BaBar Collaboration Directory :

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

$x^2 . t^3$ $x^2 . t^2$ $x^1 . t^1$ 5 6
------- = ------- . -------
$x^2 . t^3$ $x^2 . t^2$ $x^1 . t^1$ 5 6

$D^{*0} \to D^0\gamma$.

$x^2 . t^2$ $x^2 . t^2$ $x^2 . t^3$ 6 7
------- = ------- . -------
$x^2 . t^2$ $x^2 . t^2$ $x^2 . t^2$ 6 6

$B^0 \to D^{*-}D^{*+}K^0_S$

$x^3 . t^2$ $x^2 . t^3$ $x^2 . t^3$ $x^4 . t^3$ 11 11
------- = ------- . ------- . -------
$x^3 . t^2$ $x^2 . t^3$ $x^2 . t^3$ $x^4 . t^3$ 11 11

$B^+ \to D^{*-}D^{*+}K^+$,

$x^3 . t^3$ $x^2 . t^3$ $x^2 . t^3$ $x^2 . t^1$ 9 10
------- = ------- . ------- . -------
$x^3 . t^3$ $x^2 . t^3$ $x^2 . t^3$ $x^2 . t^1$ 9 10

$D^0 \to K^-\pi^+, K^-\pi^+\pi^0, K^-\pi^+\pi^-\pi^+$
$D^+ \to K^-\pi^+\pi^+$,
$D^{*+} \to D^0\pi^+$, $D^0 \to K^-\pi^+$
$N(\tau^+ \to \overline{\nu}_\tau h^+\pi^0)/N(\tau^+ \to \overline{\nu}_\tau h^+\pi^0\pi^0)$
$B^0 \to \overline{D}^0 D^0 K^+$
$D^{*+} \to D^0\pi^+$, $D^{*-} \to \overline{D}^0\pi^-$

$x^2 . t^3$ $x^2 . t^2$ $x^1 . t^1$ 5 6
------- = ------- . -------
$x^2 . t^3$ $x^2 . t^2$ $x^1 . t^1$ 5 6

Table 1: Number of events and branching fractions for each mode. The first error on the branching fraction is the statistical uncertainty and the second one is the systematic uncertainty.

B decay mode	Total yield in signal region	Estimated background	Excess	Branching fraction (10^{-3})	90% C.L. upper limit (10^{-3})
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$B^0 \to D^- D^0 K^+$	599	479±12	120±27	$1.7 \pm 0.3 \pm 0.3$	
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B^0 decays through external+internal W-emission amplitudes					
$B^0 \to D^- D^+ K^0$	26	19±2	7±5	$0.8^{+0.6}_{-0.5} \pm 0.3$	< 1.7
$B^0 \to D^{*-} D^+ K^0$+CC	84	34±3	50±10	$6.5 \pm 1.2 \pm 1.0$	
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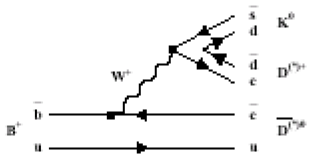
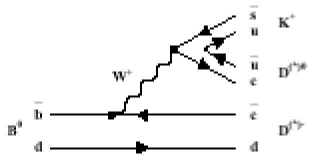
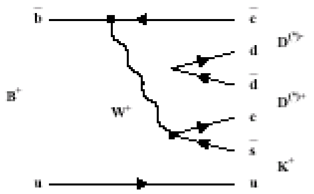
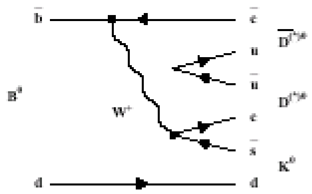
Table 2: Submode branching fractions used in the analysis [12]. The errors on the $\mathcal{B}(D^0 \to K^-\pi^+\pi^0)$ and $\mathcal{B}(D^0 \to K^-\pi^+\pi^-\pi^+)$ correlated to the error on $\mathcal{B}(D^0 \to K^-\pi^+)$ are indicated separately with the subscript $K\pi$.

