

**$\Sigma(1690)$  Bumps**

$$I(J^P) = 1(?^?) \quad \text{Status: } **$$

OMITTED FROM SUMMARY TABLE

See the note preceding the  $\Sigma(1670)$  Listings. Seen in production experiments only, mainly in  $\Lambda\pi$ . **$\Sigma(1690)$  MASS  
(PRODUCTION EXPERIMENTS)**

| <u>VALUE (MeV)</u>                            | <u>EVTS</u> | <u>DOCUMENT ID</u>      | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u>                    |
|---|-------------|-------------------------|-------------|------------|-----------------------------------|
| <b><math>\approx 1690</math> OUR ESTIMATE</b> |             |                         |             |            |                                   |
| 1698 $\pm$ 20                                 | 70          | <sup>1</sup> GODDARD 79 | HBC         | +          | $\pi^+ p$ 10.3 GeV/c              |
| 1707 $\pm$ 20                                 | 40          | <sup>2</sup> GODDARD 79 | HBC         | +          | $\pi^+ p$ 10.3 GeV/c              |
| 1698 $\pm$ 20                                 | 15          | ADERHOLZ 69             | HBC         | +          | $\pi^+ p$ 8 GeV/c                 |
| 1682 $\pm$ 2                                  | 46          | BLUMENFELD 69           | HBC         | +          | $K_L^0 p$                         |
| 1700 $\pm$ 20                                 |             | MOTT 69                 | HBC         | +          | $K^- p$ 5.5 GeV/c                 |
| 1694 $\pm$ 24                                 | 60          | <sup>3</sup> PRIMER 68  | HBC         | +          | $K^- p$ 4.6–5 GeV/c               |
| 1700 $\pm$ 6                                  |             | <sup>4</sup> SIMS 68    | HBC         | –          | $K^- N \rightarrow \Lambda\pi\pi$ |
| 1715 $\pm$ 12                                 | 30          | COLLEY 67               | HBC         | +          | $K^- p$ 6 GeV/c                   |

 **$\Sigma(1690)$  WIDTH  
(PRODUCTION EXPERIMENTS)**

| <u>VALUE (MeV)</u>  | <u>EVTS</u> | <u>DOCUMENT ID</u>      | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u>                    |
|---------------------|-------------|-------------------------|-------------|------------|-----------------------------------|
| 240 $\pm$ 60        | 70          | <sup>1</sup> GODDARD 79 | HBC         | +          | $\pi^+ p$ 10.3 GeV/c              |
| 130 $^{+100}_{-60}$ | 40          | <sup>2</sup> GODDARD 79 | HBC         | +          | $\pi^+ p$ 10.3 GeV/c              |
| 142 $\pm$ 40        | 15          | ADERHOLZ 69             | HBC         | +          | $\pi^+ p$ 8 GeV/c                 |
| 25 $\pm$ 10         | 46          | BLUMENFELD 69           | HBC         | +          | $K_L^0 p$                         |
| 130 $\pm$ 25        |             | MOTT 69                 | HBC         | +          | $K^- p$ 5.5 GeV/c                 |
| 105 $\pm$ 35        | 60          | <sup>3</sup> PRIMER 68  | HBC         | +          | $K^- p$ 4.6–5 GeV/c               |
| 62 $\pm$ 14         |             | <sup>4</sup> SIMS 68    | HBC         | –          | $K^- N \rightarrow \Lambda\pi\pi$ |
| 100 $\pm$ 35        | 30          | COLLEY 67               | HBC         | +          | $K^- p$ 6 GeV/c                   |

 **$\Sigma(1690)$  DECAY MODES  
(PRODUCTION EXPERIMENTS)**

| Mode       |  |
|------------|--|
| $\Gamma_1$ | $N\bar{K}$                                     |
| $\Gamma_2$ | $\Lambda\pi$                                   |
| $\Gamma_3$ | $\Sigma\pi$                                    |
| $\Gamma_4$ | $\Sigma(1385)\pi$                              |
| $\Gamma_5$ | $\Lambda\pi\pi$ (including $\Sigma(1385)\pi$ ) |

## $\Sigma(1690)$ BRANCHING RATIOS (PRODUCTION EXPERIMENTS)

| $\Gamma(N\bar{K})/\Gamma(\Lambda\pi)$ |             |                    |             |            |                |                      | $\Gamma_1/\Gamma_2$ |
|---------------------------------------|-------------|--------------------|-------------|------------|----------------|----------------------|---------------------|
| <u>VALUE</u>                          | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |                      |                     |
| small                                 |             | GODDARD            | 79          | HBC        | +              | $\pi^+ p$ 10.2 GeV/c |                     |
| <0.2                                  |             | MOTT               | 69          | HBC        | +              | $K^- p$ 5.5 GeV/c    |                     |
| $0.4 \pm 0.25$                        | 18          | COLLEY             | 67          | HBC        | +              | 6/30 events          |                     |

