Ξ_c^+

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

Neither of J or P has actually been measured. Nor have any absolute branching fractions been measured.

Ξ_c^+ MASS

The fit uses the Ξ_c^+ and Ξ_c^0 mass and mass-difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2467.94$^{+0.17}_{-0.20}$ OUR FIT					
2467.95±0.19 OUR AVERAGE					
2467.97±0.14±0.17	3.8k	[1] AAIJ	14Z	LHCB	pp at 7, 8 TeV
2468.00±0.18±0.51	5.1k	AALTONEN	14B	CDF	$p\overline{p}$ at 1.96 TeV
2468.1 ±0.4 $^{+0.2}_{-1.4}$	4.9k	[2] LESIAK	05	BELL	e^+e^-, $\Upsilon(4S)$
2465.8 ±1.9 ±2.5	90	FRABETTI	98	E687	γ Be, $\overline{E}_\gamma$= 220 GeV
2467.0 ±1.6 ±2.0	147	EDWARDS	96	CLE2	$e^+e^- \approx \Upsilon(4S)$
2465.1 ±3.6 ±1.9	30	ALBRECHT	90F	ARG	e^+e^- at $\Upsilon(4S)$
2467 ±3 ±4	23	ALAM	89	CLEO	e^+e^- 10.6 GeV
2466.5 ±2.7 ±1.2	5	BARLAG	89C	ACCM	π^- Cu 230 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2464.4 ±2.0 ±1.4	30	FRABETTI	93B	E687	See FRABETTI 98
2459 ±5 ±30	56	[3] COTEUS	87	SPEC	$nA \simeq$ 600 GeV
2460 ±25	82	BIAGI	83	SPEC	Σ^- Be 135 GeV

[1] AAIJ 14Z systematic error includes in quadrature the 0.14 MeV uncertainty from the m(Λ_c^+) mass value.

[2] The systematic error was (wrongly) given the other way round in LESIAK 05; see the erratum.

[3] Although COTEUS 87 claims to agree well with BIAGI 83 on the mass and width, there appears to be a discrepancy between the two experiments. BIAGI 83 sees a single peak (stated significance about 6 standard deviations) in the $\Lambda K^- \pi^+ \pi^+$ mass spectrum. COTEUS 87 sees *two* peaks in the same spectrum, one at the Ξ_c^+ mass, the other 75 MeV lower. The latter is attributed to $\Xi_c^+ \to \Sigma^0 K^- \pi^+ \pi^+ \to (\Lambda\gamma) K^- \pi^+ \pi^+$, with the γ unseen. The *combined* significance of the double peak is stated to be 5.5 standard deviations. But the absence of any trace of a lower peak in BIAGI 83 seems to us to throw into question the interpretation of the lower peak of COTEUS 87.

Ξ_c^+ MEAN LIFE

VALUE (10^{-15} s)	EVTS	DOCUMENT ID		TECN	COMMENT
456± 5 OUR AVERAGE					
457± 5± 3	56k	[1] AAIJ	19AG	LHCB	$\Xi_c^+ \to pK^-\pi^+$
503± 47± 18	250	MAHMOOD	02	CLE2	$e^+e^- \approx \Upsilon(4S)$
439± 22± 9	532	LINK	01D	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$340^{+\ 70}_{-\ 50} \pm\ 20$	56	FRABETTI	98	E687	γ Be, $\overline{E}_{\gamma}$= 220 GeV
$400^{+180}_{-120} \pm 100$	102	COTEUS	87	SPEC	nA $\simeq$ 600 GeV
$480^{+210}_{-150}{}^{+200}_{-100}$	53	BIAGI	85C	SPEC	Σ^- Be 135 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$410^{+110}_{-\ 80} \pm\ 20$	30	FRABETTI	93B	E687	See FRABETTI 98
$200^{+110}_{-\ 60}$	6	BARLAG	89C	ACCM	π^- (K^-) Cu 230 GeV

[1] AAIJ 19AG reports [Ξ_c^+ MEAN LIFE] / [$D^{\pm}$ MEAN LIFE] = $0.4392 \pm 0.0034 \pm 0.0028$ which we multiply by our best value $D^{\pm}$ MEAN LIFE = $(1.040 \pm 0.007) \times 10^{-12}$ s. Our first error is their experiment's error and our second error is the systematic error from using our best value.

Ξ_c^+ DECAY MODES

Branching fractions marked with a footnote, e.g. [*a*], have been corrected for decay modes not observed in the experiments. For example, the submode fraction $\Xi_c^+ \to \Sigma^+ \overline{K}^*(892)^0$ seen in $\Xi_c^+ \to \Sigma^+ K^- \pi^+$ has been multiplied up to include $\overline{K}^*(892)^0 \to \overline{K}^0 \pi^0$ decays.

