



$$I(J^P) = 0(\frac{1}{2}^+) \text{ Status: } ****$$

The parity of the  $\Lambda_c^+$  is defined to be positive (as are the parities of the proton, neutron, and  $\Lambda$ ). The spin  $J$  has not actually been measured yet. Results of an analysis of  $pK^-\pi^+$  decays (JEZABEK 92) are consistent with the expected  $J = 1/2$ . The quark content is  $udc$ .

We have omitted some results that have been superseded by later experiments. The omitted results may be found in earlier editions.

### $\Lambda_c^+$ MASS

Measurements with an error greater than 5 MeV or that are otherwise obsolete have been omitted.

The fit also includes  $\Sigma_c-\Lambda_c^+$  and  $\Lambda_c^{*+}-\Lambda_c^+$  mass-difference measurements, but this doesn't affect the  $\Lambda_c^+$  mass.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2284.9±0.6 OUR FIT</b>				
<b>2284.9±0.6 OUR AVERAGE</b>				
2284.7±0.6±0.7	1134	AVERY	91 CLEO	Six modes
2281.7±2.7±2.6	29	ALVAREZ	90B NA14	$pK^-\pi^+$
2285.8±0.6±1.2	101	BARLAG	89 NA32	$pK^-\pi^+$
2284.7±2.3±0.5	5	AGUILAR-...	88B LEBC	$pK^-\pi^+$
2283.1±1.7±2.0	628	ALBRECHT	88C ARG	$pK^-\pi^+$ , $p\bar{K}^0$ , $\Lambda_3\pi$
2286.2±1.7±0.7	97	ANJOS	88B E691	$pK^-\pi^+$
2281 ±3	2	JONES	87 HBC	$pK^-\pi^+$
2283 ±3	3	BOSETTI	82 HBC	$pK^-\pi^+$
2290 ±3	1	CALICCHIO	80 HYBR	$pK^-\pi^+$

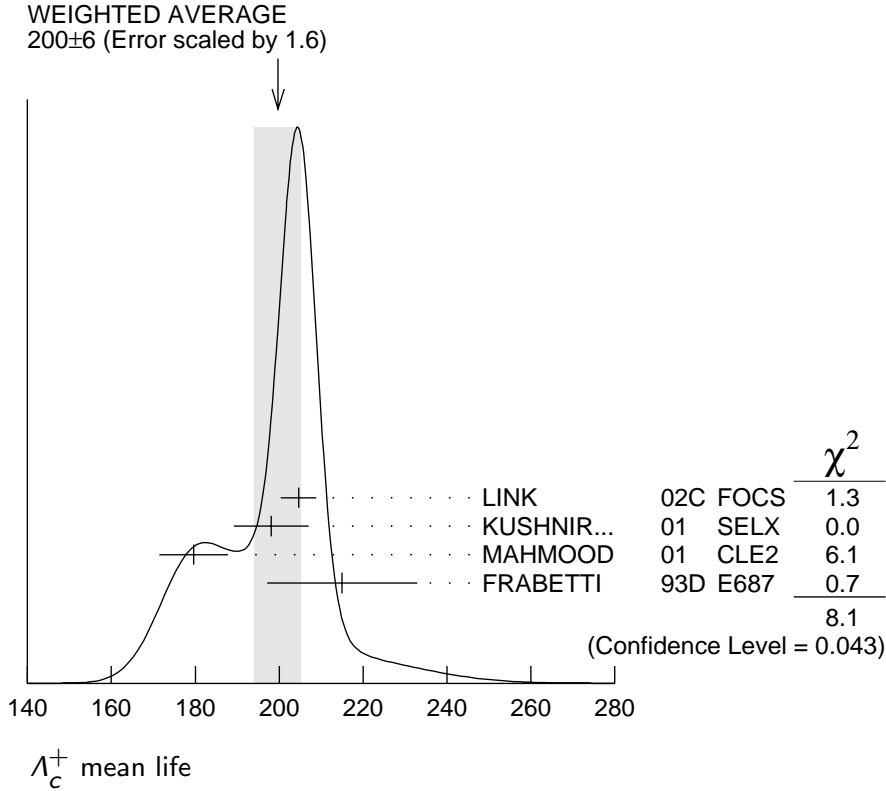
### $\Lambda_c^+$ MEAN LIFE

Measurements with an error  $\geq 100 \times 10^{-15}$  s or with fewer than 20 events have been omitted.

VALUE ( $10^{-15}$ s)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>200 ± 6 OUR AVERAGE</b> Error includes scale factor of 1.6. See the ideogram below.				
204.6± 3.4± 2.5	8034	LINK	02C FOCS	$pK^-\pi^+$
198.1± 7.0± 5.6	1630	KUSHNIR...	01 SELX	$\Lambda_c^+ \rightarrow pK^-\pi^+$
179.6± 6.9± 4.4	4749	MAHMOOD	01 CLE2	$e^+e^- \approx \Upsilon(4S)$
215 ±16 ± 8	1340	FRABETTI	93D E687	$\gamma\text{Be}, \Lambda_c^+ \rightarrow pK^-\pi^+$

• • • We do not use the following data for averages, fits, limits, etc. • • •

180 ±30 ±30	29	ALVAREZ	90 NA14	$\gamma, \Lambda_c^+ \rightarrow pK^- \pi^+$
200 ±30 ±30	90	FRABETTI	90 E687	$\gamma \text{Be}, \Lambda_c^+ \rightarrow pK^- \pi^+$
196 +23 -20	101	BARLAG	89 NA32	$pK^- \pi^+ + \text{c.c.}$
220 ±30 ±20	97	ANJOS	88B E691	$pK^- \pi^+ + \text{c.c.}$



## $\Lambda_c^+$ DECAY MODES

Nearly all branching fractions of the  $\Lambda_c^+$  are measured relative to the  $pK^- \pi^+$  mode, but there are no model-independent measurements of this branching fraction. We explain how we arrive at our value of  $B(\Lambda_c^+ \rightarrow pK^- \pi^+)$  in a Note at the beginning of the branching-ratio measurements, below. When this branching fraction is eventually well determined, all the other branching fractions will slide up or down proportionally as the true value differs from the value we use here.

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level
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**Hadronic modes with a  $p$ :  $S = -1$  final states**

$\Gamma_1$	$p\bar{K}^0$		$( 2.3 \pm 0.6 ) \%$
$\Gamma_2$	$pK^-\pi^+$	[a]	$( 5.0 \pm 1.3 ) \%$
$\Gamma_3$	$p\bar{K}^*(892)^0$	[b]	$( 1.6 \pm 0.5 ) \%$
$\Gamma_4$	$\Delta(1232)^{++}K^-$		$( 8.6 \pm 3.0 ) \times 10^{-3}$
$\Gamma_5$	$\Lambda(1520)\pi^+$	[b]	$( 5.9 \pm 2.1 ) \times 10^{-3}$
$\Gamma_6$	$pK^-\pi^+$ nonresonant		$( 2.8 \pm 0.8 ) \%$
$\Gamma_7$	$p\bar{K}^0\pi^0$		$( 3.3 \pm 1.0 ) \%$
$\Gamma_8$	$p\bar{K}^0\eta$		$( 1.2 \pm 0.4 ) \%$
$\Gamma_9$	$p\bar{K}^0\pi^+\pi^-$		$( 2.6 \pm 0.7 ) \%$
$\Gamma_{10}$	$pK^-\pi^+\pi^0$		$( 3.4 \pm 1.0 ) \%$
$\Gamma_{11}$	$pK^*(892)^-\pi^+$	[b]	$( 1.1 \pm 0.5 ) \%$
$\Gamma_{12}$	$p(K^-\pi^+)_{\text{nonresonant}}\pi^0$		$( 3.6 \pm 1.2 ) \%$
$\Gamma_{13}$	$\Delta(1232)\bar{K}^*(892)$	seen	
$\Gamma_{14}$	$pK^-\pi^+\pi^+\pi^-$		$( 1.1 \pm 0.8 ) \times 10^{-3}$
$\Gamma_{15}$	$pK^-\pi^+\pi^0\pi^0$		$( 8 \pm 4 ) \times 10^{-3}$
$\Gamma_{16}$	$pK^-\pi^+\pi^0\pi^0\pi^0$		

