Λ_c^+

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

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We have omitted some results that have been superseded by later experiments.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.

Λ_c^+ MASS

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

The fit also uses Σ_c-Λ_c^+ and Λ_c^{*+}-Λ_c^+ mass-difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2284.9±0.6 OUR FIT					
2284.9±0.6 OUR AVERAGE					
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	$pK^-\pi^+$, $p\overline{K}^0$, $\Lambda 3\pi$
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	$pK^-\pi^+$

Λ_c^+ MEAN LIFE

Measurements with an error $\geq 0.1 \times 10^{-12}$ s or with fewer than 20 events have been omitted.

VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT
0.206±0.012 OUR AVERAGE					
0.215±0.016±0.008	1340	FRABETTI	93D	E687	γBe, $\Lambda_c^+ \to pK^-\pi^+$
0.18 ±0.03 ±0.03	29	ALVAREZ	90	NA14	γ, $\Lambda_c^+ \to pK^-\pi^+$
0.20 ±0.03 ±0.03	90	FRABETTI	90	E687	γBe, $\Lambda_c^+ \to pK^-\pi^+$
$0.196^{+0.023}_{-0.020}$	101	BARLAG	89	NA32	$pK^-\pi^+$ + c.c.
0.22 ±0.03 ±0.02	97	ANJOS	88B	E691	$pK^-\pi^+$ + c.c.

Λ_c^+ DECAY MODES

	Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level
	Hadronic modes with a p and one $\overline{K}$			
Γ_1	$p\overline{K}^0$		(2.2 ± 0.4) %	
Γ_2	$pK^-\pi^+$		(4.4 ± 0.6) %	
Γ_3	$p\overline{K}^*(892)^0$	[a]	(1.6 ± 0.4) %	
Γ_4	$\Delta(1232)^{++}K^-$		(7 ± 4) $\times 10^{-3}$	
Γ_5	$\Lambda(1520)\pi^+$	[a]	($4.0 \pm {}^{2.0}_{1.7}$) $\times 10^{-3}$	
Γ_6	$pK^-\pi^+$ nonresonant		($2.5 \pm {}^{0.5}_{0.6}$) %	
Γ_7	$p\overline{K}^0\eta$		(1.10± 0.29) %	
Γ_8	$p\overline{K}^0\pi^+\pi^-$		(2.1 ± 0.8) %	
Γ_9	$pK^-\pi^+\pi^0$		seen	
Γ_{10}	$pK^*(892)^-\pi^+$	[a]	(9 ± 5) $\times 10^{-3}$	
Γ_{11}	$p(K^-\pi^+)_{\text{nonresonant}}\pi^0$		(3.2 ± 0.7) %	
Γ_{12}	$\Delta(1232)\overline{K}^*(892)$		seen	
Γ_{13}	$pK^-\pi^+\pi^+\pi^-$		(10 ± 7) $\times 10^{-4}$	
Γ_{14}	$pK^-\pi^+\pi^0\pi^0$		(7.0 ± 3.5) $\times 10^{-3}$	
Γ_{15}	$pK^-\pi^+\pi^0\pi^0\pi^0$		(4.4 ± 2.8) $\times 10^{-3}$	

Hadronic modes with a p and zero or two K's

Γ_{16}	$p\pi^+\pi^-$		(3.0 ± 1.6) × 10^{-3}		
Γ_{17}	$p f_0(980)$	[a]	(2.4 ± 1.6) × 10^{-3}		
Γ_{18}	$p\pi^+\pi^+\pi^-\pi^-$		(1.6 ± 1.0) × 10^{-3}		
Γ_{19}	pK^+K^-		(2.0 ± 0.6) × 10^{-3}		
Γ_{20}	$p\phi$	[a]	(1.06± 0.33) × 10^{-3}		

