

$\Lambda(1600) \ 1/2^+$  $I(J^P) = 0(\frac{1}{2}^+) \ \text{Status: } ****$ 

## $\Lambda(1600)$ POLE POSITION

### REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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#### 1540 to 1560 ( $\approx 1550$ ) OUR ESTIMATE

**1546 $\pm$ 6 OUR AVERAGE** Error includes scale factor of 2.1.1562 $\pm$ 8 SARANTSEV 19 DPWA  $\bar{K}N$  multichannel1544 $^{+3}_{-3}$ <sup>1</sup> KAMANO 15 DPWA Multichannel

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

1572 ZHANG 13A DPWA Multichannel

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

### –2 $\times$ IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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#### 120 to 240 ( $\approx 180$ ) OUR ESTIMATE

**159 $^{+60}_{-12}$  OUR AVERAGE** Error includes scale factor of 6.2.232 $\pm$ 15 SARANTSEV 19 DPWA  $\bar{K}N$  multichannel112 $^{+12}_{-2}$ <sup>1</sup> KAMANO 15 DPWA Multichannel

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

138 ZHANG 13A DPWA Multichannel

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

## $\Lambda(1600)$ POLE RESIDUES

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

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1600) \rightarrow N\bar{K}$

MODULUS	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
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**0.36  $\pm$ 0.07** –63  $\pm$  10 SARANTSEV 19 DPWA  $\bar{K}N$  multichannel

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

0.105 –80<sup>1</sup> KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15.

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1600) \rightarrow \Sigma\pi$

MODULUS	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
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**0.39  $\pm$ 0.08** 148  $\pm$  10 SARANTSEV 19 DPWA  $\bar{K}N$  multichannel

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

0.232 108<sup>1</sup> KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1600) \rightarrow \Lambda\eta$**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.22±0.13</b>	<b>180 ± 20</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1600) \rightarrow \Lambda\sigma$**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.30±0.06</b>	<b>-70 ± 10</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1600) \rightarrow \Sigma(1385)\pi$**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.37 ±0.07</b>	<b>103 ± 12</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

0.183	77	<sup>1</sup> KAMANO	15	DPWA Multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1600) \rightarrow N\bar{K}^*(892), S=1/2, P\text{-wave}$**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.02±0.01</b>	<b>126 ± 45</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Lambda(1600) \rightarrow N\bar{K}^*(892), S=3/2, P\text{-wave}$**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.02±0.01</b>	<b>-135 ± 45</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**$\Lambda(1600)$  MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1570 to 1630 ( $\approx 1600$ ) OUR ESTIMATE**

1570.5 ± 4.6 ± 12.1	ABLIKIM	25AF BES3	$\psi(3686) \rightarrow \Lambda\bar{\Sigma}^0\pi^0 +$ c.c. (PWA)
1605 ± 8	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
1592 ± 10	ZHANG	13A	DPWA Multichannel
1568 ± 20	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1703 ± 100	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1573 ± 25	GOPAL	77	DPWA $\bar{K}N$ multichannel
1596 ± 6	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$
1620 ± 10	LANGBEIN	72	IPWA $\bar{K}N$ multichannel

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

1572 or 1617	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
1646 ± 7	<sup>2</sup> CARROLL	76	DPWA Isospin-0 total $\sigma$
1570	KIM	71	DPWA K-matrix analysis

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

<sup>2</sup>A total cross-section bump with  $(J+1/2) \Gamma_{el} / \Gamma_{total} = 0.04$ .

