

# $\Sigma(1915) F_{15}$

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

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>
<b>1900 to 1935 (<math>\approx</math> 1915) OUR ESTIMATE</b>			
1937 $\pm$ 20	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1894 $\pm$ 5	<sup>1</sup> CORDEN	77C	$K^- n \rightarrow \Sigma \pi$
1909 $\pm$ 5	<sup>1</sup> CORDEN	77C	$K^- n \rightarrow \Sigma \pi$
1920 $\pm$ 10	GOPAL	77	DPWA $\bar{K}N$ multichannel
1900 $\pm$ 4	<sup>2</sup> 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 <sup>+15</sup> <sub>-20</sub>	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	<sup>3</sup> 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>
<b>80 to 160 (<math>\approx</math> 120) OUR ESTIMATE</b>			
161 $\pm$ 20	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
107 $\pm$ 14	<sup>1</sup> CORDEN	77C	$K^- n \rightarrow \Sigma \pi$
85 $\pm$ 13	<sup>1</sup> CORDEN	77C	$K^- n \rightarrow \Sigma \pi$
130 $\pm$ 10	GOPAL	77	DPWA $\bar{K}N$ multichannel
75 $\pm$ 14	<sup>2</sup> 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	<sup>3</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
60	DEBELLEFON	76	IPWA $K^- p \rightarrow \Lambda \pi^0$

## Σ(1915) DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	5–15 %
$\Gamma_2$ $\Lambda\pi$	seen
$\Gamma_3$ $\Sigma\pi$	seen
$\Gamma_4$ $\Sigma(1385)\pi$	< 5 %
$\Gamma_5$ $\Sigma(1385)\pi$ , <i>P</i> -wave	
$\Gamma_6$ $\Sigma(1385)\pi$ , <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  $\Lambda$  and  $\Sigma$  Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$	$\Gamma_1/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
<b>0.05 to 0.15 OUR ESTIMATE</b>	
0.03±0.02	<sup>4</sup> 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	<sup>3</sup> 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	<sup>2</sup> 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	<sup>3</sup> 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	<sup>1</sup> CORDEN    77C $K^-n \rightarrow \Sigma\pi$
−0.15±0.02	<sup>1</sup> 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	<sup>3</sup> 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	<sup>5</sup> CAMERON 78 DPWA $K^- p \rightarrow \Sigma(1385)\pi$

### $\Sigma(1915)$ FOOTNOTES

- <sup>1</sup> The two entries for CORDEN 77C are from two different acceptable solutions.
- <sup>2</sup> Preferred solution 3; see CORDEN 76 for other possibilities.
- <sup>3</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
- <sup>4</sup> The mass and width are fixed to the GOPAL 77 values due to the low elasticity.
- <sup>5</sup> The published sign has been changed to be in accord with the baryon-first convention.

### $\Sigma(1915)$ REFERENCES

PDG	86	PL 170B	M. Aguilar-Benitez <i>et al.</i>	(CERN, CIT+)
PDG	82	PL 111B	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
ALSTON-...	78	PR D18 182	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
Also	77	PRL 38 1007	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
CAMERON	78	NP B143 189	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
CORDEN	77C	NP B125 61	M.J. Corden <i>et al.</i>	(BIRM) IJP
DECLAIS	77	CERN 77-16	Y. Declais <i>et al.</i>	(CAEN, CERN) IJP
GOPAL	77	NP B119 362	G.P. Gopal <i>et al.</i>	(LOIC, RHEL) IJP
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also	77B	NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also	77C	NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
CORDEN	76	NP B104 382	M.J. Corden <i>et al.</i>	(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 <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP
Also	75B	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 <i>et al.</i>	(BNL)