Hadronic modes with a hyperon

Γ_{21}	$\Lambda\pi^+$		(7.9 ± 1.8) × 10^{-3}		
Γ_{22}	$\Lambda\pi^+\pi^0$		(3.2 ± 0.9) %		
Γ_{23}	$\Lambda\rho^0$		< 4	%	CL=95%
Γ_{24}	$\Lambda\pi^+\pi^+\pi^-$		(2.9 ± 0.6) %		
Γ_{25}	$\Lambda\pi^+\eta$		(1.5 ± 0.4) %		
Γ_{26}	$\Sigma(1385)^+\eta$	[a]	(7.5 ± 2.4) × 10^{-3}		
Γ_{27}	$\Lambda K^+\overline{K}^0$		(5.3 ± 1.4) × 10^{-3}		
Γ_{28}	$\Sigma^0\pi^+$		(8.8 ± 2.0) × 10^{-3}		
Γ_{29}	$\Sigma^+\pi^0$		(8.8 ± 2.2) × 10^{-3}		
Γ_{30}	$\Sigma^+\eta$		(4.8 ± 1.7) × 10^{-3}		
Γ_{31}	$\Sigma^+\pi^+\pi^-$		(3.0 ± 0.6) %		
Γ_{32}	$\Sigma^+\rho^0$		< 1.2	%	CL=95%
Γ_{33}	$\Sigma^-\pi^+\pi^+$		(1.6 ± 0.6) %		
Γ_{34}	$\Sigma^0\pi^+\pi^0$		(1.6 ± 0.6) %		
Γ_{35}	$\Sigma^0\pi^+\pi^+\pi^-$		(9.2 ± 3.4) × 10^{-3}		
Γ_{36}	$\Sigma^+\pi^+\pi^-\pi^0$				
Γ_{37}	$\Sigma^+\omega$	[a]	(2.4 ± 0.7) %		
Γ_{38}	$\Sigma^+\pi^+\pi^+\pi^-\pi^-$		(2.6 $^{+\ 3.5}_{-\ 1.8}$) × 10^{-3}		
Γ_{39}	$\Sigma^+K^+K^-$		(3.1 ± 0.8) × 10^{-3}		
Γ_{40}	$\Sigma^+\phi$	[a]	(3.0 ± 1.3) × 10^{-3}		
Γ_{41}	$\Sigma^+K^+\pi^-$		(5.7 $^{+\ 5.3}_{-\ 3.2}$) × 10^{-3}		
Γ_{42}	Ξ^0K^+		(3.4 ± 0.9) × 10^{-3}		
Γ_{43}	$\Xi^-K^+\pi^+$		(4.3 ± 1.1) × 10^{-3}		
Γ_{44}	$\Xi(1530)^0K^+$	[a]	(2.3 ± 0.7) × 10^{-3}		

Semileptonic modes

Γ_{45}	$\Lambda\ell^+\nu_\ell$	[b]	(2.3 ± 0.5) %		
Γ_{46}	e^+ anything		(4.5 ± 1.7) %		
Γ_{47}	$p e^+$ anything		(1.8 ± 0.9) %		
Γ_{48}	Λe^+ anything		(1.6 ± 0.6) %		
Γ_{49}	$\Lambda\mu^+$ anything		(1.5 ± 0.9) %		
Γ_{50}	$\Lambda\ell^+\nu_\ell$ anything				

Inclusive modes

Γ_{51}	p anything		(50 ±16) %		
Γ_{52}	p anything (no Λ)		(12 ±19) %		
Γ_{53}	p hadrons				
Γ_{54}	n anything		(50 ±16) %		
Γ_{55}	n anything (no Λ)		(29 ±17) %		
Γ_{56}	Λ anything		(35 ±11) %		S=1.4
Γ_{57}	$\Sigma^\pm$ anything	[c]	(10 ± 5) %		

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

Γ_{58}	$p\mu^+\mu^-$	$C1$	< 3.4	× 10^{-4}	CL=90%
Γ_{59}	$\Sigma^-\mu^+\mu^+$	L	< 7.0	× 10^{-4}	CL=90%

Γ_{60}	dummy mode used by the fit	(92.7 ± 1.0) %	

[a] This branching fraction includes all the decay modes of the final-state resonance.

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

[c] The value is for the sum of the charge states of particle/antiparticle states indicated.

CONSTRAINED FIT INFORMATION

An overall fit to 3 branching ratios uses 9 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 =$ 2.0 for 7 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, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_{24}	61		
x_{60}	−90	−89	
	x_2	x_{24}	

Λ_c^+ BRANCHING RATIOS

Most of the modes are measured relative to the $pK^-\pi^+$ mode. A few obsolete results have been omitted.

Hadronic modes with a p and one $\overline{K}$

$\Gamma(p\overline{K}^0)/\Gamma(pK^-\pi^+)$ Γ_1/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.49±0.07 OUR AVERAGE					
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	γBe 70–260 GeV
0.62±0.15±0.03	73	ALBRECHT	88C	ARG	e^+e^- 10 GeV

$\Gamma(pK^-\pi^+)/\Gamma_{\text{total}}$ Γ_2/Γ

Most of the other modes are measured relative to this mode.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.044 ±0.006 OUR FIT						
0.044 ±0.006 OUR AVERAGE						
0.0594±0.0031±0.0144			[1] BERGFELD	94	CLEO	$e^+e^- \approx \Upsilon(4S)$
0.040 ±0.003 ±0.008			[2] ALBRECHT	92O	ARG	$e^+e^- \approx \Upsilon(4S)$
0.043 ±0.010 ±0.008			[3] CRAWFORD	92	CLEO	e^+e^- 10.5 GeV
0.041 ±0.024		208	[4] ALBRECHT	88E	ARG	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
>0.044	90	6	[5] AGUILAR-...	88B	LEBC	pp 27.4 GeV

