$N(1675)\ 5/2^-$

$I(J^P) = \frac{1}{2}(\frac{5}{2}^-)$ Status: ∗∗∗∗

Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics **C38** 070001 (2014).

N(1675) POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1655 to 1665 (≈ 1660) OUR ESTIMATE				
1655± 4	SOKHOYAN	15A	DPWA	Multichannel
1654± 2	[1] SVARC	14	L+P	$\pi N \to \pi N$
1660±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1646	ROENCHEN	15A	DPWA	Multichannel
1640	SHKLYAR	13	DPWA	Multichannel
1654± 4	ANISOVICH	12A	DPWA	Multichannel
1656	SHRESTHA	12A	DPWA	Multichannel
1658± 9	BATINIC	10	DPWA	$\pi N \to N\pi, N\eta$
1657	ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
1674	VRANA	00	DPWA	Multichannel
1656	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
125 to 150 (≈ 135) OUR ESTIMATE				
147± 5	SOKHOYAN	15A	DPWA	Multichannel
125± 3±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
140±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
125	ROENCHEN	15A	DPWA	Multichannel
108	SHKLYAR	13	DPWA	Multichannel
151± 5	ANISOVICH	12A	DPWA	Multichannel
128	SHRESTHA	12A	DPWA	Multichannel
137± 7	BATINIC	10	DPWA	$\pi N \to N\pi, N\eta$
139	ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
120	VRANA	00	DPWA	Multichannel
126	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

N(1675) ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
23 to 33 (≈ 28) OUR ESTIMATE				
28±1	SOKHOYAN	15A	DPWA	Multichannel
23±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
31±5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$

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

24	ROENCHEN	15A	DPWA	Multichannel
20	SHKLYAR	13	DPWA	Multichannel
28±1	ANISOVICH	12A	DPWA	Multichannel
25	BATINIC	10	DPWA	$\pi N \rightarrow N\pi$, $N\eta$
27	ARNDT	06	DPWA	$\pi N \rightarrow \pi N$, ηN
23	HOEHLER	93	ARGD	$\pi N \rightarrow \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

PHASE θ

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−30 to −20 (≈ −25) OUR ESTIMATE				
−24± 4	SOKHOYAN	15A	DPWA	Multichannel
−25± 2	[1] SVARC	14	L+P	$\pi N \rightarrow \pi N$
−30±10	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−22	ROENCHEN	15A	DPWA	Multichannel
−49	SHKLYAR	13	DPWA	Multichannel
−26± 4	ANISOVICH	12A	DPWA	Multichannel
−16	BATINIC	10	DPWA	$\pi N \rightarrow N\pi$, $N\eta$
−21	ARNDT	06	DPWA	$\pi N \rightarrow \pi N$, ηN
−22	HOEHLER	93	ARGD	$\pi N \rightarrow \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

N(1675) INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(1675) \rightarrow \Delta\pi$, *D*-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.33±0.04	90 ± 15	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.33±0.05	82 ± 10	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1675) \rightarrow N\eta$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.044	−43	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1675) \rightarrow \Lambda K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.001	100	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1675) \rightarrow \Sigma K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.031	−175	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1675) \rightarrow N\sigma$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.13±0.03	125 ± 20	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.15±0.04	132 ± 18	ANISOVICH	12A	DPWA	Multichannel

N(1675) BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1665 to 1680 (≈ 1675) OUR ESTIMATE				
1663 ± 4	SOKHOYAN	15A	DPWA	Multichannel
1666 ± 2	[1] SHKLYAR	13	DPWA	Multichannel
1679 ± 1	[1] SHRESTHA	12A	DPWA	Multichannel
1674.1± 0.2	[1] ARNDT	06	DPWA	$\pi N \rightarrow \pi N$, ηN
1675 ±10	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
1679 ± 8	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1664 ± 5	ANISOVICH	12A	DPWA	Multichannel
1679 ± 9	BATINIC	10	DPWA	$\pi N \rightarrow N\pi$, $N\eta$
1685 ± 4	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

N(1675) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
130 to 160 (≈ 145) OUR ESTIMATE				
146 ± 6	SOKHOYAN	15A	DPWA	Multichannel
148 ± 1	[1] SHKLYAR	13	DPWA	Multichannel
145 ± 4	[1] SHRESTHA	12A	DPWA	Multichannel
146.5± 1.0	[1] ARNDT	06	DPWA	$\pi N \rightarrow \pi N$, ηN
160 ±20	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
120 ±15	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
152 ± 7	ANISOVICH	12A	DPWA	Multichannel
152 ± 8	BATINIC	10	DPWA	$\pi N \rightarrow N\pi$, $N\eta$
131 ±10	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

N(1675) DECAY MODES

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

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\pi$	38–42 %
Γ_2	$N\eta$	< 1 %
Γ_3	$N\pi\pi$	25–45 %
Γ_4	$\Delta(1232)\pi$	
Γ_5	$\Delta(1232)\pi$, D-wave	23–37 %

Γ_6	$N\sigma$	3–7 %
Γ_7	$p\gamma$	0–0.02 %
Γ_8	$p\gamma$, helicity=1/2	0–0.01 %
Γ_9	$p\gamma$, helicity=3/2	0–0.01 %
Γ_{10}	$n\gamma$	0–0.15 %
Γ_{11}	$n\gamma$, helicity=1/2	0–0.05 %
Γ_{12}	$n\gamma$, helicity=3/2	0–0.10 %

