 0.21 \pm 0.24$	$0.1 \pm 0.1 \pm 0.1$
$D^0 \to K_1^-(1270)\pi^+$, $K_1^-(1270)[D] \to \bar{K}^{*0}\pi^-$	$3.00 \pm 0.09 \pm 0.15$	$0.7 \pm 0.2 \pm 0.2$
$D^0 \to K_1^-(1270)\pi^+$, $K_1^-(1270) \to K^-\rho^0$	$-2.46 \pm 0.06 \pm 0.21$	$3.4 \pm 0.3 \pm 0.5$
$D^0 \to (\rho^0 K^-)_{\mathrm{A}}\pi^+$, $(\rho^0 K^-)_{\mathrm{A}}[D] \to K^-\rho^0$	$-0.43 \pm 0.09 \pm 0.12$	$1.1 \pm 0.2 \pm 0.3$
$D^0 \to (K^-\rho^0)_{\mathrm{P}}\pi^+$	$-0.14 \pm 0.11 \pm 0.10$	$7.4 \pm 1.6 \pm 5.7$
$D^0 \to (K^-\pi^+)_{\mathrm{S}}\rho^0$	$-2.45 \pm 0.19 \pm 0.47$	$2.0 \pm 0.7 \pm 1.9$
$D^0 \to (K^-\rho^0)_{\mathrm{V}}\pi^+$	$-1.34 \pm 0.12 \pm 0.09$	$0.4 \pm 0.1 \pm 0.1$
$D^0 \to (\bar{K}^{*0}\pi^-)_{\mathrm{P}}\pi^+$	$-2.09 \pm 0.12 \pm 0.22$	$2.4 \pm 0.5 \pm 0.5$
$D^0 \to \bar{K}^{*0}(\pi^+\pi^-)_{\mathrm{S}}$	$-0.17 \pm 0.11 \pm 0.12$	$2.6 \pm 0.6 \pm 0.6$
$D^0 \to (\bar{K}^{*0}\pi^-)_{\mathrm{V}}\pi^+$	$-2.13 \pm 0.10 \pm 0.11$	$0.8 \pm 0.1 \pm 0.1$
$D^0 \to ((K^-\pi^+)_{\mathrm{S}}\pi^-)_{\mathrm{A}}\pi^+$	$-1.36 \pm 0.08 \pm 0.37$	$5.6 \pm 0.9 \pm 2.7$
$D^0 \to K^-((\pi^+\pi^-)_{\mathrm{S}}\pi^+)_{\mathrm{A}}$	$-2.23 \pm 0.08 \pm 0.22$	$13.1 \pm 1.9 \pm 2.2$
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{S}}$	$-1.40 \pm 0.04 \pm 0.22$	$16.3 \pm 0.5 \pm 0.6$
$D^0[S] \to (K^-\pi^+)_{\mathrm{V}}(\pi^+\pi^-)_{\mathrm{V}}$	$1.59 \pm 0.13 \pm 0.41$	$5.4 \pm 1.2 \pm 1.9$
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{V}}$	$-0.16 \pm 0.17 \pm 0.43$	$1.9 \pm 0.6 \pm 1.2$
$D^0 \to (K^-\pi^+)_{\mathrm{V}}(\pi^+\pi^-)_{\mathrm{S}}$	$2.58 \pm 0.08 \pm 0.25$	$2.9 \pm 0.5 \pm 1.7$
$D^0 \to (K^-\pi^+)_{\mathrm{T}}(\pi^+\pi^-)_{\mathrm{S}}$	$-2.92 \pm 0.14 \pm 0.12$	$0.3 \pm 0.1 \pm 0.1$
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{T}}$	$2.45 \pm 0.12 \pm 0.37$	$0.5 \pm 0.1 \pm 0.1$

Results

Projections of invariant mass (a-h) and χ distribution (i)



Results

Systematic Uncertainties Study

The systematic uncertainties are divided into four categories: (I) Amplitude model, (II) Background estimation, (III) Experimental effects, (IV) Fitter performance.

These uncertainties are added in quadrature, as they are uncorrelated, to obtain the total systematic uncertainties.

I. Amplitude model

This uncertainties come from the fixed parameters in the formula of total amplitude, include:

- the effective radius of resonance in the Blatte-weisskopf barriers,
- the mass and width of intermediate resonances,
- the fixed parameters in the formula of $K\pi$ S wave.

Results

Systematic Uncertainties Study

II. Background estimation

This category include 3 sources:

- the shape of peaking background $D^0 \to K_S^0 K^- \pi^+$,
- the number of peaking background $D^0 \to K_S^0 K^- \pi^+$,
- the effect of other background.

III. Experimental effects

In this category, we studied the effect from PID and tracking efficiencies and resolution.

IV. Fitter performance

We estimate the possible bias from the fit with Pull distribution check.

Systematic Uncertainties Study

Systematic uncertainties of phases of different amplitudes

ϕ_i	Source(σ_{stat}) I	II	III	IV	total(σ_{stat})
$D^0[S] \to \bar{K}^{*0}\rho^0$	2.96	0.04	0.14	0.13	2.97
$D^0[P] \to \bar{K}^{*0}\rho^0$	1.98	0.04	0.11	0.12	1.98
$D^0[D] \to \bar{K}^{*0}\rho^0$	1.78	0.03	0.18	0.09	1.79
$D^0 \to K^- a_1^+(1260)$, $a_1^+(1260)[D] \to \rho^0\pi^+$	1.38	0.02	0.09	0.09	1.39
$D^0 \to K_1^-(1270)\pi^+$,$K_1^-(1270)[S] \to \bar{K}^{*0}\pi^-$	1.10	0.07	0.10	0.09	1.11
$D^0 \to K_1^-(1270)\pi^+$,$K_1^-(1270)[D] \to \bar{K}^{*0}\pi^-$	1.61	0.06	0.11	0.06	1.62
$D^0 \to K_1^-(1270)\pi^+$,$K_1^-(1270) \to K^-\rho^0$	3.61	0.03	0.09	0.13	3.62
$D^0 \to (\rho^0 K^-)_{\mathrm{A}}\pi^+$	1.28	0.06	0.14	0.09	1.29
$D^0 \to (K^-\rho^0)_{\mathrm{P}}\pi^+$	0.92	0.10	0.10	0.07	0.93
$D^0 \to (K^-\pi^+)_{\mathrm{S}}\rho^0$	2.46	0.06	0.10	0.09	2.47
$D^0 \to (K^-\rho^0)_{\mathrm{V}}\pi^+$	0.74	0.01	0.09	0.08	0.75
$D^0 \to (\bar{K}^{*0}\pi^-)_{\mathrm{P}}\pi^+$	1.82	0.03	0.09	0.06	1.82
$D^0 \to \bar{K}^*(\pi^+\pi^-)_{\mathrm{S}}$	1.07	0.04	0.12	0.11	1.08
$D^0 \to (\bar{K}^{*0}\pi^-)_{\mathrm{V}}\pi^+$	1.00	0.02	0.10	0.18	1.02
$D^0 \to ((K^-\pi^+)_{\mathrm{S}}\pi^-)_{\mathrm{A}}\pi^+$	4.78	0.15	0.12	0.07	4.79
$D^0 \to K^-((\pi^+\pi^-)_{\mathrm{S}}\pi^+)_{\mathrm{A}}$	2.69	0.13	0.10	0.07	2.70
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{S}}$	6.27	0.04	0.10	0.12	6.27
$D^0[S] \to (K^-\pi^+)_{\mathrm{V}}(\pi^+\pi^-)_{\mathrm{V}}$	3.28	0.06	0.09	0.06	3.28
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{V}}$	2.59	0.09	0.10	0.10	2.60
$D^0 \to (K^-\pi^+)_{\mathrm{V}}(\pi^+\pi^-)_{\mathrm{S}}$	3.07	0.09	0.10	0.18	3.08
$D^0 \to (K^-\pi^+)_{\mathrm{T}}(\pi^+\pi^-)_{\mathrm{S}}$	0.81	0.04	0.12	0.06	0.82
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{T}}$	3.11	0.06	0.11	0.16	3.19