[1] BERGFELD 94 measures $\Gamma(pK^-\pi^+)/\Gamma(\Lambda\ell^+\nu_\ell) = 1.93 \pm 0.10 \pm 0.33$ and calculates $\Gamma(e^+\text{anything})/\Gamma_{\text{total}} = 0.034 \pm 0.004$ from D-meson data, assuming that all charmed hadrons have the same semileptonic width. Combined, these values give $\Gamma(pK^-\pi^+)/\Gamma_{\text{total}} = f \times (6.67 \pm 0.35 \pm 1.35)\%$, where $f \equiv \Gamma(\Lambda\ell^+\nu_\ell)/\Gamma(\ell^+\text{anything})$. Since $f \leq 1$, this gives an upper bound on $\Gamma(pK^-\pi^+)/\Gamma_{\text{total}}$. In the spectator model, the quantity corresponding to f in D-meson decay is $\Gamma(D \to (\overline{K}+\overline{K}^*)\ell^+\nu_\ell)/\Gamma(D \to \ell^+\text{anything}) = 0.89 \pm 0.12$. This value of f leads to the value of $\Gamma(pK^-\pi^+)/\Gamma_{\text{total}}$ we give here.

[2] ALBRECHT 92O uses $B(\overline{B} \to \Lambda_c^+ X) \times B(\Lambda_c^+ \to pK^-\pi^+) = (0.28 \pm 0.05)\%$ plus $B(\overline{B} \to \Lambda_c^+ X) = (6.8 \pm 0.5 \pm 0.3)\%$ and assumes that $\overline{B} \to \Xi_c X$ and $\overline{B} \to \Omega_c X$ decays are suppressed and negligible.

[3] CRAWFORD 92 uses $B(\overline{B} \to \Lambda_c^+ X) \times B(\Lambda_c^+ \to pK^-\pi^+) = (0.273 \pm 0.051 \pm 0.039)\%$ and estimates $B(\overline{B} \to \Lambda_c^+ X) = (6.4 \pm 0.8 \pm 0.8)\%$. If final states other than $\Lambda_c^+ \overline{N} X$ contribute to $\overline{B}$ decay, the $\Lambda_c^+ \to pK^-\pi^+$ branching fraction would increase.

[4] ALBRECHT 88E uses their result $B(\overline{B} \to \Lambda_c^+ X) \times B(\Lambda_c^+ \to pK^-\pi^+) = (0.30 \pm 0.12 \pm 0.06)\%$ plus $B(\overline{B} \to \Lambda_c^+ X) = (7.4 \pm 2.9)\%$ from other measurements of inclusive proton and Λ yields in B decays.

[5] This AGUILAR-BENITEZ 88B limit assumes that $\tau_{\Lambda_c} = 1.2 \times 10^{-13}$ s, and it "decreases by 20% [to > 0.035] assuming a lifetime of 1.7×10^{-13} s instead." Our average for τ_{Λ_c} is still higher (see the mean-life section), which would further reduce the limit.

$\Gamma(p\overline{K}^*(892)^0)/\Gamma(pK^-\pi^+)$ Γ_3/Γ_2

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.36^{+0.06}_{-0.07}$ OUR AVERAGE					
$0.35^{+0.06}_{-0.07}\pm0.03$	39	BOZEK	93	NA32	π^- Cu 230 GeV
0.42 ± 0.24	12	BASILE	81B	CNTR	$pp \to \Lambda_c^+ e^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.35 ± 0.11		BARLAG	90D	NA32	See BOZEK 93

$\Gamma(\Delta(1232)^{++}K^-)/\Gamma(pK^-\pi^+)$ Γ_4/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.16 ± 0.10 OUR AVERAGE Error includes scale factor of 1.5.					
$0.12^{+0.04}_{-0.05}\pm0.05$	14	BOZEK	93	NA32	π^- Cu 230 GeV
0.40 ± 0.17	17	BASILE	81B	CNTR	$pp \to \Lambda_c^+ e^- X$

$\Gamma(\Lambda(1520)\pi^+)/\Gamma(pK^-\pi^+)$ Γ_5/Γ_2

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.09^{+0.04}_{-0.03}\pm0.02$	12	BOZEK	93	NA32	π^- Cu 230 GeV

$\Gamma(pK^-\pi^+ \text{nonresonant})/\Gamma(pK^-\pi^+)$ Γ_6/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.56^{+0.07}_{-0.09}\pm0.05$	71	BOZEK	93	NA32	π^- Cu 230 GeV

$\Gamma(p\overline{K}^0\eta)/\Gamma(pK^-\pi^+)$ Γ_7/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.25\pm0.04\pm0.04$	57	AMMAR	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(p\overline{K}^0\pi^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_8/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.49 ± 0.17 OUR AVERAGE Error includes scale factor of 1.4.					
$0.43\pm0.12\pm0.04$	83	AVERY	91	CLEO	e^+e^- 10.5 GeV
$0.98\pm0.36\pm0.08$	12	BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(pK^-\pi^+\pi^0)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	44	AMENDOLIA	87	SPEC	γGe-Si

