

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

For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

 **$\Sigma(1660)$  POLE POSITION****REAL PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$1547^{+111}_{-59}$	<sup>1</sup> KAMANO	15	DPWA Multichannel
---------------------	---------------------	----	-------------------

<sup>1</sup>From the preferred solution A in KAMANO 15. Solution B reports  $M = 1457^{+5}_{-1}$  MeV.

**-2×IMAGINARY PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
-------------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

$183^{+86}_{-78}$	<sup>1</sup> KAMANO	15	DPWA Multichannel
-------------------	---------------------	----	-------------------

<sup>1</sup>From the preferred solution A in KAMANO 15. Solution B reports  $\Gamma = 78^{+2}_{-8}$  MeV.

 **$\Sigma(1660)$  POLE RESIDUES**

The normalized residue is the residue divided by  $\Gamma_{pole}/2$ .

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1660) \rightarrow N\bar{K}$** 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
---------	-----------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0247	168	<sup>1</sup> KAMANO	15	DPWA Multichannel
--------	-----	---------------------	----	-------------------

<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Sigma\pi$** 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
---------	-----------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.16	78	<sup>1</sup> KAMANO	15	DPWA Multichannel
------	----	---------------------	----	-------------------

<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Lambda\pi$** 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
---------	-----------	-------------	------	---------

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0614	-84	<sup>1</sup> KAMANO	15	DPWA Multichannel
--------	-----	---------------------	----	-------------------

<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Sigma(1385)\pi$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
----------------	------------------------------------	--------------------	-------------	----------------

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0513	-44	<sup>1</sup> KAMANO	15	DPWA Multichannel
--------	-----	---------------------	----	-------------------

<sup>1</sup>From the preferred solution A in KAMANO 15.

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

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
--------------------	--------------------	-------------	----------------

**1630 to 1690 ( $\approx 1660$ ) OUR ESTIMATE**

1633 $\pm 3$	GAO	12	DPWA $\bar{K}N \rightarrow \Lambda\pi$
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 $K^-p \rightarrow \Lambda\pi^0$

<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.

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

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
--------------------	--------------------	-------------	----------------

**40 to 200 ( $\approx 100$ ) OUR ESTIMATE**

121 $\begin{matrix} + 4 \\ - 7 \end{matrix}$	GAO	12	DPWA $\bar{K}N \rightarrow \Lambda\pi$
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 $\begin{matrix} +165 \\ - 60 \end{matrix}$	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 $K^-p \rightarrow \Lambda\pi^0$

<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.

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	10–30 %
$\Gamma_2$ $\Lambda\pi$	seen
$\Gamma_3$ $\Sigma\pi$	seen
$\Gamma_4$ $\Sigma(1385)\pi$	

 **$\Sigma(1660)$  BRANCHING RATIOS**

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

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

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.1 to 0.3 OUR ESTIMATE</b>			
$0.12 \pm 0.03$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
$0.10 \pm 0.05$	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.005	<sup>1</sup> KAMANO	15	DPWA Multichannel
<0.04	GOPAL	77	DPWA See GOPAL 80
0.27 or 0.29	<sup>2</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

<sup>1</sup>From the preferred solution A in KAMANO 15.

<sup>2</sup>The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

 **$\Gamma(\Lambda\pi)/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$** 

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.128	<sup>1</sup> KAMANO	15	DPWA Multichannel

<sup>1</sup>From the preferred solution A in KAMANO 15.

 **$\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$** 

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.865	<sup>1</sup> KAMANO	15	DPWA Multichannel

<sup>1</sup>From the preferred solution A in KAMANO 15.

 **$\Gamma(\Sigma(1385)\pi)/\Gamma_{\text{total}}$   $\Gamma_4/\Gamma$** 

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.001	<sup>1</sup> KAMANO	15	DPWA Multichannel

<sup>1</sup>From the preferred solution A in KAMANO 15.

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Lambda\pi$   $(\Gamma_1 \Gamma_2)^{1/2} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
$-0.064^{+0.005}_{-0.003}$	GAO	12	DPWA $\bar{K}N \rightarrow \Lambda\pi$
$< 0.04$	GOPAL	77	DPWA $\bar{K}N$ multichannel
$0.12^{+0.12}_{-0.04}$	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>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
$-0.04 \pm 0.02$	<sup>2</sup> BAILLON	75	IPWA $\bar{K}N \rightarrow \Lambda\pi$
$+0.16 \pm 0.01$	<sup>3</sup> PONTE	75	DPWA $K^- p \rightarrow \Lambda\pi^0$

<sup>1</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

<sup>2</sup> From solution 1 of BAILLON 75; not present in solution 2.

<sup>3</sup> From solution 2 of PONTE 75; not present in solution 1.

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1660) \rightarrow \Sigma\pi$   $(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
$-0.13 \pm 0.04$	<sup>1</sup> KOISO	85	DPWA $K^- p \rightarrow \Sigma\pi$
$-0.16 \pm 0.03$	GOPAL	77	DPWA $\bar{K}N$ multichannel
$-0.11 \pm 0.01$	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 $K^- N \rightarrow \Sigma\pi$

<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.

### Σ(1660) REFERENCES

KAMANO	15	PR C92 025205	H. Kamano <i>et al.</i>	(ANL, OSAK)
GAO	12	PR C86 025201	P. Gao, J. Shi, B.S. Zou	(BHEP, BEIJT)
Also		NP A867 41	P. Gao, B.S. Zou, A. Sibirtsev	(BHEP, BEIJT+)
KOISO	85	NP A433 619	H. Koiso <i>et al.</i>	(TOKY, MASA)
PDG	82	PL 111B 1	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		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		NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also		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		NP B87 157	A.J. van Horn	(LBL) IJP
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP