

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

The latest GWU analysis (ARNDT 06) finds no evidence for this resonance.

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

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1900±30 OUR ESTIMATE</b>			
1910±30	GUTZ	14	DPWA Multichannel
1998±3	SHKLYAR	13	DPWA Multichannel
1905±30	ANISOVICH	12A	DPWA Multichannel
1915±60	NIKONOV	08	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1900±8	SHRESTHA	12A	DPWA Multichannel
1951±53	PENNER	02C	DPWA Multichannel
1879±17	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

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

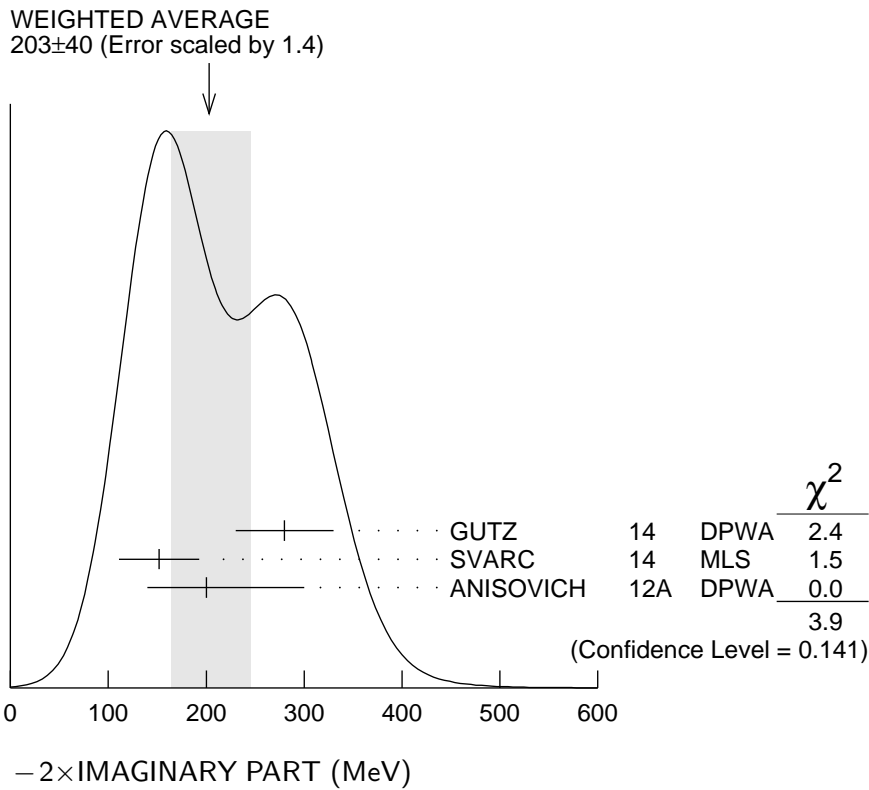
<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>200±50 OUR ESTIMATE</b>			
270±50	GUTZ	14	DPWA Multichannel
359±10	SHKLYAR	13	DPWA Multichannel
250 <sup>+120</sup> <sub>-50</sub>	ANISOVICH	12A	DPWA Multichannel
180±40	NIKONOV	08	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
101±15	SHRESTHA	12A	DPWA Multichannel
622±42	PENNER	02C	DPWA Multichannel
498±78	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

 **$N(1900)$  POLE POSITION****REAL PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1918±14 OUR AVERAGE</b>			
1910±30	GUTZ	14	DPWA Multichannel
1928±18±2	<sup>1</sup> SVARC	14	MLS $\pi N \rightarrow \pi N$
1900±30	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1910	SHKLYAR	13	DPWA Multichannel
1895	SHRESTHA	12A	DPWA Multichannel

## –2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>203± 40 OUR AVERAGE</b>	Error includes scale factor of 1.4. See the ideogram below.		
280± 50	GUTZ	14	DPWA Multichannel
152± 40±9	<sup>1</sup> SVARC	14	MLS $\pi N \rightarrow \pi N$
200 <sup>+100</sup> <sub>-60</sub>	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
173	SHKLYAR	13	DPWA Multichannel
100	SHRESTHA	12A	DPWA Multichannel



## N(1900) ELASTIC POLE RESIDUE

### MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
4±2	GUTZ	14	DPWA Multichannel
4±1±1	<sup>1</sup> SVARC	14	MLS $\pi N \rightarrow \pi N$
3±2	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
10	SHKLYAR	13	DPWA Multichannel

### PHASE $\theta$

<u>VALUE (<math>^{\circ}</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$-10 \pm 40$	GUTZ	14	DPWA Multichannel
$-29 \pm 15 \pm 2$	<sup>1</sup> SVARC	14	MLS $\pi N \rightarrow \pi N$
$10 \pm 35$	ANISOVICH	12A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$-64$	SHKLYAR	13	DPWA Multichannel

### 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>
$5 \pm 2$	$70 \pm 60$	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>
$7 \pm 3$	$135 \pm 25$	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>
$4 \pm 2$	$110 \pm 30$	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>
<b><math>4 \pm 1</math></b>	<b><math>170 \pm 30</math></b>	GUTZ	14	DPWA Multichannel