**Hadronic modes with a  $p$ :  $S = 0$  final states**

$\Gamma_{17}$	$p\pi^+\pi^-$		$( 3.5 \pm 2.0 ) \times 10^{-3}$
$\Gamma_{18}$	$pf_0(980)$	[b]	$( 2.8 \pm 1.9 ) \times 10^{-3}$
$\Gamma_{19}$	$p\pi^+\pi^+\pi^-\pi^-$		$( 1.8 \pm 1.2 ) \times 10^{-3}$
$\Gamma_{20}$	$pK^+K^-$		$( 7.7 \pm 3.5 ) \times 10^{-4}$
$\Gamma_{21}$	$p\phi$	[b]	$( 8.2 \pm 2.7 ) \times 10^{-4}$
$\Gamma_{22}$	$pK^+K^-$ non- $\phi$		$( 3.5 \pm 1.7 ) \times 10^{-4}$

**Hadronic modes with a hyperon:  $S = -1$  final states**

$\Gamma_{23}$	$\Lambda\pi^+$		$( 9.0 \pm 2.8 ) \times 10^{-3}$	
$\Gamma_{24}$	$\Lambda\pi^+\pi^0$		$( 3.6 \pm 1.3 ) \%$	
$\Gamma_{25}$	$\Lambda\rho^+$		$< 5$	CL=95%
$\Gamma_{26}$	$\Lambda\pi^+\pi^+\pi^-$		$( 3.3 \pm 1.0 ) \%$	
$\Gamma_{27}$	$\Lambda\pi^+\pi^+\pi^-\pi^0$ total		$( 1.8 \pm 0.8 ) \%$	
$\Gamma_{28}$	$\Lambda\pi^+\eta$		$( 1.8 \pm 0.6 ) \%$	
$\Gamma_{29}$	$\Sigma(1385)^+\eta$	[b]	$( 8.5 \pm 3.3 ) \times 10^{-3}$	
$\Gamma_{30}$	$\Lambda\pi^+\omega$	[b]	$( 1.2 \pm 0.5 ) \%$	
$\Gamma_{31}$	$\Lambda\pi^+\pi^+\pi^-\pi^0$ , no $\eta$ or $\omega$		$< 7$	$\times 10^{-3}$ CL=90%
$\Gamma_{32}$	$\Lambda K^+\bar{K}^0$		$( 6.0 \pm 2.1 ) \times 10^{-3}$	
$\Gamma_{33}$	$\Xi(1690)^0 K^+, \Xi(1690)^0 \rightarrow \Lambda\bar{K}^0$		$( 1.6 \pm 0.8 ) \times 10^{-3}$	
$\Gamma_{34}$	$\Sigma^0\pi^+$		$( 9.9 \pm 3.2 ) \times 10^{-3}$	
$\Gamma_{35}$	$\Sigma^+\pi^0$		$( 1.00 \pm 0.34 ) \%$	
$\Gamma_{36}$	$\Sigma^+\eta$		$( 5.5 \pm 2.3 ) \times 10^{-3}$	
$\Gamma_{37}$	$\Sigma^+\pi^+\pi^-$		$( 3.6 \pm 1.0 ) \%$	
$\Gamma_{38}$	$\Sigma^+\rho^0$		$< 1.4$	$\%$ CL=95%

$\Gamma_{39}$	$\Sigma^- \pi^+ \pi^+$		$( 1.9 \pm 0.8 ) \%$	
$\Gamma_{40}$	$\Sigma^0 \pi^+ \pi^0$		$( 1.8 \pm 0.8 ) \%$	
$\Gamma_{41}$	$\Sigma^0 \pi^+ \pi^+ \pi^-$		$( 1.1 \pm 0.4 ) \%$	
$\Gamma_{42}$	$\Sigma^+ \pi^+ \pi^- \pi^0$		—	
$\Gamma_{43}$	$\Sigma^+ \omega$	[b]	$( 2.7 \pm 1.0 ) \%$	
$\Gamma_{44}$	$\Sigma^+ K^+ K^-$		$( 2.8 \pm 0.8 ) \times 10^{-3}$	
$\Gamma_{45}$	$\Sigma^+ \phi$	[b]	$( 3.2 \pm 1.0 ) \times 10^{-3}$	
$\Gamma_{46}$	$\Xi(1690)^0 K^+, \Xi(1690)^0 \rightarrow \Sigma^+ K^-$		$( 8.2 \pm 3.1 ) \times 10^{-4}$	
$\Gamma_{47}$	$\Sigma^+ K^+ K^-$ nonresonant		$< 7 \times 10^{-4}$	CL=90%
$\Gamma_{48}$	$\Xi^0 K^+$		$( 3.9 \pm 1.4 ) \times 10^{-3}$	
$\Gamma_{49}$	$\Xi^- K^+ \pi^+$		$( 4.9 \pm 1.7 ) \times 10^{-3}$	
$\Gamma_{50}$	$\Xi(1530)^0 K^+$	[b]	$( 2.6 \pm 1.0 ) \times 10^{-3}$	

**Hadronic modes with a hyperon:  $S = 0$  final states**

$\Gamma_{51}$	$\Lambda K^+$		$( 6.7 \pm 2.5 ) \times 10^{-4}$	
$\Gamma_{52}$	$\Sigma^0 K^+$		$( 5.6 \pm 2.4 ) \times 10^{-4}$	
$\Gamma_{53}$	$\Sigma^+ K^+ \pi^-$		$( 1.7 \pm 0.7 ) \times 10^{-3}$	
$\Gamma_{54}$	$\Sigma^+ K^*(892)^0$	[b]	$( 2.8 \pm 1.1 ) \times 10^{-3}$	
$\Gamma_{55}$	$\Sigma^- K^+ \pi^+$		$< 1.0 \times 10^{-3}$	CL=90%

**Semileptonic modes**

$\Gamma_{56}$	$\Lambda \ell^+ \nu_\ell$	[c]	$( 2.0 \pm 0.6 ) \%$	
$\Gamma_{57}$	$\Lambda e^+ \nu_e$		$( 2.1 \pm 0.6 ) \%$	
$\Gamma_{58}$	$\Lambda \mu^+ \nu_\mu$		$( 2.0 \pm 0.7 ) \%$	

**Inclusive modes**

$\Gamma_{59}$	$e^+$ anything		$( 4.5 \pm 1.7 ) \%$	
$\Gamma_{60}$	$p e^+$ anything		$( 1.8 \pm 0.9 ) \%$	
$\Gamma_{61}$	$\Lambda e^+$ anything			
$\Gamma_{62}$	$p$ anything		$( 50 \pm 16 ) \%$	
$\Gamma_{63}$	$p$ anything (no $\Lambda$ )		$( 12 \pm 19 ) \%$	
$\Gamma_{64}$	$p$ hadrons			
$\Gamma_{65}$	$n$ anything		$( 50 \pm 16 ) \%$	
$\Gamma_{66}$	$n$ anything (no $\Lambda$ )		$( 29 \pm 17 ) \%$	
$\Gamma_{67}$	$\Lambda$ anything		$( 35 \pm 11 ) \%$	S=1.4
$\Gamma_{68}$	$\Sigma^\pm$ anything	[d]	$( 10 \pm 5 ) \%$	
$\Gamma_{69}$	3prongs		$( 24 \pm 8 ) \%$	

**$\Delta C = 1$  weak neutral current ( $C1$ ) modes, or Lepton number ( $L$ ) violating modes**

$\Gamma_{70}$	$p \mu^+ \mu^-$	$C1$	$< 3.4 \times 10^{-4}$	CL=90%
$\Gamma_{71}$	$\Sigma^- \mu^+ \mu^+$	$L$	$< 7.0 \times 10^{-4}$	CL=90%

- [a] See the note on “ $\Lambda_c^+$  Branching Fractions” below.
- [b] This branching fraction includes all the decay modes of the final-state resonance.
- [c] An  $\ell$  indicates an  $e$  or a  $\mu$  mode, not a sum over these modes.
- [d] The value is for the sum of the charge states or particle/antiparticle states indicated.