$\Gamma(pK^*(892)^-\pi^+)/\Gamma(p\overline{K}^0\pi^+\pi^-)$ Γ_{10}/Γ_8

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.44 ± 0.14	17	ALEEV	94	BIS2	nN 20–70 GeV

$\Gamma(p(K^-\pi^+)_{\text{nonresonant}}\pi^0)/\Gamma(pK^-\pi^+)$ Γ_{11}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.73\pm0.12\pm0.05$	67	BOZEK	93	NA32	π^- Cu 230 GeV

$\Gamma(\Delta(1232)\overline{K}^*(892))/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
seen	35	AMENDOLIA	87	SPEC	γGe-Si

$\Gamma(pK^-\pi^+\pi^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{13}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
0.022 ± 0.015	BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(pK^-\pi^+\pi^0\pi^0)/\Gamma(pK^-\pi^+)$ Γ_{14}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.16\pm0.07\pm0.03$	15	BOZEK	93	NA32	π^- Cu 230 GeV

$\Gamma(pK^-\pi^+\pi^0\pi^0\pi^0)/\Gamma(pK^-\pi^+)$ Γ_{15}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.10\pm0.06\pm0.02$	8	BOZEK	93	NA32	π^- Cu 230 GeV

Hadronic modes with a p and 0 or 2 K's

$\Gamma(p\pi^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{16}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
0.069±0.036	BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(pf_0(980))/\Gamma(pK^-\pi^+)$ Γ_{17}/Γ_2

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.055±0.036	BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(p\pi^+\pi^+\pi^-\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{18}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
0.036±0.023	BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(pK^+K^-)/\Gamma(pK^-\pi^+)$ Γ_{19}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.046±0.012 OUR AVERAGE		Error includes scale factor of 1.2.			
0.039±0.009±0.007	214	ALEXANDER	96C	CLEO	$e^+e^- \approx \Upsilon(4S)$
0.096±0.029±0.010	30	FRABETTI	93H	E687	γBe, $\overline{E}_\gamma$ 220 GeV
0.048±0.027		BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(p\phi)/\Gamma(pK^-\pi^+)$ Γ_{20}/Γ_2

Unseen decay modes of the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.024±0.006±0.003	54	ALEXANDER	96C	CLEO	$e^+e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.040±0.027		BARLAG	90D	NA32	π^- 230 GeV

$\Gamma(p\phi)/\Gamma(pK^+K^-)$ Γ_{20}/Γ_{19}

Unseen decay modes of the ϕ 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	γBe, $\overline{E}_\gamma$ 220 GeV

Hadronic modes with a hyperon

$\Gamma(\Lambda\pi^+)/\Gamma(pK^-\pi^+)$ Γ_{21}/Γ_2

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.180±0.032 OUR AVERAGE						
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	γBe 70–260 GeV
<0.16	90		ALBRECHT	88C	ARG	e^+e^- 10 GeV

$\Gamma(\Lambda\pi^+\pi^0)/\Gamma(pK^-\pi^+)$ Γ_{22}/Γ_2

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

$\Gamma(\Lambda\rho^0)/\Gamma(pK^-\pi^+)$ Γ_{23}/Γ_2

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.95	95	AVERY	94	CLEO	$e^+e^- \approx \Upsilon(3S), \Upsilon(4S)$

$\Gamma(\Lambda\pi^+\pi^+\pi^-)/\Gamma_{total}$ Γ_{24}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.029±0.006 OUR FIT					
0.028±0.007±0.011	70	[6] BOWCOCK	85	CLEO	e^+e^- 10.5 GeV

[6] See BOWCOCK 85 for assumptions made on charm production and Λ_c production from charm to get this result.

$\Gamma(\Lambda\pi^+\pi^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{24}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.66±0.10 OUR FIT					
0.66±0.11 OUR AVERAGE					
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	γBe 70–260 GeV
0.94±0.41±0.13	10	BARLAG	90D	NA32	π^- 230 GeV
0.61±0.16±0.04	105	ALBRECHT	88C	ARG	e^+e^- 10 GeV

$\Gamma(p\overline{K}^0\pi^+\pi^-)/\Gamma(\Lambda\pi^+\pi^+\pi^-)$ Γ_8/Γ_{24}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.3±1.2	130	ALEEV	84	BIS2	nC 40–70 GeV

$\Gamma(\Lambda\pi^+\eta)/\Gamma(pK^-\pi^+)$ Γ_{25}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.35±0.05±0.06	116	AMMAR	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma(1385)^+\eta)/\Gamma(pK^-\pi^+)$ Γ_{26}/Γ_2