	Mode		Fraction (Γ_i/Γ)	Confidence level
	No absolute branching fractions have been measured. The following are branching *ratios* relative to $\Xi^- 2\pi^+$.			
	Cabibbo-favored ($S = -2$) decays — relative to $\Xi^- 2\pi^+$			
Γ_1	$p 2K_S^0$		0.087 ± 0.021	
Γ_2	$\Lambda \overline{K}^0 \pi^+$		—	
Γ_3	$\Sigma(1385)^+ \overline{K}^0$	[a]	1.0 ± 0.5	
Γ_4	$\Lambda K^- 2\pi^+$		0.323 ± 0.033	
Γ_5	$\Lambda \overline{K}^*(892)^0 \pi^+$	[a]	< 0.16	90%
Γ_6	$\Sigma(1385)^+ K^- \pi^+$	[a]	< 0.23	90%
Γ_7	$\Sigma^+ K^- \pi^+$		0.94 ± 0.10	
Γ_8	$\Sigma^+ \overline{K}^*(892)^0$	[a]	0.81 ± 0.15	
Γ_9	$\Sigma^0 K^- 2\pi^+$		0.27 ± 0.12	
Γ_{10}	$\Xi^0 \pi^+$		0.55 ± 0.16	
Γ_{11}	$\Xi^- 2\pi^+$		**DEFINED AS 1**	
Γ_{12}	$\Xi(1530)^0 \pi^+$	[a]	< 0.10	90%
Γ_{13}	$\Xi(1620)^0 \pi^+$		seen	
Γ_{14}	$\Xi(1690)^0 \pi^+$		seen	
Γ_{15}	$\Xi^0 \pi^+ \pi^0$		2.3 ± 0.7	
Γ_{16}	$\Xi^0 \pi^- 2\pi^+$		1.7 ± 0.5	
Γ_{17}	$\Xi^0 e^+ \nu_e$		$2.3^{+0.7}_{-0.8}$	
Γ_{18}	$\Omega^- K^+ \pi^+$		0.07 ± 0.04	

Cabibbo-suppressed decays — relative to $\Xi^- 2\pi^+$

Γ_{19}	$p K^- \pi^+$		0.0045 ± 0.0022	
Γ_{20}	$p \overline{K}^*(892)^0$	[a]	0.0024 ± 0.0013	
Γ_{21}	$\Sigma^+ \pi^+ \pi^-$		0.48 ± 0.20	
Γ_{22}	$\Sigma^- 2\pi^+$		0.18 ± 0.09	
Γ_{23}	$\Sigma^+ K^+ K^-$		0.15 ± 0.06	
Γ_{24}	$\Sigma^+ \phi$	[a]	< 0.11	90%
Γ_{25}	$\Xi(1690)^0 K^+$, $\Xi^0 \to \Sigma^+ K^-$		< 0.05	90%
Γ_{26}	$p \phi(1020)$		$(9 \pm 4) \times 10^{-5}$	

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

Ξ_c^+ BRANCHING RATIOS

Cabibbo-favored ($S = -2$) decays

$\Gamma(p 2K_S^0)/\Gamma(\Xi^- 2\pi^+)$ — Γ_1/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.087±0.016±0.014	168 ± 27	LESIAK	05	BELL	$e^+ e^-$, $\Upsilon(4S)$

$\Gamma(\Sigma(1385)^+ \overline{K}^0)/\Gamma(\Xi^- 2\pi^+)$ — Γ_3/Γ_{11}

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.00±0.49±0.24	20	LINK	03E	FOCS	< 1.72, 90% CL

$\Gamma(\Lambda K^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+)$ — Γ_4/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.323±0.033 OUR AVERAGE					
0.32 ±0.03 ±0.02	1177 ± 55	LESIAK	05	BELL	$e^+ e^-$, $\Upsilon(4S)$
0.28 ±0.06 ±0.06	58	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx 180$ GeV
0.58 ±0.16 ±0.07	61	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Lambda \overline{K}^*(892)^0 \pi^+)/\Gamma(\Lambda K^- 2\pi^+)$ — Γ_5/Γ_4

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.5	90	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma(1385)^+ K^- \pi^+)/\Gamma(\Lambda K^- 2\pi^+)$ — Γ_6/Γ_4

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.7	90	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^+ K^- \pi^+)/\Gamma(\Xi^- 2\pi^+)$ — Γ_7/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.94±0.10 OUR AVERAGE					
0.91±0.11±0.04	251	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
0.92±0.20±0.07		[1] JUN	00	SELX	Σ^- nucleus, 600 GeV
1.18±0.26±0.17	119	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

[1] This JUN 00 result is redundant with other results given below.