### CONSTRAINED FIT INFORMATION

An overall fit to 6 branching ratios uses 9 measurements and one constraint to determine 5 parameters. The overall fit has a  $\chi^2 = 2.1$  for 5 degrees of freedom.

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

$x_{37}$	91		
$x_{44}$	87	93	
$x_{45}$	84	90	84
	$x_2$	$x_{37}$	$x_{44}$

## $\Lambda_c^+$ BRANCHING FRACTIONS

Revised 2002 by P.R. Burchat (Stanford University).

Most  $\Lambda_c^+$  branching fractions are measured relative to the decay mode  $\Lambda_c^+ \rightarrow pK^-\pi^+$ . However, there are no completely model-independent measurements of the absolute branching fraction for  $\Lambda_c^+ \rightarrow pK^-\pi^+$ . Here we describe the measurements that have been used to extract  $B(\Lambda_c^+ \rightarrow pK^-\pi^+)$ , the model-dependence of the results, and the method we have used to average the results.

ARGUS (ALBRECHT 88C) and CLEO (CRAWFORD 92) measure  $B(\bar{B} \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow pK^-\pi^+)$  to be  $(0.30 \pm 0.12 \pm 0.06)\%$  and  $(0.273 \pm 0.051 \pm 0.039)\%$ . Under the assumptions that decays of  $\bar{B}$  mesons to baryons are dominated by  $\bar{B} \rightarrow \Lambda_c^+ X$  and that  $\Lambda_c^+ X$  final states other than  $\Lambda_c^+ \bar{N} X$  can be neglected, they also measure  $B(\bar{B} \rightarrow \Lambda_c^+ X)$  to be  $(6.8 \pm 0.5 \pm$

0.3)% (ALBRECHT 92O) and  $(6.4 \pm 0.8 \pm 0.8)\%$  (CRAWFORD 92). Combining these results, we get  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (4.14 \pm 0.91)\%$ . However, the assumption that  $\bar{B}$  decay modes to baryons other than  $\Lambda_c^+ \bar{N}X$  are negligible is not on solid ground experimentally or theoretically [2]. Therefore, the branching fraction for  $\Lambda_c^+ \rightarrow pK^-\pi^+$  given above may be low by some undetermined amount.

A second type of model-dependent determination of  $B(\Lambda_c^+ \rightarrow pK^-\pi^+)$  is based on measurements by ARGUS (ALBRECHT 91G) and CLEO (BERGFELD 94) of  $\sigma(e^+e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow \Lambda \ell^+ \nu_\ell) = (4.15 \pm 1.03 \pm 1.18)$  pb and  $(4.77 \pm 0.25 \pm 0.66)$  pb. ARGUS (ALBRECHT 96E) and CLEO (AVERY 91) have also measured  $\sigma(e^+e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow pK^-\pi^+)$ . The weighted average is  $(11.2 \pm 1.3)$  pb.

From these measurements, we extract  $R \equiv B(\Lambda_c^+ \rightarrow pK^-\pi^+)/B(\Lambda_c^+ \rightarrow \Lambda \ell^+ \nu_\ell) = 2.40 \pm 0.43$ . We estimate the  $\Lambda_c^+ \rightarrow pK^-\pi^+$  branching fraction from the equation

$$B(\Lambda_c^+ \rightarrow pK^-\pi^+) = R f F \frac{\Gamma(D \rightarrow X \ell^+ \nu_\ell)}{1 + |V_{cd}/V_{cs}|^2} \cdot \tau(\Lambda_c^+) , \quad (1)$$

where  $f = B(\Lambda_c^+ \rightarrow \Lambda \ell^+ \nu_\ell)/B(\Lambda_c^+ \rightarrow X_s \ell^+ \nu_\ell)$  and  $F = \Gamma(\Lambda_c^+ \rightarrow X_s \ell^+ \nu_\ell)/\Gamma(D^0 \rightarrow X_s \ell^+ \nu_\ell)$ . When we use  $1 + |V_{cd}/V_{cs}|^2 = 1.05$  and the world averages  $\Gamma(D \rightarrow X \ell^+ \nu_\ell) = (0.166 \pm 0.006) \times 10^{12} \text{ s}^{-1}$  and  $\tau(\Lambda_c^+) = (0.192 \pm 0.005) \times 10^{-12} \text{ s}$ , we calculate  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (7.3 \pm 1.4)\% \cdot f F$ . Theoretical estimates for  $f$  and  $F$  are near 1.0 with significant uncertainties.

So, we have two results with significant model-dependence:  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (4.14 \pm 0.91)\%$  from  $\bar{B}$  decays, and  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (7.3 \pm 1.4)\% \cdot f F$  from semileptonic  $\Lambda_c^+$  decays. If we set  $f F = 1.0$  in the second result, and assign an uncertainty of 30% to each result to account for the unknown model-dependence, we get the consistent results  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) =$

$(4.14 \pm 0.91 \pm 1.24)\%$  and  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (7.3 \pm 1.4 \pm 2.2)\%$ . The weighted average of these two results is  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (5.0 \pm 1.3)\%$ , where the uncertainty contains both the experimental uncertainty and the 30% estimate of model dependence in each result. We assigned the value  $(5.0 \pm 1.3)\%$  to the  $\Lambda_c^+ \rightarrow pK^-\pi^+$  branching fraction in our 2000 *Review* [1].

A third type of measurement of  $B(\Lambda_c^+ \rightarrow pK^-\pi^+)$  has been published by CLEO (JAFFE 00). Under the assumption that a  $\bar{D}$  meson and an antiproton in opposite hemispheres is evidence for a  $\Lambda_c^+$  in the hemisphere of the  $\bar{p}$ , the fraction of such  $\bar{D}\bar{p}$  events with a  $\Lambda_c^+ \rightarrow pK^-\pi^+$  decay can be used to determine the  $\Lambda_c^+ \rightarrow pK^-\pi^+$  branching fraction. CLEO measures  $B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (5.0 \pm 1.3)\%$ , which is coincidentally exactly the same value as our PDG 00 average given above. The quoted uncertainty includes significant contributions from model-dependent effects (*e.g.*, differences between the  $\bar{p}$  momentum spectrum in events with a  $\Lambda_c^+$  and  $\bar{p}$  in the same hemisphere, and with a  $\bar{D}$  and  $\bar{p}$  in opposite hemispheres; extrapolation of the  $\Lambda_c^+$  and  $\bar{D}$  momentum spectrum below the minimum value used for rejecting  $B$  decay products; and our limited understanding of backgrounds such as  $D\bar{D}N\bar{p}$  events).

We have chosen to continue to assign the value  $(5.0 \pm 1.3)\%$  to the  $\Lambda_c^+ \rightarrow pK^-\pi^+$  branching fraction (given as PDG 02 below). As was noted earlier, most of the other  $\Lambda_c^+$  decay modes are measured relative to this mode.

New methods for measuring the  $\Lambda_c^+$  absolute branching fractions have been proposed [2,3].

## References

1. D.E. Groom *et al.* (Particle Data Group), *Review of Particle Physics*, Eur. Phys. J. **C15**, 1 (2000).
2. I. Dunietz, Phys. Rev. **D58**, 094010 (1998).

