

$N(1700) \ 3/2^-$ $I(J^P) = \frac{1}{2}(3/2^-)$ Status: ***Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics **C38** 070001 (2014). **$N(1700)$ POLE POSITION****REAL PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1650 to 1750 (≈ 1700) OUR ESTIMATE			
1780 \pm 35	SOKHOYAN	15A	DPWA Multichannel
1757 \pm 4 \pm 1	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
1660 \pm 30	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1770 \pm 40	ANISOVICH	12A	DPWA Multichannel
1662	SHRESTHA	12A	DPWA Multichannel
1806 \pm 23	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1704	VRANA	00	DPWA Multichannel
1700	HOEHLER	93	SPED $\pi N \rightarrow \pi N$

¹Fit to the amplitudes of HOEHLER 79.**-2 \times IMAGINARY PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
100 to 300 (≈ 200) OUR ESTIMATE			
420 \pm 140	SOKHOYAN	15A	DPWA Multichannel
136 \pm 7 \pm 4	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
90 \pm 40	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
420 \pm 180	ANISOVICH	12A	DPWA Multichannel
55	SHRESTHA	12A	DPWA Multichannel
129 \pm 33	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
156	VRANA	00	DPWA Multichannel
120	HOEHLER	93	SPED $\pi N \rightarrow \pi N$

¹Fit to the amplitudes of HOEHLER 79. **$N(1700)$ ELASTIC POLE RESIDUE****MODULUS $|r|$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
5 to 50 (≈ 10) OUR ESTIMATE			
60 \pm 30	SOKHOYAN	15A	DPWA Multichannel
7 \pm 1 \pm 1	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
6 \pm 3	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
50 \pm 40	ANISOVICH	12A	DPWA Multichannel
7	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
5	HOEHLER	93	SPED $\pi N \rightarrow \pi N$

¹Fit to the amplitudes of HOEHLER 79.

PHASE θ

<u>VALUE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
–120 to 0 (\approx – 90) OUR ESTIMATE			
–115 \pm 30	SOKHOYAN	15A	DPWA Multichannel
–113 \pm 4 \pm 2	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
0 \pm 50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
–100 \pm 40	ANISOVICH	12A	DPWA Multichannel
– 34	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
¹ Fit to the amplitudes of HOEHLER 79.			

 $N(1700)$ INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow \Delta\pi$, S-wave

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.33 \pm 0.10	–70 \pm 25	SOKHOYAN	15A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.34 \pm 0.21	–60 \pm 40	ANISOVICH	12A	DPWA Multichannel

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow \Delta\pi$, D-wave

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.10 \pm 0.06	75 \pm 30	SOKHOYAN	15A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.08 \pm 0.06	90 \pm 35	ANISOVICH	12A	DPWA Multichannel

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow N\sigma$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.13 \pm 0.08	–100 \pm 35	SOKHOYAN	15A	DPWA Multichannel

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow N(1440)\pi$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.13 \pm 0.05	40 \pm 35	SOKHOYAN	15A	DPWA Multichannel

Normalized residue in $N\pi \rightarrow N(1700) \rightarrow N(1520)\pi$, P-wave

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.07 \pm 0.03	160 \pm 45	SOKHOYAN	15A	DPWA Multichannel

 $N(1700)$ BREIT-WIGNER MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1650 to 1800 (\approx 1720) OUR ESTIMATE			
1800 \pm 35	SOKHOYAN	15A	DPWA Multichannel
1665 \pm 3	¹ SHRESTHA	12A	DPWA Multichannel
1675 \pm 25	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1731 \pm 15	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$

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

1790±40	ANISOVICH	12A	DPWA	Multichannel
1817±22	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
1736±33	VRANA	00	DPWA	Multichannel

¹Statistical error only.

N(1700) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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100 to 300 (≈ 200) OUR ESTIMATE

400±100	SOKHOYAN	15A	DPWA	Multichannel
56± 8	¹ SHRESTHA	12A	DPWA	Multichannel
90± 40	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
110± 30	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$

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

390±140	ANISOVICH	12A	DPWA	Multichannel
134± 37	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
175±133	VRANA	00	DPWA	Multichannel

¹Statistical error only.

N(1700) DECAY MODES

The following branching fractions are our estimates, not fits or averages.

