

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

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

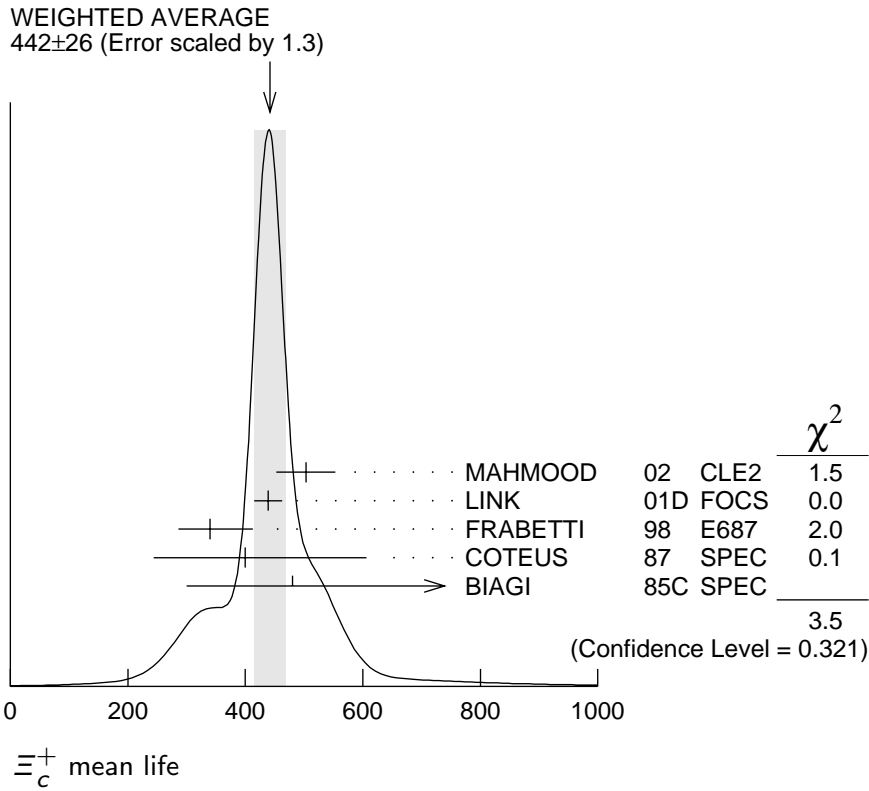
The fit uses the  $\Xi_c^+$  and  $\Xi_c^0$  mass and mass-difference measurements.

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2466.3 ± 1.4 OUR FIT</b>				
<b>2466.4 ± 1.5 OUR AVERAGE</b>				
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>1</sup> COTEUS	87 SPEC	$nA \simeq 600$ GeV
2460 ± 25	82	BIAGI	83 SPEC	$\Sigma^-$ Be 135 GeV

<sup>1</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

<u>VALUE (<math>10^{-15}</math> s)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>442 ± 26 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>+</sup> <sub>-50</sub> ± 70 ± 20	56	FRABETTI	98 E687	$\gamma$ Be, $\bar{E}_\gamma = 220$ GeV
400 <sup>+</sup> <sub>-120</sub> ± 180 ± 100	102	COTEUS	87 SPEC	$nA \simeq 600$ GeV
480 <sup>+</sup> <sub>-150</sub> ± 210 ± 200 ± 100	53	BIAGI	85C SPEC	$\Sigma^-$ Be 135 GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
410 <sup>+</sup> <sub>-80</sub> ± 110 ± 20	30	FRABETTI	93B E687	See FRABETTI 98
200 <sup>+</sup> <sub>-60</sub> ± 110	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  $\Xi^- \pi^+ \pi^+$ .**

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

$\Gamma_1$	$\Lambda \bar{K}^0 \pi^+$	—	
$\Gamma_2$	$\Sigma(1385)^+ \bar{K}^0$	[a,b]	$1.0 \pm 0.5$
$\Gamma_3$	$\Lambda K^- \pi^+ \pi^+$	[a]	$0.34 \pm 0.12$
$\Gamma_4$	$\Lambda \bar{K}^*(892)^0 \pi^+$	[a,b]	$< 0.2$ 90%
$\Gamma_5$	$\Sigma(1385)^+ K^- \pi^+$	[a,b]	$< 0.3$ 90%
$\Gamma_6$	$\Sigma^+ K^- \pi^+$	[a]	$0.94 \pm 0.11$
$\Gamma_7$	$\Sigma^+ \bar{K}^*(892)^0$	[a,b]	$0.81 \pm 0.15$
$\Gamma_8$	$\Sigma^0 K^- \pi^+ \pi^+$	[a]	$0.29 \pm 0.16$
$\Gamma_9$	$\Xi^0 \pi^+$	[a]	$0.55 \pm 0.16$
$\Gamma_{10}$	$\Xi^- \pi^+ \pi^+$	[a]	DEFINED AS 1
$\Gamma_{11}$	$\Xi(1530)^0 \pi^+$	[a,b]	$< 0.1$ 90%
$\Gamma_{12}$	$\Xi^0 \pi^+ \pi^0$	[a]	$2.34 \pm 0.68$
$\Gamma_{13}$	$\Xi^0 \pi^+ \pi^+ \pi^-$	[a]	$1.74 \pm 0.50$
$\Gamma_{14}$	$\Xi^0 e^+ \nu_e$	[a]	$2.3^{+0.7}_{-0.9}$
$\Gamma_{15}$	$\Omega^- K^+ \pi^+$	[a]	$0.07 \pm 0.04$