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.17±0.04±0.03	54	AMMAR	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Lambda K^+\overline{K}^0)/\Gamma(pK^-\pi^+)$ Γ_{27}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.12 ±0.02 ±0.02	59	AMMAR	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^0\pi^+)/\Gamma(pK^-\pi^+)$ Γ_{28}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.20±0.04 OUR AVERAGE					
0.21±0.02±0.04	196	AVERY	94	CLEO	$e^+e^- \approx \Upsilon(3S), \Upsilon(4S)$
0.17±0.06±0.04		ALBRECHT	92	ARG	$e^+e^- \approx 10.4$ GeV

$\Gamma(\Sigma^+\pi^0)/\Gamma(pK^-\pi^+)$ Γ_{29}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.20±0.03±0.03	93	KUBOTA	93	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^+\eta)/\Gamma(pK^-\pi^+)$ Γ_{30}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.11±0.03±0.02	26	AMMAR	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^+\pi^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{31}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.68±0.09 OUR AVERAGE					
0.74±0.07±0.09	487	KUBOTA	93	CLEO	$e^+e^- \approx \Upsilon(4S)$
$0.54^{+0.18}_{-0.15}$	11	BARLAG	92	NA32	π^- Cu 230 GeV

$\Gamma(\Sigma^+\rho^0)/\Gamma(pK^-\pi^+)$ Γ_{32}/Γ_2

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.27	95	KUBOTA	93	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^-\pi^+\pi^+)/\Gamma(\Sigma^+\pi^+\pi^-)$ Γ_{33}/Γ_{31}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.53±0.15±0.07	56	FRABETTI	94E	E687	γBe, $\overline{E}_\gamma$ 220 GeV

$\Gamma(\Sigma^0\pi^+\pi^0)/\Gamma(pK^-\pi^+)$ Γ_{34}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.36±0.09±0.10	117	AVERY	94	CLEO	$e^+e^- \approx \Upsilon(3S), \Upsilon(4S)$

$\Gamma(\Sigma^0\pi^+\pi^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{35}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.21±0.05±0.05	90	AVERY	94	CLEO	$e^+e^- \approx \Upsilon(3S), \Upsilon(4S)$

$\Gamma(\Sigma^+\omega)/\Gamma(pK^-\pi^+)$ Γ_{37}/Γ_2

Unseen decay modes of the ω are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.54±0.13±0.06	107	KUBOTA	93	CLEO	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^+\pi^+\pi^+\pi^-\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{38}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.06^{+0.08}_{-0.04}}$	1	BARLAG	92	NA32	π^- Cu 230 GeV

$\Gamma(\Sigma^+K^+K^-)/\Gamma(pK^-\pi^+)$ Γ_{39}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.070±0.011±0.011	59	AVERY	93	CLEO	$e^+e^- \approx 10.5$ GeV

$\Gamma(\Sigma^+\phi)/\Gamma(pK^-\pi^+)$ Γ_{40}/Γ_2

Unseen decay modes of the ϕ are included.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.069±0.023±0.016	26	AVERY	93	CLEO	$e^+e^-\approx 10.5$ GeV

$\Gamma(\Sigma^+K^+\pi^-)/\Gamma(pK^-\pi^+)$ Γ_{41}/Γ_2

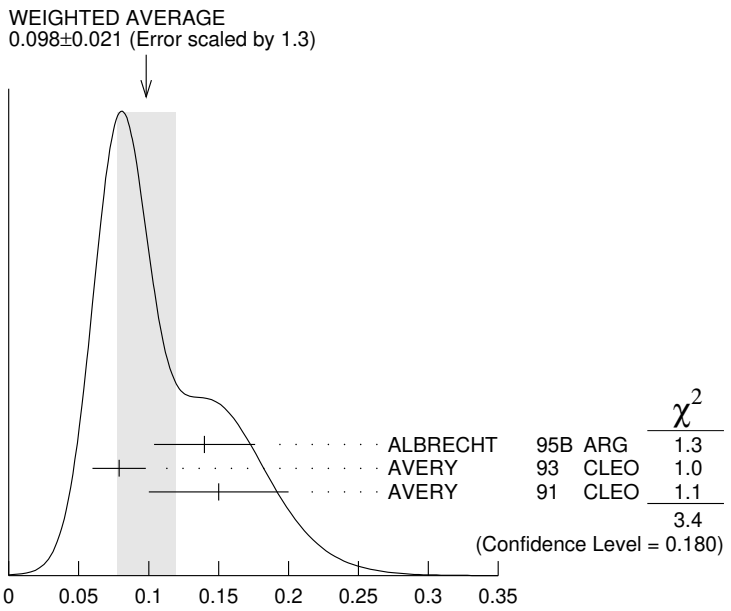
VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.13^{+0.12}_{-0.07}}$	2	BARLAG	92	NA32	π^- Cu 230 GeV

