

# $\Sigma_c(2455)$

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

Neither  $J$  nor  $P$  has been measured;  $1/2^+$  is the quark model prediction.

## $\Sigma_c(2455)$ MASSES

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

### $\Sigma_c(2455)^{++}$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<b>2452.8 ± 0.6 OUR FIT</b>	

### $\Sigma_c(2455)^+$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<b>2453.6 ± 0.9 OUR FIT</b>	

### $\Sigma_c(2455)^0$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<b>2452.2 ± 0.6 OUR FIT</b>	

## $m_{\Sigma_c(2455)} - m_{\Lambda_c^+}$

### $m_{\Sigma_c^{++}} - m_{\Lambda_c^+}$

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>167.87 ± 0.19 OUR FIT</b>				
<b>167.87 ± 0.20 OUR AVERAGE</b>				
167.76 ± 0.29 ± 0.15	122	AITALA	96B E791	$\pi^- N$ , 500 GeV
167.6 ± 0.6 ± 0.6	56	FRABETTI	96 E687	$\gamma Be$ , $\overline{E}_\gamma \approx 220$ GeV
168.2 ± 0.3 ± 0.2	126	CRAWFORD	93 CLE2	$e^+ e^- \approx \Upsilon(4S)$
167.8 ± 0.4 ± 0.3	54	BOWCOCK	89 CLEO	$e^+ e^-$ 10 GeV
168.2 ± 0.5 ± 1.6	92	ALBRECHT	88D ARG	$e^+ e^-$ 10 GeV
167.4 ± 0.5 ± 2.0	46	DIESBURG	87 SPEC	$nA \sim 600$ GeV
167 ± 1	2	JONES	87 HBC	$\nu p$ in BEBC
168 ± 3	6	BALTAY	79 HLBC	$\nu Ne-H$ in 15-ft
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
166 ± 1	1	BOSETTI	82 HBC	See JONES 87
166 ± 15	1	CAZZOLI	75 HBC	$\nu p$ in BNL 7-ft

### $m_{\Sigma_c^+} - m_{\Lambda_c^+}$

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>168.7 ± 0.6 OUR FIT</b>				
<b>168 ± 3</b>	1	CALICCHIO	80 HBC	$\nu p$ in BEBC-TST
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
168.5 ± 0.4 ± 0.2	111	<sup>1</sup> CRAWFORD	93 CLE2	$e^+ e^- \approx \Upsilon(4S)$

<sup>1</sup>This result enters the fit through  $m_{\Sigma_c^+} - m_{\Sigma_c^0}$  below.

$$m_{\Sigma_c^0} - m_{\Lambda_c^+}$$

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
<b>167.30 ± 0.20</b>				<b>OUR FIT</b>
<b>167.31 ± 0.21</b>				<b>OUR AVERAGE</b>
167.38 ± 0.29 ± 0.15	143	AITALA	96B E791	$\pi^- N$ , 500 GeV
167.8 ± 0.6 ± 0.2		ALEEV	96 SPEC	$n$ nucleus, 50 GeV/ $c$
166.6 ± 0.5 ± 0.6	69	FRABETTI	96 E687	$\gamma$ Be, $\overline{E}_\gamma \approx 220$ GeV
167.1 ± 0.3 ± 0.2	124	CRAWFORD	93 CLE2	$e^+e^- \approx \Upsilon(4S)$
168.4 ± 1.0 ± 0.3	14	ANJOS	89D E691	$\gamma$ Be 90–260 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
167.9 ± 0.5 ± 0.3	48	<sup>2</sup> BOWCOCK	89 CLEO	$e^+e^-$ 10 GeV
167.0 ± 0.5 ± 1.6	70	<sup>2</sup> ALBRECHT	88D ARG	$e^+e^-$ 10 GeV
178.2 ± 0.4 ± 2.0	85	<sup>3</sup> DIESBURG	87 SPEC	$nA \sim 600$ GeV
163 ± 2	1	AMMAR	86 EMUL	$\nu A$

<sup>2</sup>This result enters the fit through  $m_{\Sigma_c^{++}} - m_{\Sigma_c^0}$  given below.

<sup>3</sup>See the note on DIESBURG 87 in the  $m_{\Sigma_c^{++}} - m_{\Sigma_c^0}$  section below.

### $\Sigma_c(2455)$ MASS DIFFERENCES

$$m_{\Sigma_c^{++}} - m_{\Sigma_c^0}$$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>0.57 ± 0.23</b>			<b>OUR FIT</b>
<b>0.66 ± 0.28</b>			<b>OUR AVERAGE</b> Error includes scale factor of 1.1.
+ 0.38 ± 0.40 ± 0.15	AITALA	96B E791	$\pi^- N$ , 500 GeV
1.1 ± 0.4 ± 0.1	CRAWFORD	93 CLE2	$e^+e^- \approx \Upsilon(4S)$
− 0.1 ± 0.6 ± 0.1	BOWCOCK	89 CLEO	$e^+e^-$ 10 GeV
+ 1.2 ± 0.7 ± 0.3	ALBRECHT	88D ARG	$e^+e^- \sim 10$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
− 10.8 ± 2.9	<sup>4</sup> DIESBURG	87 SPEC	$nA \sim 600$ GeV

<sup>4</sup>DIESBURG 87 is completely incompatible with the other experiments, which is surprising since it agrees with them about  $m_{\Sigma_c(2455)^{++}} - m_{\Lambda_c^+}$ . We go with the majority here.

$$m_{\Sigma_c^+} - m_{\Sigma_c^0}$$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1.4 ± 0.6</b>			<b>OUR FIT</b>
<b>1.4 ± 0.5 ± 0.3</b>	CRAWFORD	93 CLE2	$e^+e^- \approx \Upsilon(4S)$

### $\Sigma_c(2455)$ DECAY MODES

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

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

## $\Sigma_c(2455)$ REFERENCES

AITALA	96B	PL B379 292	+Amato, Anjos+	(FNAL E791 Collab.)
ALEEV	96	JINRRC 3 31	+Balandin+	(Serpukhov EXCHARM Collab.)
FRABETTI	96	PL B365 461	+Cheung, Cumalat+	(FNAL E687 Collab.)
CRAWFORD	93	PRL 71 3259	+Daubenmier, Fulton+	(CLEO Collab.)
ANJOS	89D	PRL 62 1721	+Appel, Bean, Bracker, Browder+	(FNAL E691 Collab.)
BOWCOCK	89	PRL 62 1240	+Kinoshita, Pipkin, Procario, Wilson+	(CLEO Collab.)
ALBRECHT	88D	PL B211 489	+Boeckmann, Glaeser+	(ARGUS Collab.)
DIESBURG	87	PRL 59 2711	+Ladbury, Binkley+	(FNAL E400 Collab.)
JONES	87	ZPHY C36 593	+Jones, Kennedy, O'Neale+	(CERN WA21 Collab.)
AMMAR	86	JETPL 43 515	+Ammosov, Bakic, Baranov, Burnett+	(ITEP)
		Translated from ZETFP	43 401.	
BOSETTI	82	PL 109B 234	+Graessler+	(AACH3, BONN, CERN, MPIM, OXF)
CALICCHIO	80	PL 93B 521	+	(BARI, BIRM, BRUX, CERN, EPOL, RHEL+)
BALTAY	79	PRL 42 1721	+Caroumbalis, French, Hibbs+	(COLU, BNL) I
CAZZOLI	75	PRL 34 1125	+Cnops, Connolly, Louttit, Murtagh+	(BNL)

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