3. P. Migliozi *et al.*, Phys. Lett. **B462**, 217 (1999).

**$\Lambda_c^+$  BRANCHING RATIOS**

————— Hadronic modes with a  $p$ :  $S = -1$  final states —————

**$\Gamma(p\bar{K}^0)/\Gamma(pK^-\pi^+)$   $\Gamma_1/\Gamma_2$**

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.47±0.04 OUR AVERAGE</b>				
0.46±0.02±0.04	1025	ALAM	98 CLE2	$e^+e^- \approx \Upsilon(4S)$
0.44±0.07±0.05	133	AVERY	91 CLEO	$e^+e^-$ 10.5 GeV
0.55±0.17±0.14	45	ANJOS	90 E691	$\gamma$ Be 70–260 GeV
0.62±0.15±0.03	73	ALBRECHT	88C ARG	$e^+e^-$ 10 GeV

**$\Gamma(pK^-\pi^+)/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$**

See the note on " $\Lambda_c^+$  Branching Fractions" above.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.050±0.013 OUR FIT</b>				
<b>0.050±0.013</b>		PDG	02	See note at top of ratios
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.050±0.005±0.012	1205	<sup>1</sup> JAFFE	00 CLE2	$e^+e^-$ 10.52–10.58 GeV
0.041±0.010		<sup>2,3</sup> ALBRECHT	92O ARG	$e^+e^- \approx \Upsilon(4S)$
0.044±0.012		<sup>2,4</sup> CRAWFORD	92 CLEO	$e^+e^-$ 10.5 GeV

<sup>1</sup> JAFFE 00 assumes that a  $\bar{D}$  meson and an antiproton in opposite hemispheres tags for a  $\Lambda_c^+$  in the hemisphere of the  $\bar{p}$ . The fraction of such  $\bar{D}\bar{p}$  events with a  $\Lambda_c^+ \rightarrow pK^-\pi^+$  decay then gives the  $pK^-\pi^+$  branching fraction. See the paper for assumptions, caveats, etc.

<sup>2</sup> To extract  $\Gamma(pK^-\pi^+)/\Gamma_{\text{total}}$ , we use  $B(\bar{B} \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow pK^-\pi^+) = (0.28 \pm 0.06)\%$ , which is the average of measurements from ARGUS (ALBRECHT 88C) and CLEO (CRAWFORD 92).

<sup>3</sup> ALBRECHT 92O measures  $B(\bar{B} \rightarrow \Lambda_c^+ X) = (6.8 \pm 0.5 \pm 0.3)\%$ .

<sup>4</sup> CRAWFORD 92 measures  $B(\bar{B} \rightarrow \Lambda_c^+ X) = (6.4 \pm 0.8 \pm 0.8)\%$ .

**$\Gamma(p\bar{K}^*(892)^0)/\Gamma(pK^-\pi^+)$   $\Gamma_3/\Gamma_2$**

Unseen decay modes of the  $\bar{K}^*(892)^0$  are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.31±0.04 OUR AVERAGE</b>				
0.29±0.04±0.03		<sup>5</sup> AITALA	00 E791	$\pi^- N$ , 500 GeV
0.35 <sup>+0.06</sup> <sub>-0.07</sub> ±0.03	39	BOZEK	93 NA32	$\pi^-$ Cu 230 GeV
0.42±0.24	12	BASILE	81B CNTR	$pp \rightarrow \Lambda_c^+ e^- X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.35±0.11 BARLAG 90D NA32 See BOZEK 93

<sup>5</sup> AITALA 00 makes a coherent 5-dimensional amplitude analysis of  $946 \pm 38 \Lambda_c^+ \rightarrow pK^-\pi^+$  decays.



$\Gamma(\Delta(1232)^{++} K^-)/\Gamma(\rho K^- \pi^+)$   $\Gamma_4/\Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.17±0.04 OUR AVERAGE</b> Error includes scale factor of 1.1.				
0.18±0.03±0.03		<sup>6</sup> AITALA	00 E791	$\pi^- N$ , 500 GeV
0.12 <sup>+0.04</sup> <sub>-0.05</sub> ±0.05	14	BOZEK	93 NA32	$\pi^- Cu$ 230 GeV
0.40±0.17	17	BASILE	81B CNTR	$pp \rightarrow \Lambda_c^+ e^- X$

<sup>6</sup> AITALA 00 makes a coherent 5-dimensional amplitude analysis of  $946 \pm 38 \Lambda_c^+ \rightarrow \rho K^- \pi^+$  decays.

$\Gamma(\Lambda(1520)\pi^+)/\Gamma(\rho K^- \pi^+)$   $\Gamma_5/\Gamma_2$

Unseen decay modes of the  $\Lambda(1520)$  are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.119<sup>+0.032</sup><sub>-0.028</sub> OUR AVERAGE</b>				
0.15 ±0.04 ±0.02		<sup>7</sup> AITALA	00 E791	$\pi^- N$ , 500 GeV
0.09 <sup>+0.04</sup> <sub>-0.03</sub> ±0.02	12	BOZEK	93 NA32	$\pi^- Cu$ 230 GeV

<sup>7</sup> AITALA 00 makes a coherent 5-dimensional amplitude analysis of  $946 \pm 38 \Lambda_c^+ \rightarrow \rho K^- \pi^+$  decays.

$\Gamma(\rho K^- \pi^+ \text{nonresonant})/\Gamma(\rho K^- \pi^+)$   $\Gamma_6/\Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.55±0.06 OUR AVERAGE</b>				
0.55±0.06±0.04		<sup>8</sup> AITALA	00 E791	$\pi^- N$ , 500 GeV
0.56 <sup>+0.07</sup> <sub>-0.09</sub> ±0.05	71	BOZEK	93 NA32	$\pi^- Cu$ 230 GeV

<sup>8</sup> AITALA 00 makes a coherent 5-dimensional amplitude analysis of  $946 \pm 38 \Lambda_c^+ \rightarrow \rho K^- \pi^+$  decays.

$\Gamma(\rho \bar{K}^0 \pi^0)/\Gamma(\rho K^- \pi^+)$   $\Gamma_7/\Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.66±0.05±0.07</b>	774	ALAM	98 CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\rho \bar{K}^0 \eta)/\Gamma(\rho K^- \pi^+)$   $\Gamma_8/\Gamma_2$

Unseen decay modes of the  $\eta$  are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.25±0.04±0.04</b>	57	AMMAR	95 CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\rho \bar{K}^0 \pi^+ \pi^-)/\Gamma(\rho K^- \pi^+)$   $\Gamma_9/\Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.51±0.06 OUR AVERAGE</b>				
0.52±0.04±0.05	985	ALAM	98 CLE2	$e^+ e^- \approx \Upsilon(4S)$
0.43±0.12±0.04	83	AVERY	91 CLEO	$e^+ e^-$ 10.5 GeV
0.98±0.36±0.08	12	BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho K^- \pi^+ \pi^0)/\Gamma(\rho K^- \pi^+)$   $\Gamma_{10}/\Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.67±0.04±0.11</b>	2606	ALAM	98 CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\rho K^*(892)^- \pi^+) / \Gamma(\rho \bar{K}^0 \pi^+ \pi^-)$   $\Gamma_{11} / \Gamma_9$

Unseen decay modes of the  $K^*(892)^-$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.44 ± 0.14</b>	17	ALEEV	94 BIS2	$nN$ 20–70 GeV

$\Gamma(\rho(K^- \pi^+)_{\text{nonresonant}} \pi^0) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{12} / \Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.73 ± 0.12 ± 0.05</b>	67	BOZEK	93 NA32	$\pi^-$ Cu 230 GeV

$\Gamma(\Delta(1232) \bar{K}^*(892)) / \Gamma_{\text{total}}$   $\Gamma_{13} / \Gamma$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>seen</b>	35	AMENDOLIA	87 SPEC	$\gamma$ Ge-Si

$\Gamma(\rho K^- \pi^+ \pi^+ \pi^-) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{14} / \Gamma_2$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.022 ± 0.015</b>	BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho K^- \pi^+ \pi^0 \pi^0) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{15} / \Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.16 ± 0.07 ± 0.03</b>	15	BOZEK	93 NA32	$\pi^-$ Cu 230 GeV

$\Gamma(\rho K^- \pi^+ \pi^0 \pi^0 \pi^0) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{16} / \Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.10 ± 0.06 ± 0.02</b>	8	BOZEK	93 NA32	$\pi^-$ Cu 230 GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

————— **Hadronic modes with a  $\rho$ :  $S = 0$  final states** —————

$\Gamma(\rho \pi^+ \pi^-) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{17} / \Gamma_2$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.069 ± 0.036</b>	BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho f_0(980)) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{18} / \Gamma_2$