$\Gamma(\Xi^0K^+)/\Gamma(pK^-\pi^+)$ Γ_{42}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.078±0.013±0.013	56	AVERY	93	CLEO	$e^+e^-\approx 10.5$ GeV

$\Gamma(\Xi^-K^+\pi^+)/\Gamma(pK^-\pi^+)$ Γ_{43}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.098±0.021 OUR AVERAGE		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	CLEO	$e^+e^-\approx 10.5$ GeV
0.15 ±0.04 ±0.03	30	AVERY	91	CLEO	e^+e^- 10.5 GeV



$\Gamma(\Xi(1530)^0K^+)/\Gamma(pK^-\pi^+)$ Γ_{44}/Γ_2

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.052±0.014 OUR AVERAGE					
0.05 ±0.02 ±0.01	11	ALBRECHT	95B	ARG	$e^+e^-\approx 10.4$ GeV
0.053±0.016±0.010	24	AVERY	93	CLEO	$e^+e^-\approx 10.5$ GeV

Semileptonic modes

$\Gamma(\Lambda\ell^+\nu_\ell)/\Gamma(pK^-\pi^+)$ Γ_{45}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
0.518±0.027±0.089	BERGFELD	94	CLEO	$e^+e^-\approx \Upsilon(4S)$

$\Gamma(e^+\text{anything})/\Gamma_{\text{total}}$ Γ_{46}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.045±0.017	VELLA	82	MRK2	e^+e^- 4.5–6.8 GeV

$\Gamma(pe^+\text{anything})/\Gamma_{\text{total}}$ Γ_{47}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.018±0.009	[7] VELLA	82	MRK2	e^+e^- 4.5–6.8 GeV

[7] VELLA 82 includes protons from Λ decay.

$\Gamma(\Lambda e^+ \text{anything})/\Gamma_{\text{total}}$ Γ_{48}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.011 ± 0.008	[8] VELLA	82	MRK2	e^+e^- 4.5–6.8 GeV

[8] VELLA 82 includes Λ's from Σ^0 decay.

$\Gamma(\Lambda e^+ \text{anything})/\Gamma(pK^-\pi^+)$ Γ_{48}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.37 \pm 0.11 \pm 0.08$	73	ALBRECHT	91G	ARG	e^+e^- $\approx$ 10.4 GeV

$\Gamma(\Lambda \mu^+ \text{anything})/\Gamma(pK^-\pi^+)$ Γ_{49}/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.35 \pm 0.18 \pm 0.09$	30	ALBRECHT	91G	ARG	e^+e^- $\approx$ 10.4 GeV

Inclusive modes

$\Gamma(p \text{ anything})/\Gamma_{\text{total}}$ Γ_{51}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$0.50 \pm 0.08 \pm 0.14$	[9] CRAWFORD	92	CLEO	e^+e^- 10.5 GeV

[9] This CRAWFORD 92 value includes protons from Λ decay. The value is model dependent, but account is taken of this in the systematic error.

$\Gamma(p \text{ anything (no } \Lambda))/\Gamma_{\text{total}}$ Γ_{52}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$0.12 \pm 0.10 \pm 0.16$	CRAWFORD	92	CLEO	e^+e^- 10.5 GeV

$\Gamma(n \text{ anything})/\Gamma_{\text{total}}$ Γ_{54}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$0.50 \pm 0.08 \pm 0.14$	[10] CRAWFORD	92	CLEO	e^+e^- 10.5 GeV

[10] This CRAWFORD 92 value includes neutrons from Λ decay. The value is model dependent, but account is taken of this in the systematic error.

$\Gamma(n \text{ anything (no } \Lambda))/\Gamma_{\text{total}}$ Γ_{55}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
$0.29 \pm 0.09 \pm 0.15$	CRAWFORD	92	CLEO	e^+e^- 10.5 GeV

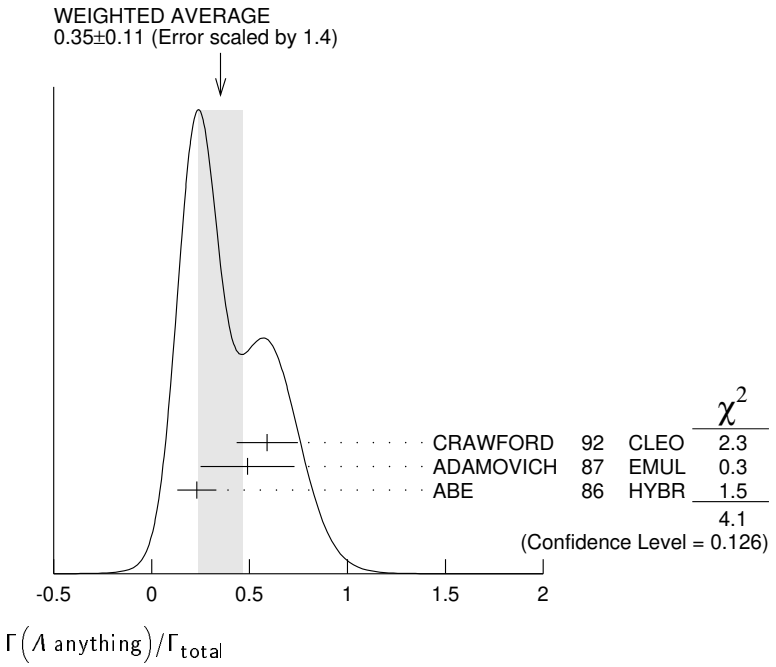
$\Gamma(p \text{ hadrons})/\Gamma_{\text{total}}$ Γ_{53}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.41 ± 0.24	ADAMOVICH	87	EMUL	γA 20–70 GeV/c

