

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

According to the quark model, the  $\Xi_c^+$  (quark content  $usc$ ) and  $\Xi_c^0$  form an isospin doublet, and the spin-parity ought to be  $J^P = 1/2^+$ . None of  $I$ ,  $J$ , or  $P$  has actually been measured.

### $\Xi_c^+$ MASS

The fit uses the  $\Xi_c^+$  and  $\Xi_c^0$  mass and mass-difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2467.93<sup>+0.28</sup><sub>-0.40</sub></b>				<b>OUR FIT</b>
<b>2467.89<sup>+0.34</sup><sub>-0.50</sub></b>				<b>OUR AVERAGE</b>
2468.00 ± 0.18 ± 0.51	5.1k	AALTONEN	14B	CDF $p\bar{p}$ at 1.96 TeV
2468.1 ± 0.4 <sup>+0.2</sup> <sub>-1.4</sub>	4.9k	<sup>1</sup> LESIAK	05	BELL $e^+e^-$ , $\Upsilon(4S)$
2465.8 ± 1.9 ± 2.5	90	FRABETTI	98	E687 $\gamma$ Be, $\bar{E}_\gamma = 220$ 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 $\pi^-$ 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	<sup>2</sup> COTEUS	87	SPEC $nA \simeq 600$ GeV
2460 ± 25	82	BIAGI	83	SPEC $\Sigma^-$ Be 135 GeV

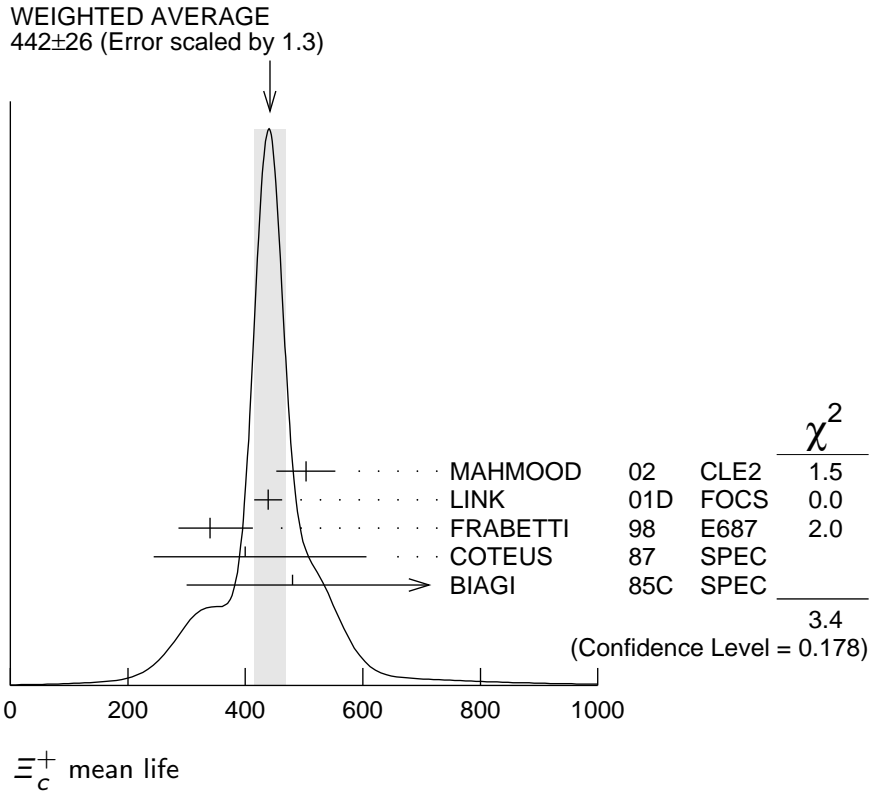
<sup>1</sup> The systematic error was (wrongly) given the other way round in LESIAK 05; see the erratum.

<sup>2</sup> 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  $\Xi_c^+$  mass, the other 75 MeV lower. The latter is attributed to  $\Xi_c^+ \rightarrow \Sigma^0 K^- \pi^+ \pi^+ \rightarrow (\Lambda \gamma) K^- \pi^+ \pi^+$ , with the  $\gamma$  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.