Unseen decay modes of the  $f_0(980)$  are included.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.055 ± 0.036</b>	BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho \pi^+ \pi^+ \pi^- \pi^-) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{19} / \Gamma_2$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.036 ± 0.023</b>	BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho K^+ K^-) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{20} / \Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.015 ± 0.006 OUR AVERAGE</b>				Error includes scale factor of 2.1.
0.014 ± 0.002 ± 0.002	676	ABE	02C BELL	$e^+ e^- \approx \Upsilon(4S)$
0.039 ± 0.009 ± 0.007	214	ALEXANDER	96C CLE2	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.096 ± 0.029 ± 0.010	30	FRABETTI	93H E687	$\gamma$ Be, $\bar{E}_\gamma$ 220 GeV
0.048 ± 0.027		BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho\phi)/\Gamma(\rho K^- \pi^+)$

$\Gamma_{21}/\Gamma_2$

Unseen decay modes of the  $\phi$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.0164 ± 0.0032 OUR AVERAGE</b>				Error includes scale factor of 1.2.
0.015 ± 0.002 ± 0.002	345	ABE	02C BELL	$e^+ e^- \approx \Upsilon(4S)$
0.024 ± 0.006 ± 0.003	54	ALEXANDER	96C CLE2	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.040 ± 0.027		BARLAG	90D NA32	$\pi^-$ 230 GeV

$\Gamma(\rho\phi)/\Gamma(\rho K^+ K^-)$

$\Gamma_{21}/\Gamma_{20}$

Unseen decay modes of the  $\phi$  are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.58	90	FRABETTI	93H E687	$\gamma$ Be, $\bar{E}_\gamma$ 220 GeV

$\Gamma(\rho K^+ K^- \text{ non-}\phi)/\Gamma(\rho K^- \pi^+)$

$\Gamma_{22}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.007 ± 0.002 ± 0.002</b>	344	ABE	02C BELL	$e^+ e^- \approx \Upsilon(4S)$

————— Hadronic modes with a hyperon:  $S = -1$  final states —————

$\Gamma(\Lambda\pi^+)/\Gamma(\rho K^- \pi^+)$

$\Gamma_{23}/\Gamma_2$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.180 ± 0.032 OUR AVERAGE</b>					
0.18 ± 0.03 ± 0.04			ALBRECHT	92 ARG	$e^+ e^- \approx 10.4$ GeV
0.18 ± 0.03 ± 0.03		87	AVERY	91 CLEO	$e^+ e^-$ 10.5 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.33	90		ANJOS	90 E691	$\gamma$ Be 70–260 GeV
<0.16	90		ALBRECHT	88C ARG	$e^+ e^-$ 10 GeV

$\Gamma(\Lambda\pi^+\pi^0)/\Gamma(\rho K^- \pi^+)$

$\Gamma_{24}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.73 ± 0.09 ± 0.16</b>	464	AVERY	94 CLE2	$e^+ e^- \approx \Upsilon(3S), \Upsilon(4S)$

$\Gamma(\Lambda\rho^+)/\Gamma(\rho K^- \pi^+)$

$\Gamma_{25}/\Gamma_2$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.95</b>	95	AVERY	94 CLE2	$e^+ e^- \approx \Upsilon(3S), \Upsilon(4S)$

$\Gamma(\Lambda\pi^+\pi^+\pi^-)/\Gamma(\rho K^- \pi^+)$

$\Gamma_{26}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.66 ± 0.11 OUR AVERAGE</b>				
0.65 ± 0.11 ± 0.12	289	AVERY	91 CLEO	$e^+ e^-$ 10.5 GeV
0.82 ± 0.29 ± 0.27	44	ANJOS	90 E691	$\gamma$ Be 70–260 GeV
0.94 ± 0.41 ± 0.13	10	BARLAG	90D NA32	$\pi^-$ 230 GeV
0.61 ± 0.16 ± 0.04	105	ALBRECHT	88C ARG	$e^+ e^-$ 10 GeV

$\Gamma(\rho\bar{K}^0\pi^+\pi^-)/\Gamma(\Lambda\pi^+\pi^+\pi^-)$   $\Gamma_9/\Gamma_{26}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$2.6 \pm 1.2$		ALEEV	96	SPEC <i>n</i> nucleus, 50 GeV/c
$4.3 \pm 1.2$	130	ALEEV	84	BIS2 <i>n</i> C 40–70 GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$\Gamma(\Lambda\pi^+\pi^+\pi^-\pi^0 \text{ total})/\Gamma(\rho K^-\pi^+)$   $\Gamma_{27}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.36 \pm 0.09 \pm 0.09</math></b>	50	<sup>9</sup> CRONIN-HEN..03	CLE3	$e^+e^- \approx \gamma(4S)$

<sup>9</sup> CRONIN-HENNESSY 03 finds this channel to be dominately  $\Lambda\eta\pi^+$  and  $\Lambda\omega\pi^+$ ; see below.

$\Gamma(\Lambda\pi^+\eta)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{28}/\Gamma_2$

Unseen decay modes of the  $\eta$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.36 \pm 0.07</math> OUR AVERAGE</b>				
$0.41 \pm 0.17 \pm 0.10$	11	CRONIN-HEN..03	CLE3	$e^+e^- \approx \gamma(4S)$
$0.35 \pm 0.05 \pm 0.06$	116	AMMAR	95	CLE2 $e^+e^- \approx \gamma(4S)$

$\Gamma(\Sigma(1385)^+\eta)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{29}/\Gamma_2$

Unseen decay modes of the  $\Sigma(1385)^+$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.17 \pm 0.04 \pm 0.03</math></b>	54	AMMAR	95	CLE2 $e^+e^- \approx \gamma(4S)$

$\Gamma(\Lambda\pi^+\omega)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{30}/\Gamma_2$

Unseen decay modes of the  $\omega$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.24 \pm 0.06 \pm 0.06</math></b>	32	CRONIN-HEN..03	CLE3	$e^+e^- \approx \gamma(4S)$

$\Gamma(\Lambda\pi^+\pi^+\pi^-\pi^0, \text{ no } \eta \text{ or } \omega)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{31}/\Gamma_2$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 0.13</math></b>	90	CRONIN-HEN..03	CLE3	$e^+e^- \approx \gamma(4S)$

$\Gamma(\Lambda K^+\bar{K}^0)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{32}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.12 \pm 0.02 \pm 0.02</math></b>	59	AMMAR	95	CLE2 $e^+e^- \approx \gamma(4S)$

$\Gamma(\Xi(1690)^0 K^+, \Xi(1690)^0 \rightarrow \Lambda\bar{K}^0)/\Gamma(\Lambda K^+\bar{K}^0)$   $\Gamma_{33}/\Gamma_{32}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.26 \pm 0.08 \pm 0.03</math></b>	93	ABE	02C	BELL $e^+e^- \approx \gamma(4S)$

$\Gamma(\Sigma^0\pi^+)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{34}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.20 \pm 0.04</math> OUR AVERAGE</b>				
$0.21 \pm 0.02 \pm 0.04$	196	AVERY	94	CLE2 $e^+e^- \approx \gamma(3S), \gamma(4S)$
$0.17 \pm 0.06 \pm 0.04$		ALBRECHT	92	ARG $e^+e^- \approx 10.4$ GeV

$\Gamma(\Sigma^+\pi^0)/\Gamma(\rho K^-\pi^+)$   $\Gamma_{35}/\Gamma_2$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.20 \pm 0.03 \pm 0.03</math></b>	93	KUBOTA	93	CLE2 $e^+e^- \approx \gamma(4S)$

