

$\Sigma(2250)$ $I(J^P) = 1(?^?)$ Status: **

OMITTED FROM SUMMARY TABLE

Results from partial-wave analyses are too weak to warrant separating them from the production and cross-section experiments. LASINSKI 71 in $\bar{K}N$ using a Pomeron + resonances model, and DEBELLEFON 76, DEBELLEFON 77, and DEBELLEFON 78 in energy-dependent partial-wave analyses of $\bar{K}N \rightarrow \Lambda\pi$, $\Sigma\pi$, and $N\bar{K}$, respectively, suggest two resonances around this mass.

 $\Sigma(2250)$ MASS

| VALUE (MeV) | DOCUMENT ID | TECN | COMMENT |
|---|-----------------------------|------|---|
| 2210 to 2280 (≈ 2250) OUR ESTIMATE | | | |
| 2270 \pm 50 | DEBELLEFON 78 | DPWA | D_5 wave |
| 2210 \pm 30 | DEBELLEFON 78 | DPWA | G_9 wave |
| 2275 \pm 20 | DEBELLEFON 77 | DPWA | D_5 wave |
| 2215 \pm 20 | DEBELLEFON 77 | DPWA | G_9 wave |
| 2300 \pm 30 | ¹ DEBELLEFON 75B | HBC | $K^- p \rightarrow \Xi^{*0} K^0$ |
| 2251 ⁺³⁰ ₋₂₀ | VANHORN 75 | DPWA | $K^- p \rightarrow \Lambda\pi^0, F_5$ wave |
| 2280 \pm 14 | AGUILAR-... 70B | HBC | $K^- p$ 3.9, 4.6 GeV/c |
| 2237 \pm 11 | BRICMAN 70 | CNTR | Total, charge exchange |
| 2255 \pm 10 | COOL 70 | CNTR | $K^- p, K^- d$ total |
| 2250 \pm 7 | BUGG 68 | CNTR | $K^- p, K^- d$ total |
| ● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ● | | | |
| 2260 | DEBELLEFON 76 | IPWA | D_5 wave |
| 2215 | DEBELLEFON 76 | IPWA | G_9 wave |
| 2250 \pm 20 | LU 70 | CNTR | $\gamma p \rightarrow K^+ Y^*$ |
| 2245 | BLANPIED 65 | CNTR | $\gamma p \rightarrow K^+ Y^*$ |
| 2299 \pm 6 | BOCK 65 | HBC | $\bar{p} p$ 5.7 GeV/c |

 $\Sigma(2250)$ WIDTH

| VALUE (MeV) | DOCUMENT ID | TECN | COMMENT |
|--|-----------------------------|------|---|
| 60 to 150 (≈ 100) OUR ESTIMATE | | | |
| 120 \pm 40 | DEBELLEFON 78 | DPWA | D_5 wave |
| 80 \pm 20 | DEBELLEFON 78 | DPWA | G_9 wave |
| 70 \pm 20 | DEBELLEFON 77 | DPWA | D_5 wave |
| 60 \pm 20 | DEBELLEFON 77 | DPWA | G_9 wave |
| 130 \pm 20 | ¹ DEBELLEFON 75B | HBC | $K^- p \rightarrow \Xi^{*0} K^0$ |
| 192 \pm 30 | VANHORN 75 | DPWA | $K^- p \rightarrow \Lambda\pi^0, F_5$ wave |
| 100 \pm 20 | AGUILAR-... 70B | HBC | $K^- p$ 3.9, 4.6 GeV/c |
| 164 \pm 50 | BRICMAN 70 | CNTR | Total, charge exchange |
| 230 \pm 20 | BUGG 68 | CNTR | $K^- p, K^- d$ total |

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | |
|------------------|---------------|------|--------------------------------|
| 100 | DEBELLEFON 76 | IPWA | D_5 wave |
| 140 | DEBELLEFON 76 | IPWA | G_9 wave |
| 170 | COOL 70 | CNTR | $K^- p, K^- d$ total |
| 125 | LU 70 | CNTR | $\gamma p \rightarrow K^+ Y^*$ |
| 150 | BLANPIED 65 | CNTR | $\gamma p \rightarrow K^+ Y^*$ |
| 21^{+17}_{-21} | BOCK 65 | HBC | $\bar{p} p$ 5.7 GeV/c |

$\Sigma(2250)$ DECAY MODES

| Mode | Fraction (Γ_i/Γ) |
|-------------------------|--------------------------------|
| Γ_1 $N\bar{K}$ | <10 % |
| Γ_2 $\Lambda\pi$ | seen |
| Γ_3 $\Sigma\pi$ | seen |
| Γ_4 $\Xi(1530)K$ | |

