

$\Sigma_c(2520)$  $I(J^P) = 1(\frac{3}{2}^+)$  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

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**2518.41<sup>+0.22</sup><sub>-0.18</sub> OUR FIT** Error includes scale factor of 1.1.

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

2530	$\pm 5$	$\pm 5$	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

VALUE (MeV)	DOCUMENT ID
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**2517.4<sup>+0.7</sup><sub>-0.5</sub> OUR FIT**

 $\Sigma_c(2520)^0$  MASS

VALUE (MeV)	DOCUMENT ID
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**2518.48 $\pm$ 0.20 OUR FIT** Error includes scale factor of 1.1.

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

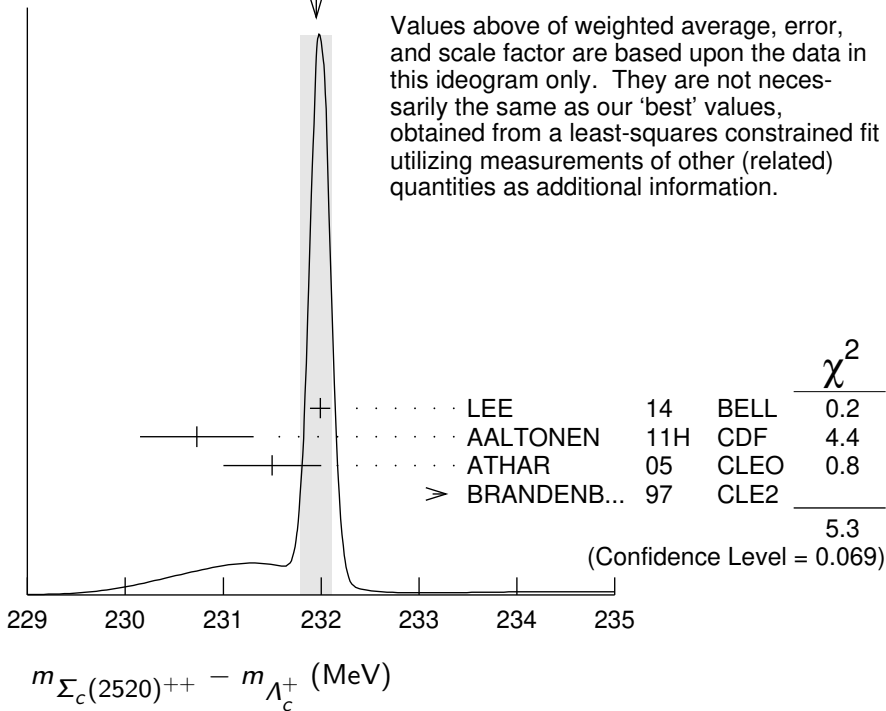
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**231.95<sup>+0.18</sup><sub>-0.12</sub> OUR FIT** Error includes scale factor of 1.3.

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

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

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



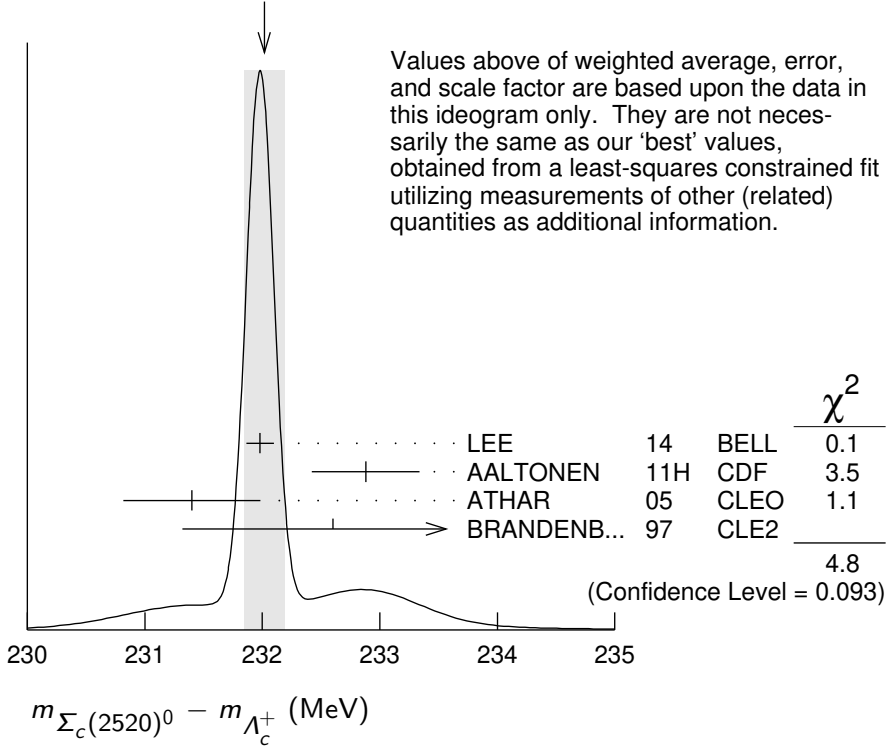
**$m_{\Sigma_c(2520)^+} - m_{\Lambda_c^+}$**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>230.9^{+0.7}_{-0.5}</math></b>				<b>OUR FIT</b>
<b><math>230.9^{+0.7}_{-0.5}</math></b>				<b>OUR AVERAGE</b>
$230.9 \pm 0.5^{+0.5}_{-0.1}$		YELTON	21	BELL $e^+e^-$ at $\Upsilon(nS)$
$231.0 \pm 1.1 \pm 2.0$	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^{+0.16}_{-0.14}</math></b>				<b>OUR FIT</b> Error includes scale factor of 1.3.
<b><math>232.02 \pm 0.17</math></b>				<b>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
$0.01 \pm 0.15 \pm 0.03$	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 $e^+e^- \approx \Upsilon(4S)$

<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
$14.78^{+0.30}_{-0.40}$ OUR AVERAGE				
$14.77 \pm 0.25^{+0.18}_{-0.30}$	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
$17.2^{+2.3+3.1}_{-2.1-0.7}$			YELTON	21	BELL $e^+e^-$ at $\Upsilon(nS)$

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

<17            90    327        AMMAR        01    CLE2     $e^+e^- \approx \Upsilon(4S)$

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

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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#### 15.3 $^{+0.4}_{-0.5}$ OUR AVERAGE

$15.41 \pm 0.41^{+0.20}_{-0.32}$	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 ( $\Gamma_i/\Gamma$ )
$\Gamma_1 \quad \Lambda_c^+ \pi$	$\approx 100\%$

### $\Sigma_c(2520)$ REFERENCES

YELTON	21	PR D104 052003	J. Yelton <i>et al.</i>	(BELLE Collab.)
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.				