

$$N(1880) \ 1/2^+$$

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

***N*(1880) POLE POSITION**

REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1820 to 1900 ($\approx$ 1860) OUR ESTIMATE			
1860 $\pm$ 40	ANISOVICH	17A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1880	HUNT	19	DPWA Multichannel
1875 $\pm$ 11	¹ ANISOVICH	17A	L+P $\gamma p, \pi^- p \rightarrow K \Lambda$
1870 $\pm$ 40	SOKHOYAN	15A	DPWA Multichannel
1870 $\pm$ 40	GUTZ	14	DPWA Multichannel
1860 $\pm$ 35	ANISOVICH	12A	DPWA Multichannel

¹ Statistical error only.

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
180 to 280 ($\approx$ 230) OUR ESTIMATE			
230 $\pm$ 50	ANISOVICH	17A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
429	HUNT	19	DPWA Multichannel
33 $\pm$ 9	² ANISOVICH	17A	L+P $\gamma p, \pi^- p \rightarrow K \Lambda$
220 $\pm$ 50	SOKHOYAN	15A	DPWA Multichannel
220 $\pm$ 50	GUTZ	14	DPWA Multichannel
250 $\pm$ 70	ANISOVICH	12A	DPWA Multichannel

² Statistical error only.

***N*(1880) ELASTIC POLE RESIDUE**

MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
6 $\pm$ 4	SOKHOYAN	15A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
6 $\pm$ 4	GUTZ	14	DPWA Multichannel
6 $\pm$ 4	ANISOVICH	12A	DPWA Multichannel

PHASE θ

VALUE (°)	DOCUMENT ID	TECN	COMMENT
70 $\pm$ 60	SOKHOYAN	15A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
70 $\pm$ 60	GUTZ	14	DPWA Multichannel
80 $\pm$ 65	ANISOVICH	12A	DPWA Multichannel

$N(1880)$ INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow N\eta$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.11 ± 0.07	-75 ± 55	ANISOVICH	12A DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow \Lambda K$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.05 ± 0.02	27 ± 30	ANISOVICH	17A DPWA	$\gamma p, \pi^- p \rightarrow K \Lambda$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.3 ± 0.1	82 ± 9	³ ANISOVICH	17A L+P	$\gamma p, \pi^- p \rightarrow K \Lambda$
0.03 ± 0.02	40 ± 40	ANISOVICH	12A DPWA	Multichannel

³Statistical error only.

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow \Sigma K$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.11 ± 0.06	95 ± 40	ANISOVICH	12A DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow \Delta\pi, P\text{-wave}$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.14 ± 0.08	-150 ± 55	SOKHOYAN	15A DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.20 ± 0.08	-150 ± 50	ANISOVICH	12A DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow N(1535)\pi$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.09 ± 0.05	130 ± 60	GUTZ	14 DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow N a_0(980)$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04 ± 0.03	40 ± 65	GUTZ	14 DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1880) \rightarrow N\sigma$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.10 ± 0.05	-140 ± 55	SOKHOYAN	15A DPWA	Multichannel

 $N(1880)$ BREIT-WIGNER MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1830 to 1930 (≈ 1880) OUR ESTIMATE			
1967 ± 20	⁴ HUNT	19 DPWA	Multichannel
1875 ± 40	SOKHOYAN	15A DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1875 ± 40	GUTZ	14 DPWA	Multichannel
1870 ± 35	ANISOVICH	12A DPWA	Multichannel
1900 ± 36	⁴ SHRESTHA	12A DPWA	Multichannel

⁴Statistical error only.

***N*(1880) BREIT-WIGNER WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
200 to 400 ($\approx$ 300) OUR ESTIMATE			
500 ± 77	⁵ HUNT	19	DPWA Multichannel
230 ± 50	SOKHOYAN	15A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
230 ± 50	GUTZ	14	DPWA Multichannel
235 ± 65	ANISOVICH	12A	DPWA Multichannel
485 ± 142	⁵ SHRESTHA	12A	DPWA Multichannel
⁵ Statistical error only.			

***N*(1880) DECAY MODES**

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	3–31 %
Γ_2 $N\eta$	1–55 %
Γ_3 $N\omega$	12–28 %
Γ_4 ΛK	1–3 %
Γ_5 ΣK	10–24 %
Γ_6 $N\pi\pi$	>32 %
Γ_7 $\Delta(1232)\pi$	5–42 %
Γ_8 $N\rho$, $S=1/2$, P -wave	19–45 %
Γ_9 $N\sigma$	8–40 %
Γ_{10} $N(1535)\pi$	4–12 %
Γ_{11} $N a_0(980)$	1–5 %
Γ_{12} $\Lambda K^*(892)$	0.5–1.1 %
Γ_{13} $p\gamma$, helicity=1/2	seen
Γ_{14} $n\gamma$, helicity=1/2	0.002–0.63 %

***N*(1880) BRANCHING RATIOS**

$\Gamma(N\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
3–31 % OUR ESTIMATE					
25 ± 6	⁶ HUNT	19	DPWA Multichannel		
6 ± 3	SOKHOYAN	15A	DPWA Multichannel		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
6 ± 3	GUTZ	14	DPWA Multichannel		
5 ± 3	ANISOVICH	12A	DPWA Multichannel		
15 ± 5	⁶ SHRESTHA	12A	DPWA Multichannel		
⁶ Statistical error only.					

