$\Sigma(1880)$ $1/2^+$

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

OMITTED FROM SUMMARY TABLE

A P_{11} resonance is suggested by several partial-wave analyses, but with wide variations in the mass and other parameters. We list here all claims which lie well above the P_{11} $\Sigma(1770)$.

$\Sigma(1880)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1776	ZHANG	13A	DPWA	Multichannel

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
270	ZHANG	13A	DPWA	Multichannel

$\Sigma(1880)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1820 to 1940 (≈ 1880) OUR ESTIMATE				
1821±17	ZHANG	13A	DPWA	Multichannel
1826±20	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1870±10	CAMERON	78B	DPWA	$K^- p \rightarrow N\overline{K}^*$
1847 or 1863	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
1960±30	[2] BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$
1985±50	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$
1898	[3] LEA	73	DPWA	Multichannel K-matrix
∼ 1850	ARMENTEROS	70	IPWA	$\overline{K}N \rightarrow \overline{K}N$
1950±50	BARBARO-...	70	DPWA	$K^- N \rightarrow \Lambda\pi$
1920±30	LITCHFIELD	70	DPWA	$K^- N \rightarrow \Lambda\pi$
1850	BAILEY	69	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1882±40	SMART	68	DPWA	$K^- N \rightarrow \Lambda\pi$

$\Sigma(1880)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
100 to 300 (≈ 200) OUR ESTIMATE				
300± 59	ZHANG	13A	DPWA	Multichannel
86± 15	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
80± 10	CAMERON	78B	DPWA	$K^- p \rightarrow N\overline{K}^*$
216 or 220	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
260± 40	[2] BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$
220±140	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$

222	[3] LEA	73	DPWA	Multichannel K-matrix
$\sim$ 30	ARMENTEROS	70	IPWA	$\overline{K}N \to \overline{K}N$
200$\pm$ 50	BARBARO-...	70	DPWA	$K^- N \to \Lambda\pi$
170$\pm$ 40	LITCHFIELD	70	DPWA	$K^- N \to \Lambda\pi$
200	BAILEY	69	DPWA	$\overline{K}N \to \overline{K}N$
222$\pm$150	SMART	68	DPWA	$K^- N \to \Lambda\pi$

Σ(1880) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	0.10 to 0.30 ($\approx$ 0.20)
Γ_2	$\Lambda\pi$	
Γ_3	$\Sigma\pi$	
Γ_4	$\Lambda(1520)\pi$, D-wave	(2.0 $\pm$1.0) %
Γ_5	$N\overline{K}^*(892)$, S=1/2, P-wave	
Γ_6	$N\overline{K}^*(892)$, S=3/2, P-wave	
Γ_7	$\Delta(1232)\overline{K}$, P-wave	(39 $\pm$8) %

Σ(1880) BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on Λ and Σ Resonances.

$\Gamma(N\overline{K})/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.10 to 0.30 ($\approx$ 0.20) OUR ESTIMATE				
0.10$\pm$0.03	ZHANG	13A	DPWA	Multichannel
0.06$\pm$0.02	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.27 or 0.27	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
0.31	[3] LEA	73	DPWA	Multichannel K-matrix
0.20	ARMENTEROS	70	IPWA	$\overline{K}N \to \overline{K}N$
0.22	BAILEY	69	DPWA	$\overline{K}N \to \overline{K}N$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Sigma(1880) \to \Lambda\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.24 or -0.24	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
-0.12 ±0.02	[2] BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$
$+0.05$ $^{+0.07}_{-0.02}$	VANHORN	75	DPWA	$K^- p \to \Lambda\pi^0$
-0.169 ± 0.119	DEVENISH	74B		Fixed-t dispersion rel.
-0.30	[3] LEA	73	DPWA	Multichannel K-matrix
-0.09 ±0.04	BARBARO-...	70	DPWA	$K^- N \to \Lambda\pi$
-0.14 ±0.03	LITCHFIELD	70	DPWA	$K^- N \to \Lambda\pi$
-0.11 ±0.03	SMART	68	DPWA	$K^- N \to \Lambda\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Sigma(1880) \to \Sigma\pi$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.30$ or $+0.29$	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
not seen	[3] LEA	73	DPWA	Multichannel K-matrix

$\Gamma\big(\Lambda(1520)\pi\,,\ D\text{-wave}\big)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.02±0.01	ZHANG	13A	DPWA	Multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Sigma(1880) \to N\overline{K}^*(892),\ S{=}1/2,\ P\text{-wave}$ $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.05 ± 0.03	[4] CAMERON	78B	DPWA	$K^- p \to N\overline{K}^*$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \to \Sigma(1880) \to N\overline{K}^*(892),\ S{=}3/2,\ P\text{-wave}$ $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.11\pm0.03$	CAMERON	78B	DPWA	$K^- p \to N\overline{K}^*$

$\Gamma\big(\Delta(1232)\overline{K}\,,\ P\text{-wave}\big)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.39±0.08	ZHANG	13A	DPWA	Multichannel

$\Sigma(1880)$ FOOTNOTES

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
[2] From solution 1 of BAILLON 75; not present in solution 2.
[3] Only unconstrained states from table 1 of LEA 73 are listed.
[4] The published sign has been changed to be in accord with the baryon-first convention.

$\Sigma(1880)$ REFERENCES

ZHANG	13A	PR C88 035205	H. Zhang *et al.*	(KSU)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
CAMERON	78B	NP B146 327	W. Cameron *et al.*	(RHEL, LOIC) IJP
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also		NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also		NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP
Also		NP B87 157	A.J. van Horn	(LBL) IJP
DEVENISH	74B	NP B81 330	R.C.E. Devenish, C.D. Froggatt, B.R. Martin	(DESY+)
LEA	73	NP B56 77	A.T. Lea *et al.*	(RHEL, LOUC, GLAS, AARH) IJP
ARMENTEROS	70	Duke Conf. 123 Hyperon Resonances, 1970	R. Armenteros *et al.*	(CERN, HEID, SACL) IJP
BARBARO-...	70	Duke Conf. 173 Hyperon Resonances, 1970	A. Barbaro-Galtieri	(LRL) IJP
LITCHFIELD	70	NP B22 269	P.J. Litchfield	(RHEL) IJP
BAILEY	69	Thesis UCRL 50617	J.M. Bailey	(LLL) IJP
SMART	68	PR 169 1330	W.M. Smart	(LRL) IJP