$\Gamma(\Sigma\pi)/\Gamma(\Lambda\pi)$ Γ_3/Γ_2

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
small		GODDARD	79	HBC	+	$\pi^+ p$ 10.2 GeV/c
<0.4	90	MOTT	69	HBC	+	$K^- p$ 5.5 GeV/c
0.3 ± 0.3		COLLEY	67	HBC	+	4/30 events

$\Gamma(\Sigma(1385)\pi)/\Gamma(\Lambda\pi)$ Γ_4/Γ_2

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
<0.5	MOTT	69	HBC	+	$K^- p$ 5.5 GeV/c

$\Gamma(\Lambda\pi\pi\,(\text{including}\,\Sigma(1385)\pi))/\Gamma(\Lambda\pi)$ Γ_5/Γ_2

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
2.0 ± 0.6	BLUMENFELD	69	HBC	+	31/15 events
0.5 ± 0.25	COLLEY	67	HBC	+	15/30 events

$\Gamma(\Sigma(1385)\pi)/\Gamma(\Lambda\pi\pi\,(\text{including}\,\Sigma(1385)\pi))$ Γ_4/Γ_5

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
large	SIMS	68	HBC	−	$K^- N \rightarrow \Lambda\pi\pi$
small	COLLEY	67	HBC	+	$K^- p$ 6 GeV/c

$\Sigma(1690)$ FOOTNOTES (PRODUCTION EXPERIMENTS)

[1] From $\pi^+ p \rightarrow (\Lambda\pi^+)K^+$. $J > 1/2$ is not required by the data.

[2] From $\pi^+ p \rightarrow (\Lambda\pi^+)(K\pi)^+$. $J > 1/2$ is indicated, but large background precludes a definite conclusion.

[3] See the $\Sigma(1670)$ Listings. AGUILAR-BENITEZ 70B with three times the data of PRIMER 68 find no evidence for the $\Sigma(1690)$.

[4] This analysis, which is difficult and requires several assumptions and shows no unambiguous $\Sigma(1690)$ signal, suggests $J^P = 5/2^+$. Such a state would lead all previously known Y^* trajectories.

$\Sigma(1690)$ REFERENCES (PRODUCTION EXPERIMENTS)

GODDARD	79	PR D19 1350	+Key, Luste, Prentice, Yoon, Gordon+	(TNTO, BNL) IJ
AGUILAR-...	70B	PRL 25 58	Aguilar-Benitez, Barnes, Bassano+	(BNL, SYRA)
ADERHOLZ	69	NP B11 259	+Bartsch+ (AACH3, BERL, CERN, JAGL, WARS)	I
BLUMENFELD	69	PL 29B 58	+Kalbfleisch	(BNL) I
MOTT	69	PR 177 1966	+Ammar, Davis, Kropac, Slate+	(NWES, ANL) I
Also	67	PRL 18 266	Derrick, Fields, Loken, Ammar+	(ANL, NWES) I
PRIMER	68	PRL 20 610	+Goldberg, Jaeger, Barnes, Dornan+	(SYRA, BNL) I
SIMS	68	PRL 21 1413	+Albright, Bartley, Meer+	(FSU, TUFTS, BRAN) I
COLLEY	67	PL 24B 489	(BIRM, GLAS, LOIC, MUNI, OXF, RHEL)	I

$\Sigma(1750)$ S_{11}

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

For most results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** (1982).

There is evidence for this state in many partial-wave analyses, but with wide variations in the mass, width, and couplings. The latest analyses indicated significant couplings to $N\overline{K}$ and $\Lambda\pi$, as well as to $\Sigma\eta$ whose threshold is at 1746 MeV (JONES 74).

$\Sigma(1750)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1730 to 1800 (≈ 1750) OUR ESTIMATE				
1756 ± 10	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1770 ± 10	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1770 ± 15	GOPAL	77	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1800 or 1813	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
1715 ± 10	[2] CARROLL	76	DPWA	Isospin-1 total σ
1730	DEBELLEFON	76	IPWA	$K^- p \rightarrow \Lambda\pi^0$
1780 ± 30	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$ (sol. 1)
1700 ± 30	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$ (sol. 2)
1697^{+20}_{-10}	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$
1785 ± 12	CHU	74	DBC	Fits $\sigma(K^- n \rightarrow \Sigma^-\eta)$
1760 ± 5	[3] JONES	74	HBC	Fits $\sigma(K^- p \rightarrow \Sigma^0\eta)$
1739 ± 10	PREVOST	74	DPWA	$K^- N \rightarrow \Sigma(1385)\pi$

$\Sigma(1750)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
60 to 160 (≈ 90) OUR ESTIMATE				
64 ± 10	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
161 ± 20	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
60 ± 10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
117 or 119	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
10	[2] CARROLL	76	DPWA	Isospin-1 total σ
110	DEBELLEFON	76	IPWA	$K^- p \rightarrow \Lambda\pi^0$
140 ± 30	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$ (sol. 1)
160 ± 50	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$ (sol. 2)
66^{+14}_{-12}	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$
89 ± 33	CHU	74	DBC	Fits $\sigma(K^- n \rightarrow \Sigma^-\eta)$
92 ± 7	[3] JONES	74	HBC	Fits $\sigma(K^- p \rightarrow \Sigma^0\eta)$
108 ± 20	PREVOST	74	DPWA	$K^- N \rightarrow \Sigma(1385)\pi$

$\Sigma(1750)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	10–40 %
Γ_2	$\Lambda\pi$	seen
Γ_3	$\Sigma\pi$	<8 %
Γ_4	$\Sigma\eta$	15–55 %
Γ_5	$\Sigma(1385)\pi$	
Γ_6	$\Lambda(1520)\pi$	

The above branching fractions are our estimates, not fits or averages.

$\Sigma(1750)$ 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
0.1 to 0.4 OUR ESTIMATE				
0.14 ± 0.03	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
0.33 ± 0.05	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.15 ± 0.03	GOPAL	77	DPWA	See GOPAL 80
0.06 or 0.05	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Lambda\pi$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.04 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.10 or −0.09	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
−0.12	DEBELLEFON	76	IPWA	$K^- p \rightarrow \Lambda\pi^0$
-0.12 ± 0.02	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$ (sol. 1)
-0.13 ± 0.03	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$ (sol. 2)
-0.13 ± 0.04	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$
-0.120 ± 0.077	DEVENISH	74B		Fixed-t dispersion rel.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Sigma\pi$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.09 ± 0.05	GOPAL	77	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
+0.06 or +0.06	[1] MARTIN	77	DPWA	$\overline{K}N$ multichannel
0.13 ± 0.02	LANGBEIN	72	IPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Sigma\eta$ $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.23 ± 0.01	[3] JONES	74	HBC	Fits $\sigma(K^- p \rightarrow \Sigma^0\eta)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	CLINE	69	DBC	Threshold bump

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Sigma(1385)\pi$ $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.18\pm0.15$	PREVOST	74	DPWA	$K^- N \rightarrow \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Lambda(1520)\pi$ $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.032 ± 0.021	CAMERON	77	DPWA	P-wave decay

$\Sigma(1750)$ FOOTNOTES

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

[2] A total cross-section bump with $(J+1/2)\,\Gamma_{\text{el}}\,/\,\Gamma_{\text{total}} = 0.30$.

[3] An S-wave Breit-Wigner fit to the threshold cross section with no background and errors statistical only.