$\Gamma(N\eta)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
1–55 % OUR ESTIMATE			
18 ± 8	MUELLER	20	DPWA Multichannel
2 ± 1	⁷ HUNT	19	DPWA Multichannel
25^{+30}_{-20}	ANISOVICH	12A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
16 ± 7	⁷ SHRESTHA	12A	DPWA Multichannel
⁷ Statistical error only.			

$\Gamma(N\omega)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
12–28 % OUR ESTIMATE			
20 ± 8	DENISENKO	16	DPWA Multichannel

$\Gamma(\Lambda K)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
1–3 % OUR ESTIMATE			
2 ± 1	⁸ HUNT	19	DPWA Multichannel
2 ± 1	ANISOVICH	12A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
32 ± 10	⁸ SHRESTHA	12A	DPWA Multichannel
⁸ Statistical error only.			

$\Gamma(\Sigma K)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
10–24 % OUR ESTIMATE			
17 ± 7	ANISOVICH	12A	DPWA Multichannel

$\Gamma(\Delta(1232)\pi)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
5–42 % OUR ESTIMATE			
11 ± 6	⁹ HUNT	19	DPWA Multichannel
30 ± 12	SOKHOYAN	15A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
29 ± 12	ANISOVICH	12A	DPWA Multichannel
< 2	⁹ SHRESTHA	12A	DPWA Multichannel
⁹ Statistical error only.			

$\Gamma(N\rho, S=1/2, P\text{-wave})/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
19–45 % OUR ESTIMATE			
32 ± 13	¹⁰ HUNT	19	DPWA Multichannel
¹⁰ Statistical error only.			

$\Gamma(N\sigma)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
8–40 % OUR ESTIMATE			
< 9	¹¹ HUNT	19	DPWA Multichannel
25 ± 15	SOKHOYAN	15A	DPWA Multichannel

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

8 ± 5 ¹¹ SHRESTHA 12A DPWA Multichannel

¹¹Statistical error only.

$\Gamma(N(1535)\pi)/\Gamma_{\text{total}}$	Γ_{10}/Γ			
VALUE (%)	DOCUMENT ID	TECN	COMMENT	
4–12 % OUR ESTIMATE				
8 ± 4	GUTZ	14	DPWA	Multichannel
$\Gamma(Na_0(980))/\Gamma_{\text{total}}$	Γ_{11}/Γ			
VALUE (%)	DOCUMENT ID	TECN	COMMENT	
1–5 % OUR ESTIMATE				
3 ± 2	GUTZ	14	DPWA	Multichannel
$\Gamma(\Lambda K^*(892))/\Gamma_{\text{total}}$	Γ_{12}/Γ			
VALUE (%)	DOCUMENT ID	TECN	COMMENT	
0.5–1.1 % OUR ESTIMATE				
0.8 ± 0.3	ANISOVICH	17B	DPWA	Multichannel

$N(1880)$ PHOTON DECAY AMPLITUDES AT THE POLE

$N(1880) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($\text{GeV}^{-1/2}$)	PHASE ($^\circ$)	DOCUMENT ID	TECN	COMMENT
0.072 ± 0.024	-30 ± 30	ANISOVICH	17E	DPWA Multichannel

$N(1880)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES

$N(1880) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.119 ± 0.015	¹² HUNT 19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.021 ± 0.006	¹² SHRESTHA 12A	DPWA	Multichannel

¹²Statistical error only.

$N(1880) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.016 ± 0.010	¹³ HUNT 19	DPWA	Multichannel
0.070 ± 0.022	ANISOVICH 17E	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.060 ± 0.050	ANISOVICH 13B	DPWA	Multichannel
0.014 ± 0.007	¹³ SHRESTHA 12A	DPWA	Multichannel

¹³Statistical error only.

***N*(1880) REFERENCES**

MUELLER	20	PL B803 135323	J. Mueller <i>et al.</i>	(CBELSA/TAPS Collab.)
HUNT	19	PR C99 055205	B.C. Hunt, D.M. Manley	
ANISOVICH	17A	PRL 119 062004	A.V. Anisovich <i>et al.</i>	
ANISOVICH	17B	PL B771 142	A.V. Anisovich <i>et al.</i>	
ANISOVICH	17E	PR C96 055202	A.V. Anisovich <i>et al.</i>	(BONN, PNPI, JLAB+)
DENISENKO	16	PL B755 97	I. Denisenko <i>et al.</i>	
SOKHOYAN	15A	EPJ A51 95	V. Sokhoyan <i>et al.</i>	(CBELSA/TAPS Collab.)
GUTZ	14	EPJ A50 74	E. Gutz <i>et al.</i>	(CBELSA/TAPS Collab.)
ANISOVICH	13B	EPJ A49 67	A.V. Anisovich <i>et al.</i>	
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
