Λ(1810) 1/2⁺

$$I(J^P) = O(\frac{1}{2}^+)$$
 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} .

Λ(1810) POLE POSITION

| | Λ(1 | 1810) POLE P | 05111 | ON | |
|------------------------------------|---|---|--------------|-----------|------------------------------------|
| REAL PART | - | DOCUMENT ID |) | TECN | COMMENT |
| • • • We do i | not use the followin | g data for averag | es, fits, | limits, e | tc. • • • |
| 2097 + 40 | | $^{ m 1}$ KAMANO | 15 | DPWA | Multichannel |
| 1780 | | ZHANG | 13A | DPWA | Multichannel |
| $^{ m 1}$ From the $_{ m I}$ | oreferred solution A | in KAMANO 15 | . Soluti | ion B rep | ports M $=1841^{+3}_{-4}$ MeV |
| -2×IMAGII | NARY PART | | | | |
| VALUE (MeV) | | DOCUMENT ID |) | TECN | COMMENT |
| • • • We do i | not use the followin | g data for averag | es, fits, | limits, e | tc. • • • |
| 166^{+64}_{-12} | | $^{ m 1}$ KAMANO | 15 | DPWA | Multichannel |
| 64 | | ZHANG | 13A | DPWA | Multichannel |
| 1 From the I | oreferred solution A | in KAMANO 15 | Solut | ion B Re | ports $\Gamma = 62^{+6}_{-4}$ MeV. |
| | residue in $N\overline{K}$ – $PHASE (^{\circ})$ | \rightarrow $\Lambda(1810) \rightarrow$ DOCUMEN | | TECI | N COMMENT |
| MODULUS | not use the followin | - | | | COMMENT |
| 0.205 | -63 | 1 KAMANC | | | VA Multichannel |
| | preferred solution A | | | | |
| Normalized | residue in $N\overline{K}$ – | → Λ(1810) → | $\Sigma \pi$ | | |
| | | DOCUMEN. | | TECI | N COMMENT |
| • • • We do i | not use the followin | g data for averag | es, fits, | limits, e | tc. • • • |
| 0.0325 | 29 | $^{ m 1}$ KAMANC |) 1 | 5 DPV | VA Multichannel |
| $^{ m 1}$ From the $_{ m I}$ | oreferred solution A | in KAMANO 15 | | | |
| Normalized | residue in $N\overline{K}$ – | → Λ (1810) → | Λη | | |
| MODULUS | PHASE (°) | DOCUMEN [*] | T ID | TECI | |
| • • • We do i | not use the followin | | | | |
| 0.155 | 165 | ¹ KAMANC | | 5 DPV | VA Multichannel |
| ¹ From the _I | preferred solution A | in KAMANO 15 | | | |
| HTTD://DF | G.LBL.GOV | Dago 1 | | Crost | od: 5/30/2017 17:2 |
| 111 11 .//FL | G.LDL.GUV | Page 1 | | Creat | ed: 5/30/2017 17:2 |