### N(1900) DECAY MODES

	<u>Mode</u>	<u>Fraction (<math>\Gamma_i/\Gamma</math>)</u>	<u>Scale factor</u>
$\Gamma_1$	$N\pi$	$\sim 5$ %	
$\Gamma_2$	$N\pi\pi$		
$\Gamma_3$	$N\rho, S=1/2, P\text{-wave}$		
$\Gamma_4$	$N\eta$	$\sim 12$ %	
$\Gamma_5$	$N\omega$	$(13 \pm 9)$ %	3.1
$\Gamma_6$	$N(1535)\pi$	$(7.0 \pm 3.0)$ %	
$\Gamma_7$	$\Lambda K$	0–10 %	
$\Gamma_8$	$\Sigma K$	$(5.0 \pm 2.0)$ %	
$\Gamma_9$	$p\gamma$		
$\Gamma_{10}$	$p\gamma, \text{ helicity}=1/2$		
$\Gamma_{11}$	$p\gamma, \text{ helicity}=3/2$		
$\Gamma_{12}$	$n\gamma$		
$\Gamma_{13}$	$n\gamma, \text{ helicity}=1/2$		
$\Gamma_{14}$	$n\gamma, \text{ helicity}=3/2$		

## 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>~ 5 OUR ESTIMATE</b>			
3±2	GUTZ	14	DPWA Multichannel
25±1	SHKLYAR	13	DPWA Multichannel
3±2	ANISOVICH	12A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
7±4	SHRESTHA	12A	DPWA Multichannel
2 to 9	NIKONOV	08	DPWA Multichannel
16±2	PENNER	02C	DPWA Multichannel
26±6	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

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

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>~ 12 OUR ESTIMATE</b>			
2±2	SHKLYAR	13	DPWA Multichannel
10±4	ANISOVICH	12A	DPWA Multichannel
14±5	PENNER	02C	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
< 1	SHRESTHA	12A	DPWA Multichannel

### $\Gamma(N\omega)/\Gamma_{\text{total}}$ $\Gamma_5/\Gamma$

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>13±9 OUR AVERAGE</b> Error includes scale factor of 3.1.			
10±3	SHKLYAR	13	DPWA Multichannel
39±9	PENNER	02C	DPWA Multichannel

### $\Gamma(N(1535)\pi)/\Gamma_{\text{total}}$ $\Gamma_6/\Gamma$

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

### $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1900) \rightarrow N\rho, S=1/2, P\text{-wave}$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.21±0.08	SHRESTHA	12A	DPWA Multichannel
-0.34±0.03	MANLEY	92	IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

### $\Gamma(\Lambda K)/\Gamma_{\text{total}}$ $\Gamma_7/\Gamma$

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0 to 10 OUR ESTIMATE</b>			
16 ±5	ANISOVICH	12A	DPWA Multichannel
2.4±0.3	SHKLYAR	05	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
14 ±5	SHRESTHA	12A	DPWA Multichannel
5 to 15	NIKONOV	08	DPWA Multichannel
0.1±0.1	PENNER	02C	DPWA Multichannel

$\Gamma(\Sigma K)/\Gamma_{\text{total}}$  $\Gamma_8/\Gamma$ 

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>5±2</b>	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1±1	PENNER	02C	DPWA Multichannel

 **$N(1900)$  PHOTON DECAY AMPLITUDES**

Papers on  $\gamma N$  amplitudes predating 1981 may be found in our 2006 edition, *Journal of Physics* **G33** 1 (2006).

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

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.024±0.014	GUTZ	14	DPWA Multichannel
0.026±0.015	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.008±0.001	SHKLYAR	13	DPWA Multichannel
0.041±0.008	SHRESTHA	12A	DPWA Multichannel
-0.017	PENNER	02D	DPWA Multichannel

 **$N(1900) \rightarrow p\gamma$ , 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>
-0.067±0.030	GUTZ	14	DPWA Multichannel
-0.065±0.030	ANISOVICH	12A	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
0. ±0.001	SHKLYAR	13	DPWA Multichannel
-0.004±0.006	SHRESTHA	12A	DPWA Multichannel
0.031	PENNER	02D	DPWA Multichannel

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

<u>VALUE (GeV<sup>-1/2</sup>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.000±0.030	ANISOVICH	13B	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.010±0.004	SHRESTHA	12A	DPWA Multichannel
-0.016	PENNER	02D	DPWA Multichannel

 **$N(1900) \rightarrow n\gamma$ , 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>
-0.060±0.045	ANISOVICH	13B	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.011±0.007	SHRESTHA	12A	DPWA Multichannel
-0.002	PENNER	02D	DPWA Multichannel

 **$N(1900)$  FOOTNOTES**

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

## N(1900) REFERENCES

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>	
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)
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)
PDG	06	JP G33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
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)
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KSA)
Also		PR D30 904	D.M. Manley <i>et al.</i>	(VPI)
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT)

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