Inclusive Decay $D^0 \rightarrow K^{*0}X$

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Some time ago (→ Fig)

reported:

B ($D^0 \rightarrow K^*X$) B ($K^* \rightarrow K^-\pi^+$) ≈ 6.67%

→ B ($D^0 \rightarrow K^*X$) ≈ 10%

Data used: Exp.7 - Exp.27

Now: use "high quality sample"

$D^{*+} \rightarrow D^0\pi^+$
$\hookrightarrow K^-\pi^+$
$\hookrightarrow K^-\pi^+\pi^0$

tag side

+ 0, 1, 2 primary mesons

$D^{*-} \rightarrow \bar{D}^0\pi^-$
$\hookrightarrow K^+\pi^-X$

"right sign"
signal side

2872 events of above type

~ 106 K*X

~ 53 $D^0 \rightarrow K\pi$

HANDFIT only! (→ Fig)

with assumption: incl and excl Kπ have same efficiency

$$\frac{106}{53} * 3.8 * \frac{1}{0.66} = 11.5\% \qquad \sim B(D^0 \rightarrow K^*X)$$

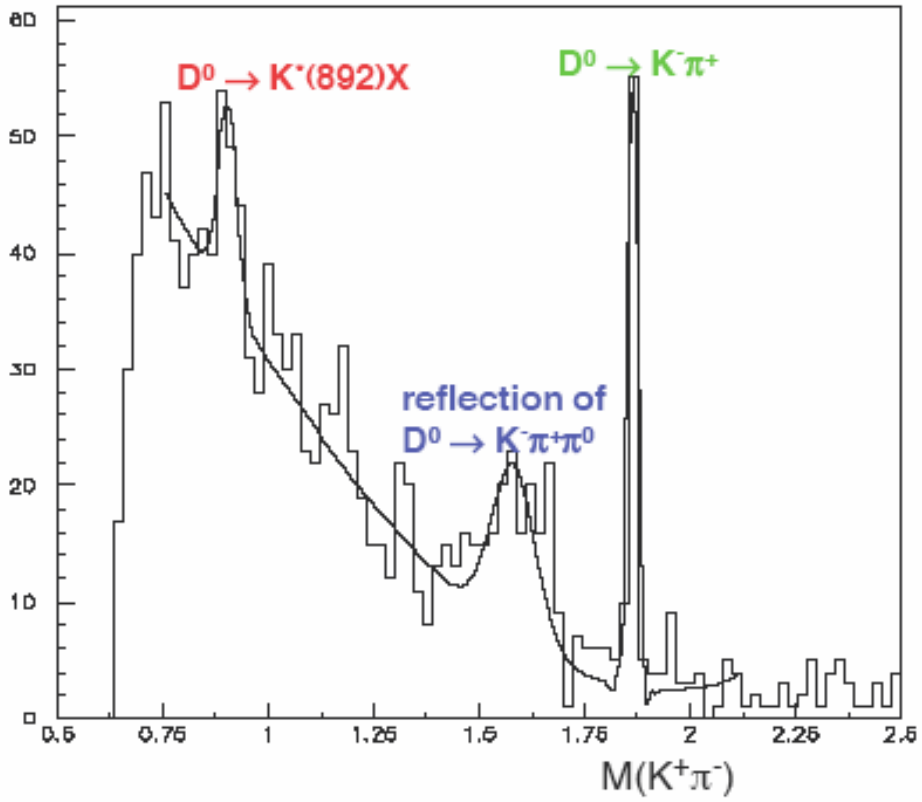
ALL QUOTED VALUES ARE PRELIMINARY ……rather estimates!

