

$\Lambda(1810) P_{01}$

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

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
1750 to 1850 (≈ 1810) OUR ESTIMATE			
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 σ
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	¹ 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
50 to 250 (≈ 150) OUR ESTIMATE			
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	¹ MARTIN	77	DPWA $\bar{K}N$ multichannel
28	CARROLL	76	DPWA Isospin-0 total σ
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 (Γ_i/Γ)
Γ_1 $N\bar{K}$	20–50 %
Γ_2 $\Sigma\pi$	10–40 %
Γ_3 $\Sigma(1385)\pi$	seen
Γ_4 $N\bar{K}^*(892)$	30–60 %
Γ_5 $N\bar{K}^*(892)$, $S=1/2$, P -wave	
Γ_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 Λ and Σ Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$	Γ_1/Γ
<u>VALUE</u>	<u>DOCUMENT ID</u> <u>TECN</u> <u>COMMENT</u>
0.2 to 0.5 OUR ESTIMATE	
0.24±0.04	GOPAL 80 DPWA $\bar{K}N \rightarrow \bar{K}N$
0.36±0.05	LANGBEIN 72 IPWA $\bar{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •	
0.21±0.04	GOPAL 77 DPWA See GOPAL 80
0.52 or 0.49	¹ 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±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	¹ 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	² ARMENTEROS70 DPWA $\bar{K}N \rightarrow \Sigma\pi$
−0.13±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±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±0.03	² 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 ± 0.06	CAMERON	78B	DPWA $K^- p \rightarrow N\bar{K}^*$

$\Lambda(1810)$ FOOTNOTES

- ¹ The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
² 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