### Cabibbo-suppressed decays

$\Gamma_{16}$	$p K^- \pi^+$	[a]	$0.21 \pm 0.03$	
$\Gamma_{17}$	$p \bar{K}^*(892)^0$	[a,b]	$0.12 \pm 0.02$	
$\Gamma_{18}$	$\Sigma^+ K^+ K^-$	[a]	$0.15 \pm 0.07$	
$\Gamma_{19}$	$\Sigma^+ \phi$	[a,b]	$< 0.11$	90%
$\Gamma_{20}$	$\Xi(1690)^0 K^+$ $\times B(\Xi(1690)^0 \rightarrow \Sigma^+ K^-)$	[a]	$< 0.05$	90%

[a] No absolute branching fractions have been measured. The following are branching *ratios* relative to  $\Xi^- \pi^+ \pi^+$ .

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

### $\Xi_c^+$ BRANCHING RATIOS

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

$\Gamma(\Sigma(1385)^+ \bar{K}^0) / \Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_2 / \Gamma_{10}$

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

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

$\Gamma(\Lambda K^- \pi^+ \pi^+) / \Gamma_{\text{total}}$   $\Gamma_3 / \Gamma$

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

seen	56	COTEUS	87	SPEC	$nA \approx 600$ GeV
seen	82	<sup>2</sup> BIAGI	83	SPEC	$\Sigma^-$ Be 135 GeV

<sup>2</sup>BIAGI 85B looks for but does not see the  $\Xi_c^+$  in  $p K^- \bar{K}^0 \pi^+$  ( $\Gamma(p K^- \bar{K}^0 \pi^+) / \Gamma(\Lambda K^- \pi^+ \pi^+) < 0.08$  with 90% CL),  $p 2K^- 2\pi^+$  ( $\Gamma(p 2K^- 2\pi^+) / \Gamma(\Lambda K^- \pi^+ \pi^+) < 0.03$ , 90% CL),  $\Omega^- K^+ \pi^+$ ,  $\Lambda K^{*0} \pi^+$ , and  $\Sigma(1385)^+ K^- \pi^+$ .

$\Gamma(\Lambda K^- \pi^+ \pi^+) / \Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_3 / \Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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**$0.34 \pm 0.12$  OUR AVERAGE** Error includes scale factor of 1.5.

$0.28 \pm 0.06 \pm 0.06$	58	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
$0.58 \pm 0.16 \pm 0.07$	61	BERGFELD	96 CLE2	$e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Lambda \bar{K}^*(892)^0 \pi^+) / \Gamma(\Lambda K^- \pi^+ \pi^+)$   $\Gamma_4 / \Gamma_3$

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

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

$\Gamma(\Sigma(1385)^+ K^- \pi^+) / \Gamma(\Lambda K^- \pi^+ \pi^+)$   $\Gamma_5 / \Gamma_3$

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

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

$\Gamma(\Sigma^+ K^- \pi^+)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_6/\Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.94±0.11 OUR AVERAGE**

0.91±0.11±0.04	251	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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1.18±0.26±0.17	119	BERGFELD	96 CLE2	$e^+e^- \approx \Upsilon(4S)$
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••• We do not use the following data for averages, fits, limits, etc. •••

0.92±0.20±0.07		<sup>3</sup> JUN	00 SELX	$\Sigma^-$ nucleus, 600 GeV
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<sup>3</sup>This JUN 00 result is redundant with other results given below.