Systematic Uncertainties Study

Systematic uncertainties of fit fractions of different amplitudes

Fit fractions	Source(σ_{stat}) I	II	III	IV	total(σ_{stat})
$D^0[S] \to \bar{K}^{*0}\rho^0$	1.76	0.04	0.09	0.10	1.77
$D^0[P] \to \bar{K}^{*0}\rho^0$	0.27	0.02	0.09	0.12	0.31
$D^0[D] \to \bar{K}^{*0}\rho^0$	1.79	0.06	0.12	0.17	1.80
$D^0 \to K^- a_1^+(1260), a_1^+(1260)[S] \to \rho^0\pi^+$	1.48	0.10	0.12	0.07	1.45
$D^0 \to K^- a_1^+(1260), a_1^+(1260)[D] \to \rho^0\pi^+$	0.93	0.04	0.09	0.06	0.94
$D^0 \to K_1^-(1270)\pi^+, K_1^-(1270)[S] \to \bar{K}^{*0}\pi^-$	1.01	0.05	0.11	0.16	1.03
$D^0 \to K_1^-(1270)\pi^+, K_1^-(1270)[D] \to \bar{K}^{*0}\pi^-$	1.12	0.03	0.12	0.13	1.14
$D^0 \to K_1(1270)^-\pi^+, K_1^-(1270) \to K^-\rho^0$	1.58	0.04	0.23	0.06	1.60
$D^0 \to (\rho^0 K^-)_{\mathrm{A}}\pi^+$	1.38	0.08	0.09	0.09	1.39
$D^0 \to (\bar{K}^{*0}\pi)_{\mathrm{P}}\pi$	0.93	0.06	0.09	0.16	0.95
$D^0 \to (K^-\pi^+)_{\mathrm{S}}\rho^0$	2.81	0.09	0.11	0.09	2.82
$D^0 \to (K^-\rho^0)_{\mathrm{V}}\pi^+$	0.69	0.03	0.09	0.06	0.70
$D^0 \to (\bar{K}^{*0}\pi^-)_{\mathrm{P}}\pi^+$	0.93	0.06	0.09	0.16	0.95
$D^0 \to K^{*0}(\pi^+\pi^-)_{\mathrm{S}}$	1.06	0.05	0.09	0.20	1.08
$D^0 \to (\bar{K}^{*0}\pi^-)_{\mathrm{V}}\pi^+$	0.60	0.02	0.00	0.10	0.61
$D^0 \to ((K^-\pi^+)_{\mathrm{S}}\pi^-)_{\mathrm{A}}\pi^+$	3.10	0.07	0.09	0.06	3.10
$D^0 \to K^-((\pi^+\pi^-)_{\mathrm{S}}\pi^+)_{\mathrm{A}}$	1.14	0.08	0.10	0.07	1.15
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{S}}$	1.29	0.12	0.10	0.12	1.30
$D^0[S] \to (K^-\pi^+)_{\mathrm{V}}(\pi^+\pi^-)_{\mathrm{V}}$	1.73	0.07	0.09	0.07	1.73
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{V}}$	2.08	0.12	0.10	0.07	2.09
$D^0 \to (K^-\pi^+)_{\mathrm{V}}(\pi^+\pi^-)_{\mathrm{S}}$	3.54	0.05	0.10	0.11	3.54
$D^0 \to (K^-\pi^+)_{\mathrm{T}}(\pi^+\pi^-)_{\mathrm{S}}$	0.87	0.07	0.11	0.07	0.88
$D^0 \to (K^-\pi^+)_{\mathrm{S}}(\pi^+\pi^-)_{\mathrm{T}}$	0.99	0.09	0.10	0.08	1.01

Results

According to the intermediate resonances, we divides the 23 amplitudes into 7 components.

Component	Fit fraction (%)
$D^0 \to \bar{K}^{*0}\rho^0$	$12.3 \pm 0.4 \pm 0.5$
$D^0 \to K^- a_1^+(1260)(\rho^0\pi^+)$	$54.6 \pm 2.8 \pm 3.7$
$D^0 \to K_1^-(1270)(\bar{K}^{*0}\pi^-)\pi^+$	$0.8 \pm 0.2 \pm 0.2$
$D^0 \to K_1^-(1270)(K^-\rho^0)\pi^+$	$3.4 \pm 0.3 \pm 0.2$
$D^0 \to K^-\pi^+\rho^0$	$8.4 \pm 1.1 \pm 2.2$
$D^0 \to \bar{K}^{*0}\pi^+\pi^-$	$7.0 \pm 0.4 \pm 0.3$
$D^0 \to K^-\pi^+\pi^+\pi^-$	$21.9 \pm 0.6 \pm 0.6$

With the branching fraction of $D^0 \to K^-\pi^+\pi^+\pi^-$ from PDG, the branching fractions can calculated as: $Br(Component) = FF(Componet)Br(D^0 \to K^-\pi^+\pi^+\pi^-)$.

Component	Branching fraction (%)	PDG value (%)
$D^0 \to \bar{K}^{*0}\rho^0$	$0.99 \pm 0.04 \pm 0.04 \pm 0.03$	1.05 ± 0.23
$D^0 \to K^- a_1^+(1260)(\rho^0\pi^+)$	$4.41 \pm 0.22 \pm 0.30 \pm 0.13$	3.6 ± 0.6
$D^0 \to K_1^-(1270)(\bar{K}^{*0}\pi^-)\pi^+$	$0.07 \pm 0.01 \pm 0.02 \pm 0.00$	0.29 ± 0.03
$D^0 \to K_1^-(1270)(K^-\rho^0)\pi^+$	$0.27 \pm 0.02 \pm 0.02 \pm 0.01$	
$D^0 \to K^-\pi^+\rho^0$	$0.68 \pm 0.09 \pm 0.18 \pm 0.02$	0.51 ± 0.23
$D^0 \to \bar{K}^{*0}\pi^+\pi^-$	$0.57 \pm 0.03 \pm 0.03 \pm 0.02$	0.99 ± 0.23
$D^0 \to K^-\pi^+\pi^+\pi^-$	$1.77 \pm 0.05 \pm 0.04 \pm 0.05$	1.88 ± 0.26

Measurements of branching fractions of some PP decays of D^+ and D^0

Motivation

There are some interests of factors in the measurements of $D \to PP$:

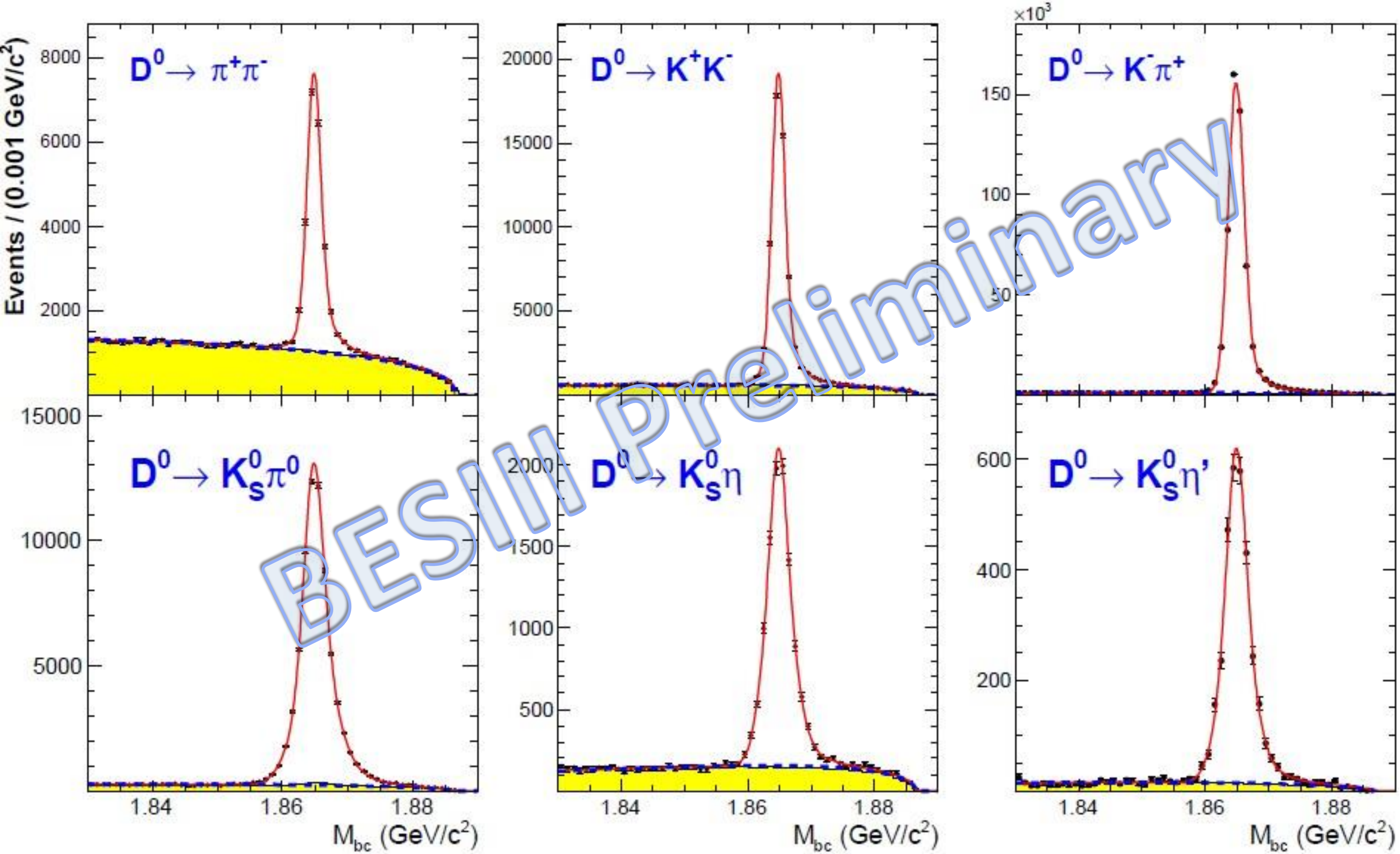
- great significance in the study of the strong and weak interactions in *D* decays.
- Study of SU(3) breaking effect.
- Observation of CP violation in D decay.