N(1675) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
38 to 42 (≈ 40) OUR ESTIMATE				
41 ±2	SOKHOYAN	15A	DPWA	Multichannel
41 ±1	[1] SHKLYAR	13	DPWA	Multichannel
38.6±0.6	[1] SHRESTHA	12A	DPWA	Multichannel
39.3±0.1	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
38 ±5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
38 ±3	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
40 ±3	ANISOVICH	12A	DPWA	Multichannel
35 ±4	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
35 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

$\Gamma(N\eta)/\Gamma_{total}$ Γ_2/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<1	SHKLYAR	13	DPWA	Multichannel
<1	SHRESTHA	12A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.1±0.1	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
3 ±3	THOMA	08	DPWA	Multichannel
0 ±1	VRANA	00	DPWA	Multichannel

$\Gamma(\Delta(1232)\pi$, D-wave$)/\Gamma_{total}$ Γ_5/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
30±7	SOKHOYAN	15A	DPWA	Multichannel
46±1	[1] SHRESTHA	12A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
33±8	ANISOVICH	12A	DPWA	Multichannel
63±2	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

$\Gamma(N\sigma)/\Gamma_{total}$ Γ_6/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5±2	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
7±3	ANISOVICH	12A	DPWA	Multichannel

N(1675) PHOTON DECAY AMPLITUDES AT THE POLE

$N(1675) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.022±0.003	−12 ± 7	SOKHOYAN	15A	DPWA	Multichannel
$0.022^{+0.004}_{-0.007}$	49^{+5}_{-2}	ROENCHEN	14	DPWA	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.032	36	ROENCHEN	15A	DPWA	Multichannel

$N(1675) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.028±0.006	−17 ± 6	SOKHOYAN	15A	DPWA	Multichannel
$0.036^{+0.004}_{-0.005}$	−30 ± 4	ROENCHEN	14	DPWA	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.051	−9.3	ROENCHEN	15A	DPWA	Multichannel

N(1675) BREIT-WIGNER PHOTON DECAY AMPLITUDES

$N(1675) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.010 to 0.025 (≈ 0.018) OUR ESTIMATE				
0.022±0.003	SOKHOYAN	15A	DPWA	Multichannel
0.009±0.001	[1] SHKLYAR	13	DPWA	Multichannel
0.013±0.001	[1] WORKMAN	12A	DPWA	$\gamma N \rightarrow N\pi$
0.018±0.002	[1] DUGGER	07	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.024±0.003	ANISOVICH	12A	DPWA	Multichannel
0.011±0.001	[1] SHRESTHA	12A	DPWA	Multichannel
0.015	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$

[1] Statistical error only.

$N(1675) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.015 to 0.030 (≈ 0.022) OUR ESTIMATE				
0.027±0.006	SOKHOYAN	15A	DPWA	Multichannel
0.021±0.001	[1] SHKLYAR	13	DPWA	Multichannel
0.016±0.001	[1] WORKMAN	12A	DPWA	$\gamma N \rightarrow N\pi$
0.021±0.001	[1] DUGGER	07	DPWA	$\gamma N \rightarrow \pi N$

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

0.025±0.007	ANISOVICH	12A	DPWA	Multichannel
0.020±0.001	[1] SHRESTHA	12A	DPWA	Multichannel
0.022	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$

[1] Statistical error only.

$N(1675) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
−0.065 to −0.055 (≈ − 0.060) OUR ESTIMATE				
−0.060±0.007	ANISOVICH	13B	DPWA	Multichannel
−0.058±0.002	[1] CHEN	12A	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.040±0.004	[1] SHRESTHA	12A	DPWA	Multichannel
−0.062	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$

[1] Statistical error only.

$N(1675) \rightarrow n\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
−0.095 to −0.075 (≈ − 0.085) OUR ESTIMATE				
−0.088±0.010	ANISOVICH	13B	DPWA	Multichannel
−0.080±0.005	[1] CHEN	12A	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.068±0.004	[1] SHRESTHA	12A	DPWA	Multichannel
−0.084	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$

[1] Statistical error only.

N(1675) REFERENCES

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

ROENCHEN	15A	EPJ A51 70	D. Roenchen et al.	
SOKHOYAN	15A	EPJ A51 95	V. Sokhoyan et al.	(CBELSA/TAPS Collab.)
PDG	14	CP C38 070001	K. Olive et al.	(PDG Collab.)
ROENCHEN	14	EPJ A50 101	D. Roenchen et al.	
Also		EPJ A51 63 (errat.)	D. Roenchen et al.	
SVARC	14	PR C89 045205	A. Svarc et al.	(RBI Zagreb, UNI Tuzla)
ANISOVICH	13B	EPJ A49 67	A.V. Anisovich et al.	
SHKLYAR	13	PR C87 015201	V. Shklyar, H. Lenske, U. Mosel	(GIES)
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich et al.	(BONN, PNPI)
CHEN	12A	PR C86 015206	W. Chen et al.	(DUKE, GWU, MSST, ITEP+)
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
WORKMAN	12A	PR C86 015202	R. Workman et al.	(GWU)
BATINIC	10	PR C82 038203	M. Batinic et al.	(ZAGR)
THOMA	08	PL B659 87	U. Thoma et al.	(CB-ELSA Collab.)
DRECHSEL	07	EPJ A34 69	D. Drechsel, S.S. Kamalov, L. Tiator	(MAINZ, JINR)
DUGGER	07	PR C76 025211	M. Dugger et al.	(JLab CLAS Collab.)
ARNDT	06	PR C74 045205	R.A. Arndt et al.	(GWU)
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 et al.	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky et al.	(CMU, LBL) IJP
HOEHLER	79	PDAT 12-1	G. Hohler et al.	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP