

$N(1900) \ 3/2^+$  $I(J^P) = \frac{1}{2}(3/2^+)$  Status: \*\*\*\* **$N(1900)$  POLE POSITION****REAL PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1900 to 1940 (<math>\approx</math> 1920) OUR ESTIMATE</b>			
1945 $\pm$ 35	ANISOVICH	17A	DPWA Multichannel
1928 $\pm$ 18 $\pm$ 2	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1856	HUNT	19	DPWA Multichannel
1912 $\pm$ 30	<sup>2</sup> ANISOVICH	17A	L+P $\gamma p, \pi^- p \rightarrow K \Lambda$
1910 $\pm$ 30	SOKHOYAN	15A	DPWA Multichannel
1910 $\pm$ 30	GUTZ	14	DPWA Multichannel
1910	SHKLYAR	13	DPWA Multichannel
1900 $\pm$ 30	ANISOVICH	12A	DPWA Multichannel

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.<sup>2</sup> Statistical error only.**-2xIMAGINARY PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>100 to 200 (<math>\approx</math> 150) OUR ESTIMATE</b>			
135 $^{+70}_{-30}$	ANISOVICH	17A	DPWA Multichannel
152 $\pm$ 40 $\pm$ 9	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
241	HUNT	19	DPWA Multichannel
166 $\pm$ 30	<sup>2</sup> ANISOVICH	17A	L+P $\gamma p, \pi^- p \rightarrow K \Lambda$
280 $\pm$ 50	SOKHOYAN	15A	DPWA Multichannel
280 $\pm$ 50	GUTZ	14	DPWA Multichannel
173	SHKLYAR	13	DPWA Multichannel
200 $^{+100}_{-60}$	ANISOVICH	12A	DPWA Multichannel

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.<sup>2</sup> Statistical error only. **$N(1900)$  ELASTIC POLE RESIDUE****MODULUS  $|r|$** 

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>2 to 6 (<math>\approx</math> 4) OUR ESTIMATE</b>			
4 $\pm$ 2	SOKHOYAN	15A	DPWA Multichannel
4 $\pm$ 1 $\pm$ 1	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
4 $\pm$ 2	GUTZ	14	DPWA Multichannel
10	SHKLYAR	13	DPWA Multichannel
3 $\pm$ 2	ANISOVICH	12A	DPWA Multichannel

<sup>1</sup> Fit to the amplitudes of HOEHLER 79.

**PHASE  $\theta$** 

<u>VALUE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>–50 to 10 (<math>\approx</math> –20) OUR ESTIMATE</b>			
–10 $\pm$ 40	SOKHOYAN	15A	DPWA Multichannel
–29 $\pm$ 15 $\pm$ 2	<sup>1</sup> SVARC	14	L+P $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
–10 $\pm$ 40	GUTZ	14	DPWA Multichannel
–64	SHKLYAR	13	DPWA Multichannel
10 $\pm$ 35	ANISOVICH	12A	DPWA Multichannel
<sup>1</sup> Fit to the amplitudes of HOEHLER 79.			

 **$N(1900)$  INELASTIC POLE RESIDUE**

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

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow N\eta$** 

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.05 $\pm$ 0.02	70 $\pm$ 60	ANISOVICH	12A	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow \Lambda K$** 

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.03 $\pm$ 0.02	90 $\pm$ 40	ANISOVICH	17A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.07 $\pm$ 0.03	135 $\pm$ 25	ANISOVICH	12A	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow \Sigma K$** 

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04 $\pm$ 0.02	110 $\pm$ 30	ANISOVICH	12A	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow N(1535)\pi$** 

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.04 $\pm$ 0.01	170 $\pm$ 30	GUTZ	14	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow \Delta(1232)\pi$ ,  $P$ -wave**

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.07 $\pm$ 0.04	–65 $\pm$ 30	SOKHOYAN	15A	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow \Delta(1232)\pi$ ,  $F$ -wave**