## $\Lambda(1600)$ WIDTH

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>150 to 250 (<math>\approx 200</math>) OUR ESTIMATE</b>			
228.1 $\pm$ 11.9 $\pm$ 34.8	ABLIKIM	25AF BES3	$\psi(3686) \rightarrow \Lambda \bar{\Sigma}^0 \pi^0 +$ c.c. (PWA)
245 $\pm$ 15	SARANTSEV	19 DPWA	$\bar{K}N$ multichannel
150 $\pm$ 28	ZHANG	13A DPWA	Multichannel
116 $\pm$ 20	GOPAL	80 DPWA	$\bar{K}N \rightarrow \bar{K}N$
593 $\pm$ 200	ALSTON-...	78 DPWA	$\bar{K}N \rightarrow \bar{K}N$
147 $\pm$ 50	GOPAL	77 DPWA	$\bar{K}N$ multichannel
175 $\pm$ 20	KANE	74 DPWA	$K^- p \rightarrow \Sigma \pi$
60 $\pm$ 10	LANGBEIN	72 IPWA	$\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
247 or 271	<sup>1</sup> MARTIN	77 DPWA	$\bar{K}N$ multichannel
20	<sup>2</sup> CARROLL	76 DPWA	Isospin-0 total $\sigma$
50	KIM	71 DPWA	K-matrix analysis

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

<sup>2</sup> A total cross-section bump with  $(J+1/2) \Gamma_{el} / \Gamma_{total} = 0.04$ .

## $\Lambda(1600)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	15–30 %
$\Gamma_2$ $\Sigma \pi$	10–60 %
$\Gamma_3$ $\Lambda \sigma$	(19 $\pm$ 4) %
$\Gamma_4$ $\Sigma(1385)\pi$	( 9 $\pm$ 4) %

## $\Lambda(1600)$ BRANCHING RATIOS

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

<u><math>\Gamma(N\bar{K})/\Gamma_{total}</math></u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	<u><math>\Gamma_1/\Gamma</math></u>
<b>0.14 to 0.28 OUR ESTIMATE</b>				
0.29 $\pm$ 0.06	SARANTSEV	19 DPWA	$\bar{K}N$ multichannel	
0.14 $\pm$ 0.04	ZHANG	13A DPWA	Multichannel	
0.23 $\pm$ 0.04	GOPAL	80 DPWA	$\bar{K}N \rightarrow \bar{K}N$	
0.14 $\pm$ 0.05	ALSTON-...	78 DPWA	$\bar{K}N \rightarrow \bar{K}N$	
0.25 $\pm$ 0.15	LANGBEIN	72 IPWA	$\bar{K}N$ multichannel	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.064	<sup>1</sup> KAMANO	15 DPWA	Multichannel	
0.24 $\pm$ 0.04	GOPAL	77 DPWA	See GOPAL 80	
0.30 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.

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

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.37 ± 0.07</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.851	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

$\Gamma(\Lambda\sigma)/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.19 ± 0.04</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.09 ± 0.04</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.085	<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  $N\bar{K} \rightarrow \Lambda(1600) \rightarrow \Sigma\pi$   $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
−0.23 ± 0.03	ZHANG 13A	DPWA	Multichannel
−0.16 ± 0.04	GOPAL 77	DPWA	$\bar{K}N$ multichannel
−0.33 ± 0.11	KANE 74	DPWA	$K^-p \rightarrow \Sigma\pi$
0.28 ± 0.09	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
−0.39 or −0.39	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel
not seen	HEPP 76B	DPWA	$K^-N \rightarrow \Sigma\pi$

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

**$\Lambda(1600)$  REFERENCES**

ABLIKIM 25AF	JHEP 2502 212	M. Ablikim <i>et al.</i>	(BESIII Collab.)
SARANTSEV 19	EPJ A55 180	A.V. Sarantsev <i>et al.</i>	(BONN, PNPI)
KAMANO 15	PR C92 025205	H. Kamano <i>et al.</i>	(ANL, OSAK)
ZHANG 13A	PR C88 035205	H. Zhang <i>et al.</i>	(KSU)
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
CARROLL 76	PRL 37 806	A.S. Carroll <i>et al.</i>	(BNL) I
HEPP 76B	PL 65B 487	V. Hepp <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
KANE 74	LBL-2452	D.F. Kane	(LBL) IJP
LANGBEIN 72	NP B47 477	W. Langbein, F. Wagner	(MPIM) IJP
KIM 71	PRL 27 356	J.K. Kim	(HARV) IJP