

$\Lambda(1810) \ 1/2^+$  $I(J^P) = 0(\frac{1}{2}^+) \ \text{Status: } ***$ 

### $\Lambda(1810)$ POLE POSITION

#### REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1773 ± 7</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

2097 <sup>+40</sup> <sub>-1</sub>	<sup>1</sup> KAMANO 15	DPWA	Multichannel
1780	ZHANG 13A	DPWA	Multichannel

<sup>1</sup> From the preferred solution A in KAMANO 15. Solution B reports  $M = 1841^{+3}_{-4}$  MeV.

#### -2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>38 ± 14</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

166 <sup>+64</sup> <sub>-12</sub>	<sup>1</sup> KAMANO 15	DPWA	Multichannel
64	ZHANG 13A	DPWA	Multichannel

<sup>1</sup> From the preferred solution A in KAMANO 15. Solution B Reports  $\Gamma = 62^{+6}_{-4}$  MeV.

### $\Lambda(1810)$ POLE RESIDUES

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

#### Normalized residue in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.018 ± 0.008</b>	<b>65 ± 26</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

0.205	-63	<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 $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Sigma\pi$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.045 ± 0.020</b>	<b>-143 ± 24</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

0.0325	29	<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 $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Lambda\eta$

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.155</b>	<b>165</b>	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

0.155	165	<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 $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Lambda\sigma$

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.055 ± 0.020</b>	<b>30 ± 16</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Xi K$

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.0937	−64	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Sigma(1385)\pi$

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.08 ± 0.03</b>	<b>−50 ± 30</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.244	−10	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}^*(892), S=1/2, P\text{-wave}$

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.03 ± 0.03</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.159	−97	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

### Normalized residue in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}^*(892), S=3/2, P\text{-wave}$

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.05 ± 0.04</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
0.0497	2	<sup>1</sup> KAMANO 15	DPWA	Multichannel

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

## $\Lambda(1810)$ MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1740 to 1840 (<math>\approx</math> 1790) OUR ESTIMATE</b>			
1773 ± 7	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
1821 ± 10	ZHANG 13A	DPWA	Multichannel
1841 ± 20	GOPAL 80	DPWA	$\bar{K}N \rightarrow \bar{K}N$
1735 ± 5	CARROLL 76	DPWA	Isospin-0 total $\sigma$
1746 ± 10	PREVOST 74	DPWA	$K^-N \rightarrow \Sigma(1385)\pi$
1780 ± 20	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1853 ± 20	GOPAL 77	DPWA	$\bar{K}N$ multichannel
1861 or 1953	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel
1755	KIM 71	DPWA	K-matrix analysis
1800	ARMENTEROS70	HBC	$\bar{K}N \rightarrow \bar{K}N$
1750	ARMENTEROS70	HBC	$\bar{K}N \rightarrow \Sigma\pi$
1690 ± 10	BARBARO-... 70	HBC	$\bar{K}N \rightarrow \Sigma\pi$
1740	BAILEY 69	DPWA	$\bar{K}N \rightarrow \bar{K}N$
1745	ARMENTEROS68B	HBC	$\bar{K}N \rightarrow \bar{K}N$

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

## $\Lambda(1810)$ WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>50 to 170 (<math>\approx 110</math>) OUR ESTIMATE</b>			
$39 \pm 15$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel
$174 \pm 50$	ZHANG	13A	DPWA Multichannel
$164 \pm 20$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
$90 \pm 20$	CAMERON	78B	DPWA $K^- p \rightarrow N\bar{K}^*$
$46 \pm 20$	PREVOST	74	DPWA $K^- N \rightarrow \Sigma(1385)\pi$
$120 \pm 10$	LANGBEIN	72	IPWA $\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$166 \pm 20$	GOPAL	77	DPWA $\bar{K}N$ multichannel
535 or 585	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
28	CARROLL	76	DPWA Isospin-0 total $\sigma$
35	KIM	71	DPWA K-matrix analysis
30	ARMENTEROS70	HBC	$\bar{K}N \rightarrow \bar{K}N$
70	ARMENTEROS70	HBC	$\bar{K}N \rightarrow \Sigma\pi$
22	BARBARO-...	70	HBC $\bar{K}N \rightarrow \Sigma\pi$
300	BAILEY	69	DPWA $\bar{K}N \rightarrow \bar{K}N$
147	ARMENTEROS68B	HBC	

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

## $\Lambda(1810)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	0.05 to 0.35
$\Gamma_2$ $\Sigma\pi$	(16 $\pm$ 5) %
$\Gamma_3$ $\Lambda\eta$	
$\Gamma_4$ $\Xi K$	
$\Gamma_5$ $\Sigma(1385)\pi$	(40 $\pm$ 15) %
$\Gamma_6$ $N\bar{K}^*(892)$	30–60 %
$\Gamma_7$ $N\bar{K}^*(892)$ , $S=1/2$ , $P$ -wave	
$\Gamma_8$ $N\bar{K}^*(892)$ , $S=3/2$ , $P$ -wave	

## $\Lambda(1810)$ BRANCHING RATIOS

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
<b>0.05 to 0.35 OUR ESTIMATE</b>				
$0.025 \pm 0.013$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$0.19 \pm 0.08$	ZHANG	13A	DPWA $\bar{K}N$ multichannel	
$0.24 \pm 0.04$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$	
$0.36 \pm 0.05$	LANGBEIN	72	IPWA $\bar{K}N$ multichannel	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.225	<sup>1</sup> KAMANO	15	DPWA $\bar{K}N$ multichannel	
$0.21 \pm 0.04$	GOPAL	77	DPWA See GOPAL 80	

0.52 or 0.49	<sup>2</sup> MARTIN	77	DPWA	$\bar{K}N$ multichannel
0.30	KIM	71	DPWA	K-matrix analysis
0.15	ARMENTEROS70		DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.55	BAILEY	69	DPWA	$\bar{K}N \rightarrow \bar{K}N$
0.4	ARMENTEROS68B		DPWA	$\bar{K}N \rightarrow \bar{K}N$

<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.

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.16 ± 0.05</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

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

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

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

$\Gamma(\Xi K)/\Gamma_{\text{total}}$   $\Gamma_4/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

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

$\Gamma(\Sigma(1385)\pi)/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.40 ± 0.15</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

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

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

$\Gamma(N\bar{K}^*(892), S=1/2, P\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_7/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Sigma\pi$   $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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− 0.08 ± 0.05      ZHANG      13A      DPWA      Multichannel

− 0.24 ± 0.04      GOPAL      77      DPWA       $\bar{K}N$  multichannel

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

+ 0.25 or + 0.23      <sup>1</sup> MARTIN      77      DPWA       $\bar{K}N$  multichannel

< 0.01      LANGBEIN      72      IPWA       $\bar{K}N$  multichannel

0.17	KIM	71	DPWA	K-matrix analysis
+0.20	<sup>2</sup> ARMENTEROS70		DPWA	$\bar{K}N \rightarrow \Sigma\pi$
-0.13±0.03	BARBARO-...	70	DPWA	$\bar{K}N \rightarrow \Sigma\pi$

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

<sup>2</sup> The published sign has been changed to be in accord with the baryon-first convention.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Sigma(1385)\pi$	$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$
VALUE	DOCUMENT ID TECN COMMENT
+0.18±0.10	PREVOST 74 DPWA $K^-N \rightarrow \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}^*(892), S=1/2, P\text{-wave}$	$(\Gamma_1\Gamma_7)^{1/2}/\Gamma$
VALUE	DOCUMENT ID TECN COMMENT
-0.14±0.03	<sup>1</sup> CAMERON 78B DPWA $K^-p \rightarrow N\bar{K}^*$

<sup>1</sup> The published sign has been changed to be in accord with the baryon-first convention.

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}^*(892), S=3/2, P\text{-wave}$	$(\Gamma_1\Gamma_8)^{1/2}/\Gamma$
VALUE	DOCUMENT ID TECN COMMENT
+0.38±0.06	ZHANG 13A DPWA Multichannel
+0.35±0.06	CAMERON 78B DPWA $K^-p \rightarrow N\bar{K}^*$

### $\Lambda(1810)$ 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
CAMERON 78B	NP B146 327	W. Cameron <i>et al.</i>	(RHEL, LOIC) 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)
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CARROLL 76	PRL 37 806	A.S. Carroll <i>et al.</i>	(BNL) I
PREVOST 74	NP B69 246	J. Prevost <i>et al.</i>	(SACL, CERN, HEID)
LANGBEIN 72	NP B47 477	W. Langbein, F. Wagner	(MPIM) IJP
KIM 71	PRL 27 356	J.K. Kim	(HARV) IJP
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ARMENTEROS 70	Duke Conf. 123	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) IJP
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BARBARO-... 70	Duke Conf. 173	A. Barbaro-Galtieri	(LRL) IJP
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BAILEY 69	Thesis UCRL 50617	J.M. Bailey	(LLL) IJP
ARMENTEROS 68B	NP B8 195	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) IJP