$\Sigma(1915)$ F_{15}

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

Discovered by COOL 66. For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** (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** (1986).

$\Sigma(1915)$ MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1900 to 1935 (≈ 1915) OUR ESTIMATE				
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	$K^- p \rightarrow \Lambda\pi^0$

$\Sigma(1915)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
80 to 160 (≈ 120) OUR ESTIMATE				
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	$K^- p \rightarrow \Lambda\pi^0$

$\Sigma(1915)$ 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	$\Sigma(1385)\pi$	<5 %
Γ_5	$\Sigma(1385)\pi$, P-wave	
Γ_6	$\Sigma(1385)\pi$, F-wave	

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

$\Sigma(1915)$ 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				
0.03±0.02	[4] 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. • • •				
0.05±0.03	GOPAL	77	DPWA	See GOPAL 80
0.08 or 0.08	[3] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ 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	[2] 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	[3] MARTIN	77	DPWA	$\overline{K}N$ multichannel
−0.10	DEBELLEFON	76	IPWA	$K^-p \to \Lambda\pi^0$

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

VALUE	DOCUMENT ID		TECN	COMMENT
−0.17±0.01	[1] CORDEN	77C		$K^-n \to \Sigma\pi$
−0.15±0.02	[1] CORDEN	77C		$K^-n \to \Sigma\pi$
−0.19±0.03	GOPAL	77	DPWA	$\overline{K}N$ multichannel
−0.16±0.03	KANE	74	DPWA	$K^-p \to \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.05 or −0.05	[3] MARTIN	77	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(1915) \to \Sigma(1385)\pi$, *P*-wave **$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$**

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Sigma(1915) \to \Sigma(1385)\pi$, *F*-wave **$(\Gamma_1\Gamma_6)^{1/2}/\Gamma$**

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.039 \pm 0.009$	[5] CAMERON	78	DPWA	$K^- p \to \Sigma(1385)\pi$

Σ(1915) FOOTNOTES

[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.
[4] The mass and width are fixed to the GOPAL 77 values due to the low elasticity.
[5] The published sign has been changed to be in accord with the baryon-first convention.

Σ(1915) REFERENCES

PDG	86	PL 170B	Aguilar-Benitez, Porter+	(CERN, CIT+)
PDG	82	PL 111B	Roos, Porter, Aguilar-Benitez+	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159		(RHEL) IJP
ALSTON-...	78	PR D18 182	Alston-Garnjost, Kenney+	(LBL, MTHO, CERN) IJP
Also	77	PRL 38 1007	Alston-Garnjost, Kenney+	(LBL, MTHO, CERN) IJP
CAMERON	78	NP B143 189	+Franek, Gopal, Bacon, Butterworth+	(RHEL, LOIC) IJP
CORDEN	77C	NP B125 61	+Cox, Kenyon, O'Neale, Stubbs, Sumorok+	(BIRM) IJP
DECLAIS	77	CERN 77-16	+Duchon, Louvel, Patry, Seguinot+	(CAEN, CERN) IJP
GOPAL	77	NP B119 362	+Ross, VanHorn, McPherson+	(LOIC, RHEL) IJP
MARTIN	77	NP B127 349	+Pidcock, Moorhouse	(LOUC, GLAS) IJP
Also	77B	NP B126 266	Martin, Pidcock	(LOUC)
Also	77C	NP B126 285	Martin, Pidcock	(LOUC) IJP
CORDEN	76	NP B104 382	+Cox, Dartnell, Kenyon, O'Neale+	(BIRM) IJP
DEBELLEFON	76	NP B109 129	De Bellefon, Berthon	(CDEF) IJP
BAILLON	75	NP B94 39	+Litchfield	(CERN, RHEL) IJP
HEMINGWAY	75	NP B91 12	+Eades, Harmsen+	(CERN, HEIDH, MPIM) IJP
VANHORN	75	NP B87 145		(LBL) IJP
Also	75B	NP B87 157	VanHorn	(LBL) IJP
DEVENISH	74B	NP B81 330	+Froggatt, Martin	(DESY, NORD, LOUC)
KANE	74	LBL-2452		(LBL) IJP
COOL	66	PRL 16 1228	+Giacomelli, Kycia, Leontic, Lundby+	(BNL)