Most of the D decays have been studied by CLEO in 2010[1] , other measurements come from Belle[2] , BaBar[3] and CDF[4] , etc.

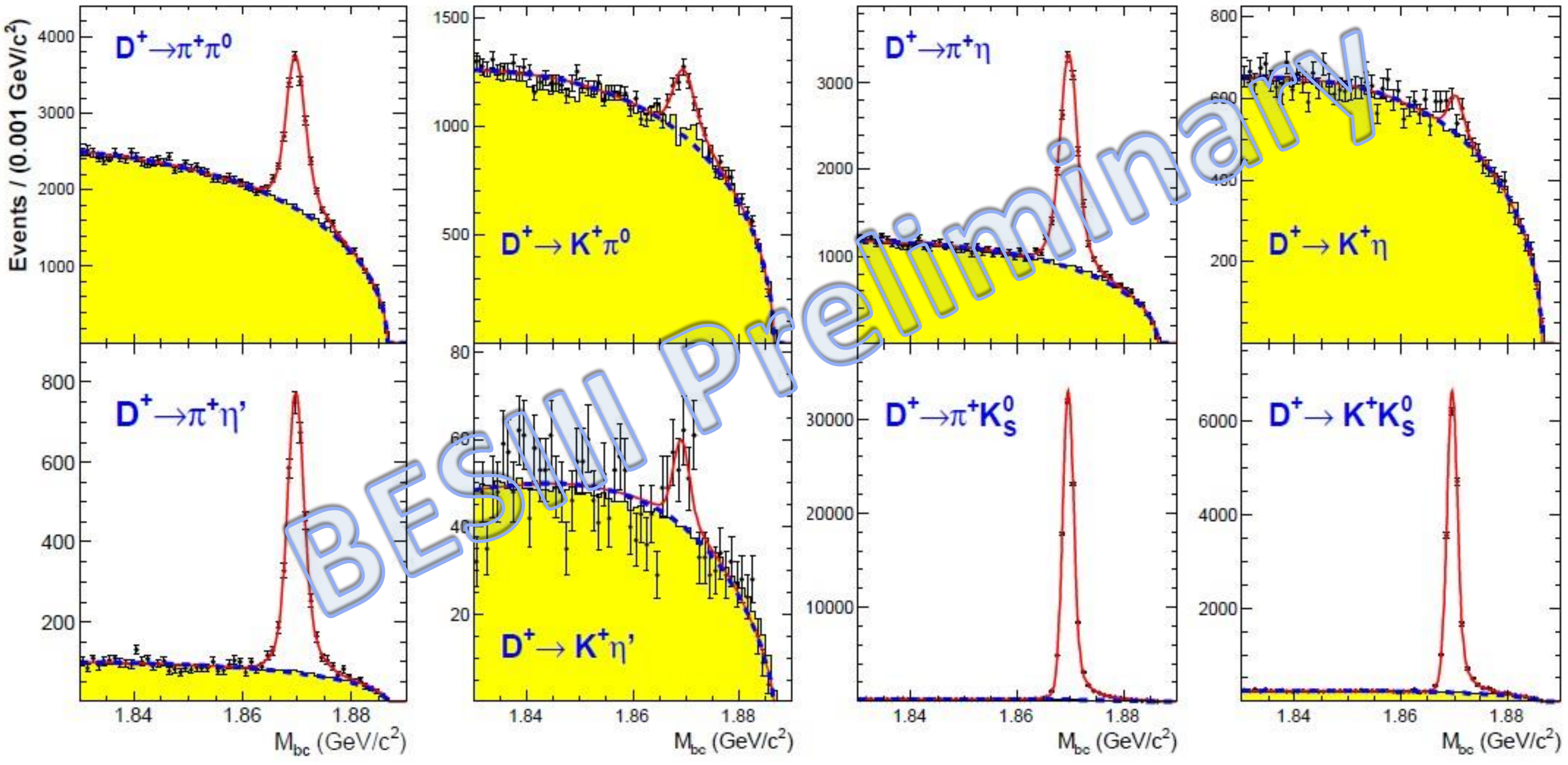
Some of the branching fractions (BFs) are not well established. With the 2.93 fb^{-1} data taken at 3.773 GeV, these measurements are expected to be improved.

