

$N(1880) \ 1/2^+$ $I(J^P) = \frac{1}{2}(\frac{1}{2}^+) \text{ Status: } ***$ **$N(1880)$ POLE POSITION****REAL PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1820 to 1900 (≈ 1860) OUR ESTIMATE			
1860 \pm 25	SARANTSEV 25	DPWA	Multichannel
••• We do not use the following data for averages, fits, limits, etc. •••			
1880	HUNT 19	DPWA	Multichannel
1875 \pm 11	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

–2×IMAGINARY PART

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
180 to 280 (≈ 230) OUR ESTIMATE			
270 \pm 30	SARANTSEV 25	DPWA	Multichannel
••• We do not use the following data for averages, fits, limits, etc. •••			
429	HUNT 19	DPWA	Multichannel
33 \pm 9	¹ 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

¹Statistical error only. **$N(1880)$ ELASTIC POLE RESIDUE****MODULUS $|r|$**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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

<u>VALUE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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 RESIDUEThe “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 \pm 0.07	–75 \pm 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	² ANISOVICH	17A L+P	$\gamma p, \pi^- p \rightarrow K \Lambda$
0.03 ± 0.02	40 ± 40	ANISOVICH	12A DPWA	Multichannel

²Statistical 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			
1865 ± 25	SARANTSEV	25 DPWA	Multichannel
1967 ± 20	³ HUNT	19 DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1875 ± 40	SOKHOYAN	15A DPWA	Multichannel
1875 ± 40	GUTZ	14 DPWA	Multichannel
1900 ± 36	³ SHRESTHA	12A DPWA	Multichannel

³Statistical error only. **$N(1880)$ BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
200 to 400 (≈ 300) OUR ESTIMATE			
275 ± 30	SARANTSEV	25 DPWA	Multichannel
500 ± 77	⁴ HUNT	19 DPWA	Multichannel

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

230 ± 50	SOKHOYAN	15A	DPWA	Multichannel
230 ± 50	GUTZ	14	DPWA	Multichannel
485 ± 142	⁴ SHRESTHA	12A	DPWA	Multichannel

⁴Statistical 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 $N\rho$	(28 ± 7) %
Γ_9 $N\rho, S=1/2$	19–45 %
Γ_{10} $N\rho, S=3/2$	(8.0 ± 3.0) %
Γ_{11} $N\sigma$	8–40 %
Γ_{12} $N(1535)\pi$	4–12 %
Γ_{13} $N a_0(980)$	1–5 %
Γ_{14} $\Lambda K^*(892)$	0.5–1.1 %
Γ_{15} $p\gamma, \text{helicity}=1/2$	seen
Γ_{16} $n\gamma, \text{helicity}=1/2$	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			
11 ± 6	SEIFEN	25	DPWA Multichannel
25 ± 6	⁵ HUNT	19	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
6 ± 3	SOKHOYAN	15A	DPWA Multichannel
6 ± 3	GUTZ	14	DPWA Multichannel
15 ± 5	⁵ SHRESTHA	12A	DPWA Multichannel

⁵Statistical 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	⁶ 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	⁶ SHRESTHA	12A	DPWA Multichannel

⁶ Statistical error only.

$\Gamma(N\omega)/\Gamma_{\text{total}}$				Γ_3/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
12–28 % OUR ESTIMATE				
20 ± 8	DENISENKO	16	DPWA Multichannel	

$\Gamma(\Lambda K)/\Gamma_{\text{total}}$				Γ_4/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1–3 % OUR ESTIMATE				
2 ± 1	⁷ HUNT	19	DPWA Multichannel	
2 ± 1	ANISOVICH	12A	DPWA Multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
32 ± 10	⁷ SHRESTHA	12A	DPWA Multichannel	

⁷ Statistical error only.

$\Gamma(\Sigma K)/\Gamma_{\text{total}}$				Γ_5/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
10–24 % OUR ESTIMATE				
17 ± 7	ANISOVICH	12A	DPWA Multichannel	

$\Gamma(\Delta(1232)\pi)/\Gamma_{\text{total}}$				Γ_7/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
5–42 % OUR ESTIMATE				
6 ± 3	SARANTSEV	25	DPWA Multichannel	
4 ± 2	SEIFEN	25	DPWA Multichannel	
11 ± 6	⁸ HUNT	19	DPWA Multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
30 ± 12	SOKHOYAN	15A	DPWA Multichannel	
< 2	⁸ SHRESTHA	12A	DPWA Multichannel	

⁸ Statistical error only.

$\Gamma(N\rho)/\Gamma_{\text{total}}$				Γ_8/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
28 ± 7	SARANTSEV	25	DPWA Multichannel	

$\Gamma(N\rho, S=1/2)/\Gamma_{\text{total}}$				Γ_9/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
19–45 % OUR ESTIMATE				
20 ± 6	SARANTSEV	25	DPWA Multichannel	
32 ± 13	⁹ HUNT	19	DPWA Multichannel	

⁹ Statistical error only.

$\Gamma(N\rho, S=3/2)/\Gamma_{\text{total}}$				Γ_{10}/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
8 ± 3	SARANTSEV	25	DPWA Multichannel	

$\Gamma(N\sigma)/\Gamma_{\text{total}}$					Γ_{11}/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
8-40 % OUR ESTIMATE					
20 ± 4	SARANTSEV	25	DPWA	Multichannel	
22 ± 13	SEIFEN	25	DPWA	Multichannel	
< 9	¹⁰ HUNT	19	DPWA	Multichannel	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
25 ± 15	SOKHOYAN	15A	DPWA	Multichannel	
8 ± 5	¹⁰ SHRESTHA	12A	DPWA	Multichannel	
¹⁰ Statistical error only.					

$\Gamma(N(1535)\pi)/\Gamma_{\text{total}}$					Γ_{12}/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
4-12 % OUR ESTIMATE					
6 ± 3	SEIFEN	25	DPWA	Multichannel	
8 ± 4	GUTZ	14	DPWA	Multichannel	

$\Gamma(Na_0(980))/\Gamma_{\text{total}}$					Γ_{13}/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
1-5 % OUR ESTIMATE					
3 ± 2	GUTZ	14	DPWA	Multichannel	

$\Gamma(\Lambda K^*(892))/\Gamma_{\text{total}}$					Γ_{14}/Γ
<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
0.5-1.1 % OUR ESTIMATE					
0.8 ± 0.3	ANISOVICH	17B	DPWA	Multichannel	

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

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

<u>MODULUS ($\text{GeV}^{-1/2}$)</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.015 ± 0.005	-10 ± 20	SARANTSEV	25	DPWA	Multichannel

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

<u>MODULUS ($\text{GeV}^{-1/2}$)</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
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 $A_{1/2}$

<u>VALUE ($\text{GeV}^{-1/2}$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.016 ± 0.005	SARANTSEV	25	DPWA	Multichannel
0.119 ± 0.015	¹¹ HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.021 ± 0.006	¹¹ SHRESTHA	12A	DPWA	Multichannel

¹¹Statistical error only.

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

<u>VALUE (GeV^{-1/2})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.016±0.010	¹² 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	¹² SHRESTHA	12A	DPWA Multichannel
¹² Statistical error only.			

 $N(1880)$ REFERENCES

SARANTSEV	25	PR C112 015202	A.V. Sarantsev <i>et al.</i>	(Bonn-Gatchina Collab.)
SEIFEN	25	EPJ A61 173	T. Seifen <i>et al.</i>	(CBELSA/TAPS Collab.)
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)