$\Gamma(\Sigma^+ \eta)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{36}/\Gamma_2$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.11±0.03±0.02</b>	26	AMMAR	95 CLE2	$e^+ e^- \approx \gamma(4S)$	
$\Gamma(\Sigma^+ \pi^+ \pi^-)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{37}/\Gamma_2$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.73±0.08 OUR FIT</b>					
<b>0.68±0.09 OUR AVERAGE</b>					
0.74±0.07±0.09	487	KUBOTA	93 CLE2	$e^+ e^- \approx \gamma(4S)$	
0.54 <sup>+0.18</sup> <sub>-0.15</sub>	11	BARLAG	92 NA32	$\pi^- \text{Cu } 230 \text{ GeV}$	
$\Gamma(\Sigma^+ \rho^0)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{38}/\Gamma_2$		
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>&lt;0.27</b>	95	KUBOTA	93 CLE2	$e^+ e^- \approx \gamma(4S)$	
$\Gamma(\Sigma^- \pi^+ \pi^+)/\Gamma(\Sigma^+ \pi^+ \pi^-)$			$\Gamma_{39}/\Gamma_{37}$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.53±0.15±0.07</b>	56	FRABETTI	94E E687	$\gamma \text{Be}, \bar{E}_\gamma 220 \text{ GeV}$	
$\Gamma(\Sigma^0 \pi^+ \pi^0)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{40}/\Gamma_2$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.36±0.09±0.10</b>	117	AVERY	94 CLE2	$e^+ e^- \approx \gamma(3S), \gamma(4S)$	
$\Gamma(\Sigma^0 \pi^+ \pi^+ \pi^-)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{41}/\Gamma_2$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.21±0.05±0.05</b>	90	AVERY	94 CLE2	$e^+ e^- \approx \gamma(3S), \gamma(4S)$	
$\Gamma(\Sigma^+ \omega)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{43}/\Gamma_2$		
Unseen decay modes of the $\omega$ are included.					
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.54±0.13±0.06</b>	107	KUBOTA	93 CLE2	$e^+ e^- \approx \gamma(4S)$	
$\Gamma(\Sigma^+ K^+ K^-)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{44}/\Gamma_2$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.057±0.008 OUR FIT</b>					
<b>0.070±0.011±0.011</b>	59	AVERY	93 CLE2	$e^+ e^- \approx 10.5 \text{ GeV}$	
$\Gamma(\Sigma^+ K^+ K^-)/\Gamma(\Sigma^+ \pi^+ \pi^-)$			$\Gamma_{44}/\Gamma_{37}$		
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.078±0.009 OUR FIT</b>					
<b>0.074±0.009 OUR AVERAGE</b>					
0.076±0.007±0.009	246	ABE	02C BELL	$e^+ e^- \approx \gamma(4S)$	
0.071±0.011±0.011	103	LINK	02G FOCS	$\gamma \text{ nucleus}, \approx 180 \text{ GeV}$	
$\Gamma(\Sigma^+ \phi)/\Gamma(\rho K^- \pi^+)$			$\Gamma_{45}/\Gamma_2$		
Unseen decay modes of the $\phi$ are included.					
<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.063±0.011 OUR FIT</b>					
<b>0.069±0.023±0.016</b>	26	AVERY	93 CLE2	$e^+ e^- \approx 10.5 \text{ GeV}$	

$\Gamma(\Sigma^+ \phi) / \Gamma(\Sigma^+ \pi^+ \pi^-)$   $\Gamma_{45} / \Gamma_{37}$

Unseen decay modes of the  $\phi$  are included.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.087 ± 0.012 OUR FIT</b>				
<b>0.086 ± 0.012 OUR AVERAGE</b>				
0.085 ± 0.012 ± 0.012	129	ABE	02C BELL	$e^+ e^- \approx \Upsilon(4S)$
0.087 ± 0.016 ± 0.006	57	LINK	02G FOCS	$\gamma$ nucleus, $\approx 180$ GeV

$\Gamma(\Xi(1690)^0 K^+, \Xi(1690)^0 \rightarrow \Sigma^+ K^-) / \Gamma(\Sigma^+ \pi^+ \pi^-)$   $\Gamma_{46} / \Gamma_{37}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.023 ± 0.005 OUR AVERAGE</b>				
0.023 ± 0.005 ± 0.005	75	ABE	02C BELL	$e^+ e^- \approx \Upsilon(4S)$
0.022 ± 0.006 ± 0.006	34	LINK	02G FOCS	$\gamma$ nucleus, $\approx 180$ GeV

$\Gamma(\Sigma^+ K^+ K^- \text{ nonresonant}) / \Gamma(\Sigma^+ \pi^+ \pi^-)$   $\Gamma_{47} / \Gamma_{37}$

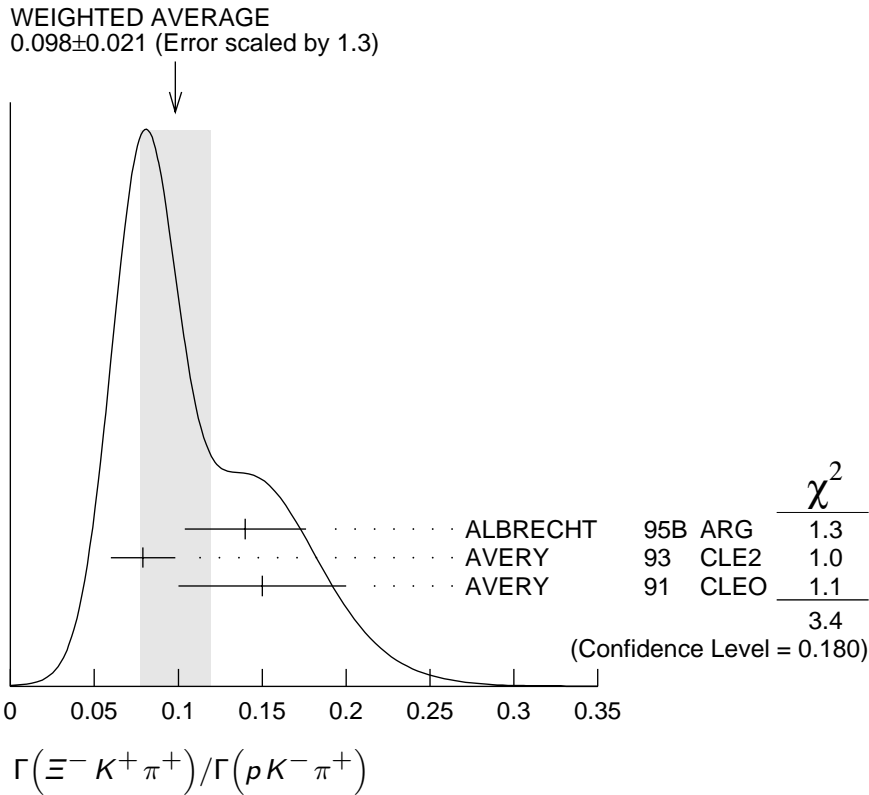
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;0.018</b>	90	ABE	02C BELL	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.028	90	LINK	02G FOCS	$\gamma$ nucleus, $\approx 180$ GeV

$\Gamma(\Xi^0 K^+) / \Gamma(p K^- \pi^+)$   $\Gamma_{48} / \Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.078 ± 0.013 ± 0.013</b>	56	AVERY	93 CLE2	$e^+ e^- \approx 10.5$ GeV

$\Gamma(\Xi^- K^+ \pi^+) / \Gamma(p K^- \pi^+)$   $\Gamma_{49} / \Gamma_2$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.098 ± 0.021 OUR AVERAGE</b> Error includes scale factor of 1.3. See the ideogram below.				
0.14 ± 0.03 ± 0.02	34	ALBRECHT	95B ARG	$e^+ e^- \approx 10.4$ GeV
0.079 ± 0.013 ± 0.014	60	AVERY	93 CLE2	$e^+ e^- \approx 10.5$ GeV
0.15 ± 0.04 ± 0.03	30	AVERY	91 CLEO	$e^+ e^- 10.5$ GeV



**$\Gamma(\Xi(1530)^0 K^+) / \Gamma(\rho K^- \pi^+)$   $\Gamma_{50} / \Gamma_2$**

Unseen decay modes of the  $\Xi(1530)^0$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.052 \pm 0.014</math></b>	<b>OUR AVERAGE</b>			
$0.05 \pm 0.02 \pm 0.01$	11	ALBRECHT	95B ARG	$e^+ e^- \approx 10.4$ GeV
$0.053 \pm 0.016 \pm 0.010$	24	AVERY	93 CLE2	$e^+ e^- \approx 10.5$ GeV

