$\Sigma_c(2520)$

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

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
2518.41$^{+0.21}_{-0.19}$ 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	[1] AMMOSOV 93	HLBC	$\nu p \to \mu^- \Sigma_c(2530)^{++}$

[1] AMMOSOV 93 sees a cluster of 6 events and estimates the background to be 1 event.

$\Sigma_c(2520)^+$ MASS

VALUE (MeV)	DOCUMENT ID
2517.5$\pm$2.3 OUR FIT	

$\Sigma_c(2520)^0$ MASS

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

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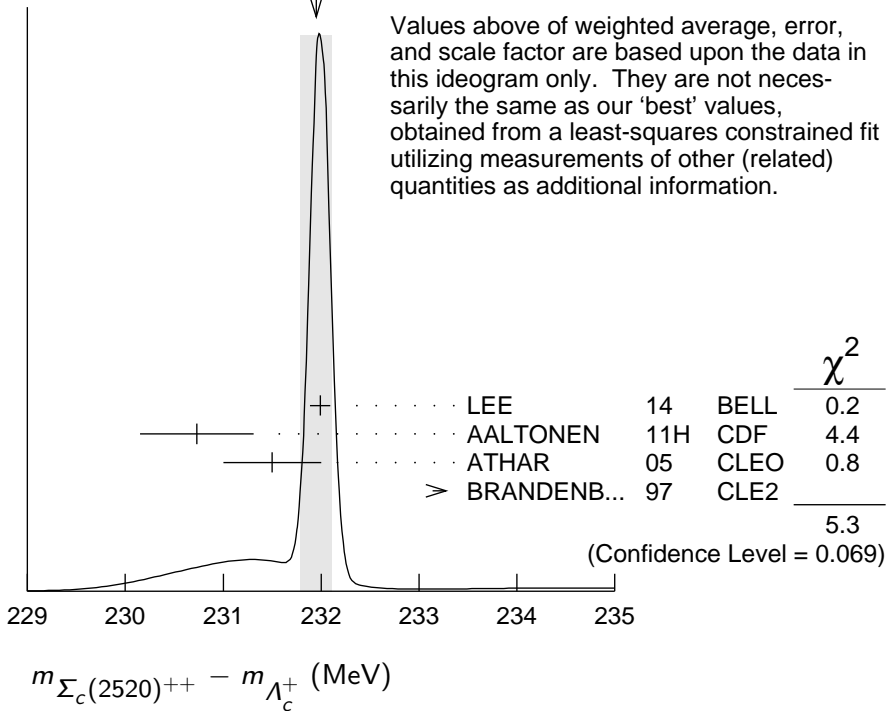
$m_{\Sigma_c(2520)^{++}} - m_{\Lambda_c^+}$

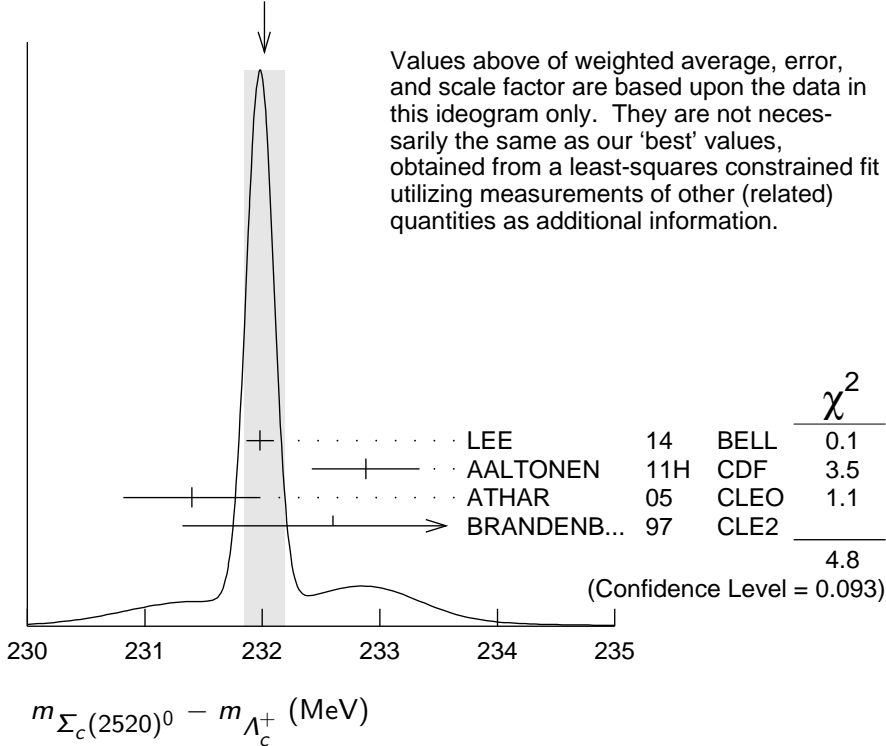| VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
231.95$^{+0.17}_{-0.12}$ OUR FIT Error includes scale factor of 1.3.				
231.95$\pm$0.16 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.				
231.99$\pm$0.10$\pm$0.02	44k	LEE 14	BELL	$e^+ e^-$ at $\Upsilon(4S)$
230.73$\pm$0.56$\pm$0.16	8.8k	AALTONEN 11H	CDF	$p\overline{p}$ 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±0.16 (Error scaled by 1.6)

Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

			χ^2
LEE	14	BELL	0.2
AALTONEN	11H	CDF	4.4
ATHAR	05	CLEO	0.8
BRANDENB...	97	CLE2	
			5.3

(Confidence Level = 0.069)

229   230   231   232   233   234   235

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

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

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
231.0±2.3 OUR FIT					
231.0±1.1±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
232.02$^{+0.15}_{-0.14}$ OUR FIT	Error includes scale factor of 1.3.				
232.02±0.17 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.				
231.98±0.11±0.04	41k	LEE	14	BELL	e^+e^- at $\Upsilon(4S)$
232.88±0.43±0.16	9.0k	AALTONEN	11H	CDF	$p\overline{p}$ at 1.96 TeV
231.4 ±0.5 ±0.3	1.3k	ATHAR	05	CLEO	e^+e^-, 9.4–11.5 GeV
232.6 ±1.0 ±0.8	504	BRANDENB...	97	CLE2	$e^+e^- \approx \Upsilon(4S)$

WEIGHTED AVERAGE
232.02±0.17 (Error scaled by 1.5)

Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

			χ^2
LEE	14	BELL	0.1
AALTONEN	11H	CDF	3.5
ATHAR	05	CLEO	1.1
BRANDENB...	97	CLE2	
			4.8

(Confidence Level = 0.093)

230   231   232   233   234   235

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

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

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
0.01±0.15±0.03	44/41k	LEE	14	BELL	e^+e^- at $\Upsilon(4S)$

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

0.1 ±0.8 ±0.3		[2] ATHAR	05	CLEO	e^+e^-, 9.4–11.5 GeV
1.9 ±1.4 ±1.0		[3] BRANDENB...	97	CLE2	$e^+e^- \approx \Upsilon(4S)$

[2] This ATHAR 05 result is redundant with measurements in earlier entries.
[3] 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					
$14.77\pm0.25^{+0.18}_{-0.30}$	44k	LEE	14	BELL	e^+e^- at $\Upsilon(4S)$
$15.03\pm2.12\pm1.36$	8.8k	AALTONEN	11H	CDF	$p\overline{p}$ at 1.96 TeV
$14.4^{+1.6}_{-1.5}\pm1.4$	1.3k	ATHAR	05	CLEO	e^+e^-, 9.4–11.5 GeV
$17.9^{+3.8}_{-3.2}\pm4.0$	677	BRANDENB...	97	CLE2	$e^+e^- \approx \Upsilon(4S)$

$\Sigma_c(2520)^+$ WIDTH

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

$\Sigma_c(2520)^0$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
15.3 $+0.4\atop-0.5$ OUR AVERAGE					
$15.41\pm0.41{+0.20\atop-0.32}$	41k	LEE	14	BELL	e^+e^- at $\Upsilon(4S)$
$12.51\pm1.82\pm1.37$	9.0k	AALTONEN	11H	CDF	$p\overline{p}$ at 1.96 TeV
$16.6{+1.9\atop-1.7}\pm1.4$	1.3k	ATHAR	05	CLEO	e^+e^-, 9.4–11.5 GeV
$13.0{+3.7\atop-3.0}\pm4.0$	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 Σ_c having this mass.

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\Lambda_c^+\pi$	$\approx 100\%$

$\Sigma_c(2520)$ REFERENCES

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