Inclusive decay $D^0 \to K^*(892)X$

"some time ago"

not in PDG list

$K^-\pi^+$ effective masses of combinations of charged particles from kinematically selected D^0 via recoil, tagging $D^{*+}D^{*-}$, $D^{*+}D^{*-}\pi^0$ and $D^{*+}D^{*-}\pi^+\pi^-$, ... events



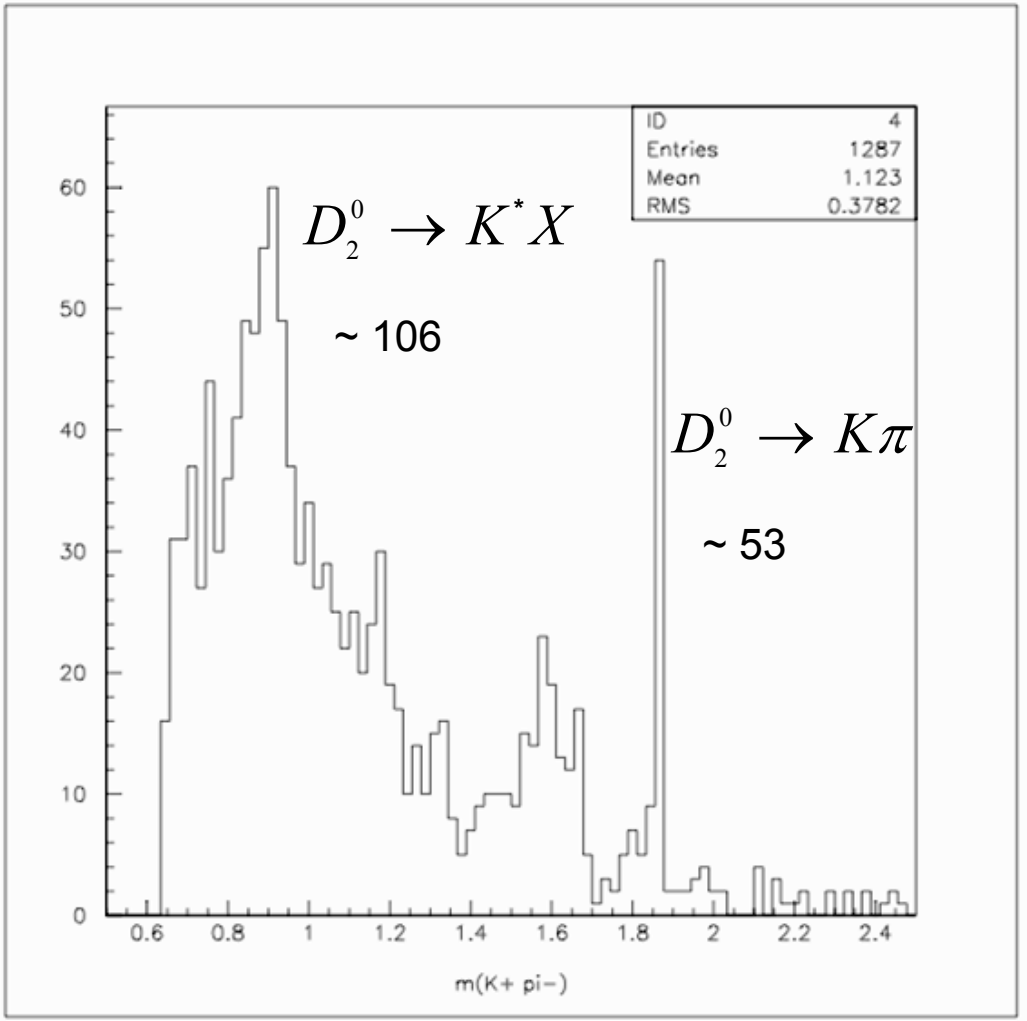
Preliminary fit:

3 Gaussians

3rd order polynomial

$$B(D^0 \to K^*X) * B(K^* \to K^-\pi^+) = \frac{125.9}{71.7} * 3.8\% = 6.67\%$$

DATA



$D^{*+} \to D_1^0 \pi^+$

$\hookrightarrow K\pi$

$K\pi\pi^0$

+ 0, 1, 2 primary mesons

$D^{*-} \to \bar{D}_2^0 \pi^-$

$\hookrightarrow (K\pi)X$

"right" sign

MC

for efficiency evaluations: use MC of type

$D^{*+} \to D_1^0 \pi^+$
$\quad \hookrightarrow K^- \pi^+$
$\quad\quad K^- \pi^+ \pi^0$
$\quad\quad K^- \pi^+ \pi^+ \pi^-$