**Hadronic modes with a hyperon:  $S = 0$  final states**

**$\Gamma(\Lambda K^+) / \Gamma(\Lambda \pi^+)$   $\Gamma_{51} / \Gamma_{23}$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.074 \pm 0.010 \pm 0.012</math></b>	265	ABE	02C BELL	$e^+ e^- \approx \gamma(4S)$

**$\Gamma(\Sigma^0 K^+) / \Gamma(\Sigma^0 \pi^+)$   $\Gamma_{52} / \Gamma_{34}$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.056 \pm 0.014 \pm 0.008</math></b>	75	ABE	02C BELL	$e^+ e^- \approx \gamma(4S)$

**$\Gamma(\Sigma^+ K^+ \pi^-) / \Gamma(\Sigma^+ \pi^+ \pi^-)$   $\Gamma_{53} / \Gamma_{37}$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.047 \pm 0.011 \pm 0.008</math></b>	105	ABE	02C BELL	$e^+ e^- \approx \gamma(4S)$

**$\Gamma(\Sigma^+ K^*(892)^0) / \Gamma(\Sigma^+ \pi^+ \pi^-)$   $\Gamma_{54} / \Gamma_{37}$**

Unseen decay modes of the  $K^*(892)^0$  are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.078 \pm 0.018 \pm 0.013</math></b>	49	LINK	02G FOCS	$\gamma$ nucleus, $\approx 180$ GeV

$\Gamma(\Sigma^- K^+ \pi^+)/\Gamma(\Sigma^+ K^*(892)^0)$   $\Gamma_{55}/\Gamma_{54}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.35	90	LINK	02G FOCS	$\gamma$ nucleus, $\approx 180$ GeV

————— Semileptonic modes —————

$\Gamma(\Lambda \ell^+ \nu_\ell)/\Gamma(p K^- \pi^+)$   $\Gamma_{56}/\Gamma_2$

We average here the averages of the next two data blocks.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.41 ± 0.05 OUR AVERAGE</b>			
0.42 ± 0.07	PDG	02	Our $\Gamma(\Lambda e^+ \nu_e)/\Gamma(p K^- \pi^+)$
0.39 ± 0.08	PDG	02	Our $\Gamma(\Lambda \mu^+ \nu_\mu)/\Gamma(p K^- \pi^+)$

$\Gamma(\Lambda e^+ \nu_e)/\Gamma(p K^- \pi^+)$   $\Gamma_{57}/\Gamma_2$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.42 ± 0.07 OUR AVERAGE</b>			
0.43 ± 0.08	10,11 BERGFELD	94 CLE2	$e^+ e^- \approx \Upsilon(4S)$
0.38 ± 0.14	11,12 ALBRECHT	91G ARG	$e^+ e^- \approx 10.4$ GeV

<sup>10</sup> BERGFELD 94 measures  $\sigma(e^+ e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow \Lambda e^+ \nu_e) = (4.87 \pm 0.28 \pm 0.69)$  pb.

<sup>11</sup> To extract  $\Gamma(\Lambda_c^+ \rightarrow \Lambda e^+ \nu_e)/\Gamma(\Lambda_c^+ \rightarrow p K^- \pi^+)$ , we use  $\sigma(e^+ e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c \rightarrow p K^- \pi^+) = (11.2 \pm 1.3)$  pb, which is the weighted average of measurements from ARGUS (ALBRECHT 96E) and CLEO (AVERY 91).

<sup>12</sup> ALBRECHT 91G measures  $\sigma(e^+ e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow \Lambda e^+ \nu_e) = (4.20 \pm 1.28 \pm 0.71)$  pb.

$\Gamma(\Lambda \mu^+ \nu_\mu)/\Gamma(p K^- \pi^+)$   $\Gamma_{58}/\Gamma_2$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.39 ± 0.08 OUR AVERAGE</b>			
0.40 ± 0.09	13,14 BERGFELD	94 CLE2	$e^+ e^- \approx \Upsilon(4S)$
0.35 ± 0.20	14,15 ALBRECHT	91G ARG	$e^+ e^- \approx 10.4$ GeV

<sup>13</sup> BERGFELD 94 measures  $\sigma(e^+ e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow \Lambda \mu^+ \nu_\mu) = (4.43 \pm 0.51 \pm 0.64)$  pb.

<sup>14</sup> To extract  $\Gamma(\Lambda_c^+ \rightarrow \Lambda \mu^+ \nu_\mu)/\Gamma(\Lambda_c^+ \rightarrow p K^- \pi^+)$ , we use  $\sigma(e^+ e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c \rightarrow p K^- \pi^+) = (11.2 \pm 1.3)$  pb, which is the weighted average of measurements from ARGUS (ALBRECHT 96E) and CLEO (AVERY 91).

<sup>15</sup> ALBRECHT 91G measures  $\sigma(e^+ e^- \rightarrow \Lambda_c^+ X) \cdot B(\Lambda_c^+ \rightarrow \Lambda \mu^+ \nu_\mu) = (3.91 \pm 2.02 \pm 0.90)$  pb.

————— Inclusive modes —————

$\Gamma(e^+ \text{ anything})/\Gamma_{\text{total}}$   $\Gamma_{59}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.045 ± 0.017</b>	VELLA	82 MRK2	$e^+ e^-$ 4.5–6.8 GeV

$\Gamma(p e^+ \text{ anything})/\Gamma_{\text{total}}$   $\Gamma_{60}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.018 ± 0.009</b>	<sup>16</sup> VELLA	82 MRK2	$e^+ e^-$ 4.5–6.8 GeV

<sup>16</sup>VELLA 82 includes protons from  $\Lambda$  decay.



**$\Gamma(\Lambda e^+ \text{ anything})/\Gamma_{\text{total}}$**   **$\Gamma_{61}/\Gamma$**

<i>VALUE</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.011±0.008	<sup>17</sup> VELLA	82	MRK2 $e^+e^-$ 4.5–6.8 GeV
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<sup>17</sup>VELLA 82 includes  $\Lambda$ 's from  $\Sigma^0$  decay.

**$\Gamma(p \text{ anything})/\Gamma_{\text{total}}$**   **$\Gamma_{62}/\Gamma$**

<i>VALUE</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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0.50±0.08±0.14	<sup>18</sup> CRAWFORD	92	CLEO $e^+e^-$ 10.5 GeV
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<sup>18</sup>This CRAWFORD 92 value includes protons from  $\Lambda$  decay. The value is model dependent, but account is taken of this in the systematic error.

**$\Gamma(p \text{ anything (no } \Lambda))/\Gamma_{\text{total}}$**   **$\Gamma_{63}/\Gamma$**

<i>VALUE</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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0.12±0.10±0.16	CRAWFORD	92	CLEO $e^+e^-$ 10.5 GeV
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**$\Gamma(n \text{ anything})/\Gamma_{\text{total}}$**   **$\Gamma_{65}/\Gamma$**

<i>VALUE</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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0.50±0.08±0.14	<sup>19</sup> CRAWFORD	92	CLEO $e^+e^-$ 10.5 GeV
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<sup>19</sup>This CRAWFORD 92 value includes neutrons from  $\Lambda$  decay. The value is model dependent, but account is taken of this in the systematic error.

