Hadronic modes with two *K*'s

Γ_{105}	$\overline{K}^0 K^+$		$(7.8 \pm 1.7) \times 10^{-3}$	
Γ_{106}	$K^+ K^- \pi^+$		$(1.13 \pm 0.13)\ \%$	

In the fit as $\frac{1}{2}\Gamma_{121} + \frac{2}{3}\Gamma_{122} + \Gamma_{109}$, where $\frac{1}{2}\Gamma_{121} = \Gamma_{107}$ and $\frac{2}{3}\Gamma_{122} = \Gamma_{108}$.

Γ_{107}	$\phi\pi^+ \times B(\phi \to K^+K^-)$		$(3.3 \pm 0.4) \times 10^{-3}$	
Γ_{108}	$\overline{K}^*(892)^0 K^+ \times B(\overline{K}^{*0} \to K^-\pi^+)$		$(3.4 \pm 0.7) \times 10^{-3}$	
Γ_{109}	$K^+K^-\pi^+$ nonresonant		$(4.6 \pm 0.9) \times 10^{-3}$	
Γ_{110}	$K^+K^-\pi^+\pi^0$			
Γ_{111}	$\phi\pi^+\pi^0 \times B(\phi \to K^+K^-)$		$(1.2 \pm 0.5)\ \%$	
Γ_{112}	$\phi\rho^+ \times B(\phi \to K^+K^-)$		$< 7 \times 10^{-3}$	CL=90%
Γ_{113}	$K^+K^-\pi^+\pi^0$ non-ϕ		$(1.5\ ^{+0.7}_{-0.6})\ \%$	
Γ_{114}	$K^+\overline{K}^0\pi^+\pi^-$		$< 2\ \%$	CL=90%
Γ_{115}	$K^0K^-\pi^+\pi^+$		$(1.0 \pm 0.6)\ \%$	
Γ_{116}	$K^*(892)^+\overline{K}^*(892)^0 \times B^2(K^* \to K\pi^+)$		$(1.2 \pm 0.5)\ \%$	
Γ_{117}	$K^0K^-\pi^+\pi^+$ non-$K^{*+}\overline{K}^{*0}$		$< 7.9 \times 10^{-3}$	CL=90%
Γ_{118}	$K^+K^-\pi^+\pi^+\pi^-$			
Γ_{119}	$\phi\pi^+\pi^+\pi^- \times B(\phi \to K^+K^-)$		$< 1 \times 10^{-3}$	CL=90%
Γ_{120}	$K^+K^-\pi^+\pi^+\pi^-$ nonresonant		$< 3\ \%$	CL=90%

Fractions of the following modes with resonances have already appeared above as submodes of particular charged-particle modes.

Γ_{121}	$\phi\pi^+$		$(6.7 \pm 0.8) \times 10^{-3}$	
Γ_{122}	$\overline{K}^*(892)^0 K^+$		$(5.1 \pm 1.0) \times 10^{-3}$	
Γ_{123}	$\phi\pi^+\pi^0$		$(2.3 \pm 1.0)\ \%$	
Γ_{124}	$\phi\rho^+$		$< 1.5\ \%$	CL=90%
Γ_{125}	$K^*(892)^+\overline{K}^*(892)^0$		$(2.6 \pm 1.1)\ \%$	
Γ_{126}	$\phi\pi^+\pi^+\pi^-$		$< 2 \times 10^{-3}$	CL=90%

Doubly Cabibbo suppressed (*DC*) modes, $\Delta C = 1$ weak neutral current (*C1*) modes, or Lepton Family number (*LF*) or Lepton number (*L*) violating modes