$\Sigma(2250)$ 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 |
|--|---------------|------|------------|-------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT | |
| <0.1 OUR ESTIMATE | | | | |
| 0.08 ± 0.02 | DEBELLEFON 78 | DPWA | D_5 wave | |
| 0.02 ± 0.01 | DEBELLEFON 78 | DPWA | G_9 wave | |

| $(J+\frac{1}{2}) \times \Gamma(N\bar{K})/\Gamma_{\text{total}}$ | | | | Γ_1/Γ |
|---|-------------|------|------------------------|-------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.16 ± 0.12 | BRICMAN 70 | CNTR | Total, charge exchange | |
| 0.42 | COOL 70 | CNTR | $K^- p, K^- d$ total | |
| 0.47 | BUGG 68 | CNTR | | |

| $(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(2250) \rightarrow \Lambda\pi$ | | | | $(\Gamma_1 \Gamma_2)^{1/2}/\Gamma$ |
|---|-------------|------|--|------------------------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT | |
| -0.16 ± 0.03 | VANHORN 75 | DPWA | $K^- p \rightarrow \Lambda\pi^0, F_5$ wave | |

• • • We do not use the following data for averages, fits, limits, etc. • • •

| | | | |
|-------|----------------|------|--|
| +0.11 | DEBELLEFON 76 | IPWA | D_5 wave |
| -0.10 | DEBELLEFON 76 | IPWA | G_9 wave |
| -0.18 | BARBARO-... 70 | DPWA | $K^- p \rightarrow \Lambda\pi^0, G_9$ wave |

| $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(2250) \rightarrow \Sigma\pi$ | | | $(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$ |
|--|----------------|------|---|
| VALUE | DOCUMENT ID | TECN | COMMENT |
| +0.06 ± 0.02 | DEBELLEFON 77 | DPWA | D_5 wave |
| -0.03 ± 0.02 | DEBELLEFON 77 | DPWA | G_9 wave |
| +0.07 | BARBARO-... 70 | DPWA | $K^- p \rightarrow \Sigma\pi, G_9$ wave |

| $\Gamma(N\bar{K}) / \Gamma(\Sigma\pi)$ | | | Γ_1 / Γ_3 |
|---|-------------|------|---------------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| <0.18 | BARNES | 69 | HBC 1 standard dev. limit |

| $\Gamma(\Lambda\pi) / \Gamma(\Sigma\pi)$ | | | Γ_2 / Γ_3 |
|---|-------------|------|---------------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | |
| <0.18 | BARNES | 69 | HBC 1 standard dev. limit |

| $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(2250) \rightarrow \Xi(1530)K$ | | | $(\Gamma_1 \Gamma_4)^{1/2} / \Gamma$ |
|---|-----------------------------|------|--------------------------------------|
| VALUE | DOCUMENT ID | TECN | COMMENT |
| 0.18 ± 0.04 | ¹ DEBELLEFON 75B | HBC | $K^- p \rightarrow \Xi^* K^0$ |

$\Sigma(2250)$ FOOTNOTES

¹ Seen in the (initial and final state) D_5 wave. Isospin not determined.

$\Sigma(2250)$ REFERENCES

| | | | |
|--------------------------|----------------|----------------------------------|----------------------|
| DEBELLEFON 78 | NC 42A 403 | A. de Bellefon <i>et al.</i> | (CDEF, SACL) IJP |
| DEBELLEFON 77 | NC 37A 175 | A. de Bellefon <i>et al.</i> | (CDEF, SACL) IJP |
| DEBELLEFON 76 | NP B109 129 | A. de Bellefon, A. Berthon | (CDEF) IJP |
| Also | NP B90 1 | A. de Bellefon <i>et al.</i> | (CDEF, SACL) IJP |
| DEBELLEFON 75B | NC 28A 289 | A. de Bellefon <i>et al.</i> | (CDEF, SACL) |
| VANHORN 75 | NP B87 145 | A.J. van Horn | (LBL) IJP |
| Also | NP B87 157 | A.J. van Horn | (LBL) IJP |
| LASINSKI 71 | NP B29 125 | T.A. Lasinski | (EFI) IJP |
| AGUILAR-... 70B | PRL 25 58 | M. Aguilar-Benitez <i>et al.</i> | (BNL, SYRA) |
| BARBARO-... 70 | Duke Conf. 173 | A. Barbaro-Galtieri | (LRL) IJP |
| Hyperon Resonances, 1970 | | | |
| BRICMAN 70 | PL 31B 152 | C. Bricman <i>et al.</i> | (CERN, CAEN, SACL) |
| COOL 70 | PR D1 1887 | R.L. Cool <i>et al.</i> | (BNL) I |
| Also | PRL 16 1228 | R.L. Cool <i>et al.</i> | (BNL) I |
| LU 70 | PR D2 1846 | D.C. Lu <i>et al.</i> | (YALE) |
| BARNES 69 | PRL 22 479 | V.E. Barnes <i>et al.</i> | (BNL, SYRA) |
| BUGG 68 | PR 168 1466 | D.V. Bugg <i>et al.</i> | (RHEL, BIRM, CAVE) I |
| BLANPIED 65 | PRL 14 741 | W.A. Blanpied <i>et al.</i> | (YALE, CEA) |
| BOCK 65 | PL 17 166 | R.K. Bock <i>et al.</i> | (CERN, SACL) |