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

$I(J^P) = 1(\frac{5}{2}^+)$ 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** | | | | |
| $1937 \pm 20$ | ALSTON-... | 78 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| $1894 \pm 5$ | [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 | $\overline{K}N$ multichannel |
| $1900 \pm 4$ | [2] CORDEN | 76 | DPWA | $K^- n \rightarrow \Lambda\pi^-$ |
| $1920 \pm 30$ | BAILLON | 75 | IPWA | $\overline{K}N \rightarrow \Lambda\pi$ |
| $1914 \pm 10$ | HEMINGWAY | 75 | DPWA | $K^- p \rightarrow \overline{K}N$ |
| $1920^{+15}_{-20}$ | 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 | $\overline{K}N \rightarrow \overline{K}N$ |
| 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** | | | | |
| $161 \pm 20$ | ALSTON-... | 78 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| $107 \pm 14$ | [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 | $\overline{K}N$ multichannel |
| $75 \pm 14$ | [2] CORDEN | 76 | DPWA | $K^- n \rightarrow \Lambda\pi^-$ |
| $70 \pm 20$ | BAILLON | 75 | IPWA | $\overline{K}N \rightarrow \Lambda\pi$ |
| $85 \pm 15$ | HEMINGWAY | 75 | DPWA | $K^- p \rightarrow \overline{K}N$ |
| $102 \pm 18$ | 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 | $\overline{K}N$ multichannel |
| 60 | DEBELLEFON | 76 | IPWA | $K^- p \rightarrow \Lambda\pi^0$ |

## $\Sigma(1915)$ DECAY MODES

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

### $\Gamma(N\overline{K})/\Gamma_{total}$ $\Gamma_1/\Gamma$

| 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 | $K^- p \to \Sigma(1385)\pi$ |

## $\Sigma(1915)$ 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 | M. Aguilar-Benitez *et al.* | (CERN, CIT+) |
| PDG | 82 | PL 111B | 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 | 77 | 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 | 77B | NP B126 266 | B.R. Martin, M.K. Pidcock | (LOUC) |
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| KANE | 74 | LBL-2452 | D.F. Kane | (LBL) IJP |
| COOL | 66 | PRL 16 1228 | R.L. Cool *et al.* | (BNL) |