$\Gamma(\Sigma^+ \bar{K}^*(892)^0)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_7/\Gamma_{10}$

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.81±0.15 OUR AVERAGE**

0.78±0.16±0.06	119	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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0.92±0.27±0.14	61	BERGFELD	96 CLE2	$e^+e^- \approx \Upsilon(4S)$
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••• We do not use the following data for averages, fits, limits, etc. •••

seen	59	AVERY	95 CLE2	$e^+e^- \approx \Upsilon(4S)$
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$\Gamma(\Sigma^0 K^- \pi^+ \pi^+)/\Gamma(\Lambda K^- \pi^+ \pi^+)$   $\Gamma_8/\Gamma_3$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>0.84±0.36</b>	47	<sup>4</sup> COTEUS	87 SPEC	$nA \approx 600$ GeV
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<sup>4</sup>See, however, the note on the COTEUS 87  $\Xi_c^+$  mass measurement.

$\Gamma(\Xi^0 \pi^+)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_9/\Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>0.55±0.13±0.09</b>	39	EDWARDS	96 CLE2	$e^+e^- \approx \Upsilon(4S)$
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$\Gamma(\Xi^- \pi^+ \pi^+)/\Gamma_{\text{total}}$   $\Gamma_{10}/\Gamma$

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

seen	131	BERGFELD	96 CLE2	$e^+e^- \approx \Upsilon(4S)$
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seen	160	AVERY	95 CLE2	$e^+e^- \approx \Upsilon(4S)$
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seen	30	FRABETTI	93B E687	$\gamma$ Be, $\bar{E}_\gamma = 220$ GeV
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seen	30	ALBRECHT	90F ARG	$e^+e^-$ at $\Upsilon(4S)$
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seen	23	ALAM	89 CLEO	$e^+e^-$ 10.6 GeV
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$\Gamma(\Xi(1530)^0 \pi^+)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_{11}/\Gamma_{10}$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt;0.1</b>	90	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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••• 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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$\Gamma(\Xi^0 \pi^+ \pi^0)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_{12}/\Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>2.34±0.57±0.37</b>	81	EDWARDS	96 CLE2	$e^+e^- \approx \Upsilon(4S)$
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$\Gamma(\Xi(1530)^0 \pi^+)/\Gamma(\Xi^0 \pi^+ \pi^0)$   $\Gamma_{11}/\Gamma_{12}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.3	90	EDWARDS	96 CLE2	$e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(\Xi^0 \pi^+ \pi^+ \pi^-)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_{13}/\Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>1.74 ± 0.42 ± 0.27</b>	57	EDWARDS	96 CLE2	$e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(\Xi^0 e^+ \nu_e)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_{14}/\Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>2.3 ± 0.6<sup>+0.3</sup><sub>-0.6</sub></b>	41	ALEXANDER	95B CLE2	$e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(\Omega^- K^+ \pi^+)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_{15}/\Gamma_{10}$

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

$\Gamma(p K^- \pi^+)/\Gamma(\Sigma^+ K^- \pi^+)$   $\Gamma_{16}/\Gamma_6$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>0.22 ± 0.06 ± 0.03</b>	76	JUN	00 SELX	$\Sigma^-$ nucleus, 600 GeV
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$\Gamma(p K^- \pi^+)/\Gamma(\Xi^- \pi^+ \pi^+)$   $\Gamma_{16}/\Gamma_{10}$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.214 ± 0.034 OUR AVERAGE**

0.234 ± 0.047 ± 0.022	202	LINK	01B FOCS	$\gamma$ nucleus
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0.20 ± 0.04 ± 0.02	76	JUN	00 SELX	$\Sigma^-$ nucleus, 600 GeV
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$\Gamma(p \bar{K}^*(892)^0)/\Gamma(p K^- \pi^+)$   $\Gamma_{17}/\Gamma_{16}$

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

VALUE	DOCUMENT ID	TECN	COMMENT
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<b>0.54 ± 0.09 ± 0.05</b>	LINK	01B FOCS	$\gamma$ nucleus
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$\Gamma(\Sigma^+ K^+ K^-)/\Gamma(\Sigma^+ K^- \pi^+)$   $\Gamma_{18}/\Gamma_6$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>0.16 ± 0.06 ± 0.01</b>	17	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(\Sigma^+ \phi)/\Gamma(\Sigma^+ K^- \pi^+)$   $\Gamma_{19}/\Gamma_6$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt;0.12</b>	90	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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$\Gamma(\Xi(1690)^0 K^+ \times B(\Xi(1690)^0 \rightarrow \Sigma^+ K^-))/\Gamma(\Sigma^+ K^- \pi^+)$   $\Gamma_{20}/\Gamma_6$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt;0.05</b>	90	LINK	03E FOCS	$\gamma$ nucleus, $\bar{E}_\gamma \approx 180$ GeV
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## $\Xi_c^+$ REFERENCES

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	95E	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	85B	ZPHY C28 175	S.F. Biagi <i>et al.</i>	(CERN WA62 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.)

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