Γ_{127}	$K^+\pi^+\pi^-$	*DC*	$< 5 \times 10^{-3}$	CL=90%
Γ_{128}	$K^+K^+K^-$	*DC*	$(5.2 \pm 2.0) \times 10^{-3}$	
Γ_{129}	ϕK^+	*DC*	$(3.9\ ^{+2.2}_{-1.9}) \times 10^{-4}$	
Γ_{130}	$\pi^+e^+e^-$	*C1*	$< 2.5 \times 10^{-3}$	CL=90%
Γ_{131}	$\pi^+\mu^+\mu^-$	*C1*	$< 2.9 \times 10^{-3}$	CL=90%
Γ_{132}	$K^+e^+e^-$	[f]	$< 4.8 \times 10^{-3}$	CL=90%
Γ_{133}	$K^+\mu^+\mu^-$	[f]	$< 9.2 \times 10^{-3}$	CL=90%
Γ_{134}	$\pi^+e^{\pm}\mu^{\mp}$	*LF* [g]	$< 3.8 \times 10^{-3}$	CL=90%
Γ_{135}	$\pi^+e^+\mu^-$	*LF*	$< 3.3 \times 10^{-3}$	CL=90%
Γ_{136}	$\pi^+e^-\mu^+$	*LF*	$< 3.3 \times 10^{-3}$	CL=90%
Γ_{137}	$K^+e^+\mu^-$	*LF*	$< 3.4 \times 10^{-3}$	CL=90%
Γ_{138}	$K^+e^-\mu^+$	*LF*	$< 3.4 \times 10^{-3}$	CL=90%
Γ_{139}	$\pi^-e^+e^+$	*L*	$< 4.8 \times 10^{-3}$	CL=90%
Γ_{140}	$\pi^-\mu^+\mu^+$	*L*	$< 6.8 \times 10^{-3}$	CL=90%
Γ_{141}	$\pi^-e^+\mu^+$	*L*	$< 3.7 \times 10^{-3}$	CL=90%
Γ_{142}	$K^-e^+e^+$	*L*	$< 9.1 \times 10^{-3}$	CL=90%
Γ_{143}	$K^-\mu^+\mu^+$	*L*	$< 4.3 \times 10^{-3}$	CL=90%
Γ_{144}	$K^-e^+\mu^+$	*L*	$< 4.0 \times 10^{-3}$	CL=90%

Γ_{145}	A dummy mode used by the fit.		$(34 \pm 5)\ \%$	

[a] This is a weighted average of $D^{\pm}$ (44%) and D^0 (56%) branching fractions. See "D^+ and $D^0 \to (\eta$anything) / (total D^+ and D^0)" under "D^+ Branching Ratios" in these Full Listings.

[b] This value combines the e^+ and μ^+ branching fractions, making a small phase-space adjustment to the μ^+ fraction to be able to use it as an e^+ fraction; hence the "ℓ^+." In fact, some of the e^+ measurements already use μ^+ events in this way.

[c] ℓ indicates e or μ mode, not sum over modes.

[d] The branching fractions for this mode may differ from the sum of the submodes that contribute to it, due to interference effects. See the relevant papers.

[e] The two experiments determining this ratio are in serious disagreement. See the Full Listings.

[f] This mode is not a useful test for a ΔC=1 weak neutral current because both quarks must change flavor in this decay.

[g] The value is for the sum of the charge states indicated.

CONSTRAINED FIT INFORMATION

An overall fit to 26 branching ratios uses 45 measurements and one constraint to determine 17 parameters. The overall fit has a $\chi^2 = 14.5$ for 29 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\rm total}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_{10}	x_{13}	x_{18}	x_{27}	x_{28}	x_{34}	x_{35}	x_{40}	x_{44}	x_{52}
x_{13}	4									
x_{18}	4	2								
x_{27}	15	29	8							
x_{28}	12	7	31	26						
x_{34}	41	6	5	20	16					
x_{35}	27	17	14	57	45	35				
x_{40}	0	0	0	0	0	0	0			
x_{44}	6	4	3	13	10	8	23	0		
x_{52}	8	5	4	17	14	10	30	0	18	
x_{69}	9	6	5	20	16	12	35	0	8	11
x_{76}	4	3	2	9	7	5	15	0	31	37
x_{82}	2	1	1	5	4	3	9	0	29	13
x_{109}	9	5	5	19	15	11	33	0	7	10
x_{121}	15	10	8	33	26	20	57	0	13	17
x_{122}	9	6	5	20	16	12	35	0	8	10
x_{145}	−33	−27	−12	−40	−34	−30	−53	−59	−46	−45