$D^{*-} \to \bar{D}_2^0 \pi^-$
$\quad \hookrightarrow all$

+ cc

of course: in reality $D_1^0 \to$ "all"

beware: Program could pick up $\bar{D}_2^0 \to K^- \pi^+$ etc on signal side as tag

→ will enhance (in this MC) $D^0 \to K\pi$ (excl)

therefore: use 2 separate samples

1) $D^{*+} \to D_1^0 \pi^+$ on tag side

2) $D^{*-} \to D_1^0 \pi^-$ on tag side (→ Fig)

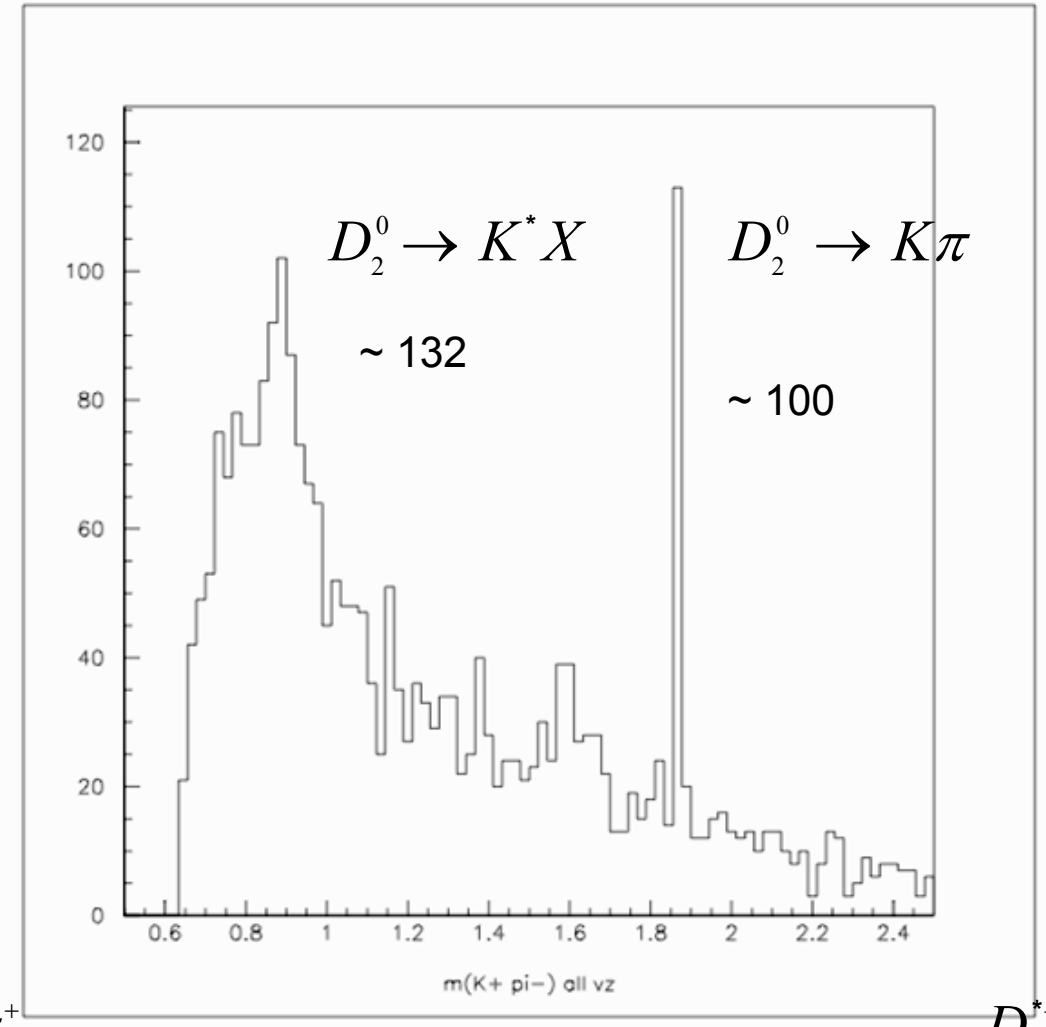
check correct sign of D_2^0 decay

K*(Kπ) - efficiency

From $\frac{132}{3088}\frac{1}{0.66}$ ~ 6.5% = 65% efficiency to reach MC input BR = 9.8%