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.10 $\pm$ 0.05	80 $\pm$ 30	SOKHOYAN	15A	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow N(1520)\pi$** 

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.07 $\pm$ 0.04	–105 $\pm$ 35	SOKHOYAN	15A	DPWA Multichannel

**Normalized residue in  $N\pi \rightarrow N(1900) \rightarrow N\sigma$** 

<u>MODULUS</u>	<u>PHASE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.03 $\pm$ 0.02	–110 $\pm$ 35	SOKHOYAN	15A	DPWA Multichannel

**$N(1900)$  BREIT-WIGNER MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1890 to 1950 (<math>\approx</math> 1920) OUR ESTIMATE</b>			
1911 $\pm$ 6	<sup>1</sup> HUNT	19	DPWA Multichannel
1910 $\pm$ 30	SOKHOYAN	15A	DPWA Multichannel
1998 $\pm$ 3	<sup>1</sup> SHKLYAR	13	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1910 $\pm$ 30	GUTZ	14	DPWA Multichannel
1905 $\pm$ 30	ANISOVICH	12A	DPWA Multichannel
1900 $\pm$ 8	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
1951 $\pm$ 53	PENNER	02C	DPWA Multichannel
<sup>1</sup> Statistical error only.			

 **$N(1900)$  BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>100 to 320 (<math>\approx</math> 200) OUR ESTIMATE</b>			
292 $\pm$ 16	<sup>1</sup> HUNT	19	DPWA Multichannel
270 $\pm$ 50	SOKHOYAN	15A	DPWA Multichannel
359 $\pm$ 10	<sup>1</sup> SHKLYAR	13	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
270 $\pm$ 50	GUTZ	14	DPWA Multichannel
250 $^{+120}_{-50}$	ANISOVICH	12A	DPWA Multichannel
101 $\pm$ 15	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
622 $\pm$ 42	PENNER	02C	DPWA Multichannel
<sup>1</sup> Statistical error only.			

 **$N(1900)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\pi$	1–20 %
$\Gamma_2$ $N\eta$	2–14 %
$\Gamma_3$ $N\eta'$	4–8 %
$\Gamma_4$ $N\omega$	7–13 %
$\Gamma_5$ $\Lambda K$	2–20 %
$\Gamma_6$ $\Sigma K$	3–7 %
$\Gamma_7$ $N\pi\pi$	>56 %
$\Gamma_8$ $\Delta(1232)\pi$	30–70 %
$\Gamma_9$ $\Delta(1232)\pi$ , $P$ -wave	9–25 %
$\Gamma_{10}$ $\Delta(1232)\pi$ , $F$ -wave	21–45 %
$\Gamma_{11}$ $N\rho$ , $S=1/2$	25–40 %

$\Gamma_{12}$	$N\sigma$	1–7 %
$\Gamma_{13}$	$N(1520)\pi$	7–23 %
$\Gamma_{14}$	$N(1535)\pi$	4–10 %
$\Gamma_{15}$	$\Lambda K^*(892)$	< 0.2 %
$\Gamma_{16}$	$p\gamma$	0.001–0.025 %
$\Gamma_{17}$	$p\gamma$ , helicity=1/2	0.001–0.021 %
$\Gamma_{18}$	$p\gamma$ , helicity=3/2	<0.003 %
$\Gamma_{19}$	$n\gamma$	<0.040 %
$\Gamma_{20}$	$n\gamma$ , helicity=1/2	<0.007 %
$\Gamma_{21}$	$n\gamma$ , helicity=3/2	<0.033 %

### **$N(1900)$ BRANCHING RATIOS**

#### $\Gamma(N\pi)/\Gamma_{\text{total}}$ $\Gamma_1/\Gamma$

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1–20 % OUR ESTIMATE</b>			
1.9±0.1	<sup>1</sup> HUNT	19	DPWA Multichannel
3 ±2	SOKHOYAN	15A	DPWA Multichannel
25 ±1	<sup>1</sup> SHKLYAR	13	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
3 ±2	GUTZ	14	DPWA Multichannel
3 ±2	ANISOVICH	12A	DPWA Multichannel
7 ±4	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
16 ±2	PENNER	02C	DPWA Multichannel

<sup>1</sup>Statistical error only.