	x_{69}	x_{76}	x_{82}	x_{109}	x_{121}	x_{122}
x_{76}	5					
x_{82}	3	12				
x_{109}	12	5	3			
x_{121}	20	9	5	19		
x_{122}	12	5	3	11	20	
x_{145}	−26	−46	−33	−19	−32	−20

D^+ BRANCHING RATIOS

See the "Note on D Meson Branching Fractions" and the "Note on Semileptonic Decays of D and B Mesons," above.

Inclusive modes

$\Gamma(e^+\text{anything})/\Gamma_{\rm total}$ — Γ_1/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.172±0.019 OUR AVERAGE					
$0.20\ ^{+0.09}_{-0.07}$		AGUILAR-...	87E	HYBR	πp, pp 360, 400 GeV
0.170±0.019±0.007	158	BALTRUSAIT...85B		MRK3	e^+e^- 3.77 GeV
0.168±0.064	23	SCHINDLER	81	MRK2	e^+e^- 3.771 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.220\ ^{+0.044}_{-0.022}$		BACINO	80	DLCO	e^+e^- 3.77 GeV

D^+ and $D^0 \to (e^+\text{anything})$ / (total D^+ and D^0)

If measured at the $\psi(3770)$, this quantity is a weighted average of D^+ (44%) and D^0 (56%) branching fractions. Only experiments at $E_{\rm cm}$ = 3.77 GeV are included in the average here.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.110±0.011 OUR AVERAGE	Error includes scale factor of 1.1.				
0.117±0.011	295	BALTRUSAIT...85B		MRK3	e^+e^- 3.77 GeV
0.10 ±0.032		[4] SCHINDLER	81	MRK2	e^+e^- 3.771 GeV
0.072±0.028		FELLER	78	MRK1	e^+e^- 3.772 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.134±0.015±0.010		[5] ABE	93E	VNS	e^+e^- 58 GeV
$0.098\pm0.009\ ^{+0.006}_{-0.005}$	240	[6] ALBRECHT	92F	ARG	$e^+e^- \approx$ 10 GeV
0.096±0.007±0.015		[7] ONG	88	MRK2	e^+e^- 29 GeV
$0.116\ ^{+0.011}_{-0.009}$		[7] PAL	86	DLCO	e^+e^- 29 GeV
0.091±0.009±0.013		[7] AIHARA	85	TPC	e^+e^- 29 GeV
0.092±0.022±0.040		[7] ALTHOFF	84J	TASS	e^+e^- 34.6 GeV
0.091±0.013		[7] KOOP	84	DLCO	See PAL 86
0.08 ±0.015		[8] BACINO	79	DLCO	e^+e^- 3.772 GeV

[4] Isolates D^+ and $D^0 \to e^+$X and weights for relative production (44%–56%).

[5] ABE 93E also measures forward-backward asymmetries and fragmentation functions for c and b quarks.

[6] ALBRECHT 92F uses the excess of right-sign over wrong-sign leptons in a sample of events tagged by fully reconstructed $D^*(2010)^+ \to D^0\pi^+$ decays.

[7] Average BR for charm $\to e^+$X. Unlike at $E_{\rm cm}$ = 3.77 GeV, the admixture of charmed mesons is unknown.

[8] Not independent of BACINO 80 measurements of $\Gamma(e^+\text{anything})/\Gamma_{\rm total}$ for the D^+ and D^0 separately.