| $\Gamma(\Sigma\pi)/\Gamma(\Lambda\pi)$ |            |                    |             |            |                |                      | $\Gamma_3/\Gamma_2$ |
|--|------------|--------------------|-------------|------------|----------------|----------------------|---------------------|
| <u>VALUE</u>                           | <u>CL%</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |                      |                     |
| small                                  |            | GODDARD            | 79          | HBC        | +              | $\pi^+ p$ 10.2 GeV/c |                     |
| <0.4                                   | 90         | MOTT               | 69          | HBC        | +              | $K^- p$ 5.5 GeV/c    |                     |
| $0.3 \pm 0.3$                          |            | COLLEY             | 67          | HBC        | +              | 4/30 events          |                     |

| $\Gamma(\Sigma(1385)\pi)/\Gamma(\Lambda\pi)$ |  |                    |             |            |                |                   | $\Gamma_4/\Gamma_2$ |
|--|--|--------------------|-------------|------------|----------------|-------------------|---------------------|
| <u>VALUE</u>                                 |  | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |                   |                     |
| <0.5   |  | MOTT               | 69          | HBC        | +              | $K^- p$ 5.5 GeV/c |                     |

| $\Gamma(\Lambda\pi\pi(\text{including } \Sigma(1385)\pi))/\Gamma(\Lambda\pi)$ |  |                    |             |            |                |              | $\Gamma_5/\Gamma_2$ |
|---|--|--------------------|-------------|------------|----------------|--------------|---------------------|
| <u>VALUE</u>  |  | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |              |                     |
| $2.0 \pm 0.6$   |  | BLUMENFELD         | 69          | HBC        | +              | 31/15 events |                     |
| $0.5 \pm 0.25$  |  | COLLEY             | 67          | HBC        | +              | 15/30 events |                     |

| $\Gamma(\Sigma(1385)\pi)/\Gamma(\Lambda\pi\pi(\text{including } \Sigma(1385)\pi))$ |  |                    |             |            |                |                                   | $\Gamma_4/\Gamma_5$ |
|--|--|--------------------|-------------|------------|----------------|-----------------------------------|---------------------|
| <u>VALUE</u>   |  | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |                                   |                     |
| large  |  | SIMS               | 68          | HBC        | -              | $K^- N \rightarrow \Lambda\pi\pi$ |                     |
| small  |  | COLLEY             | 67          | HBC        | +              | $K^- p$ 6 GeV/c                   |                     |

## $\Sigma(1690)$ FOOTNOTES (PRODUCTION EXPERIMENTS)

- <sup>1</sup> From  $\pi^+ p \rightarrow (\Lambda\pi^+)K^+$ .  $J > 1/2$  is not required by the data.
- <sup>2</sup> From  $\pi^+ p \rightarrow (\Lambda\pi^+)(K\pi)^+$ .  $J > 1/2$  is indicated, but large background precludes a definite conclusion.
- <sup>3</sup> See the  $\Sigma(1670)$  Listings. AGUILAR-BENITEZ 70B with three times the data of PRIMER 68 find no evidence for the  $\Sigma(1690)$ .
- <sup>4</sup> This analysis, which is difficult and requires several assumptions and shows no unambiguous  $\Sigma(1690)$  signal, suggests  $J^P = 5/2^+$ . Such a state would lead all previously known  $Y^*$  trajectories.

## $\Sigma(1690)$ REFERENCES (PRODUCTION EXPERIMENTS)

|             |     |             |                                   |                                  |
|-------------|-----|-------------|-----------------------------------|----------------------------------|
| GODDARD     | 79  | PR D19 1350 | M.C. Goddard <i>et al.</i>        | (TNTO, BNL) IJ                   |
| AGUILAR-... | 70B | PRL 25 58   | M. Aguilar-Benitez <i>et al.</i>  | (BNL, SYRA)                      |
| ADERHOLZ    | 69  | NP B11 259  | M. Aderholz <i>et al.</i>         | (AACH3, BERL, CERN+) I           |
| BLUMENFELD  | 69  | PL 29B 58   | B.J. Blumenfeld, G.R. Kalbfleisch | (BNL) I                          |
| MOTT        | 69  | PR 177 1966 | J. Mott <i>et al.</i>             | (NWES, ANL) I                    |
| Also        |     | PRL 18 266  | M. Derrick <i>et al.</i>          | (ANL, NWES) I                    |
| PRIMER      | 68  | PRL 20 610  | M. Primer <i>et al.</i>           | (SYRA, BNL) I                    |
| SIMS        | 68  | PRL 21 1413 | W.H. Sims <i>et al.</i>           | (FSU, TUFTS, BRAN) I             |
| COLLEY      | 67  | PL 24B 489  | D.C. Colley                       | (BIRM, GLAS, LOIC, MUNI, OXF+) I |