

$\Sigma(1660) P_{11}$  $I(J^P) = 1(\frac{1}{2}^+)$  Status: \*\*\*

For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** (1982).

 **$\Sigma(1660)$  MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1630 to 1690 (<math>\approx 1660</math>) OUR ESTIMATE</b>			
1665.1 $\pm$ 11.2	<sup>1</sup> KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
1670 $\pm$ 10	GOPAL	80	DPWA $\bar{K} N \rightarrow \bar{K} N$
1679 $\pm$ 10	ALSTON-...	78	DPWA $\bar{K} N \rightarrow \bar{K} N$
1676 $\pm$ 15	GOPAL	77	DPWA $\bar{K} N$ multichannel
1668 $\pm$ 25	VANHORN	75	DPWA $K^- p \rightarrow \Lambda \pi^0$
1670 $\pm$ 20	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1565 or 1597	<sup>2</sup> MARTIN	77	DPWA $\bar{K} N$ multichannel
1660 $\pm$ 30	<sup>3</sup> BAILLON	75	IPWA $\bar{K} N \rightarrow \Lambda \pi$
1671 $\pm$ 2	<sup>4</sup> PONTE	75	DPWA $K^- p \rightarrow \Lambda \pi^0$

 **$\Sigma(1660)$  WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>40 to 200 (<math>\approx 100</math>) OUR ESTIMATE</b>			
81.5 $\pm$ 22.2	<sup>1</sup> KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
152 $\pm$ 20	GOPAL	80	DPWA $\bar{K} N \rightarrow \bar{K} N$
38 $\pm$ 10	ALSTON-...	78	DPWA $\bar{K} N \rightarrow \bar{K} N$
120 $\pm$ 20	GOPAL	77	DPWA $\bar{K} N$ multichannel
230 $\begin{smallmatrix} +165 \\ -60 \end{smallmatrix}$	VANHORN	75	DPWA $K^- p \rightarrow \Lambda \pi^0$
250 $\pm$ 110	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
202 or 217	<sup>2</sup> MARTIN	77	DPWA $\bar{K} N$ multichannel
80 $\pm$ 40	<sup>3</sup> BAILLON	75	IPWA $\bar{K} N \rightarrow \Lambda \pi$
81 $\pm$ 10	<sup>4</sup> PONTE	75	DPWA $K^- p \rightarrow \Lambda \pi^0$

 **$\Sigma(1660)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	10–30 %
$\Gamma_2$ $\Lambda\pi$	seen
$\Gamma_3$ $\Sigma\pi$	seen

## $\Sigma(1660)$ BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on  $\Lambda$  and  $\Sigma$  Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.1 to 0.3 OUR ESTIMATE</b>				
0.12±0.03	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$	
0.10±0.05	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<0.04	GOPAL	77	DPWA See GOPAL 80	
0.27 or 0.29	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Lambda\pi$				$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
< 0.04	GOPAL	77	DPWA $\bar{K}N$ multichannel	
0.12 <sup>+0.12</sup> <sub>-0.04</sub>	VANHORN	75	DPWA $K^-p \rightarrow \Lambda\pi^0$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
-0.10 or -0.11	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel	
-0.04±0.02	<sup>3</sup> BAILLON	75	IPWA $\bar{K}N \rightarrow \Lambda\pi$	
+0.16±0.01	<sup>4</sup> PONTE	75	DPWA $K^-p \rightarrow \Lambda\pi^0$	

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Sigma\pi$				$(\Gamma_1\Gamma_3)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
-0.13±0.04	<sup>1</sup> KOISO	85	DPWA $K^-p \rightarrow \Sigma\pi$	
-0.16±0.03	GOPAL	77	DPWA $\bar{K}N$ multichannel	
-0.11±0.01	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
-0.34 or -0.37	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel	
not seen	HEPP	76B	DPWA $K^-N \rightarrow \Sigma\pi$	

### $\Sigma(1660)$ FOOTNOTES

- <sup>1</sup> The evidence of KOISO 85 is weak.  
<sup>2</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.  
<sup>3</sup> From solution 1 of BAILLON 75; not present in solution 2.  
<sup>4</sup> From solution 2 of PONTE 75; not present in solution 1.

## Σ(1660) REFERENCES

KOISO	85	NP A433 619	H. Koiso <i>et al.</i>	(TOKY, MASA)
PDG	82	PL 111B	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
ALSTON-...	78	PR D18 182	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
Also	77	PRL 38 1007	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
GOPAL	77	NP B119 362	G.P. Gopal <i>et al.</i>	(LOIC, RHEL) IJP
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also	77B	NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also	77C	NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
HEPP	76B	PL 65B 487	V. Hepp <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP
PONTE	75	PR D12 2597	R.A. Ponte <i>et al.</i>	(MASA, TENN, UCR) IJP
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP
Also	75B	NP B87 157	A.J. van Horn	(LBL) IJP
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP

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