

$\Lambda(1810) P_{01}$  $I(J^P) = 0(\frac{1}{2}^+)$  Status: \*\*\*

Almost all the recent analyses contain a  $P_{01}$  state, and sometimes two of them, but the masses, widths, and branching ratios vary greatly. See also the  $\Lambda(1600) P_{01}$ .

 **$\Lambda(1810)$  MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1750 to 1850 (<math>\approx 1810</math>) OUR ESTIMATE</b>			
1841 $\pm$ 20	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1853 $\pm$ 20	GOPAL	77	DPWA $\bar{K}N$ multichannel
1735 $\pm$ 5	CARROLL	76	DPWA Isospin-0 total $\sigma$
1746 $\pm$ 10	PREVOST	74	DPWA $K^-N \rightarrow \Sigma(1385)\pi$
1780 $\pm$ 20	LANGBEIN	72	IPWA $\bar{K}N$ multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
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 $\pm$ 10	BARBARO-...	70	HBC $\bar{K}N \rightarrow \Sigma\pi$
1740	BAILEY	69	DPWA $\bar{K}N \rightarrow \bar{K}N$
1745	ARMENTEROS68B	HBC	$\bar{K}N \rightarrow \bar{K}N$

 **$\Lambda(1810)$  WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>50 to 250 (<math>\approx 150</math>) OUR ESTIMATE</b>			
164 $\pm$ 20	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
90 $\pm$ 20	CAMERON	78B	DPWA $K^-p \rightarrow N\bar{K}^*$
166 $\pm$ 20	GOPAL	77	DPWA $\bar{K}N$ multichannel
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. ● ● ●			
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	

## $\Lambda(1810)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	20–50 %
$\Gamma_2$ $\Sigma\pi$	10–40 %
$\Gamma_3$ $\Sigma(1385)\pi$	seen
$\Gamma_4$ $N\bar{K}^*(892)$	30–60 %
$\Gamma_5$ $N\bar{K}^*(892)$ , $S=1/2$ , $P$ -wave	
$\Gamma_6$ $N\bar{K}^*(892)$ , $S=3/2$ , $P$ -wave	

The above branching fractions are our estimates, not fits or averages.

## $\Lambda(1810)$ 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>0.2 to 0.5 OUR ESTIMATE</b>	
$0.24 \pm 0.04$	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. • • •	
$0.21 \pm 0.04$	GOPAL    77    DPWA See GOPAL 80
$0.52$ or $0.49$	<sup>1</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 $\bar{K}N \rightarrow \bar{K}N$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ 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>
$-0.24 \pm 0.04$	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 $\bar{K}N \rightarrow \Sigma\pi$
$-0.13 \pm 0.03$	BARBARO-...    70    DPWA $\bar{K}N \rightarrow \Sigma\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow \Sigma(1385)\pi$	$(\Gamma_1\Gamma_3)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$+0.18 \pm 0.10$	PREVOST    74    DPWA $K^-N \rightarrow \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}^*(892)$ , $S=1/2$ , $P$ -wave	$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
$-0.14 \pm 0.03$	<sup>2</sup> CAMERON    78B    DPWA $K^-p \rightarrow N\bar{K}^*$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1810) \rightarrow N\bar{K}^*(892), S=3/2, P\text{-wave}$	$(\Gamma_1 \Gamma_6)^{1/2} / \Gamma$
VALUE	DOCUMENT ID TECN COMMENT
$+0.35 \pm 0.06$	CAMERON 78B DPWA $K^- p \rightarrow N\bar{K}^*$

### $\Lambda(1810)$ FOOTNOTES

- <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.

### $\Lambda(1810)$ REFERENCES

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)
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
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
Also	Duke Conf. 161	J.K. Kim	(HARV) IJP
	Hyperon Resonances, 1970		
ARMENTEROS 70	Duke Conf. 123	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) IJP
	Hyperon Resonances, 1970		
BARBARO-... 70	Duke Conf. 173	A. Barbaro-Galtieri	(LRL) IJP
	Hyperon Resonances, 1970		
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