**$\Gamma(n \text{ anything (no } \Lambda))/\Gamma_{\text{total}}$**   **$\Gamma_{66}/\Gamma$**

<i>VALUE</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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0.29±0.09±0.15	CRAWFORD	92	CLEO $e^+e^-$ 10.5 GeV
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**$\Gamma(p \text{ hadrons})/\Gamma_{\text{total}}$**   **$\Gamma_{64}/\Gamma$**

<i>VALUE</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.41±0.24	ADAMOVICH	87	EMUL $\gamma A$ 20–70 GeV/c
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**$\Gamma(\Lambda \text{ anything})/\Gamma_{\text{total}}$**   **$\Gamma_{67}/\Gamma$**

<i>VALUE</i>	<i>EVTS</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
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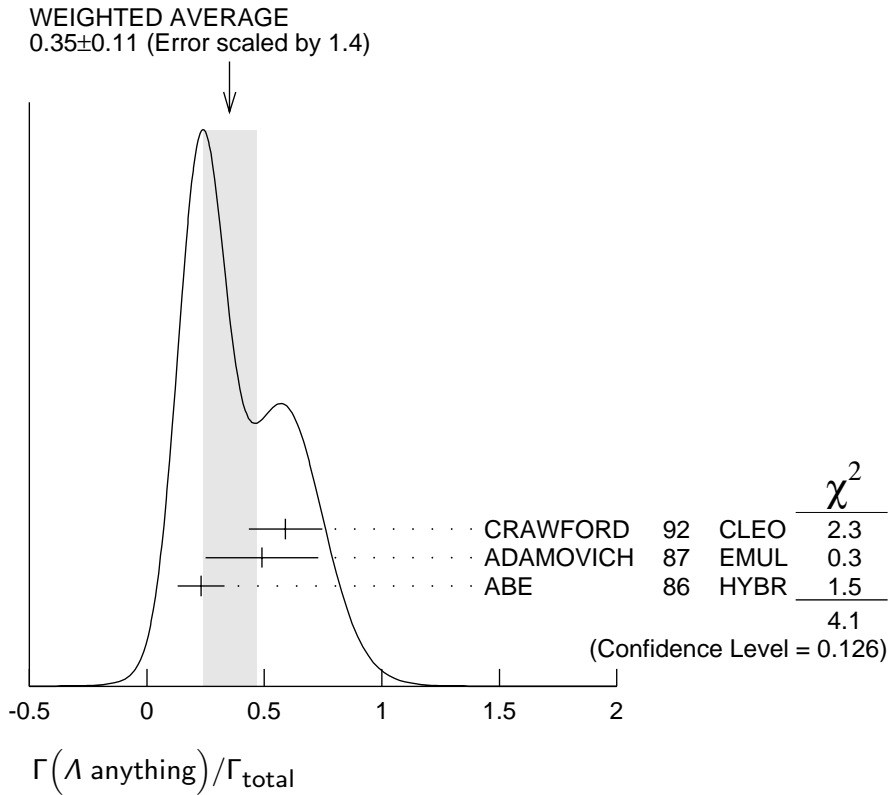
0.35±0.11	<b>OUR AVERAGE</b>	Error includes scale factor of 1.4. See the ideogram below.		
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0.59±0.10±0.12	CRAWFORD	92	CLEO $e^+e^-$ 10.5 GeV
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0.49±0.24	ADAMOVICH	87	EMUL $\gamma A$ 20–70 GeV/c
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0.23±0.10	8	<sup>20</sup> ABE	86 HYBR 20 GeV $\gamma p$
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<sup>20</sup>ABE 86 includes  $\Lambda$ 's from  $\Sigma^0$  decay.



**$\Gamma(\Sigma^\pm \text{ anything})/\Gamma_{\text{total}}$**   **$\Gamma_{68}/\Gamma$**

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.1 \pm 0.05</math></b>	5	ABE	86	HYBR 20 GeV $\gamma p$

**$\Gamma(3\text{prongs})/\Gamma_{\text{total}}$**   **$\Gamma_{69}/\Gamma$**

VALUE	DOCUMENT ID	TECN	COMMENT
<b><math>0.24 \pm 0.07 \pm 0.04</math></b>	KAYIS-TOPAK.03	CHRS	$\nu_\mu$ emulsion, $\bar{E}=27$ GeV

————— Rare or forbidden modes —————

**$\Gamma(p\mu^+\mu^-)/\Gamma_{\text{total}}$**   **$\Gamma_{70}/\Gamma$**

A test for the  $\Delta C=1$  weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;3.4 \times 10^{-4}</math></b>	90	0	KODAMA	95	E653 $\pi^-$ emulsion 600 GeV

**$\Gamma(\Sigma^- \mu^+ \mu^+)/\Gamma_{\text{total}}$**   **$\Gamma_{71}/\Gamma$**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>&lt;7.0 \times 10^{-4}</math></b>	90	0	KODAMA	95	E653 $\pi^-$ emulsion 600 GeV

## $\Lambda_c^+$ DECAY PARAMETERS

See the note on "Baryon Decay Parameters" in the neutron Listings.

### $\alpha$ FOR $\Lambda_c^+ \rightarrow \Lambda \pi^+$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>-0.98 \pm 0.19</math> OUR AVERAGE</b>				
$-0.94 \pm 0.21 \pm 0.12$	414	<sup>21</sup> BISHAI	95 CLE2	$e^+ e^- \approx \gamma(4S)$
$-0.96 \pm 0.42$		ALBRECHT	92 ARG	$e^+ e^- \approx 10.4$ GeV
$-1.1 \pm 0.4$	86	AVERY	90B CLEO	$e^+ e^- \approx 10.6$ GeV

<sup>21</sup> BISHAI 95 actually gives  $\alpha = -0.94^{+0.21+0.12}_{-0.06-0.06}$ , chopping the errors at the physical limit  $-1.0$ . However, for  $\alpha \approx -1.0$ , some experiments should *get* unphysical values ( $\alpha < -1.0$ ), and for averaging with other measurements such values (or errors that extend below  $-1.0$ ) should *not* be chopped.

### $\alpha$ FOR $\Lambda_c^+ \rightarrow \Sigma^+ \pi^0$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>-0.45 \pm 0.31 \pm 0.06</math></b>	89	BISHAI	95 CLE2	$e^+ e^- \approx \gamma(4S)$

### $\alpha$ FOR $\Lambda_c^+ \rightarrow \Lambda \ell^+ \nu_\ell$

The experiments don't cover the complete (or same incomplete)  $M(\Lambda \ell^+)$  range, but we average them together anyway.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>-0.82^{+0.11}_{-0.07}</math> OUR AVERAGE</b>				
$-0.82^{+0.09+0.06}_{-0.06-0.03}$	700	<sup>22</sup> CRAWFORD	95 CLE2	$e^+ e^- \approx \gamma(4S)$
$-0.91 \pm 0.42 \pm 0.25$		<sup>23</sup> ALBRECHT	94B ARG	$e^+ e^- \approx 10$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$-0.89^{+0.17+0.09}_{-0.11-0.05}$	350	<sup>24</sup> BERGFELD	94 CLE2	See CRAWFORD 95

<sup>22</sup> CRAWFORD 95 measures the form-factor ratio  $R \equiv f_2/f_1$  for  $\Lambda_c^+ \rightarrow \Lambda e^+ \nu_e$  events to be  $-0.25 \pm 0.14 \pm 0.08$  and from this calculates  $\alpha$ , averaged over  $q^2$ , to be the above.

<sup>23</sup> ALBRECHT 94B uses  $\Lambda e^+$  and  $\Lambda \mu^+$  events in the mass range  $1.85 < M(\Lambda \ell^+) < 2.20$  GeV.

<sup>24</sup> BERGFELD 94 uses  $\Lambda e^+$  events.

## $\Lambda_c^+$ REFERENCES

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ABE	02C PL B524 33	K. Abe <i>et al.</i>	(KEK BELLE Collab.)
LINK	02C PRL 88 161801	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
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PDG	02 PR D66 010001	K. Hagiwara <i>et al.</i>	
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JAFFE	00 PR D62 072005	D.E. Jaffe <i>et al.</i>	(CLEO Collab.)
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ALEEV	96	JINRRC 3-77 31	A.N. Aleev <i>et al.</i>	(Serpukhov EXCHARM Collab.)
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CRAWFORD	95	PRL 75 624	G. Crawford <i>et al.</i>	(CLEO Collab.)
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BOZEK	93	PL B312 247	A. Bozek <i>et al.</i>	(CERN NA32 Collab.)
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