| MODULUS | PHASE (°) | DOCUMENT ID | | TECN | COMMENT |
|--|---|---|------------------------------------|--|--|
| | | ng data for averages, f | | nits, etc. | • • • |
| 0.0937 | -64 | ¹ KAMANO | 15 | DPWA | Multichannel |
| $^{ m 1}$ From the | preferred solution A | in KAMANO 15. | | | |
| Normalized | residue in $N\overline{K}$ - | $\rightarrow \Lambda(1810) \rightarrow \Sigma($ | 1385 | $\delta)\pi$ | |
| MODULUS | PHASE (°) | DOCUMENT ID | - | TECN | COMMENT |
| • • • We do | not use the followin | ig data for averages, f | its, lir | nits, etc. | • • • |
| 0.244 | -10 | $^{ m 1}$ KAMANO | 15 | DPWA | Multichannel |
| | | | | | |
| $^{ m 1}{\sf From}$ the | preferred solution A | in KAMANO 15. | | | |
| | | _ | | | |
| | | in KAMANO 15. $ \rightarrow \Lambda(1810) \rightarrow N^{-1} $ | K *(8 | 92), <i>S</i> = | =1/2, <i>P</i> -wav |
| | residue in $N\overline{K}$ - | _ | • | • | • |
| Normalized MODULUS | residue in NK – PHASE (°) | $\rightarrow \Lambda(1810) \rightarrow N^{-1}$ | | TECN | COMMENT |
| Normalized MODULUS | residue in NK – PHASE (°) | $\rightarrow \Lambda(1810) \rightarrow N^{\frac{1}{2}}$ DOCUMENT ID | its, lir | TECN mits, etc. | <u>COMMENT</u> • • • |
| Normalized MODULUS • • • We do 0.159 | residue in NK – PHASE (°) not use the followin – 97 | $ \begin{array}{c} $ | its, lir | TECN mits, etc. | <u>COMMENT</u> • • • |
| Normalized MODULUS • • • We do 0.159 | residue in $N\overline{K}$ - PHASE (°) not use the following | $ \begin{array}{c} $ | its, lir | TECN mits, etc. | <u>COMMENT</u> • • • |
| Normalized MODULUS • • • We do 0.159 1 From the | residue in $N\overline{K}$ - PHASE (°) not use the followin -97 preferred solution A | $ \begin{array}{c} $ | ïts, lir 15 | TECN mits, etc. DPWA | COMMENT • • • Multichannel |
| Normalized MODULUS • • • We do 0.159 1 From the Normalized | residue in $N\overline{K}$ - PHASE (°) not use the followin -97 preferred solution A residue in $N\overline{K}$ - | A(1810) → NO DOCUMENT ID ag data for averages, f 1 KAMANO A in KAMANO 15. | its, lir 15 K*(8 | TECN mits, etc. DPWA 92), S= | COMMENT Multichannel 3/2, P-wave |
| Normalized MODULUS • • • We do 0.159 1 From the Normalized MODULUS | residue in $N\overline{K}$ - PHASE (°) not use the followin -97 preferred solution A residue in $N\overline{K}$ - PHASE (°) | | its, lir 15 K *(8 | TECN mits, etc. DPWA 92), S= TECN | COMMENT Multichannel 3/2, P-wave COMMENT |
| Normalized MODULUS • • • We do 0.159 1 From the Normalized MODULUS | residue in $N\overline{K}$ - PHASE (°) not use the followin -97 preferred solution A residue in $N\overline{K}$ - PHASE (°) | The second of t | its, lir 15 K*(8 | TECN mits, etc. DPWA 92), S= TECN mits, etc. | COMMENT Multichannel 3/2, P-wave COMMENT COMMENT |

Λ(1810) MASS

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|--|---------------------|--------------|-----------|---|
| 1750 to 1850 (≈ 1810) OUR ESTIN | MATE | | | |
| 1821 ± 10 | ZHANG | 13A | DPWA | Multichannel |
| 1841 ± 20 | GOPAL | 80 | DPWA | $\overline{K} N \rightarrow \overline{K} N$ |
| 1853 ± 20 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 1735 ± 5 | CARROLL | 76 | DPWA | Isospin-0 total σ |
| 1746 ± 10 | PREVOST | 74 | DPWA | $K^- N \rightarrow \Sigma(1385) \pi$ |
| 1780 ± 20 | LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel |
| • • • We do not use the following of | data for averages | s, fits, | limits, e | etc. • • • |
| 1861 or 1953 | ¹ MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| 1755 | KIM | 71 | DPWA | K-matrix analysis |
| 1800 | ARMENTERO | S70 | HBC | $\overline{K} N \rightarrow \overline{K} N$ |
| 1750 | ARMENTERO | S70 | HBC | $\overline{K}N \rightarrow \Sigma \pi$ |
| 1690 ± 10 | BARBARO | 70 | HBC | $\overline{K}N \rightarrow \Sigma \pi$ |
| 1740 | BAILEY | 69 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| 1745 | ARMENTERO | S68 B | HBC | $\overline{K}N \rightarrow \overline{K}N$ |
| $^{ m 1}$ The two MARTIN 77 values are | from a T-matrix | x pole | and froi | m a Breit-Wigner fit. |