$\Gamma(\Lambda \text{ anything})/\Gamma_{\text{total}}$ Γ_{56}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.35 ± 0.11 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.					
$0.59 \pm 0.10 \pm 0.12$		CRAWFORD	92	CLEO	e^+e^- 10.5 GeV
0.49 ± 0.24		ADAMOVICH	87	EMUL	γA 20–70 GeV/c
0.23 ± 0.10	8	[11] ABE	86	HYBR	20 GeV γp

[11] ABE 86 includes Λ's from Σ^0 decay.



$\Gamma(\Sigma^{\pm}\text{anything})/\Gamma_{\text{total}}$ **Γ_{57}/Γ**

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.1 ±0.05	5	ABE	86	HYBR	20 GeV γp

Rare or forbidden modes

$\Gamma(p\mu^+\mu^-)/\Gamma_{\text{total}}$ **Γ_{58}/Γ**

A test for the ΔC=1 weak neutral current. Allowed by higher-order electroweak interactions.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<3.4\times10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

$\Gamma(\Sigma^-\mu^+\mu^+)/\Gamma_{\text{total}}$ **Γ_{59}/Γ**

A test of lepton-number conservation.

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<7.0\times10^{-4}$	90	0	KODAMA	95	E653	π^- emulsion 600 GeV

Λ_c^+ DECAY PARAMETERS

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

α FOR $\Lambda_c^+ \to \Lambda\pi^+$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
-0.98 ± 0.19 OUR AVERAGE					
$-0.94\pm0.21\pm0.12$	414	[12] BISHAI	95	CLEO	$e^+e^- \approx \Upsilon(4S)$
-0.96 ± 0.42		ALBRECHT	92	ARG	$e^+e^-\approx$ 10.4 GeV
$-1.1\ \pm0.4$	86	AVERY	90B	CLEO	$e^+e^-\approx$ 10.6 GeV

[12] 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.

α FOR $\Lambda_c^+ \to \Sigma^+\pi^0$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$-0.45\pm0.31\pm0.06$	89	BISHAI	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

α FOR $\Lambda_c^+ \to \Lambda\ell^+\nu_\ell$

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
$-0.82^{+0.11}_{-0.07}$ OUR AVERAGE					
$-0.82^{+0.09+0.06}_{-0.06-0.03}$	700	[13] CRAWFORD	95	CLEO	$e^+e^- \approx \Upsilon(4S)$

$-0.91 \pm 0.42 \pm 0.25$		[14] 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	[15] BERGFELD	94 CLEO	See CRAWFORD 95

[13] CRAWFORD 95 measures the form-factor ratio $R \equiv f_2/f_1$ for $\Lambda_c^+ \to \Lambda e^+ \nu_e$ events to be $-0.25 \pm 0.14 \pm 0.08$ and from this calculates α, averaged over q^2, to be the above.
[14] ALBRECHT 94B uses Λe^+ and $\Lambda \mu^+$ events in the mass range $1.85 < M(\Lambda \ell^+) < 2.20$ GeV.
[15] BERGFELD 94 uses Λe^+ events.

Λ_c^+ REFERENCES

We have omitted some papers that have been superseded by later experiments. The omitted papers may be found in our 1992 edition (Physical Review **D45**, 1 June, Part II) or in earlier editions.

