

# $\Sigma_c(2520)$

$$I(J^P) = 1(\frac{3}{2}^+) \text{ Status: } ***$$

Seen in the  $\Lambda_c^+ \pi^\pm$  mass spectrum. The natural assignment is that this is the  $J^P = 3/2^+$  excitation of the  $\Sigma_c(2455)$ , the charm counterpart of the  $\Sigma(1385)$ , but neither  $J$  nor  $P$  has been measured.

## $\Sigma_c(2520)$ MASSES

The masses are obtained from the mass-difference measurements that follow.

### $\Sigma_c(2520)^{++}$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**2518.41<sup>+0.21</sup><sub>-0.19</sub> OUR FIT** Error includes scale factor of 1.1.

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

2530	±5	±5	6	<sup>1</sup> AMMOSOV	93	HLBC	$\nu p \rightarrow \mu^- \Sigma_c(2530)^{++}$
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<sup>1</sup> AMMOSOV 93 sees a cluster of 6 events and estimates the background to be 1 event.

### $\Sigma_c(2520)^+$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
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**2517.5±2.3 OUR FIT**

### $\Sigma_c(2520)^0$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
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**2518.48±0.20 OUR FIT** Error includes scale factor of 1.1.

## $\Sigma_c(2520)$ MASS DIFFERENCES

### $m_{\Sigma_c(2520)^{++}} - m_{\Lambda_c^+}$

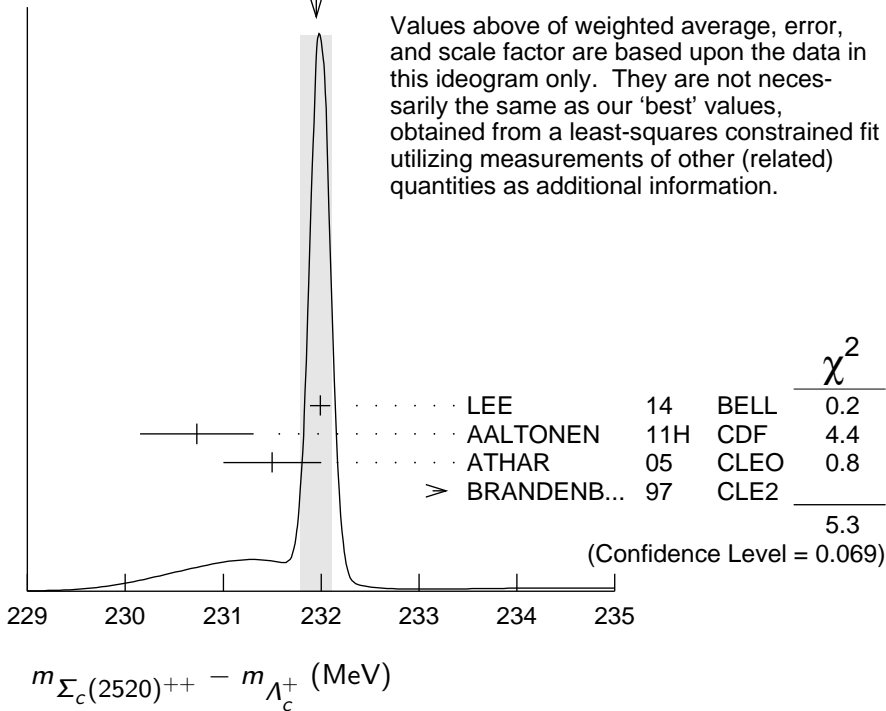
<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**231.95<sup>+0.17</sup><sub>-0.12</sub> OUR FIT** Error includes scale factor of 1.3.