$\Gamma(\Sigma^+ \overline{K}^*(892)^0)/\Gamma(\Xi^- 2\pi^+)$ — Γ_8/Γ_{11}

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.81±0.15 OUR AVERAGE					
0.78±0.16±0.06	119	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
0.92±0.27±0.14	61	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^0 K^- 2\pi^+)/\Gamma(\Lambda K^- 2\pi^+)$ — Γ_9/Γ_4

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.84±0.36	47	[1] COTEUS	87	SPEC	nA $\simeq$ 600 GeV

[1] See, however, the note on the COTEUS 87 Ξ_c^+ mass measurement.

$\Gamma(\Xi^0 \pi^+)/\Gamma(\Xi^- 2\pi^+)$ — Γ_{10}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.55±0.13±0.09	39	EDWARDS	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Xi^- 2\pi^+)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.86±1.21±0.38	24	[1] LI	19C	BELL	$e^+ e^- \approx \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen	131	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$
seen	160	AVERY	95	CLE2	$e^+ e^- \approx \Upsilon(4S)$
seen	30	FRABETTI	93B	E687	γBe, $\overline{E}_\gamma$= 220 GeV
seen	30	ALBRECHT	90F	ARG	$e^+ e^-$ at $\Upsilon(4S)$
seen	23	ALAM	89	CLEO	$e^+ e^-$ 10.6 GeV

[1] LI 19C report a significance of 6.8 σ for the observation of this decay mode, observed in Ξ_c^+ from $\overline{B}^0 \to \overline{\Lambda}_c^- \Xi_c^+$.

$\Gamma(\Xi(1530)^0 \pi^+)/\Gamma(\Xi^- 2\pi^+)$ — Γ_{12}/Γ_{11}

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.1	90	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.2	90	BERGFELD	96	CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Xi(1620)^0 \pi^+)/\Gamma_{total}$ — Γ_{13}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	SUMIHAMA	19	BELL	$e^+ e^-$ mostly at $\Upsilon(4S)$

$\Gamma(\Xi(1690)^0\pi^+)/\Gamma_{total}$ — Γ_{14}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	SUMIHAMA	19	BELL	e^+e^- mostly at $\Upsilon(4S)$

$\Gamma(\Xi^0\pi^+\pi^0)/\Gamma(\Xi^-2\pi^+)$ — Γ_{15}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
2.34±0.57±0.37	81	EDWARDS	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Xi(1530)^0\pi^+)/\Gamma(\Xi^0\pi^+\pi^0)$ — Γ_{12}/Γ_{15}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.3	90	EDWARDS	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Xi^0\pi^-2\pi^+)/\Gamma(\Xi^-2\pi^+)$ — Γ_{16}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.74±0.42±0.27	57	EDWARDS	96	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Xi^0 e^+\nu_e)/\Gamma(\Xi^-2\pi^+)$ — Γ_{17}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$2.3\pm0.6^{+0.3}_{-0.6}$	41	ALEXANDER	95B	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Omega^-K^+\pi^+)/\Gamma(\Xi^-2\pi^+)$ — Γ_{18}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.07±0.03±0.03	14	LINK	03E	FOCS	< 0.12, 90% CL

$\Gamma(pK^-\pi^+)/\Gamma_{total}$ — Γ_{19}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
4.5±2.1±0.7	24	[1] LI	19C	BELL	$e^+e^- \approx \Upsilon(4S)$

[1] LI 19C report a significance of 4.4 σ for the observation of this decay mode, observed in Ξ_c^+ from $\overline{B}^0 \to \overline{\Lambda}_c^- \Xi_c^+$.