Mode	$\mathcal{B}$ (%)
$D^0 \to K^-\pi^+$	3.80 ± 0.09
$D^0 \to K^-\pi^+\pi^0$	$13.10 \pm 0.84 \pm 0.31_{K\pi}$
$D^0 \to K^-\pi^+\pi^-\pi^+$	$7.46 \pm 0.30 \pm 0.18_{K\pi}$
$D^+ \to K^-\pi^+\pi^+$	9.1 ± 0.6
$D^{*+} \to D^0\pi^+$	67.7 ± 0.5
$D^{*+} \to D^+\pi^0$	30.7 ± 0.5
$D^{*0} \to D^0\pi^0$	61.9 ± 2.9
$D^{*0} \to D^0\gamma$	38.1 ± 2.9
$K^0_S \to \pi^+\pi^-$	68.61 ± 0.28

podle BaBar je :

$B^+ (\bar{b}\ u) \;=\; W^+ + \bar{D}^0 (\bar{c}\ u)$ // závada : podle č.v. je $B^+(\bar{b}\ d)$ //

$W^+ \;=\; K^0 (\bar{s}\ d) + D^+(\bar{d}\ c)$

$B^0 (\bar{b}\ d) \;=\; W^+ + \bar{D}^- (\bar{c}\ d)$ // závada : podle č.v. je $B^0 (\bar{b}\ u)$ //

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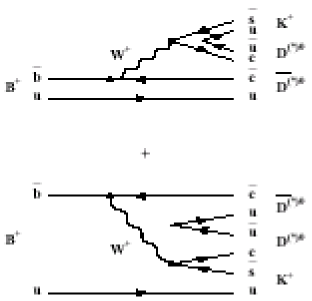
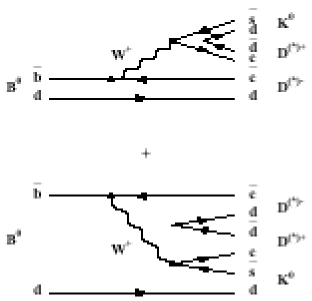

$B^0 \longrightarrow \bar{D}^{(*)}D^{(*)}K$ $\qquad$ $B^+ \longrightarrow \bar{D}^{(*)}D^{(*)}K$

$B^0 \;=\; \bar{D} + D + K^0$

$$\frac{x^3 . t^2}{x^3 . t^2} = \frac{x^2 . t^3}{x^2 . t^3} . \frac{x^2 . t^3}{x^2 . t^3} . \frac{x^2 . t^2}{x^2 . t^2} \qquad \frac{9\ 10}{9\ 10}$$

$B^+ \;=\; \bar{D} + D + K^+$

$$\frac{x^3 . t^3}{x^3 . t^3} = \frac{x^2 . t^3}{x^2 . t^3} . \frac{x^2 . t^3}{x^2 . t^3} . \frac{x^2 . t^1}{x^2 . t^1} \qquad \frac{9\ 10}{9\ 10}$$

$B^0 \to D^{(*)-} D^{(*)0} K^+$ $B^0 \to D^{(*)-} D^{(*)+} K^0_S$. $B^0 \to \overline{D}^{(*)0} D^{(*)0} K^0_S$.

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$B^0 \to \eta_c K^0_S$ $K^{*0} \to K^0_S \pi^0$

$K^0_S \to \pi^+ \pi^-$ and $\pi^0 \to \gamma\gamma$

$$\frac{x^1 . t^2}{x^1 . t^2} = \frac{x^2 . t^3}{x^2 . t^2} . \frac{x^2 . t^2}{x^2 . t^3} \qquad \frac{5\ 7}{5\ 7}$$

nerovnováha, ale zajímavé

$B^0 \to J/\psi K^0_S$

$$\frac{x^3 . t^2}{x^3 . t^2} = \frac{x^3 . t^4}{x^3 . t^4} . \frac{x^2 . t^2}{x^2 . t^2} \qquad \frac{8\ 8}{8\ 8}$$

$K^{*0} \to K^+ \pi^-$

$$\frac{x^2 . t^2}{x^2 . t^2} = \frac{x^2 . t^1}{x^2 . t^1} . \frac{x^1 . t^1}{x^1 . t^1} \qquad \frac{5\ 4}{5\ 4}$$

$K_S^0 = \pi^+ + \pi^-$

$$\frac{x^4 . t^3}{x^4 . t^3} = \frac{x^1 . t^1}{x^1 . t^1} . \frac{x^1 . t^1}{x^1 . t^1} \qquad \frac{6\ 5}{6\ 5}$$

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butions. These fractions range from $(0.3 \pm 0.1)\%$ for $J/\psi K^0_S$ ($K^0_S \to \pi^+\pi^-$) to $(13.1 \pm 5.9)\%$ for $\eta_c K^0_S$. For the $J/\psi K^0_S$ and $J/\psi K^{*0}$ decay modes, the composition, effective η_f, and ΔE distribution ($J/\psi K^0_S$ only) of the in-