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	7–17 %
Γ_2 $N\eta$	seen
Γ_3 $N\omega$	10–34 %
Γ_4 $N\pi\pi$	60–90 %
Γ_5 $\Delta(1232)\pi$	55–85 %
Γ_6 $\Delta(1232)\pi$, S-wave	50–80 %
Γ_7 $\Delta(1232)\pi$, D-wave	4–14 %
Γ_8 $N(1440)\pi$	3–11 %
Γ_9 $N(1520)\pi$	<4 %
Γ_{10} $N\rho$, S=3/2, S-wave	32–44 %
Γ_{11} $N\sigma$	2–14 %
Γ_{12} $p\gamma$	0.01–0.05 %
Γ_{13} $p\gamma$, helicity=1/2	0.0–0.024 %
Γ_{14} $p\gamma$, helicity=3/2	0.002–0.026 %
Γ_{15} $n\gamma$	0.01–0.13 %
Γ_{16} $n\gamma$, helicity=1/2	0.0–0.09 %
Γ_{17} $n\gamma$, helicity=3/2	0.01–0.05 %

$N(1700)$ BRANCHING RATIOS **$\Gamma(N\pi)/\Gamma_{\text{total}}$ Γ_1/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7 to 17 (≈ 12) OUR ESTIMATE			
15 ± 6	SOKHOYAN	15A	DPWA Multichannel
2.8 ± 0.5	¹ SHRESTHA	12A	DPWA Multichannel
11 ± 5	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
8 ± 3	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
12 ± 5	ANISOVICH	12A	DPWA Multichannel
9 ± 6	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
4 ± 2	VRANA	00	DPWA Multichannel

¹Statistical error only. **$\Gamma(N\eta)/\Gamma_{\text{total}}$ Γ_2/Γ**

<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. • • •			
14 ± 5	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
10 ± 5	THOMA	08	DPWA Multichannel
0 ± 1	VRANA	00	DPWA Multichannel

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

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
22 ± 12	DENISENKO	16	DPWA Multichannel

 $\Gamma(\Delta(1232)\pi, S\text{-wave})/\Gamma_{\text{total}}$ Γ_6/Γ

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
65 ± 15	SOKHOYAN	15A	DPWA Multichannel
31 ± 9	¹ SHRESTHA	12A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
72 ± 23	ANISOVICH	12A	DPWA Multichannel
11 ± 1	VRANA	00	DPWA Multichannel

¹Statistical error only. **$\Gamma(\Delta(1232)\pi, D\text{-wave})/\Gamma_{\text{total}}$ Γ_7/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
9 ± 5	SOKHOYAN	15A	DPWA Multichannel
3 ± 2	¹ SHRESTHA	12A	DPWA Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<10	ANISOVICH	12A	DPWA Multichannel
79 ± 56	VRANA	00	DPWA Multichannel

¹Statistical error only. **$\Gamma(N(1440)\pi)/\Gamma_{\text{total}}$ Γ_8/Γ**

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
7 ± 4	SOKHOYAN	15A	DPWA Multichannel

$\Gamma(N(1520)\pi)/\Gamma_{\text{total}}$ Γ_9/Γ

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

 $\Gamma(N\rho, S=3/2, S\text{-wave})/\Gamma_{\text{total}}$ Γ_{10}/Γ

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
38 ± 6	¹ SHRESTHA 12A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
7 ± 1	VRANA 00	DPWA	Multichannel

¹Statistical error only. $\Gamma(N\sigma)/\Gamma_{\text{total}}$ Γ_{11}/Γ

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
8 ± 6	SOKHOYAN 15A	DPWA	Multichannel
24 ± 6	¹ SHRESTHA 12A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
18 ± 12	THOMA 08	DPWA	Multichannel
0 ± 1	VRANA 00	DPWA	Multichannel

¹Statistical error only. **$N(1700)$ PHOTON DECAY AMPLITUDES AT THE POLE** **$N(1700) \rightarrow p\gamma$, 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>
0.047 ± 0.016	75 ± 30	SOKHOYAN 15A	DPWA	Multichannel

 $N(1700) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

<u>MODULUS ($\text{GeV}^{-1/2}$)</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
-0.041 ± 0.014	0 ± 20	SOKHOYAN 15A	DPWA	Multichannel

 $N(1700)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES **$N(1700) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$**

<u>VALUE ($\text{GeV}^{-1/2}$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.041 ± 0.017	ANISOVICH 12A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.021 ± 0.005	¹ SHRESTHA 12A	DPWA	Multichannel

¹Statistical error only. **$N(1700) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$**

<u>VALUE ($\text{GeV}^{-1/2}$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
-0.037 ± 0.014	SOKHOYAN 15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.034 ± 0.013	ANISOVICH 12A	DPWA	Multichannel
0.050 ± 0.009	¹ SHRESTHA 12A	DPWA	Multichannel

¹Statistical error only.

$N(1700) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.025 ± 0.010	ANISOVICH	13B	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.049 ± 0.008	¹ SHRESTHA	12A	DPWA Multichannel
¹ Statistical error only.			

$N(1700) \rightarrow n\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
-0.032 ± 0.018	ANISOVICH	13B	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.092 ± 0.014	¹ SHRESTHA	12A	DPWA Multichannel
¹ Statistical error only.			

$N(1700)$ REFERENCES

For early references, see Physics Letters **111B** 1 (1982).

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.)
PDG	14	CP C38 070001	K. Olive <i>et al.</i>	(PDG 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>	
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)
BATINIC	10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)
THOMA	08	PL B659 87	U. Thoma <i>et al.</i>	(CB-ELSA Collab.)
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT, ANL)
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
HOEHLER	79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP