$\Sigma(1915)\ 5/2^+$

$I(J^P) = 1(\frac{5}{2}^+)$ Status: ∗∗∗∗

Discovered by COOL 66. For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

This entry only includes results from partial-wave analyses. Parameters of peaks seen in cross sections and invariant-mass distributions in this region used to be listed in in a separate entry immediately following. They may be found in our 1986 edition Physics Letters **170B** 1 (1986).

Σ(1915) POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{1890^{+3}_{-2}}$	[1] KAMANO	15	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1897	ZHANG	13A	DPWA	Multichannel

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

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{97^{+4}_{-6}}$	[1] KAMANO	15	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
133	ZHANG	13A	DPWA	Multichannel

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

Σ(1915) POLE RESIDUES

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

Normalized residue in $N\overline{K} \rightarrow \Sigma(1915) \rightarrow N\overline{K}$

MODULUS	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0391	−15	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \rightarrow \Sigma(1915) \rightarrow \Sigma\pi$

MODULUS	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.157	157	[1] KAMANO	15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Sigma(1915) \to \Lambda\pi$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0757	166	[1] KAMANO 15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Sigma(1915) \to \Xi K$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.002	−88	[1] KAMANO 15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1915) \to \Sigma(1385)\pi$, P-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0724	161	[1] KAMANO 15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Lambda(1915) \to \Sigma(1385)\pi$, F-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0162	−163	[1] KAMANO 15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Sigma(1915) \to N\overline{K}^*(892)$, S=1/2 , F-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.00476	4	[1] KAMANO 15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Sigma(1915) \to N\overline{K}^*(892)$, S=3/2 , P-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.0494	51	[1] KAMANO 15	DPWA	Multichannel

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

Normalized residue in $N\overline{K} \to \Sigma(1915) \to N\overline{K}^*(892)$, S=3/2 , F-wave

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.000314	16	[1] KAMANO 15	DPWA	Multichannel

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

$\Sigma(1915)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1900 to 1935 (≈ 1915) OUR ESTIMATE				
1920± 7	ZHANG	13A	DPWA	Multichannel
1937±20	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1894± 5	[1] CORDEN	77C		$K^- n \rightarrow \Sigma\pi$
1909± 5	[1] CORDEN	77C		$K^- n \rightarrow \Sigma\pi$
1920±10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
1900± 4	[2] CORDEN	76	DPWA	$K^- n \rightarrow \Lambda\pi^-$
1920±30	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$
1914±10	HEMINGWAY	75	DPWA	$K^- p \rightarrow \overline{K}N$
1920^{+15}_{-20}	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$
1920± 5	KANE	74	DPWA	$K^- p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	DECLAIS	77	DPWA	$\overline{K}N \rightarrow \overline{K}N$
1925 or 1933	[3] MARTIN	77	DPWA	$\overline{K}N$ multichannel
1915	DEBELLEFON	76	IPWA	$K^- p \rightarrow \Lambda\pi^0$

[1] The two entries for CORDEN 77C are from two different acceptable solutions.
[2] Preferred solution 3; see CORDEN 76 for other possibilities.
[3] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$\Sigma(1915)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
80 to 160 (≈ 120) OUR ESTIMATE				
149±17	ZHANG	13A	DPWA	Multichannel
161±20	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$
107±14	[1] CORDEN	77C		$K^- n \rightarrow \Sigma\pi$
85±13	[1] CORDEN	77C		$K^- n \rightarrow \Sigma\pi$
130±10	GOPAL	77	DPWA	$\overline{K}N$ multichannel
75±14	[2] CORDEN	76	DPWA	$K^- n \rightarrow \Lambda\pi^-$
70±20	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$
85±15	HEMINGWAY	75	DPWA	$K^- p \rightarrow \overline{K}N$
102±18	VANHORN	75	DPWA	$K^- p \rightarrow \Lambda\pi^0$
162±25	KANE	74	DPWA	$K^- p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
171 or 173	[3] MARTIN	77	DPWA	$\overline{K}N$ multichannel
60	DEBELLEFON	76	IPWA	$K^- p \rightarrow \Lambda\pi^0$

[1] The two entries for CORDEN 77C are from two different acceptable solutions.
[2] Preferred solution 3; see CORDEN 76 for other possibilities.
[3] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

Σ(1915) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	5–15 %
Γ_2	$\Lambda\pi$	seen
Γ_3	$\Sigma\pi$	seen
Γ_4	ΞK	
Γ_5	$\Sigma(1385)\pi$, P-wave	
Γ_6	$\Sigma(1385)\pi$, F-wave	
Γ_7	$\Sigma(1385)\pi$	<5 %
Γ_8	$\Sigma(1385)\pi$, P-wave	
Γ_9	$\Sigma(1385)\pi$, F-wave	
Γ_{10}	$N\overline{K}^*(892)$, S=1/2, F-wave	
Γ_{11}	$N\overline{K}^*(892)$, S=3/2, P-wave	
Γ_{12}	$N\overline{K}^*(892)$, S=3/2, F-wave	

Σ(1915) BRANCHING RATIOS

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.05 to 0.15 OUR ESTIMATE				
0.026±0.004	ZHANG	13A	DPWA	Multichannel
0.03 ±0.02	[1] GOPAL	80	DPWA	$\overline{K}N \to \overline{K}N$
0.14 ±0.05	ALSTON-...	78	DPWA	$\overline{K}N \to \overline{K}N$
0.11 ±0.04	HEMINGWAY	75	DPWA	$K^- p \to \overline{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.036	[2] KAMANO	15	DPWA	Multichannel
0.05 ±0.03	GOPAL	77	DPWA	See GOPAL 80
0.08 or 0.08	[3] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] The mass and width are fixed to the GOPAL 77 values due to the low elasticity.
[2] From the preferred solution A in KAMANO 15.
[3] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.127	[1] KAMANO	15	DPWA	Multichannel

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.678	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(\Xi K)/\Gamma_{total}$ — Γ_4/Γ

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

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.112	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(\Sigma(1385)\pi, F\text{-wave})/\Gamma_{total}$ — Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.004	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(N\overline{K}^*(892), S=1/2, F\text{-wave})/\Gamma_{total}$ — Γ_{10}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.001	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(N\overline{K}^*(892), S=3/2, P\text{-wave})/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.042	[1] KAMANO	15	DPWA	Multichannel

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

$\Gamma(N\overline{K}^*(892), S=3/2, F\text{-wave})/\Gamma_{total}$ — Γ_{12}/Γ

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

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(1915) \to \Lambda\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.09 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
-0.10 ± 0.01	[1] CORDEN	76	DPWA	$K^- n \to \Lambda\pi^-$
-0.06 ± 0.02	BAILLON	75	IPWA	$\overline{K}N \to \Lambda\pi$
-0.09 ± 0.02	VANHORN	75	DPWA	$K^- p \to \Lambda\pi^0$
-0.087 ± 0.056	DEVENISH	74B		Fixed-t dispersion rel.
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.09 or -0.09	[2] MARTIN	77	DPWA	$\overline{K}N$ multichannel
-0.10	DEBELLEFON	76	IPWA	$K^- p \to \Lambda\pi^0$

[1] Preferred solution 3; see CORDEN 76 for other possibilities.
[2] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(1915) \rightarrow \Sigma\pi$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.14 ± 0.01	ZHANG	13A	DPWA	Multichannel
-0.17 ± 0.01	[1] CORDEN	77C		$K^- n \rightarrow \Sigma\pi$
-0.15 ± 0.02	[1] CORDEN	77C		$K^- n \rightarrow \Sigma\pi$
-0.19 ± 0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
-0.16 ± 0.03	KANE	74	DPWA	$K^- p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.05 or -0.05	[2] MARTIN	77	DPWA	$\overline{K}N$ multichannel

[1] The two entries for CORDEN 77C are from two different acceptable solutions.
[2] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(1915) \rightarrow \Sigma(1385)\pi$, *P*-wave $(\Gamma_1\Gamma_8)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
<0.01	CAMERON	78	DPWA	$K^- p \rightarrow \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(1915) \rightarrow \Sigma(1385)\pi$, *F*-wave $(\Gamma_1\Gamma_9)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.06\ \pm0.02$	ZHANG	13A	DPWA	Multichannel
$+0.039\pm0.009$	[1] CAMERON	78	DPWA	$K^- p \rightarrow \Sigma(1385)\pi$

[1] The published sign has been changed to be in accord with the baryon-first convention.

Σ(1915) REFERENCES

KAMANO	15	PR C92 025205	H. Kamano *et al.*	(ANL, OSAK)
ZHANG	13A	PR C88 035205	H. Zhang *et al.*	(KSU)
PDG	86	PL 170B 1	M. Aguilar-Benitez *et al.*	(CERN, CIT+)
PDG	82	PL 111B 1	M. Roos *et al.*	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
ALSTON-...	78	PR D18 182	M. Alston-Garnjost *et al.*	(LBL, MTHO+) IJP
Also		PRL 38 1007	M. Alston-Garnjost *et al.*	(LBL, MTHO+) IJP
CAMERON	78	NP B143 189	W. Cameron *et al.*	(RHEL, LOIC) IJP
CORDEN	77C	NP B125 61	M.J. Corden *et al.*	(BIRM) IJP
DECLAIS	77	CERN 77-16	Y. Declais *et al.*	(CAEN, CERN) IJP
GOPAL	77	NP B119 362	G.P. Gopal *et al.*	(LOIC, RHEL) 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
CORDEN	76	NP B104 382	M.J. Corden *et al.*	(BIRM) IJP
DEBELLEFON	76	NP B109 129	A. de Bellefon, A. Berthon	(CDEF) IJP
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP
HEMINGWAY	75	NP B91 12	R.J. Hemingway *et al.*	(CERN, HEIDH, MPIM) 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+)
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
COOL	66	PRL 16 1228	R.L. Cool *et al.*	(BNL)