NODE=B057

$\Sigma(1750)\ 1/2^-$

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

For most results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

NODE=B057

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).

$\Sigma(1750)$ POLE POSITION

NODE=B057225

REAL PART

NODE=B057RE
NODE=B057RE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1689±11	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1704^{+\ 3}_{-\ 6}$	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel
1708	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15. Solution B reports two poles at M = 1551^{+2}_{-9} MeV and 1940^{+2}_{-2} MeV.

NODE=B057RE;LINKAGE=B

−2×IMAGINARY PART

NODE=B057IM
NODE=B057IM

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
206±18	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$86^{+14}_{-\ 4}$	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel
158	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

OCCUR=2

[1] From the preferred solution A in KAMANO 15. Solution B Reports two poles with Γ = $376^{+12}_{-\ 2}$ and 172^{+4}_{-4} MeV.

NODE=B057IM;LINKAGE=A

$\Sigma(1750)$ POLE RESIDUES

NODE=B057250

The normalized residue is the residue divided by $\Gamma_{pole}/2$.

NODE=B057250

Normalized residue in $N\overline{K} \to \Sigma(1750) \to N\overline{K}$

NODE=B057A00
NODE=B057A00

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.46 ±0.09	**−144 ± 15**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0982	178	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.

NODE=B057A00;LINKAGE=A

Normalized residue in $N\overline{K} \to \Sigma(1750) \to \Sigma\pi$

NODE=B057A01
NODE=B057A01

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.27 ±0.05	**100 ± 18**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.192	137	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

NODE=B057A01;LINKAGE=A

Normalized residue in $N\overline{K} \to \Sigma(1750) \to \Sigma\eta$

NODE=B057A06
NODE=B057A06

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.05±0.03		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Sigma(1750) \to \Lambda\pi$

NODE=B057A02
NODE=B057A02

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.26 ±0.06	**115 ± 15**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.207	169	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.

NODE=B057A02;LINKAGE=A

Normalized residue in $N\overline{K} \to \Sigma(1750) \to \Xi K$

NODE=B057A07
NODE=B057A07

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.02±0.02		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Sigma(1385)\pi$, D-wave

NODE=B057A03
NODE=B057A03

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.04 ±0.03		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0536	73	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.

NODE=B057A03;LINKAGE=A

Normalized residue in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow \Lambda(1520)\pi$

NODE=B057A04
NODE=B057A04

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.15±0.07	**−25 ± 40**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \rightarrow \Sigma(1750) \rightarrow N\overline{K}^*(892)$, S=1/2, S-wave

NODE=B057A05
NODE=B057A05

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.05±0.03	**−100 ± 35**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Sigma(1750)$ MASS

NODE=B057M

NODE=B057M

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1700 to 1800 (≈ 1750) OUR ESTIMATE				→ UNCHECKED ←
1692±11	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
1739± 8	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
1756±10	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1770±10	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1770±15	GOPAL	77	DPWA	$\overline{K}N$ multichannel
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	$K^-N \rightarrow \Sigma(1385)\pi$

OCCUR=2

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
NODE=B057M;LINKAGE=E

[2] A total cross-section bump with $(J+1/2)\ \Gamma_{el}\ /\ \Gamma_{total} = 0.30$.
NODE=B057M;LINKAGE=D

[3] An S-wave Breit-Wigner fit to the threshold cross section with no background and errors statistical only.
NODE=B057M;LINKAGE=A

$\Sigma(1750)$ WIDTH

NODE=B057W

NODE=B057W

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
100 to 200 (≈ 150) OUR ESTIMATE				→ UNCHECKED ←
208±18	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
182±60	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
64±10	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$
161±20	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
60±10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
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	$K^-N \rightarrow \Sigma(1385)\pi$

OCCUR=2

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
NODE=B057W;LINKAGE=E

[2] A total cross-section bump with $(J+1/2)\ \Gamma_{el}\ /\ \Gamma_{total} = 0.30$.
NODE=B057;LINKAGE=D

[3] An S-wave Breit-Wigner fit to the threshold cross section with no background and errors statistical only.
NODE=B057W;LINKAGE=A

Σ(1750) DECAY MODES

NODE=B057215;NODE=B057

	Mode	Fraction (Γ_i/Γ)	
Γ_1	$N\overline{K}$	0.06 to 0.12	DESIG=1
Γ_2	$\Lambda\pi$	(14 ±5) %	DESIG=3
Γ_3	$\Sigma\pi$	(16 ±4) %	DESIG=4
Γ_4	$\Sigma\eta$	15–55 %	DESIG=2;OUR EST
Γ_5	$\Sigma(1385)\pi$, D-wave	< 1 %	DESIG=5
Γ_6	$\Lambda(1520)\pi$	(2.0 ±1.0) %	DESIG=6
Γ_7	$N\overline{K}^*(892)$, S=1/2	(8 ±4) %	DESIG=7
Γ_8	$N\overline{K}^*(892)$, S=3/2, D-wave		DESIG=8

Σ(1750) BRANCHING RATIOS

NODE=B057220

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

NODE=B057220

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

NODE=B057R1
NODE=B057R1

VALUE	DOCUMENT ID		TECN	COMMENT
0.06 to 0.12 OUR ESTIMATE				→ UNCHECKED ←
0.46 ±0.09	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.09 ±0.07	ZHANG	13A	DPWA	Multichannel
0.14 ±0.03	GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.33 ±0.05	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.154	[1] KAMANO	15	DPWA	Multichannel
0.15 ±0.03	GOPAL	77	DPWA	See GOPAL 80
0.06 or 0.05	[2] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
NODE=B057R1;LINKAGE=A
[2] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
NODE=B057R1;LINKAGE=E

$\Gamma(\Lambda\pi)/\Gamma_{total}$ Γ_2/Γ

NODE=B057R02
NODE=B057R02

VALUE	DOCUMENT ID		TECN	COMMENT
0.14 ±0.05	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.435	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
NODE=B057R02;LINKAGE=A

$\Gamma(\Sigma\pi)/\Gamma_{total}$ Γ_3/Γ

NODE=B057R03
NODE=B057R03

VALUE	DOCUMENT ID		TECN	COMMENT
0.16 ±0.04	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.373	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
NODE=B057R03;LINKAGE=A

$\Gamma(\Lambda(1520)\pi)/\Gamma_{total}$ Γ_6/Γ

NODE=B057R05
NODE=B057R05

VALUE	DOCUMENT ID		TECN	COMMENT
0.02±0.01	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{total}$ Γ_5/Γ

NODE=B057R04
NODE=B057R04

VALUE	DOCUMENT ID		TECN	COMMENT
<0.01	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.024	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
NODE=B057R04;LINKAGE=A

$\Gamma(N\overline{K}^*(892), S{=}1/2)/\Gamma_{total}$ Γ_7/Γ

NODE=B057R01
NODE=B057R01

VALUE	DOCUMENT ID		TECN	COMMENT
~ 0	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.08 ±0.04	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.004	[1] KAMANO	15	DPWA	$\overline{K}N$ multichannel

[1] From the preferred solution A in KAMANO 15.
NODE=B057R01;LINKAGE=A

$\Gamma(N\overline{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{total}$ Γ_8/Γ

NODE=B057R00
NODE=B057R00

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.01	[1] KAMANO	15	DPWA	Multichannel

[1] From the preferred solution A in KAMANO 15.

NODE=B057R00;LINKAGE=A

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

NODE=B057R3
NODE=B057R3

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.10 \pm 0.04$	ZHANG	13A	DPWA	Multichannel
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	$K^- p \to \Lambda\pi^0$
-0.12 ± 0.02	BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$ (sol. 1)
-0.13 ± 0.03	BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$ (sol. 2)
-0.13 ± 0.04	VANHORN	75	DPWA	$K^- p \to \Lambda\pi^0$
-0.120 ± 0.077	DEVENISH	74B		Fixed-t dispersion rel.

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

OCCUR=2

NODE=B057R3;LINKAGE=E

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

NODE=B057R4
NODE=B057R4

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.17 \pm 0.07$	ZHANG	13A	DPWA	Multichannel
-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

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

NODE=B057;LINKAGE=E

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

NODE=B057R2
NODE=B057R2

VALUE	DOCUMENT ID		TECN	COMMENT
0.23 ± 0.01	[1] JONES	74	HBC	Fits $\sigma(K^- p \to \Sigma^0\eta)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	CLINE	69	DBC	Threshold bump

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

NODE=B057;LINKAGE=A

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(1750) \to \Sigma(1385)\pi$, D-wave $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

NODE=B057R5
NODE=B057R5

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.17 \pm 0.07$	ZHANG	13A	DPWA	Multichannel
$+0.18 \pm 0.15$	PREVOST	74	DPWA	$K^- N \to \Sigma(1385)\pi$

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

NODE=B057R6
NODE=B057R6

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

$\Sigma(1750)$ REFERENCES

NODE=B057

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev *et al.*	(BONN, PNPI)	REFID=59986
KAMANO	15	PR C92 025205	H. Kamano *et al.*	(ANL, OSAK)	REFID=57507
ZHANG	13A	PR C88 035205	H. Zhang *et al.*	(KSU)	REFID=55441
PDG	82	PL 111B 1	M. Roos *et al.*	(HELS, CIT, CERN)	REFID=41167
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP	REFID=31755
ALSTON-...	78	PR D18 182	M. Alston-Garnjost *et al.*	(LBL, MTHO+) IJP	REFID=31751
Also		PRL 38 1007	M. Alston-Garnjost *et al.*	(LBL, MTHO+) IJP	REFID=31752
CAMERON	77	NP B131 399	W. Cameron *et al.*	(RHEL, LOIC) IJP	REFID=31749
GOPAL	77	NP B119 362	G.P. Gopal *et al.*	(LOIC, RHEL) IJP	REFID=31750
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP	REFID=31762
Also		NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)	REFID=31763
Also		NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP	REFID=31764
CARROLL	76	PRL 37 806	A.S. Carroll *et al.*	(BNL) I	REFID=31760
DEBELLEFON	76	NP B109 129	A. de Bellefon, A. Berthon	(CDEF) IJP	REFID=32158
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP	REFID=32089
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP	REFID=32093
Also		NP B87 157	A.J. van Horn	(LBL) IJP	REFID=32094
CHU	74	NC 20A 35	R.Y.L. Chu *et al.*	(PLAT, TUFTS, BRAN) IJP	REFID=32218
DEVENISH	74B	NP B81 330	R.C.E. Devenish, C.D. Froggatt, B.R. Martin	(DESY+)	REFID=30036
JONES	74	NP B73 141	M.D. Jones	(CHIC) IJP	REFID=32219
PREVOST	74	NP B69 246	J. Prevost *et al.*	(SACL, CERN, HEID)	REFID=31785
LANGBEIN	72	NP B47 477	W. Langbein, F. Wagner	(MPIM) IJP	REFID=31758
CLINE	69	LNC 2 407	D. Cline, R. Laumann, J. Mapp	(WISC)	REFID=31734