Cabibbo-suppressed decays

$\Gamma(pK^-\pi^+)/\Gamma(\Xi^-2\pi^+)$ — Γ_{19}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.21 ±0.04 OUR AVERAGE					
0.194±0.054	47 ± 11	VAZQUEZ-JA...	08	SELX	Σ^- nucleus, 600 GeV
0.234±0.047±0.022	202	LINK	01B	FOCS	γ nucleus
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.20 ±0.04 ±0.02	76	JUN	00	SELX	See VAZQUEZ-JAUREGUI 08

$\Gamma(p\overline{K}^*(892)^0)/\Gamma(pK^-\pi^+)$ — Γ_{20}/Γ_{19}

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.54±0.09±0.05	LINK	01B	FOCS	γ nucleus

$\Gamma(\Sigma^+\pi^+\pi^-)/\Gamma(\Xi^-2\pi^+)$ — Γ_{21}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.48±0.20	21 ± 8	VAZQUEZ-JA...08		SELX	Σ^- nucleus, 600 GeV

$\Gamma(\Sigma^-2\pi^+)/\Gamma(\Xi^-2\pi^+)$ — Γ_{22}/Γ_{11}

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.18±0.09	10 ± 4	VAZQUEZ-JA...08		SELX	Σ^- nucleus, 600 GeV

$\Gamma(\Sigma^+K^+K^-)/\Gamma(\Sigma^+K^-\pi^+)$ — Γ_{23}/Γ_7

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.16±0.06±0.01	17	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(\Sigma^+\phi)/\Gamma(\Sigma^+K^-\pi^+)$ — Γ_{24}/Γ_7

Unseen decay modes of the ϕ are included.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.12	90	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

$\Gamma(p\phi(1020))/\Gamma(pK^-\pi^+)$ — Γ_{26}/Γ_{19}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
19.8±0.7±0.9±0.2	3.4k	[1] AAIJ	19I	LHCB	pp at 8 TeV

[1] The last uncertainty is due to the uncertainty in the $\phi \to K^+K^-$ branching fraction.

$\Gamma(\Xi(1690)^0K^+ \times B(\Xi(1690)^0 \to \Sigma^+K^-))/\Gamma(\Sigma^+K^-\pi^+)$ — Γ_{25}/Γ_7

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.05	90	LINK	03E	FOCS	γ nucleus, $\overline{E}_\gamma \approx$ 180 GeV

Ξ_c^+ REFERENCES

AAIJ	19AG	PR D100 032001	R. Aaij et al.	(LHCb Collab.)
AAIJ	19I	JHEP 1904 084	R. Aaij et al.	(LHCb Collab.)
LI	19C	PR D100 031101	Y.B. Li et al.	(BELLE Collab.)
SUMIHAMA	19	PRL 122 072501	M. Sumihama et al.	(BELLE Collab.)
AAIJ	14Z	PRL 113 032001	R. Aaij et al.	(LHCb Collab.)
AALTONEN	14B	PR D89 072014	T. Aaltonen et al.	(CDF Collab.)
VAZQUEZ-JA...	08	PL B666 299	E. Vazquez-Jauregui et al.	(SELEX Collab.)
LESIAK	05	PL B605 237	T. Lesiak et al.	(BELLE Collab.)
Also		PL B617 198 (errat.)	T. Lesiak et al.	(BELLE Collab.)
LINK	03E	PL B571 139	J.M. Link et al.	(FNAL FOCUS Collab.)
MAHMOOD	02	PR D65 031102	A.H. Mahmood et al.	(CLEO Collab.)
LINK	01B	PL B512 277	J.M. Link et al.	(FNAL FOCUS Collab.)
LINK	01D	PL B523 53	J.M. Link et al.	(FNAL FOCUS Collab.)
JUN	00	PRL 84 1857	S.Y. Jun et al.	(FNAL SELEX Collab.)
FRABETTI	98	PL B427 211	P.L. Frabetti et al.	(FNAL E687 Collab.)
BERGFELD	96	PL B365 431	T. Bergfeld et al.	(CLEO Collab.)
EDWARDS	96	PL B373 261	K.W. Edwards et al.	(CLEO Collab.)
ALEXANDER	95B	PRL 74 3113	J. Alexander et al.	(CLEO Collab.)
Also		PRL 75 4155 (erratum)	J. Alexander et al.	(CLEO Collab.)
AVERY	95	PRL 75 4364	P. Avery et al.	(CLEO Collab.)
FRABETTI	93B	PRL 70 1381	P.L. Frabetti et al.	(FNAL E687 Collab.)
ALBRECHT	90F	PL B247 121	H. Albrecht et al.	(ARGUS Collab.)
ALAM	89	PL B226 401	M.S. Alam et al.	(CLEO Collab.)
BARLAG	89C	PL B233 522	S. Barlag et al.	(ACCMOR Collab.)
COTEUS	87	PRL 59 1530	P. Coteus et al.	(FNAL E400 Collab.)
BIAGI	85C	PL 150B 230	S.F. Biagi et al.	(CERN WA62 Collab.)
BIAGI	83	PL 122B 455	S.F. Biagi et al.	(CERN WA62 Collab.)