Apply on data it was $\frac{106}{2872}\frac{1}{0.66}$ ~ 7.5% $\frac{7.5}{0.65}$ ~ 11.5% ok

MC



$D^{*+} \to D_1^0 \pi^+$

$\hookrightarrow K\pi$

$K2\pi$

$(K3\pi)$

$D^{*-} \to \bar{D}_2^0 \pi^-$

$\hookrightarrow all$

$look\ for\ D_2^0 \to (K\pi)X$

"right" sign

First estimate:

number of "non D^0-" K* in signal

use: wrong sign of signal D^0 decay (D_2^0)

(→ Fig)

MC: ~ 3.5 K*

$\Rightarrow \quad \frac{3.5}{132}$ ~ 2.5% of K* in signal beware statistics!

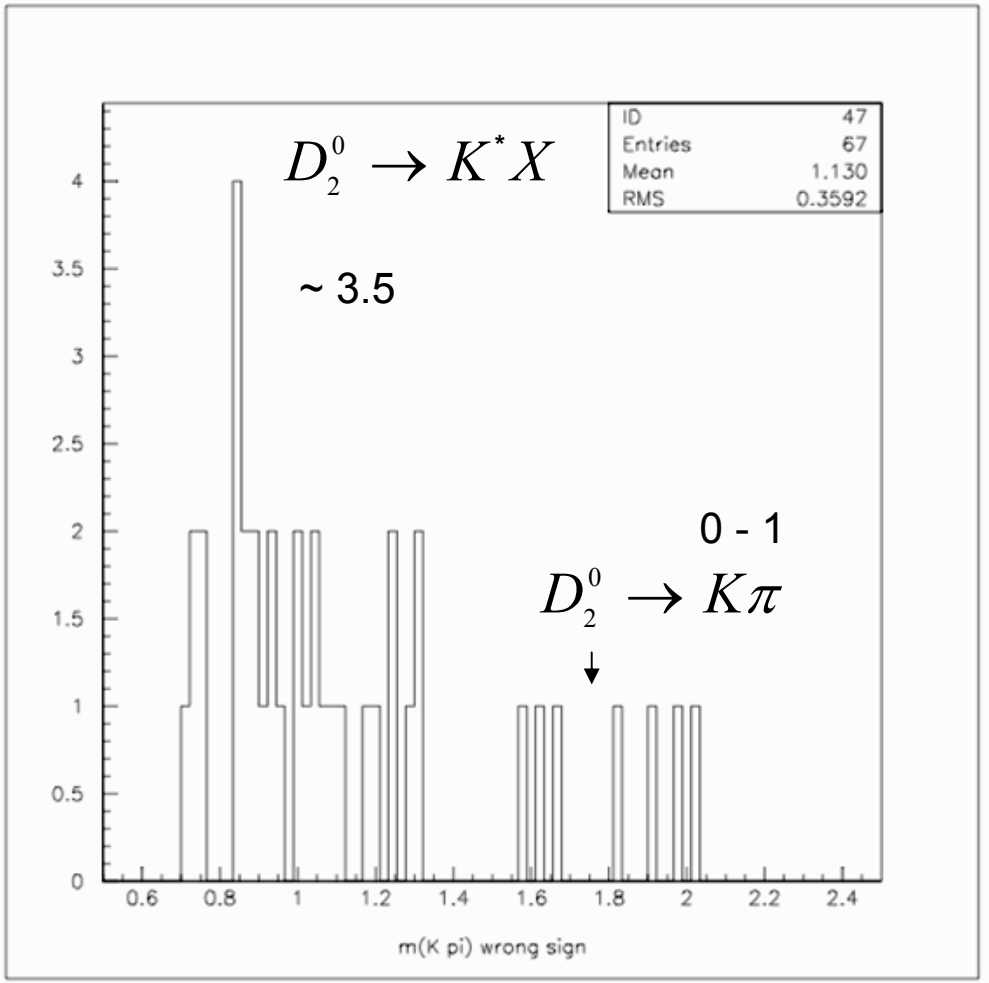
~ 0 $D^0 \to K\pi$ to be expected $132 * 0.4\% \sim 0.5$