#### $\Gamma(N\eta)/\Gamma_{\text{total}}$ $\Gamma_2/\Gamma$

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2 ±2	MUELLER	20	DPWA Multichannel
1.3±0.5	<sup>1</sup> HUNT	19	DPWA Multichannel
2 ±2	<sup>1</sup> SHKLYAR	13	DPWA Multichannel
10 ±4	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
< 1	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
14 ±5	PENNER	02C	DPWA Multichannel

<sup>1</sup>Statistical error only.

#### $\Gamma(N\eta')/\Gamma_{\text{total}}$ $\Gamma_3/\Gamma$

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>4–8 % OUR ESTIMATE</b>			
6±2	ANISOVICH	17C	DPWA Multichannel

#### $\Gamma(N\omega)/\Gamma_{\text{total}}$ $\Gamma_4/\Gamma$

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
15±8	DENISENKO	16	DPWA Multichannel
10±3	<sup>1</sup> SHKLYAR	13	DPWA Multichannel

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

39 ± 9 PENNER 02C DPWA Multichannel

<sup>1</sup>Statistical error only.

**$\Gamma(\Lambda K)/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
13.7 ± 0.3	<sup>1</sup> HUNT 19	DPWA	Multichannel
16 ± 5	ANISOVICH 12A	DPWA	Multichannel
2.4 ± 0.3	<sup>1</sup> SHKLYAR 05	DPWA	Multichannel

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

14 ± 5 <sup>1</sup> SHRESTHA 12A DPWA Multichannel  
 5 to 15 NIKONOV 08 DPWA Multichannel  
 0.1 ± 0.1 PENNER 02C DPWA Multichannel

<sup>1</sup>Statistical error only.

**$\Gamma(\Sigma K)/\Gamma_{\text{total}}$   $\Gamma_6/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
5 ± 2	ANISOVICH 12A	DPWA	Multichannel

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

1 ± 1 PENNER 02C DPWA Multichannel

**$\Gamma(\Delta(1232)\pi, P\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_9/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
17 ± 8	SOKHOYAN 15A	DPWA	Multichannel

**$\Gamma(\Delta(1232)\pi, F\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{10}/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
33 ± 12	SOKHOYAN 15A	DPWA	Multichannel

**$\Gamma(N\rho, S=1/2)/\Gamma_{\text{total}}$   $\Gamma_{11}/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>25–40 % OUR ESTIMATE</b> 32 ± 7	<sup>1</sup> HUNT 19	DPWA	Multichannel

<sup>1</sup>Statistical error only.

**$\Gamma(N\sigma)/\Gamma_{\text{total}}$   $\Gamma_{12}/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4 ± 3	SOKHOYAN 15A	DPWA	Multichannel

**$\Gamma(N(1520)\pi)/\Gamma_{\text{total}}$   $\Gamma_{13}/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
15 ± 8	SOKHOYAN 15A	DPWA	Multichannel

**$\Gamma(N(1535)\pi)/\Gamma_{\text{total}}$   $\Gamma_{14}/\Gamma$**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7 ± 3	GUTZ 14	DPWA	Multichannel

$\Gamma(\Lambda K^*(892))/\Gamma_{\text{total}}$				$\Gamma_{15}/\Gamma$
VALUE (%)	DOCUMENT ID	TECN	COMMENT	
<b>&lt; 0.2 % OUR ESTIMATE</b>				
<0.2	ANISOVICH	17B	DPWA	Multichannel