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Λ(1810) WIDTH

| VALUE (MeV) | DOCUMENT ID | | TECN | COMMENT |
|--|------------------|--------------|-----------|---|
| 50 to 250 (≈ 150) OUR ESTIMAT | E | | | |
| 174 ± 50 | ZHANG | 13A | DPWA | Multichannel |
| 164 ± 20 | GOPAL | 80 | DPWA | $\overline{K} N \rightarrow \overline{K} N$ |
| 90 ± 20 | CAMERON | 78 B | DPWA | $K^- p \rightarrow N \overline{K}^*$ |
| 166 ± 20 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| 46 ± 20 | PREVOST | 74 | DPWA | $K^- N \rightarrow \Sigma(1385) \pi$ |
| 120 ± 10 | LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel |
| • • • We do not use the following | data for average | s, fits, | limits, e | etc. • • • |
| 535 or 585 | $^{ m 1}$ MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| 28 | CARROLL | 76 | DPWA | Isospin-0 total σ |
| 35 | KIM | 71 | DPWA | K-matrix analysis |
| 30 | ARMENTERO | S70 | | $\overline{K}N \rightarrow \overline{K}N$ |
| 70 | ARMENTERO | S70 | | $\overline{K} N \rightarrow \Sigma \pi$ |
| 22 | BARBARO | 70 | HBC | $\overline{K}N \rightarrow \Sigma \pi$ |
| 300 | BAILEY | 69 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ |
| 147 | ARMENTERO | S68 B | HBC | |
| $^{ m 1}$ The two MARTIN 77 values are | from a T-matri | x pole | and froi | m a Breit-Wigner fit. |

∧(1810) DECAY MODES

| | Mode | Fraction (Γ_i/Γ) |
|-----------------------|--|------------------------------|
| $\overline{\Gamma_1}$ | NK | 20–50 % |
| Γ_2 | $\Sigma \pi$ | 10–40 % |
| Γ3 | $\Lambda\eta$ | |
| Γ_4 | ΞK | |
| Γ_5 | $\Sigma(1385)\pi$ | seen |
| Γ_6 | $N\overline{K}^*(892)$ | 30–60 % |
| Γ_7 | $N\overline{K}^*(892)$, $S{=}1/2$, $P{-}$ wave | |
| Γ ₈ | $N\overline{K}^*(892)$, $S=3/2$, P -wave | |

1/(1810) BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on \varLambda and \varSigma Resonances.

| | | | Γ ₁ | _L /Γ |
|-------------|----------------|-----------------------|---|---|
| DOCUMENT ID | | TECN | COMMENT | |
| | | | | |
| ZHANG | 13A | DPWA | Multichannel | |
| GOPAL | 80 | DPWA | $\overline{K}N \rightarrow \overline{K}N$ | |
| LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel | |
| | ZHANG GOPAL | ZHANG 13A GOPAL 80 | ZHANG 13A DPWA GOPAL 80 DPWA | DOCUMENT IDTECNCOMMENTZHANG13ADPWAMultichannelGOPAL80DPWA $\overline{K}N \rightarrow \overline{K}N$ |

| • • • We do not use the following | data for averages | , fits, | limits, e | etc. • • • | |
|---|----------------------|--------------|-----------|---|-------------------|
| 0.225 | ¹ KAMANO | 15 | DPWA | Multichannel | |
| 0.21 ± 0.04 | | 77 | | See GOPAL 80 | • |
| 0.52 or 0.49 | ^ | | | $\overline{K}N$ multichannel | |
| 0.30 | KIM | | | K-matrix analysis | |
| 0.15 | ARMENTEROS | | | • | |
| 0.55 | BAILEY | 69 | | $\overline{K}N \rightarrow \overline{K}N$ | |
| 0.4 | ARMENTERO: | S68 B | DPWA | $\overline{K}N \rightarrow \overline{K}N$ | |
| $^{ m 1}$ From the preferred solution A in $^{ m 2}$ The two MARTIN 77 values are | | c pole | and from | m a Breit-Wigner f | it. |
| $\Gamma(\Sigma\pi)/\Gamma_{total}$ | | | | | Γ ₂ /Γ |
| VALUE | DOCUMENT ID | | TECN | COMMENT | |
| ullet $ullet$ We do not use the following | data for averages | , fits, | limits, e | etc. • • • | |
| 0.009 | ¹ KAMANO | 15 | DPWA | Multichannel | |
| $^{ m 1}$ From the preferred solution A i | n KAMANO 15. | | | | |
| $\Gamma(\Lambda\eta)/\Gamma_{\text{total}}$ | | | | | Г ₃ /Г |
| VALUE | DOCUMENT ID | | TECN | COMMENT | J, |
| • • We do not use the following | data for averages | , fits, | limits, e | etc. • • • | |
| 0.111 | ¹ KAMANO | 15 | DPWA | Multichannel | |
| $^{ m 1}$ From the preferred solution A in | n KAMANO 15. | | | | |
| $\Gamma(\Xi K)/\Gamma_{\text{total}}$ | | | | | Γ ₄ /Γ |
| VALUE | DOCUMENT ID | | TECN | COMMENT | •, |
| • • We do not use the following | | | | | |
| 0.051 | ¹ KAMANO | 15 | DPWA | Multichannel | |
| $^{ m 1}$ From the preferred solution A in | n KAMANO 15. | | | | |
| $\Gamma(\Sigma(1385)\pi)/\Gamma_{total}$ | | | | | Γ ₅ /Γ |
| VALUE | DOCUMENT ID | | TECN | COMMENT | . 5/ . |
| • • We do not use the following | • | | | | |
| 0.600 | ¹ KAMANO | 15 | DPWA | Multichannel | |
| $^{ m 1}$ From the preferred solution A i | n KAMANO 15. | | | | |
| $\Gamma(N\overline{K}^*(892), S=1/2, P-wave)$ |)/Γ _{total} | | | | Γ ₇ /Γ |
| VALUE | DOCUMENT ID | | TECN | COMMENT | |
| ullet $ullet$ We do not use the following | data for averages | , fits, | limits, e | etc. • • • | |
| 0.003 | $^{ m 1}$ KAMANO | 15 | DPWA | Multichannel | |
| $^{ m 1}$ From the preferred solution A i | n KAMANO 15. | | | | |