Data: similar percentage

would give BR 11.5 → 11.2%

(→ Fig)

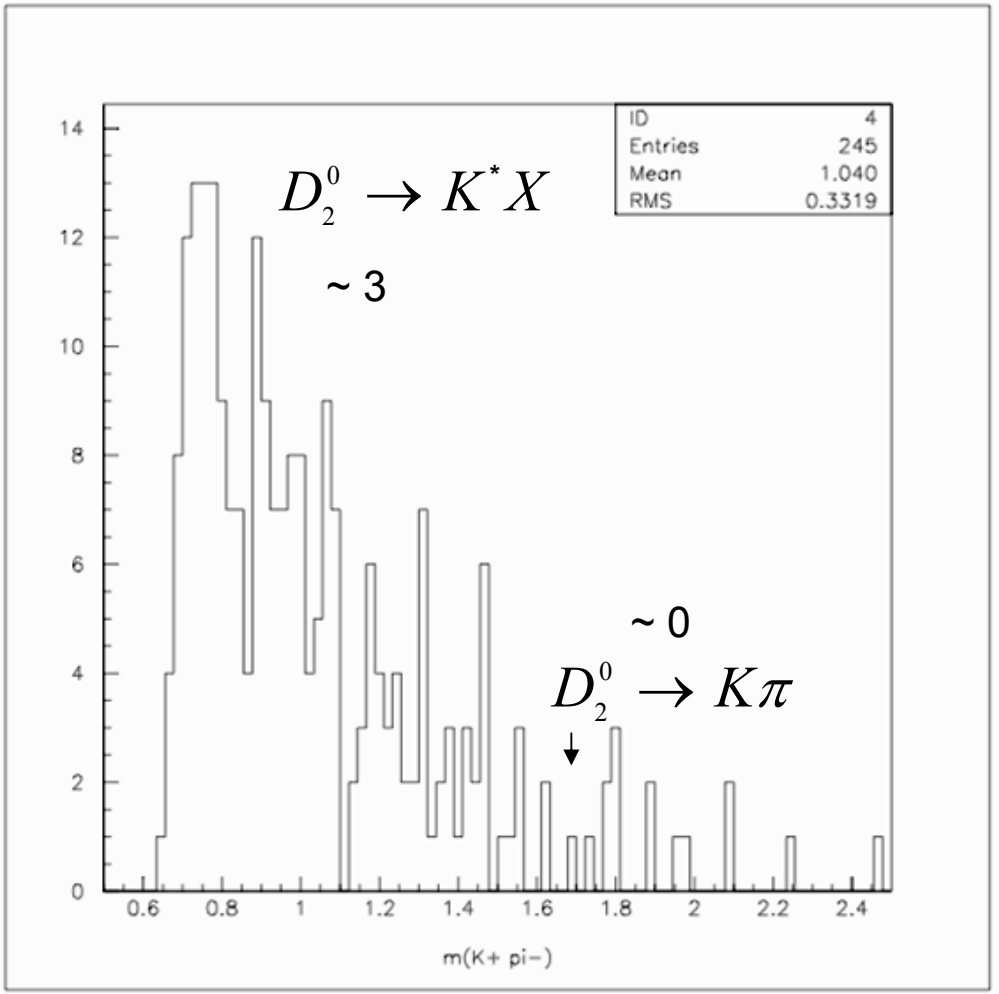
MC as before



$$D_2^0 \to (K\pi) X$$

"wrong" sign

DATA as above



$$D_2^0 \to (K\pi)X$$

"wrong" sign

SUMMARY

Inclusive analysis of $D^0 \rightarrow K^*X$ (BR not yet in PDG) seems to be good under way

urgent need : higher statistics

Data:

NTUPLES for Exp 31-37 will be ready next days $\Rightarrow$will double the statistics

Monte Carlo:

- MC as described above

  next days: statistics will be doubled

$\Rightarrow$ then resonance fitting will be reasonable

- Skimmed generic MC is available in KEK

  needs ~ 2 weeks for NTUPLE production

Optimization of program parameters is going on

sometimes there are space limitations in Vienna (MC)

there are time limitations in KEK

with bigger statistics: continue $D^0 \rightarrow \phi X$