**231.95±0.16 OUR AVERAGE** Error includes scale factor of 1.6. See the ideogram below.

231.99±0.10±0.02	44k	LEE	14	BELL	$e^+e^-$ at $\Upsilon(4S)$
230.73±0.56±0.16	8.8k	AALTONEN	11H	CDF	$p\bar{p}$ at 1.96 TeV
231.5 ±0.4 ±0.3	1.3k	ATHAR	05	CLEO	$e^+e^-$ , 9.4–11.5 GeV
234.5 ±1.1 ±0.8	677	BRANDENB...	97	CLE2	$e^+e^- \approx \Upsilon(4S)$

WEIGHTED AVERAGE  
 $231.95 \pm 0.16$  (Error scaled by 1.6)



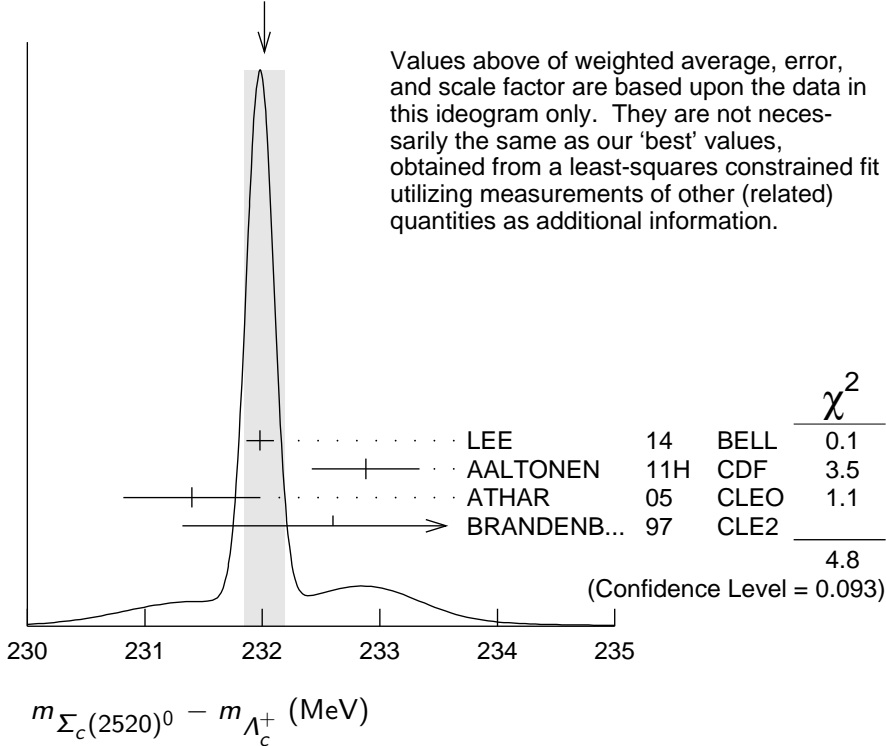
$m_{\Sigma_c(2520)^+} - m_{\Lambda_c^+}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>231.0 \pm 2.3</math> OUR FIT</b>				
$231.0 \pm 1.1 \pm 2.0$	327	AMMAR 01	CLE2	$e^+e^- \approx \Upsilon(4S)$

$m_{\Sigma_c(2520)^0} - m_{\Lambda_c^+}$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>232.02^{+0.15}_{-0.14}</math> OUR FIT</b>				Error includes scale factor of 1.3.
<b><math>232.02 \pm 0.17</math> OUR AVERAGE</b>				Error includes scale factor of 1.5. See the ideogram below.
$231.98 \pm 0.11 \pm 0.04$	41k	LEE 14	BELL	$e^+e^-$ at $\Upsilon(4S)$
$232.88 \pm 0.43 \pm 0.16$	9.0k	AALTONEN 11H	CDF	$p\bar{p}$ at 1.96 TeV
$231.4 \pm 0.5 \pm 0.3$	1.3k	ATHAR 05	CLEO	$e^+e^-$ , 9.4–11.5 GeV
$232.6 \pm 1.0 \pm 0.8$	504	BRANDENB... 97	CLE2	$e^+e^- \approx \Upsilon(4S)$