### $\Xi_c^+$ MEAN LIFE

VALUE ( $10^{-15}$ s)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>442 ± 26</b>				<b>OUR AVERAGE</b>
Error includes scale factor of 1.3. See the ideogram below.				
503 ± 47 ± 18	250	MAHMOOD	02	CLE2 $e^+e^- \approx \Upsilon(4S)$
439 ± 22 ± 9	532	LINK	01D	FOCS $\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
340 <sup>+70</sup> <sub>-50</sub> ± 20	56	FRABETTI	98	E687 $\gamma$ Be, $\bar{E}_\gamma = 220$ GeV

$400^{+180}_{-120} \pm 100$	102	COTEUS	87	SPEC	$nA \simeq 600$ GeV
$480^{+210+200}_{-150-100}$	53	BIAGI	85C	SPEC	$\Sigma^-$ 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	$\pi^- (K^-)$ Cu 230 GeV



### $\Xi_c^+$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
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**No absolute branching fractions have been measured.  
 The following are branching *ratios* relative to  $\Xi^- 2\pi^+$ .**

#### Cabibbo-favored ( $S = -2$ ) decays — relative to $\Xi^- 2\pi^+$

$\Gamma_1$	$p 2K_S^0$	$0.087 \pm 0.021$	
$\Gamma_2$	$\Lambda \bar{K}^0 \pi^+$	—	
$\Gamma_3$	$\Sigma(1385)^+ \bar{K}^0$	[a] $1.0 \pm 0.5$	
$\Gamma_4$	$\Lambda K^- 2\pi^+$	$0.323 \pm 0.033$	
$\Gamma_5$	$\Lambda \bar{K}^*(892)^0 \pi^+$	[a] $< 0.16$	90%
$\Gamma_6$	$\Sigma(1385)^+ K^- \pi^+$	[a] $< 0.23$	90%
$\Gamma_7$	$\Sigma^+ K^- \pi^+$	$0.94 \pm 0.10$	

$\Gamma_8$	$\Sigma^+ \bar{K}^*(892)^0$	[a]	$0.81 \pm 0.15$	
$\Gamma_9$	$\Sigma^0 K^- 2\pi^+$		$0.27 \pm 0.12$	
$\Gamma_{10}$	$\Xi^0 \pi^+$		$0.55 \pm 0.16$	
$\Gamma_{11}$	$\Xi^- 2\pi^+$		<b>DEFINED AS 1</b>	
$\Gamma_{12}$	$\Xi(1530)^0 \pi^+$	[a]	$<0.10$	90%
$\Gamma_{13}$	$\Xi^0 \pi^+ \pi^0$		$2.3 \pm 0.7$	
$\Gamma_{14}$	$\Xi^0 \pi^- 2\pi^+$		$1.7 \pm 0.5$	
$\Gamma_{15}$	$\Xi^0 e^+ \nu_e$		$2.3 \begin{smallmatrix} +0.7 \\ -0.8 \end{smallmatrix}$	
$\Gamma_{16}$	$\Omega^- K^+ \pi^+$		$0.07 \pm 0.04$	

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

$\Gamma_{17}$	$p K^- \pi^+$		$0.21 \pm 0.04$	
$\Gamma_{18}$	$p \bar{K}^*(892)^0$	[a]	$0.116 \pm 0.030$	
$\Gamma_{19}$	$\Sigma^+ \pi^+ \pi^-$		$0.48 \pm 0.20$	
$\Gamma_{20}$	$\Sigma^- 2\pi^+$		$0.18 \pm 0.09$	
$\Gamma_{21}$	$\Sigma^+ K^+ K^-$		$0.15 \pm 0.06$	
$\Gamma_{22}$	$\Sigma^+ \phi$	[a]	$<0.11$	90%
$\Gamma_{23}$	$\Xi(1690)^0 K^+, \Xi^0 \rightarrow \Sigma^+ K^-$		$<0.05$	90%

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

**$\Xi_c^+$  BRANCHING RATIOS**

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

**$\Gamma(p 2K_S^0)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_1/\Gamma_{11}$**

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>0.087 \pm 0.016 \pm 0.014</math></b>	$168 \pm 27$	LESIAK	05 BELL	$e^+ e^-, \gamma(4S)$

**$\Gamma(\Sigma(1385)^+ \bar{K}^0)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_3/\Gamma_{11}$**

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>1.00 \pm 0.49 \pm 0.24</math></b>	20	LINK	03E FOCS	$< 1.72, 90\% \text{ CL}$

**$\Gamma(\Lambda K^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_4/\Gamma_{11}$**

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>0.323 \pm 0.033</math> OUR AVERAGE</b>				
$0.32 \pm 0.03 \pm 0.02$	$1177 \pm 55$	LESIAK	05 BELL	$e^+ e^-, \gamma(4S)$
$0.28 \pm 0.06 \pm 0.06$	58	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180 \text{ GeV}$
$0.58 \pm 0.16 \pm 0.07$	61	BERGFELD	96 CLE2	$e^+ e^- \approx \gamma(4S)$