ALEXANDER	96C	PR D53 R1013	+Bebek, Berger+	(CLEO Collab.)
ALBRECHT	95B	PL B342 397	+Hamacher, Hofmann+	(ARGUS Collab.)
AMMAR	95	PRL 74 3534	+Baringer, Bean, Besson+	(CLEO Collab.)
BISHAI	95	PL B350 256	+Fast, Gerndt, Hinson+	(CLEO Collab.)
CRAWFORD	95	PRL 75 624	+Daubenmier, Fulton+	(CLEO Collab.)
KODAMA	95	PL B345 85	+Ushida, Mokhtarani+	(FNAL E653 Collab.)
ALBRECHT	94B	PL B326 320	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
ALEEV	94	PAN 57 1370	+Balandin+	(Serpukhov BIS-2 Collab.)
		Translated from YF 57 1443.		
AVERY	94	PL B325 257	+Freyberger, Rodriguez+	(CLEO Collab.)
BERGFELD	94	PL B323 219	+Eisenstein, Gollin, Ong+	(CLEO Collab.)
FRABETTI	94E	PL B328 193	+Cheung, Cumalat+	(FNAL E687 Collab.)
AVERY	93	PRL 71 2391	+Freyberger, Rodriguez+	(CLEO Collab.)
BOZEK	93	PL B312 247	+Barlag, Becker, Boehringer+	(CERN NA32 Collab.)
FRABETTI	93D	PRL 70 1755	+Cheung, Cumalat+	(FNAL E687 Collab.)
FRABETTI	93H	PL B314 477	+Cheung, Cumalat+	(FNAL E687 Collab.)
KUBOTA	93	PRL 71 3255	+Lattery, Nelson, Patton+	(CLEO Collab.)
ALBRECHT	92	PL B274 239	+Ehrlichmann, Hamacher, Krueger+	(ARGUS Collab.)
ALBRECHT	92O	ZPHY C56 1	+Cronstroem, Ehrlichmann+	(ARGUS Collab.)
BARLAG	92	PL B283 465	+Becker, Bozek, Boehringer+	(ACCMOR Collab.)
CRAWFORD	92	PR D45 752	+Fulton, Jensen, Johnson+	(CLEO Collab.)
JEZABEK	92	PL B286 175	+Rybicki, Rylko	(CRAC)
ALBRECHT	91G	PL B269 234	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
AVERY	91	PR D43 3599	+Besson, Garren, Yelton+	(CLEO Collab.)
ALVAREZ	90	ZPHY C47 539	+Barate, Bloch, Bonamy+	(CERN NA14/2 Collab.)
ALVAREZ	90B	PL B246 256	+Barate, Bloch, Bonamy+	(CERN NA14/2 Collab.)
ANJOS	90	PR D41 801	+Appel, Bean+	(FNAL E691 Collab.)
AVERY	90B	PRL 65 2842	+Besson, Garren, Yelton, Kinoshita+	(CLEO Collab.)
BARLAG	90D	ZPHY C48 29	+Becker, Boehringer, Bosman+	(ACCMOR Collab.)
FRABETTI	90	PL B251 639	+Bogart, Cheung, Coteus+	(FNAL E687 Collab.)
BARLAG	89	PL B218 374	+Becker, Boehringer, Bosman+	(ACCMOR Collab.)
AGUILAR-...	88B	ZPHY C40 321	Aguilar-Benitez, Allison, Bailly+	(LEBC-EHS Collab.)
Also	87	PL B189 254	Aguilar-Benitez, Allison, Bailly+	(LEBC-EHS Collab.)
Also	87B	PL B199 462	Aguilar-Benitez, Allison, Bailly+	(LEBC-EHS Collab.)
Also	88	SJNP 48 833	Begalli, Otter, Schulte, Gensch+	(LEBC-EHS Collab.)
		Translated from YAF 48 1310.		
ALBRECHT	88C	PL B207 109	+	(ARGUS Collab.)
ALBRECHT	88E	PL B210 263	+Boeckmann, Glaeser+	(ARGUS Collab.)
ANJOS	88B	PRL 60 1379	+Appel+	(FNAL E691 Collab.)
ADAMOVICH	87	EPL 4 887	+Alexandrov, Bolta+	(Photon Emulsion Collab.)
Also	87	SJNP 46 447	Viaggi, Gessaroli+	(Photon Emulsion Collab.)
		Translated from YAF 46 799.		
AMENDOLIA	87	ZPHY C36 513	+Bagliesi, Batignani, Beck+	(CERN NA1 Collab.)
JONES	87	ZPHY C36 593	+Jones, Kennedy, O'Neale+	(CERN WA21 Collab.)
ABE	86	PR D33 1	+	(SLAC Hybrid Facility Photon Collab.)
BOWCOCK	85	PRL 55 923	+Giles, Hassard, Kinoshita+	(CLEO Collab.)
ALEEV	84	ZPHY C23 333	+Arefiev, Balandin, Berdyshev+	(BIS-2 Collab.)
BOSETTI	82	PL 109B 234	+Graessler+	(AACH3, BONN, CERN, MPIM, OXF)
VELLA	82	PRL 48 1515	+Trilling, Abrams, Alam+	(SLAC, LBL, UCB)
BASILE	81B	NC 62A 14	+Romeo+	(CERN, BGNA, PGIA, FRAS)
CALICCHIO	80	PL 93B 521	+	(BARI, BIRM, BRUX, CERN, EPOL, RHEL+)