$\Sigma(1690)$ Bumps

$I(J^P) = 1(?^?)$ 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)

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
≈ 1690 OUR ESTIMATE						
1698 ± 20	70	[1] GODDARD	79	HBC	+	$\pi^+ p$ 10.3 GeV/c
1707 ± 20	40	[2] GODDARD	79	HBC	+	$\pi^+ p$ 10.3 GeV/c
1698 ± 20	15	ADERHOLZ	69	HBC	+	$\pi^+ p$ 8 GeV/c
1682 ± 2	46	BLUMENFELD	69	HBC	+	$K^0_L p$
1700 ± 20		MOTT	69	HBC	+	$K^- p$ 5.5 GeV/c
1694 ± 24	60	[3] PRIMER	68	HBC	+	$K^- p$ 4.6–5 GeV/c
1700 ± 6		[4] SIMS	68	HBC	−	$K^- N \rightarrow \Lambda\pi\pi$
1715 ± 12	30	COLLEY	67	HBC	+	$K^- p$ 6 GeV/c

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

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

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

	Mode
Γ_1	$N\overline{K}$
Γ_2	$\Lambda\pi$
Γ_3	$\Sigma\pi$
Γ_4	$\Sigma(1385)\pi$
Γ_5	$\Lambda\pi\pi$ (including $\Sigma(1385)\pi$)

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

$\Gamma(N\overline{K})/\Gamma(\Lambda\pi)$ Γ_1/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
small		GODDARD	79	HBC	+	$\pi^+ p$ 10.2 GeV/c
<0.2		MOTT	69	HBC	+	$K^- p$ 5.5 GeV/c
0.4 ± 0.25	18	COLLEY	67	HBC	+	6/30 events

$\Gamma(\Sigma\pi)/\Gamma(\Lambda\pi)$ Γ_3/Γ_2

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
small		GODDARD	79	HBC	+	$\pi^+ p$ 10.2 GeV/c
<0.4	90	MOTT	69	HBC	+	$K^- p$ 5.5 GeV/c
0.3 ± 0.3		COLLEY	67	HBC	+	4/30 events

$\Gamma(\Sigma(1385)\pi)/\Gamma(\Lambda\pi)$ Γ_4/Γ_2

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
<0.5	MOTT	69	HBC	+	$K^- p$ 5.5 GeV/c

$\Gamma(\Lambda\pi\pi(\text{including}\,\Sigma(1385)\pi))/\Gamma(\Lambda\pi)$ Γ_5/Γ_2

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
2.0 ± 0.6	BLUMENFELD	69	HBC	+	31/15 events
0.5 ± 0.25	COLLEY	67	HBC	+	15/30 events

$\Gamma(\Sigma(1385)\pi)/\Gamma(\Lambda\pi\pi(\text{including}\,\Sigma(1385)\pi))$ Γ_4/Γ_5

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
large	SIMS	68	HBC	−	$K^- N \rightarrow \Lambda\pi\pi$
small	COLLEY	67	HBC	+	$K^- p$ 6 GeV/c

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

[1] From $\pi^+ p \rightarrow (\Lambda\pi^+)K^+$. $J>1/2$ is not required by the data.
[2] From $\pi^+ p \rightarrow (\Lambda\pi^+)(K\pi)^+$. $J>1/2$ is indicated, but large background precludes a definite conclusion.
[3] See the $\Sigma(1670)$ Listings. AGUILAR-BENITEZ 70B with three times the data of PRIMER 68 find no evidence for the $\Sigma(1690)$.
[4] 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 *et al.*	(TNTO, BNL) IJ
AGUILAR-...	70B	PRL 25 58	M. Aguilar-Benitez *et al.*	(BNL, SYRA)
ADERHOLZ	69	NP B11 259	M. Aderholz *et al.*	(AACH3, BERL, CERN+) I
BLUMENFELD	69	PL 29B 58	B.J. Blumenfeld, G.R. Kalbfleisch	(BNL) I
MOTT	69	PR 177 1966	J. Mott *et al.*	(NWES, ANL) I
Also	67	PRL 18 266	M. Derrick *et al.*	(ANL, NWES) I
PRIMER	68	PRL 20 610	M. Primer *et al.*	(SYRA, BNL) I
SIMS	68	PRL 21 1413	W.H. Sims *et al.*	(FSU, TUFTS, BRAN) I
COLLEY	67	PL 24B 489	D.C. Colley	(BIRM, GLAS, LOIC, MUNI, OXF+) I