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| $(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}} \text{ in } N \overline{K} \to \Lambda$ | $(1810) \rightarrow \Sigma \pi$ | | | $(\Gamma_1\Gamma_2)^{\frac{1}{2}}/\Gamma$ |
|--|---------------------------------|-----------|-----------|---|
| VALUE | DOCUMENT ID | | TECN | COMMENT |
| -0.08 ± 0.05 | ZHANG | 13A | DPWA | Multichannel |
| -0.24 ± 0.04 | GOPAL | 77 | DPWA | $\overline{K}N$ multichannel |
| • • • We do not use the followi | ng data for average | es, fits, | limits, e | etc. • • • |
| +0.25 or +0.23 | $^{ m 1}$ MARTIN | 77 | DPWA | $\overline{K}N$ multichannel |
| < 0.01 | LANGBEIN | 72 | IPWA | $\overline{K}N$ multichannel |
| 0.17 | KIM | 71 | | K-matrix analysis |
| +0.20 | ² ARMENTERO |)S70 | DPWA | $\overline{K} N 	o \mathbf{\Sigma} \pi$ |
| -0.13 ± 0.03 | BARBARO | 70 | DPWA | $\overline{K}N \rightarrow \Sigma \pi$ |
| $^{ m 1}$ The two MARTIN 77 values | are from a T-matr | ix pole | and from | m a Breit-Wigner fit. |

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

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

| $(\Gamma_i \Gamma_f)^{\frac{1}{2}} / \Gamma_{\text{total}} \text{ in } N\overline{K} \to 1$ | $\Lambda(1810) \rightarrow \Sigma(1385)$ | π | | | $(\Gamma_1\Gamma_5)^{\frac{1}{2}}/\Gamma$ |
|---|--|-------|------|--------------------|---|
| <u>VALUE</u> | DOCUMENT ID | | TECN | COMMENT | |
| $+0.18\pm0.10$ | PREVOST | 74 | DPWA | $K^-N \rightarrow$ | $\Sigma(1385)\pi$ |

| $(\Gamma_i \Gamma_f)^{\frac{1}{2}} / \Gamma_{\text{total}} \text{ in } N\overline{K} \to K$ | $\Lambda(1810) \rightarrow N\overline{K}^*(8)$ | 92), | <i>S</i> =1/2 | , P-wave | $(\Gamma_1\Gamma_7)^{\frac{1}{2}}/\Gamma$ |
|---|--|------|---------------|--------------------|---|
| VALUE | DOCUMENT ID | | TECN | COMMENT | |
| -0.14 ± 0.03 | 1 CAMERON | 78B | DPWA | $K^-p \rightarrow$ | N <i>K</i> * |

 $^{^{1}}$ The published sign has been changed to be in accord with the baryon-first convention.

$(\Gamma_i \Gamma_f)^{\frac{1}{2}} / \Gamma_{\text{total}} \text{ in } N\overline{K} \rightarrow \Lambda(1810) \rightarrow N\overline{K}^*(892), S=3/2, P-\text{wave } (\Gamma_1 \Gamma_8)^{\frac{1}{2}} / \Gamma_{\text{total}}$

| VALUE | • | DOCUMENT ID | - ,, | | COMMENT |
|----------------|---|-------------|-------------|------|--------------------------------------|
| $+0.38\pm0.06$ | | ZHANG | 13A | DPWA | Multichannel |
| $+0.35\pm0.06$ | | CAMERON | 78 B | DPWA | $K^- p \rightarrow N \overline{K}^*$ |

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