1. Mendez, H., et al. (CLEO) Phy. Rev. D 81.5 (2010): 052013. 3
2. $\mathcal{B}(K^+\eta)$, $\mathcal{B}(K^+\eta')$ from Belle's measurements in 2011
3. $\mathcal{B}(K^+\pi^0)$, $\mathcal{B}(\pi^+\pi^0)$ from BaBar's measurements in 2006
4. $\mathcal{B}(\pi^+\pi^-)$, $\mathcal{B}(K^+K^-)$ from CDF's measurements in 2005

Fit to M_{BC} distributions of single tag D^0 of data



Fit to M_{BC} distributions of single tag D^+ of data



BF results

Mode	N^{net}_{signal}	ϵ (%)	$\mathcal{B}\pm$(stat)$\pm$(sys)	$\mathcal{B}_{PDG}$
$\pi^+\pi^-$	21105 ± 249	66.03 ± 0.25	$(1.505 \pm 0.018 \pm 0.031) \times 10^{-3}$	$(1.421 \pm 0.025) \times 10^{-3}$
K^+K^-	56438 ± 273	62.82 ± 0.32	$(4.229 \pm 0.020 \pm 0.087) \times 10^{-3}$	$(4.01 \pm 0.07) \times 10^{-3}$
$K^-\pi^+$	537745 ± 767	64.98 ± 0.09	$(3.896 \pm 0.006 \pm 0.073)$ %	(3.93 ± 0.04) %
$K^0_S\pi^0$	66539 ± 302	38.06 ± 0.17	$(1.236 \pm 0.006 \pm 0.032)$ %	(1.20 ± 0.04) %
$K^0_S\eta$	9532 ± 126	31.96 ± 0.14	$(5.149 \pm 0.068 \pm 0.134) \times 10^{-3}$	$(4.85 \pm 0.30) \times 10^{-3}$
$K^0_S\eta'$	3007 ± 61	12.66 ± 0.08	$(9.562 \pm 0.197 \pm 0.379) \times 10^{-3}$	$(9.5 \pm 0.5) \times 10^{-3}$
$\pi^0\pi^+$	10108 ± 267	48.98 ± 0.34	$(1.259 \pm 0.033 \pm 0.025) \times 10^{-3}$	$(1.24 \pm 0.06) \times 10^{-3}$
π^0K^+	1834 ± 168	51.52 ± 0.42	$(2.171 \pm 0.198 \pm 0.060) \times 10^{-4}$	$(1.89 \pm 0.25) \times 10^{-4}$
$\eta\pi^+$	11636 ± 215	46.96 ± 0.25	$(3.790 \pm 0.070 \pm 0.075) \times 10^{-3}$	$(3.66 \pm 0.22) \times 10^{-3}$
ηK^+	439 ± 72	48.21 ± 0.31	$(1.393 \pm 0.228 \pm 0.124) \times 10^{-4}$	$(1.12 \pm 0.18) \times 10^{-4}$
$\eta'\pi^+$	3088 ± 83	21.49 ± 0.18	$(5.122 \pm 0.140 \pm 0.210) \times 10^{-3}$	$(4.84 \pm 0.31) \times 10^{-3}$
$\eta' K^+$	87 ± 25	22.39 ± 0.22	$(1.377 \pm 0.428 \pm 0.202) \times 10^{-4}$	$(1.83 \pm 0.23) \times 10^{-4}$
$K^0_S\pi^+$	93884 ± 352	51.38 ± 0.18	$(1.591 \pm 0.006 \pm 0.033) \times 10^{-2}$	$(1.53 \pm 0.06) \times 10^{-2}$
$K^0_S K^+$	17704 ± 151	48.45 ± 0.14	$(3.183 \pm 0.028 \pm 0.065) \times 10^{-3}$	$(2.95 \pm 0.15) \times 10^{-3}$