**$\Gamma(\Lambda \bar{K}^*(892)^0 \pi^+)/\Gamma(\Lambda K^- 2\pi^+)$   $\Gamma_5/\Gamma_4$**

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt;0.5</math></b>	90	BERGFELD	96 CLE2	$e^+ e^- \approx \gamma(4S)$

$\Gamma(\Sigma(1385)^+ K^- \pi^+)/\Gamma(\Lambda K^- 2\pi^+)$   $\Gamma_6/\Gamma_4$

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

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

$\Gamma(\Sigma^+ K^- \pi^+)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_7/\Gamma_{11}$

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT
<b>0.94 ± 0.10 OUR AVERAGE</b>				
0.91 ± 0.11 ± 0.04	251	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
0.92 ± 0.20 ± 0.07		<sup>3</sup> JUN	00 SELX	$\Sigma^-$ nucleus, 600 GeV
1.18 ± 0.26 ± 0.17	119	BERGFELD	96 CLE2	$e^+ e^- \approx \Upsilon(4S)$

<sup>3</sup>This JUN 00 result is redundant with other results given below.

$\Gamma(\Sigma^+ \bar{K}^*(892)^0)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_8/\Gamma_{11}$

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

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

$\Gamma(\Sigma^0 K^- 2\pi^+)/\Gamma(\Lambda K^- 2\pi^+)$   $\Gamma_9/\Gamma_4$

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT
<b>0.84 ± 0.36</b>	47	<sup>4</sup> COTEUS	87 SPEC	$nA \simeq 600$ GeV

<sup>4</sup>See, however, the note on the COTEUS 87  $\Xi_c^+$  mass measurement.

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

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

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

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT
• • • 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	$\gamma$ Be, $\bar{E}_\gamma = 220$ GeV
seen	30	ALBRECHT	90F ARG	$e^+ e^-$ at $\Upsilon(4S)$
seen	23	ALAM	89 CLEO	$e^+ e^- 10.6$ GeV

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.1</b>	90	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV

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

<0.2	90	BERGFELD	96 CLE2	$e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(\Xi^0 \pi^+ \pi^0)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{13}/\Gamma_{11}$

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

$\Gamma(\Xi(1530)^0 \pi^+)/\Gamma(\Xi^0 \pi^+ \pi^0)$   $\Gamma_{12}/\Gamma_{13}$

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

$\Gamma(\Xi^0 \pi^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{14}/\Gamma_{11}$

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

$\Gamma(\Xi^0 e^+ \nu_e)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{15}/\Gamma_{11}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.3 ± 0.6<sup>+0.3</sup><sub>-0.6</sub></b>	41	ALEXANDER	95B	CLE2 $e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Omega^- K^+ \pi^+)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{16}/\Gamma_{11}$

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

———— Cabibbo-suppressed decays ————

$\Gamma(p K^- \pi^+)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{17}/\Gamma_{11}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.21 ± 0.04 OUR AVERAGE</b>				
0.194 ± 0.054	47 ± 11	VAZQUEZ-JA..08	SELX	$\Sigma^-$ nucleus, 600 GeV
0.234 ± 0.047 ± 0.022	202	LINK	01B	FOCS $\gamma$ 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

$\Gamma(p \bar{K}^*(892)^0)/\Gamma(p K^- \pi^+)$   $\Gamma_{18}/\Gamma_{17}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.54 ± 0.09 ± 0.05</b>	LINK	01B	FOCS $\gamma$ nucleus

$\Gamma(\Sigma^+ \pi^+ \pi^-)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{19}/\Gamma_{11}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.48 ± 0.20</b>	21 ± 8	VAZQUEZ-JA..08	SELX	$\Sigma^-$ nucleus, 600 GeV

$\Gamma(\Sigma^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+)$   $\Gamma_{20}/\Gamma_{11}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.18 ± 0.09</b>	10 ± 4	VAZQUEZ-JA..08	SELX	$\Sigma^-$ nucleus, 600 GeV

$\Gamma(\Sigma^+ K^+ K^-)/\Gamma(\Sigma^+ K^- \pi^+)$   $\Gamma_{21}/\Gamma_7$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.16 ± 0.06 ± 0.01</b>	17	LINK	03E	FOCS $\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV

$\Gamma(\Sigma^+ \phi)/\Gamma(\Sigma^+ K^- \pi^+)$   $\Gamma_{22}/\Gamma_7$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.12</b>	90	LINK	03E	FOCS $\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV

$$\Gamma(\Xi(1690)^0 K^+ \times B(\Xi(1690)^0 \rightarrow \Sigma^+ K^-)) / \Gamma(\Sigma^+ K^- \pi^+) \quad \Gamma_{23}/\Gamma_7$$

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

### $\Xi_c^+$ REFERENCES

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