$J/\psi \to \ell^+\ell^-$

Sample	$N_{\rm tag}$	$P(\%)$	$\sin 2\beta$
$J/\psi K^0_S$,$\psi(2S)K^0_S$,$\chi_{c1}K^0_S$,$\eta_c K^0_S$	1506	94	0.76 ± 0.07
$J/\psi K^0_L$ $(\eta_f = +1)$	988	55	0.72 ± 0.16
$J/\psi K^{*0}(K^{*0} \to K^0_S \pi^0)$	147	81	0.22 ± 0.52
Full CP sample	2641	78	0.74 ± 0.07
$J/\psi K^0_S$, $\psi(2S)K^0_S$, $\chi_{c1}K^0_S$, $\eta_c K^0_S$ only $(\eta_f = -1)$			
$J/\psi K^0_S$ $(K^0_S \to \pi^+\pi^-)$	974	97	0.82 ± 0.08
$J/\psi K^0_S$ $(K^0_S \to \pi^0\pi^0)$	170	89	0.39 ± 0.24
$\psi(2S)K^0_S$ $(K^0_S \to \pi^+\pi^-)$	150	97	0.69 ± 0.24
$\chi_{c1}K^0_S$	80	95	1.01 ± 0.40
$\eta_c K^0_S$	132	73	0.59 ± 0.32
`Lepton` category	220	98	0.79 ± 0.11
`Kaon I` category	400	93	0.78 ± 0.12
`Kaon II` category	444	93	0.73 ± 0.17
`Inclusive` category	442	92	0.45 ± 0.28
B^0 tags	740	94	0.76 ± 0.10
$\overline{B}^0$ tags	766	93	0.75 ± 0.10
$B_{\rm flav}$ sample	25375	85	0.02 ± 0.02
B^+ sample	22160	89	0.02 ± 0.02

6) Mezony pi0 a eta

(10.05.2003)

Dotaz:

1. Zajímalo by mě, jaký je rozdíl mezi částicí pí0 a částicí éta. Je možné říct, že pí0 je složeno z kvarků u a anti-u, a éta je složeno z kvarků d a anti-d? 2. Existuje nějaký veřejně přístupný fyzikální server, kde by bylo uvedeno, z jakých kvarků se jednotlivé mezony a baryony skládají? (Pavel Bednář)

Odpověď:

Mezony π^0 π^+ π^-a η^0 jsou OBA 'namíchány' z kvarků u a anti-u, d a anti-d, a eta dokonce i z s a anti-s, ale každý JINÝM ZPŮSOBEM. Pouhý kvarkový obsah totiž plně nevystihuje danou částici, takže to není tak jednoduché, jak jste si možná představoval. Namíchání vypadá přibližně takhle:
Pi0 = u anti-u - (d anti-d)
Eta = kombinace (u anti-u) + (d anti-d) + (s anti-s)
a (u anti-u) + (d anti-d) -2(s anti-s)

$(u\bar{u} + d\bar{d} - 2s\bar{s}) /\sqrt{6}$ => η^0 mezon eta neutrální
$(u\bar{u} + d\bar{d}) / \sqrt{2}$ => π^0

Tvar namíchání hlouběji souvisí s jistou symetrií, která se za vším skrývá. Jde tak o odlišné fyzikální stavy, což se projevuje jako odlišné částice (různé hmotnosti).
Dalším rozdílem je, že pion se vyskytuje ve třech různých nábojových variantách (pi+, pi0, pi-), kdežto eta pouze v jedné neutrální.

Pokud vás zajímá více, přečtěte si podrobnější odpověď... (pouze pro otrlé:)

Odkazy: Doporučuji zejména Text J. Chýly, str. 54-56, tam se skutečně dozvíte tvar vlnových funkcí protonů, neutronů...; dále str. 67: http://www-hep2.fzu.cz/Centrum/uc_texty.html
Text o mezonu eta a neutrálním pionu:(stránky 2,5)
http://www.ph.ic.ac.uk/ug/course_materials/docs/nuclear_particle_phys_lecture07.pdf
Kvarkový model: http://pdg.lbl.gov/2002/quarkmodrpp.pdf
Hmoty kvarků, různé definice a současné hodnoty: http://pdg.lbl.gov/2002/quarks_q000.pdf
(Jiří Kvita)

Seznam nalezených dotazů