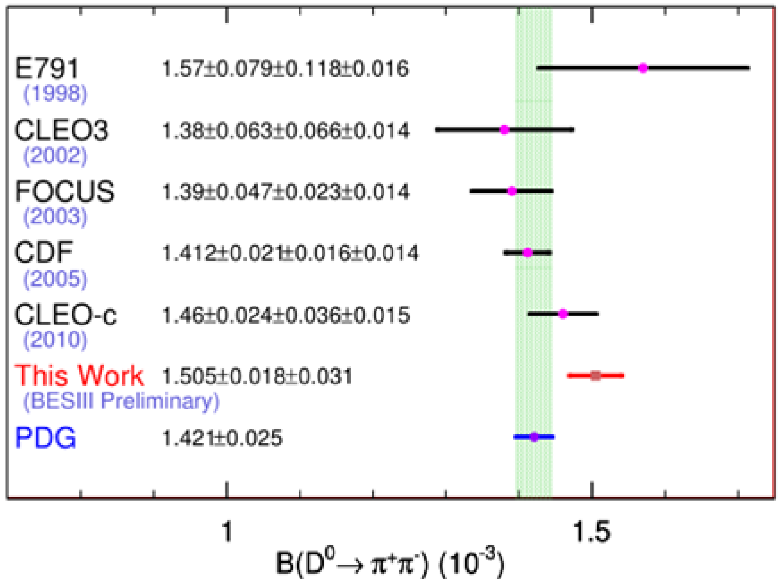
Has been corrected by PID, tracking and K^0_S, π^0/η finding

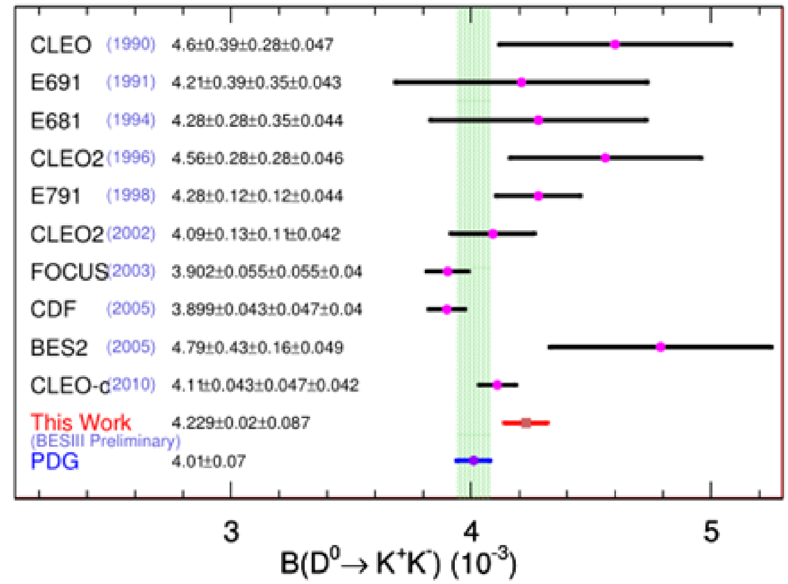
$$\mathcal{B} = \frac{N^{signal}_{net}}{2\cdot N_{D^0\bar{D}^0(D^+D^-)}\cdot\varepsilon},\ N_{D^0\bar{D}^0} = (10{,}621 \pm 29_{(stat)}) \times 10^3,\ N_{D^+D^-} = (8{,}296 \pm 31_{(stat)}) \times 10^3$$

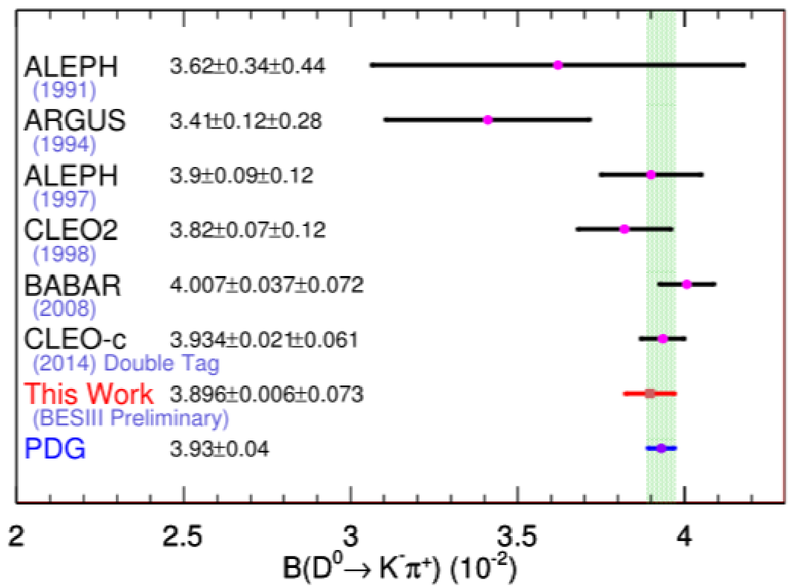
quoted from Derrick's talk given at APS2014

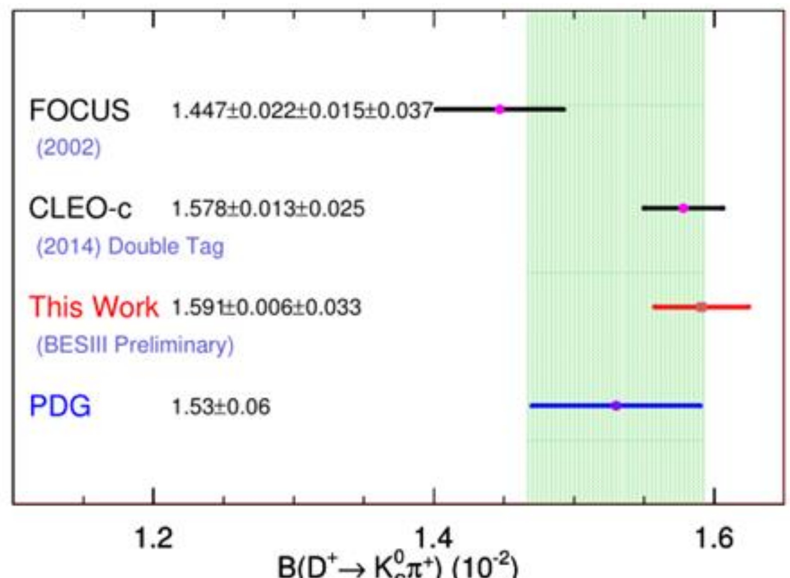
$B(D^0 \to K^-\pi^+)$ has been corrected by $B(D^0 \to K^+\pi^-)$ quoted from PDG.

Comparisons with Other Experiments in Some Modes









The results from BESIII are consistent with other measurements and have comparable precisions with the existing best measurements.

Summary

- With 2.93 fb^{-1} $\psi(3770)$ data at BESIII, some hadronic decays have been measured.
  - Amplitude analysis of $D^0 \to K^-\pi^+\pi^+\pi^-$
  - Measurements of some decays of D^+ or D^0 to PP
- Amplitude (Dalitz plot) analysis provides a kind of method to deal with multi-body decays.
- With about 3 fb^{-1} taken at 4.18GeV this year, more and more results about D/D_s will come out.

Thank you!