

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

$\Lambda(1600)$ POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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1540 to 1560 (≈ 1550) OUR ESTIMATE

1546 \pm 6 OUR AVERAGE Error includes scale factor of 2.1.

1562 \pm 8	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
1544 $^{+3}_{-3}$	¹ KAMANO	15	DPWA Multichannel

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

1572	ZHANG	13A	DPWA Multichannel
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¹From the preferred solution A in KAMANO 15.

–2 \times IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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120 to 240 (≈ 180) OUR ESTIMATE

159 $^{+60}_{-12}$ OUR AVERAGE Error includes scale factor of 6.2.

232 \pm 15	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
112 $^{+12}_{-2}$	¹ KAMANO	15	DPWA Multichannel

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

138	ZHANG	13A	DPWA Multichannel
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¹From 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 \pm0.07	–63 \pm 10	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.105	–80	¹ KAMANO	15	DPWA Multichannel
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¹From 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 \pm0.08	148 \pm 10	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.232	108	¹ KAMANO	15	DPWA Multichannel
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¹From the preferred solution A in KAMANO 15.

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

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

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

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.30±0.06	-70 ± 10	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 (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.37 ± 0.07	103 ± 12	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

0.183	77	¹ KAMANO	15	DPWA Multichannel
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¹From 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 (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.02±0.01	126 ± 45	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 (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.02±0.01	-135 ± 45	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

 $\Lambda(1600)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1570 to 1630 (≈ 1600) OUR ESTIMATE			
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	¹ MARTIN 77	DPWA	$\bar{K}N$ multichannel
1646 ± 7	² CARROLL 76	DPWA	Isospin-0 total σ
1570	KIM 71	DPWA	K-matrix analysis

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

²A 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>
150 to 250 (≈ 200) OUR ESTIMATE			
245 ± 15	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
150 ± 28	ZHANG 13A	DPWA	Multichannel
116 ± 20	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
593 ± 200	ALSTON-... 78	DPWA	$\bar{K}N \rightarrow \bar{K}N$

147 ± 50	GOPAL	77	DPWA	$\bar{K}N$ multichannel
175 ± 20	KANE	74	DPWA	$K^- p \rightarrow \Sigma \pi$
60 ± 10	LANGBEIN	72	IPWA	$\bar{K}N$ multichannel

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

247 or 271	¹ MARTIN	77	DPWA	$\bar{K}N$ multichannel
20	² CARROLL	76	DPWA	Isospin-0 total σ
50	KIM	71	DPWA	K-matrix analysis

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

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

$\Lambda(1600)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\bar{K}$	15–30 %
Γ_2 $\Sigma \pi$	10–60 %
Γ_3 $\Lambda \sigma$	(19 ± 4) %
Γ_4 $\Sigma(1385)\pi$	(9 ± 4) %

$\Lambda(1600)$ BRANCHING RATIOS

See “Sign conventions for resonance couplings” in the Note on Λ and Σ Resonances.

$\Gamma(N\bar{K})/\Gamma_{total}$ Γ_1/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
0.14 to 0.28 OUR ESTIMATE			
0.29 ± 0.06	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.14 ± 0.04	ZHANG 13A	DPWA	Multichannel
0.23 ± 0.04	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.14 ± 0.05	ALSTON-... 78	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.25 ± 0.15	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.064	¹ KAMANO 15	DPWA	Multichannel
0.24 ± 0.04	GOPAL 77	DPWA	See GOPAL 80
0.30 or 0.29	² MARTIN 77	DPWA	$\bar{K}N$ multichannel

¹ From the preferred solution A in KAMANO 15.

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

$\Gamma(\Sigma \pi)/\Gamma_{total}$ Γ_2/Γ

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

¹ From the preferred solution A in KAMANO 15.

$\Gamma(\Lambda \sigma)/\Gamma_{total}$ Γ_3/Γ

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

$\Gamma(\Sigma(1385)\pi)/\Gamma_{\text{total}}$				Γ_4/Γ
VALUE	DOCUMENT ID	TECN	COMMENT	
0.09 ± 0.04	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.085	¹ KAMANO 15	DPWA	Multichannel	
¹ 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	¹ MARTIN 77	DPWA	$\bar{K}N$ multichannel	
not seen	HEPP 76B	DPWA	$K^-N \rightarrow \Sigma\pi$	
¹ The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.				

$\Lambda(1600)$ REFERENCES

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