

$\Sigma(1915) F_{15}$

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

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 a separate entry immediately following. They may be found in our 1986 edition Physics Letters **170B** (1986).

$\Sigma(1915)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1900 to 1935 (\approx 1915) OUR ESTIMATE			
1937 \pm 20	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1894 \pm 5	¹ CORDEN	77C	$K^- n \rightarrow \Sigma\pi$
1909 \pm 5	¹ CORDEN	77C	$K^- n \rightarrow \Sigma\pi$
1920 \pm 10	GOPAL	77	DPWA $\bar{K}N$ multichannel
1900 \pm 4	² CORDEN	76	DPWA $K^- n \rightarrow \Lambda\pi^-$
1920 \pm 30	BAILLON	75	IPWA $\bar{K}N \rightarrow \Lambda\pi$
1914 \pm 10	HEMINGWAY	75	DPWA $K^- p \rightarrow \bar{K}N$
1920 $^{+15}_{-20}$	VANHORN	75	DPWA $K^- p \rightarrow \Lambda\pi^0$
1920 \pm 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 $\bar{K}N \rightarrow \bar{K}N$
1925 or 1933	³ MARTIN	77	DPWA $\bar{K}N$ multichannel
1915	DEBELLEFON	76	IPWA $K^- p \rightarrow \Lambda\pi^0$

$\Sigma(1915)$ WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
80 to 160 (\approx 120) OUR ESTIMATE			
161 \pm 20	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
107 \pm 14	¹ CORDEN	77C	$K^- n \rightarrow \Sigma\pi$
85 \pm 13	¹ CORDEN	77C	$K^- n \rightarrow \Sigma\pi$
130 \pm 10	GOPAL	77	DPWA $\bar{K}N$ multichannel
75 \pm 14	² CORDEN	76	DPWA $K^- n \rightarrow \Lambda\pi^-$
70 \pm 20	BAILLON	75	IPWA $\bar{K}N \rightarrow \Lambda\pi$
85 \pm 15	HEMINGWAY	75	DPWA $K^- p \rightarrow \bar{K}N$
102 \pm 18	VANHORN	75	DPWA $K^- p \rightarrow \Lambda\pi^0$
162 \pm 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 $\bar{K}N$ multichannel
60	DEBELLEFON	76	IPWA $K^- p \rightarrow \Lambda\pi^0$

Σ(1915) DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\bar{K}$	5–15 %
Γ_2 $\Lambda\pi$	seen
Γ_3 $\Sigma\pi$	seen
Γ_4 $\Sigma(1385)\pi$	<5 %
Γ_5 $\Sigma(1385)\pi$, <i>P</i> -wave	
Γ_6 $\Sigma(1385)\pi$, <i>F</i> -wave	

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

Σ(1915) BRANCHING RATIOS

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

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.05 to 0.15 OUR ESTIMATE	
0.03±0.02	⁴ GOPAL 80 DPWA $\bar{K}N \rightarrow \bar{K}N$
0.14±0.05	ALSTON-... 78 DPWA $\bar{K}N \rightarrow \bar{K}N$
0.11±0.04	HEMINGWAY 75 DPWA $K^-p \rightarrow \bar{K}N$
● ● ● 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 $\bar{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1915) \rightarrow \Lambda\pi$	$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
−0.09 ±0.03	GOPAL 77 DPWA $\bar{K}N$ multichannel
−0.10 ±0.01	² CORDEN 76 DPWA $K^-n \rightarrow \Lambda\pi^-$
−0.06 ±0.02	BAILLON 75 IPWA $\bar{K}N \rightarrow \Lambda\pi$
−0.09 ±0.02	VANHORN 75 DPWA $K^-p \rightarrow \Lambda\pi^0$
−0.087±0.056	DEVENISH 74B Fixed- <i>t</i> dispersion rel.
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●	
−0.09 or −0.09	³ MARTIN 77 DPWA $\bar{K}N$ multichannel
−0.10	DEBELLEFON 76 IPWA $K^-p \rightarrow \Lambda\pi^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1915) \rightarrow \Sigma\pi$	$(\Gamma_1\Gamma_3)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
−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 $\bar{K}N$ 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	³ MARTIN 77 DPWA $\bar{K}N$ multichannel

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1915) \rightarrow \Sigma(1385)\pi$, <i>P-wave</i>	$(\Gamma_1 \Gamma_5)^{1/2} / \Gamma$
VALUE	DOCUMENT ID TECN COMMENT
<0.01	CAMERON 78 DPWA $K^- p \rightarrow \Sigma(1385)\pi$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1915) \rightarrow \Sigma(1385)\pi$, <i>F-wave</i>	$(\Gamma_1 \Gamma_6)^{1/2} / \Gamma$
VALUE	DOCUMENT ID TECN COMMENT
+0.039 ± 0.009	⁵ CAMERON 78 DPWA $K^- p \rightarrow \Sigma(1385)\pi$

$\Sigma(1915)$ 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.

$\Sigma(1915)$ REFERENCES

PDG	86	PL 170B	Aguilar-Benitez, Porter+	(CERN, CIT+)
PDG	82	PL 111B	Roos, Porter, Aguilar-Benitez+	(HELSE, 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	+Franeek, 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)