

$\Sigma_c(2455)$

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

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>
2454.02 ± 0.18 OUR FIT	

$\Sigma_c(2455)^+$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
2452.9 ± 0.4 OUR FIT	

$\Sigma_c(2455)^0$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
2453.76 ± 0.18 OUR FIT	

$\Sigma_c(2455) - \Lambda_c^+$ MASS DIFFERENCES

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

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
167.56 ± 0.11 OUR FIT				
167.57 ± 0.13 OUR AVERAGE				

167.4 ± 0.1 ± 0.2	2k	ARTUSO	02	CLE2	$e^+e^- \approx \Upsilon(4S)$
167.35 ± 0.19 ± 0.12	461	LINK	00C	FOCS	γ nucleus, \bar{E}_γ 180 GeV
167.76 ± 0.29 ± 0.15	122	AITALA	96B	E791	$\pi^- N$, 500 GeV
167.6 ± 0.6 ± 0.6	56	FRABETTI	96	E687	γ Be, $\bar{E}_\gamma \approx 220$ 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

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

167 ± 1	2	JONES	87	HBC	νp in BEBC
166 ± 1	1	BOSETTI	82	HBC	See JONES 87
168 ± 3	6	BALTAY	79	HLBC	ν Ne-H in 15-ft
166 ± 15	1	CAZZOLI	75	HBC	νp 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>
166.4 ± 0.4 OUR FIT				

166.4 ± 0.2 ± 0.3	661	AMMAR	01	CLE2	$e^+e^- \approx \Upsilon(4S)$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

168.5 ± 0.4 ± 0.2	111	CRAWFORD	93	CLE2	See AMMAR 01
168 ± 3	1	CALICCHIO	80	HBC	νp in BEBC-TST

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

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
167.30 ± 0.11 OUR FIT				
167.29 ± 0.13 OUR AVERAGE				
167.2 ± 0.1 ± 0.2	2k	ARTUSO	02	CLE2 $e^+e^- \approx \Upsilon(4S)$
167.38 ± 0.21 ± 0.13	362	LINK	00C	FOCS γ nucleus, \bar{E}_γ 180 GeV
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 γ Be, $\bar{E}_\gamma \approx 220$ 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 γ Be 90–260 GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
167.9 ± 0.5 ± 0.3	48	¹ BOWCOCK	89	CLEO e^+e^- 10 GeV
167.0 ± 0.5 ± 1.6	70	¹ ALBRECHT	88D	ARG e^+e^- 10 GeV
178.2 ± 0.4 ± 2.0	85	² DIESBURG	87	SPEC $nA \sim 600$ GeV
163 ± 2	1	AMMAR	86	EMUL νA

¹This result enters the fit through $m_{\Sigma_c^{++}} - m_{\Sigma_c^0}$ given below.

²See 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
0.27 ± 0.11 OUR FIT	Error includes scale factor of 1.1.		
0.26 ± 0.14 OUR AVERAGE	Error includes scale factor of 1.2.		
+ 0.2 ± 0.1 ± 0.1	ARTUSO	02	CLE2 $e^+e^- \approx \Upsilon(4S)$
− 0.03 ± 0.28 ± 0.11	LINK	00C	FOCS γ nucleus, \bar{E}_γ 180 GeV
+ 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 ³DIESBURG 87 SPEC $nA \sim 600$ GeV

³DIESBURG 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
−0.9 ± 0.4 OUR FIT			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1.4 ± 0.5 ± 0.3	CRAWFORD	93	CLE2 See AMMAR 01

$\Sigma_c(2455)$ WIDTHS

$\Sigma_c(2455)^{++}$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2.23 ± 0.30 OUR AVERAGE				
2.3 ± 0.2 ± 0.3	2k	ARTUSO	02	CLE2 $e^+e^- \approx \Upsilon(4S)$
2.05 ^{+0.41} _{-0.38} ± 0.38	1110	LINK	02	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

$\Sigma_c(2455)^+$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<4.6	90	661	AMMAR	01	CLE2 $e^+e^- \approx \Upsilon(4S)$

$\Sigma_c(2455)^0$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2.2 ± 0.4 OUR AVERAGE Error includes scale factor of 1.4.				
2.5 ± 0.2 ± 0.3	2k	ARTUSO	02	CLE2 $e^+e^- \approx \Upsilon(4S)$
1.55 ^{+0.41} _{-0.37} ± 0.38	913	LINK	02	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

$\Sigma_c(2455)$ DECAY MODES

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

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \Lambda_c^+ \pi$	$\approx 100\%$

$\Sigma_c(2455)$ REFERENCES

ARTUSO	02	PR D65 071101R	M. Artuso <i>et al.</i>	(CLEO Collab.)
LINK	02	PL B525 205	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
AMMAR	01	PRL 86 1167	R. Ammar <i>et al.</i>	(CLEO Collab.)
LINK	00C	PL B488 218	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
AITALA	96B	PL B379 292	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
ALEEV	96	JINRRC 3-77 31	A.N. Aleev <i>et al.</i>	(Serpukhov EXCHARM Collab.)
FRABETTI	96	PL B365 461	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
CRAWFORD	93	PRL 71 3259	G. Crawford <i>et al.</i>	(CLEO Collab.)
ANJOS	89D	PRL 62 1721	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
BOWCOCK	89	PRL 62 1240	T.J.V. Bowcock <i>et al.</i>	(CLEO Collab.)
ALBRECHT	88D	PL B211 489	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
DIESBURG	87	PRL 59 2711	M. Diesburg <i>et al.</i>	(FNAL E400 Collab.)
JONES	87	ZPHY C36 593	G.T. Jones <i>et al.</i>	(CERN WA21 Collab.)
AMMAR	86	JETPL 43 515	R. Ammar <i>et al.</i>	(ITEP)
		Translated from ZETFP 43 401.		
BOSETTI	82	PL 109B 234	P.C. Bosetti <i>et al.</i>	(AACH3, BONN, CERN+)
CALICCHIO	80	PL 93B 521	M. Calicchio <i>et al.</i>	(BARI, BIRM, BRUX+)
BALTAY	79	PRL 42 1721	C. Baltay <i>et al.</i>	(COLU, BNL) I
CAZZOLI	75	PRL 34 1125	E.G. Cazzoli <i>et al.</i>	(BNL)