### **$N(1900)$ PHOTON DECAY AMPLITUDES AT THE POLE**

#### **$N(1900) \rightarrow p\gamma$ , helicity-1/2 amplitude $A_{1/2}$**

MODULUS ( $\text{GeV}^{-1/2}$ )	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
$0.026 \pm 0.014$	$60 \pm 35$	SOKHOYAN	15A	DPWA Multichannel

#### **$N(1900) \rightarrow p\gamma$ , helicity-3/2 amplitude $A_{3/2}$**

MODULUS ( $\text{GeV}^{-1/2}$ )	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
$-0.070 \pm 0.030$	$70 \pm 50$	SOKHOYAN	15A	DPWA Multichannel

### **$N(1900)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES**

#### **$N(1900) \rightarrow p\gamma$ , helicity-1/2 amplitude $A_{1/2}$**

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
$0.040 \pm 0.004$	<sup>1</sup> HUNT	19	DPWA Multichannel
$0.024 \pm 0.014$	SOKHOYAN	15A	DPWA Multichannel
$-0.008 \pm 0.001$	<sup>1</sup> SHKLYAR	13	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$0.024 \pm 0.014$	GUTZ	14	DPWA Multichannel
$0.026 \pm 0.015$	ANISOVICH	12A	DPWA Multichannel
$0.041 \pm 0.008$	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
$-0.017$	PENNER	02D	DPWA Multichannel

<sup>1</sup>Statistical error only.

#### **$N(1900) \rightarrow p\gamma$ , helicity-3/2 amplitude $A_{3/2}$**

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
$-0.094 \pm 0.007$	<sup>1</sup> HUNT	19	DPWA Multichannel
$-0.067 \pm 0.030$	SOKHOYAN	15A	DPWA Multichannel
< 0.001	SHKLYAR	13	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$-0.067 \pm 0.030$	GUTZ	14	DPWA Multichannel
$-0.065 \pm 0.030$	ANISOVICH	12A	DPWA Multichannel
$-0.004 \pm 0.006$	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
0.031	PENNER	02D	DPWA Multichannel

<sup>1</sup>Statistical error only.

#### **$N(1900) \rightarrow n\gamma$ , helicity-1/2 amplitude $A_{1/2}$**

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
$0.007 \pm 0.014$	<sup>1</sup> HUNT	19	DPWA Multichannel
$0.000 \pm 0.030$	ANISOVICH	13B	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$-0.010 \pm 0.004$	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
$-0.016$	PENNER	02D	DPWA Multichannel

<sup>1</sup>Statistical error only.

**$N(1900) \rightarrow n\gamma$ , helicity-3/2 amplitude  $A_{3/2}$** 

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.007±0.011	<sup>1</sup> HUNT	19	DPWA Multichannel
-0.060±0.045	ANISOVICH	13B	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.011±0.007	<sup>1</sup> SHRESTHA	12A	DPWA Multichannel
-0.002	PENNER	02D	DPWA Multichannel
<sup>1</sup> Statistical error only.			

 **$N(1900)$  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	17C	PL B772 247	A.V. Anisovich <i>et al.</i>	
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.)
SVARC	14	PR C89 045205	A. Svarc <i>et al.</i>	(RBI Zagreb, UNI Tuzla)
ANISOVICH	13B	EPJ A49 67	A.V. Anisovich <i>et al.</i>	
SHKLYAR	13	PR C87 015201	V. Shklyar, H. Lenske, U. Mosel	(GIES)
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)
NIKONOV	08	PL B662 245	V.A. Nikonov <i>et al.</i>	(Bonn, Gatchina)
SHKLYAR	05	PR C72 015210	V. Shklyar, H. Lenske, U. Mosel	(GIES)
PENNER	02C	PR C66 055211	G. Penner, U. Mosel	(GIES)
PENNER	02D	PR C66 055212	G. Penner, U. Mosel	(GIES)
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT)