## $\Lambda(1690)$ $D_{03}$

$I(J^P) = 0(\frac{3}{2}^-)$  Status: $\ast\ast\ast\ast$

The measurements of the mass, width, and elasticity published before 1974 are now obsolete and have been omitted. They were last listed in our 1982 edition Physics Letters **111B** (1982).

### $\Lambda(1690)$ MASS

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **1685 to 1695 ($\approx$ 1690) OUR ESTIMATE** | | | | |
| $1695.7 \pm 2.6$ | KOISO | 85 | DPWA | $K^- p \to \Sigma \pi$ |
| $1690 \pm 5$ | GOPAL | 80 | DPWA | $\overline{K} N \to \overline{K} N$ |
| $1692 \pm 5$ | ALSTON-... | 78 | DPWA | $\overline{K} N \to \overline{K} N$ |
| $1690 \pm 5$ | GOPAL | 77 | DPWA | $\overline{K} N$ multichannel |
| $1690 \pm 3$ | HEPP | 76B | DPWA | $K^- N \to \Sigma \pi$ |
| $1689 \pm 1$ | KANE | 74 | DPWA | $K^- p \to \Sigma \pi$ |
| $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$ | | | | |
| 1687 or 1689 | [1] MARTIN | 77 | DPWA | $\overline{K} N$ multichannel |
| $1692 \pm 4$ | CARROLL | 76 | DPWA | Isospin-0 total $\sigma$ |

### $\Lambda(1690)$ WIDTH

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **50 to 70 ($\approx$ 60) OUR ESTIMATE** | | | | |
| $67.2 \pm 5.6$ | KOISO | 85 | DPWA | $K^- p \to \Sigma \pi$ |
| $61 \pm 5$ | GOPAL | 80 | DPWA | $\overline{K} N \to \overline{K} N$ |
| $64 \pm 10$ | ALSTON-... | 78 | DPWA | $\overline{K} N \to \overline{K} N$ |
| $60 \pm 5$ | GOPAL | 77 | DPWA | $\overline{K} N$ multichannel |
| $82 \pm 8$ | HEPP | 76B | DPWA | $K^- N \to \Sigma \pi$ |
| $60 \pm 4$ | KANE | 74 | DPWA | $K^- p \to \Sigma \pi$ |
| $\bullet \bullet \bullet$ We do not use the following data for averages, fits, limits, etc. $\bullet \bullet \bullet$ | | | | |
| 62 or 62 | [1] MARTIN | 77 | DPWA | $\overline{K} N$ multichannel |
| 38 | CARROLL | 76 | DPWA | Isospin-0 total $\sigma$ |

### $\Lambda(1690)$ DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $N \overline{K}$ | 20–30 % |
| $\Gamma_2$ | $\Sigma \pi$ | 20–40 % |
| $\Gamma_3$ | $\Lambda \pi \pi$ | $\sim$ 25 % |
| $\Gamma_4$ | $\Sigma \pi \pi$ | $\sim$ 20 % |
| $\Gamma_5$ | $\Lambda \eta$ | |
| $\Gamma_6$ | $\Sigma(1385) \pi$, $S$-wave | |

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

## $\Lambda(1690)$ BRANCHING RATIOS

The sum of all the quoted branching ratios is more than 1.0. The two-body ratios are from partial-wave analyses, and thus probably are more reliable than the three-body ratios, which are determined from bumps in cross sections. Of the latter, the $\Sigma\pi\pi$ bump looks more significant. (The error given for the $\Lambda\pi\pi$ ratio looks unreasonably small.) Hardly any of the $\Sigma\pi\pi$ decay can be via $\Sigma(1385)$, for then seven times as much $\Lambda\pi\pi$ decay would be required. See "Sign conventions for resonance couplings" in the Note on $\Lambda$ and $\Sigma$ Resonances.

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

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.2 to 0.3 OUR ESTIMATE** | | | | |
| $0.23\pm0.03$ | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| $0.22\pm0.03$ | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $0.24\pm0.03$ | GOPAL | 77 | DPWA | See GOPAL 80 |
| 0.28 or 0.26 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Sigma\pi$ $\qquad (\Gamma_1\Gamma_2)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $-0.34\pm0.02$ | KOISO | 85 | DPWA | $K^-p \to \Sigma\pi$ |
| $-0.25\pm0.03$ | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| $-0.29\pm0.03$ | HEPP | 76B | DPWA | $K^-N \to \Sigma\pi$ |
| $-0.28\pm0.03$ | LONDON | 75 | HLBC | $K^-p \to \Sigma^0\pi^0$ |
| $-0.28\pm0.02$ | KANE | 74 | DPWA | $K^-p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $-0.30$ or $-0.28$ | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Lambda\eta$ $\qquad (\Gamma_1\Gamma_5)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $0.00\pm0.03$ | BAXTER | 73 | DPWA | $K^-p \to$ neutrals |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Lambda\pi\pi$ $\qquad (\Gamma_1\Gamma_3)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $0.25\pm0.02$ | [2] BARTLEY | 68 | HDBC | $K^-p \to \Lambda\pi\pi$ |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Sigma\pi\pi$ $\qquad (\Gamma_1\Gamma_4)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| 0.21 | ARMENTEROS68C | | HDBC | $K^-N \to \Sigma\pi\pi$ |

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1690) \to \Sigma(1385)\pi$, *S*-wave $\qquad (\Gamma_1\Gamma_6)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| $+0.27\pm0.04$ | PREVOST | 74 | DPWA | $K^-N \to \Sigma(1385)\pi$ |

## Λ(1690) FOOTNOTES

[1] The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. Another $D_{03}$ Λ at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.

[2] BARTLEY 68 uses only cross-section data.  The enhancement is not seen by PREVOST 71.

## Λ(1690) REFERENCES

| | | | | |
|---|---|---|---|---|
| KOISO | 85 | NP A433 619 | +Sai, Yamamoto, Kofler | (TOKY, MASA) |
| 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 |
| 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 |
| CARROLL | 76 | PRL 37 806 | +Chiang, Kycia, Li, Mazur, Michael+ | (BNL) I |
| HEPP | 76B | PL 65B 487 | +Braun, Grimm, Strobele+ | (CERN, HEIDH, MPIM) IJP |
| LONDON | 75 | NP B85 289 | +Yu, Boyd+ | (BNL, CERN, EPOL, ORSAY, TORI) |
| KANE | 74 | LBL-2452 | | (LBL) IJP |
| PREVOST | 74 | NP B69 246 | +Barloutaud+ | (SACL, CERN, HEID) |
| BAXTER | 73 | NP B67 125 | +Buckingham, Corbett, Dunn+ | (OXF) IJP |
| PREVOST | 71 | Amsterdam Conf. | | (CERN, HEID, SACL) |
| ARMENTEROS | 68C | NP B8 216 | +Baillon+ | (CERN, HEID, SACL) I |
| BARTLEY | 68 | PRL 21 1111 | +Chu, Dowd, Greene+ | (TUFTS, FSU, BRAN) I |