WEIGHTED AVERAGE  
 $232.02 \pm 0.17$  (Error scaled by 1.5)



**$m_{\Sigma_c(2520)^{++}} - m_{\Sigma_c(2520)^0}$**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.01 \pm 0.15 \pm 0.03</math></b>	44/41k	LEE	14	BELL $e^+e^-$ at $\Upsilon(4S)$
$0.1 \pm 0.8 \pm 0.3$		<sup>2</sup> ATHAR	05	CLEO $e^+e^-$ , 9.4–11.5 GeV
$1.9 \pm 1.4 \pm 1.0$		<sup>3</sup> BRANDENB...	97	CLE2 $e^+e^- \approx \Upsilon(4S)$

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

<sup>2</sup>This ATHAR 05 result is redundant with measurements in earlier entries.  
<sup>3</sup>This BRANDENBURG 97 result is redundant with measurements in earlier entries.

**$\Sigma_c(2520)$  WIDTHS**

**$\Sigma_c(2520)^{++}$  WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>14.78^{+0.30}_{-0.40}</math> OUR AVERAGE</b>				
$14.77 \pm 0.25^{+0.18}_{-0.30}$	44k	LEE	14	BELL $e^+e^-$ at $\Upsilon(4S)$
$15.03 \pm 2.12 \pm 1.36$	8.8k	AALTONEN	11H	CDF $p\bar{p}$ at 1.96 TeV
$14.4^{+1.6}_{-1.5} \pm 1.4$	1.3k	ATHAR	05	CLEO $e^+e^-$ , 9.4–11.5 GeV
$17.9^{+3.8}_{-3.2} \pm 4.0$	677	BRANDENB...	97	CLE2 $e^+e^- \approx \Upsilon(4S)$

**$\Sigma_c(2520)^+$  WIDTH**

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;17</b>	90	327	AMMAR	01	CLE2 $e^+e^- \approx \Upsilon(4S)$

## $\Sigma_c(2520)^0$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>15.3 <math>^{+0.4}_{-0.5}</math> OUR AVERAGE</b>				
$15.41 \pm 0.41^{+0.20}_{-0.32}$	41k	LEE	14	BELL $e^+e^-$ at $\Upsilon(4S)$
$12.51 \pm 1.82 \pm 1.37$	9.0k	AALTONEN	11H	CDF $p\bar{p}$ at 1.96 TeV
$16.6^{+1.9}_{-1.7} \pm 1.4$	1.3k	ATHAR	05	CLEO $e^+e^-$ , 9.4–11.5 GeV
$13.0^{+3.7}_{-3.0} \pm 4.0$	504	BRANDENB...	97	CLE2 $e^+e^- \approx \Upsilon(4S)$

## $\Sigma_c(2520)$ DECAY MODES

$\Lambda_c^+ \pi$  is the only strong decay allowed to a  $\Sigma_c$  having this mass.

Mode	Fraction ( $\Gamma_j/\Gamma$ )
$\Gamma_1 \Lambda_c^+ \pi$	$\approx 100\%$

## $\Sigma_c(2520)$ REFERENCES

LEE	14	PR D89 091102	S.-H. Lee <i>et al.</i>	(BELLE Collab.)
AALTONEN	11H	PR D84 012003	T. Aaltonen <i>et al.</i>	(CDF Collab.)
ATHAR	05	PR D71 051101	S.B. Athar <i>et al.</i>	(CLEO Collab.)
AMMAR	01	PRL 86 1167	R. Ammar <i>et al.</i>	(CLEO Collab.)
BRANDENB...	97	PRL 78 2304	G. Brandenburg <i>et al.</i>	(CLEO Collab.)
AMMOSOV	93	JETPL 58 247	V.V. Ammosov <i>et al.</i>	(SERP)
Translated from ZETFP 58 241.				