## Λ(1670) $S_{01}$

$I(J^P) = 0(\frac{1}{2}^-)$ Status: ****

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).

### Λ(1670) MASS

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **1660 to 1680 (≈ 1670) OUR ESTIMATE** | | | | |
| 1670.8 ± 1.7 | KOISO | 85 | DPWA | $K^- p \to \Sigma\pi$ |
| 1667 ±5 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1671 ±3 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 1670 ±5 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 1675 ±2 | HEPP | 76B | DPWA | $K^- N \to \Sigma\pi$ |
| 1679 ±1 | KANE | 74 | DPWA | $K^- p \to \Sigma\pi$ |
| 1665 ±5 | PREVOST | 74 | DPWA | $K^- N \to \Sigma(1385)\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 1664 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

### Λ(1670) WIDTH

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **25 to 50 (≈ 35) OUR ESTIMATE** | | | | |
| 34.1 ± 3.7 | KOISO | 85 | DPWA | $K^- p \to \Sigma\pi$ |
| 29 ± 5 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 29 ± 5 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 45 ±10 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 46 ± 5 | HEPP | 76B | DPWA | $K^- N \to \Sigma\pi$ |
| 40 ± 3 | KANE | 74 | DPWA | $K^- p \to \Sigma\pi$ |
| 19 ± 5 | PREVOST | 74 | DPWA | $K^- N \to \Sigma(1385)\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 12 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

### Λ(1670) DECAY MODES

| | Mode | Fraction ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $N\overline{K}$ | 15–25 % |
| $\Gamma_2$ | $\Sigma\pi$ | 20–60 % |
| $\Gamma_3$ | $\Lambda\eta$ | 15–35 % |
| $\Gamma_4$ | $\Sigma(1385)\pi$ | |

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

### Λ(1670) BRANCHING RATIOS

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

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

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.15 to 0.25 OUR ESTIMATE** | | | | |
| 0.18 ± 0.03 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 0.17 ± 0.03 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.20 ± 0.03 | GOPAL | 77 | DPWA | See GOPAL 80 |
| 0.15 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

**$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1670) \to \Sigma\pi$** $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| −0.26 ± 0.02 | KOISO | 85 | DPWA | $K^- p \to \Sigma\pi$ |
| −0.31 ± 0.03 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| −0.29 ± 0.03 | HEPP | 76B | DPWA | $K^- N \to \Sigma\pi$ |
| −0.23 ± 0.03 | LONDON | 75 | HLBC | $K^- p \to \Sigma^0\pi^0$ |
| −0.27 ± 0.02 | KANE | 74 | DPWA | $K^- p \to \Sigma\pi$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| −0.13 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |

**$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1670) \to \Lambda\eta$** $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| +0.20 ± 0.05 | BAXTER | 73 | DPWA | $K^- p \to$ neutrals |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.24 | KIM | 71 | DPWA | K-matrix analysis |
| 0.26 | ARMENTEROS | 69C | HBC | |
| 0.20 or 0.23 | BERLEY | 65 | HBC | |

**$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \to \Lambda(1670) \to \Sigma(1385)\pi$** $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| −0.18 ± 0.05 | PREVOST | 74 | DPWA | $K^- N \to \Sigma(1385)\pi$ |

### Λ(1670) FOOTNOTES

[1] MARTIN 77 obtains identical resonance parameters from a T-matrix pole and from a Breit-Wigner fit.

### Λ(1670) 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
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
KIM 71 PRL 27 356 (HARV) IJP
Also 70 Duke Conf. 161 Kim (HARV) IJP
ARMENTEROS 69C Lund Paper 229 +Baillon+ (CERN, HEID, SACL) IJP
Values are quoted in LEVI-SETTI 69.
BERLEY 65 PRL 15 641 +Connolly, Hart, Rahm, Stonehill+ (BNL) IJP


## Λ(1690) $D_{03}$

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

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).

### Λ(1690) MASS

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

### Λ(1690) WIDTH

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

### Λ(1690) DECAY MODES

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

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

### Λ(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 Λ and Σ Resonances.

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

| VALUE | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **0.2 to 0.3 OUR ESTIMATE** | | | | |
| 0.23 ± 0.03 | GOPAL | 80 | DPWA | $\overline{K}N \to \overline{K}N$ |
| 0.22 ± 0.03 | ALSTON-... | 78 | DPWA | $\overline{K}N \to \overline{K}N$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| 0.24 ± 0.03 | GOPAL | 77 | DPWA | See GOPAL 80 |
| 0.28 or 0.26 | [1] MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |