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

$I(J^P) = \frac{1}{2}(\frac{5}{2}^-)$ 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*
1650 to 1660 (≈ 1655) OUR ESTIMATE				
1652± 2	ROENCHEN	22	DPWA	Multichannel
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	HUNT	19	DPWA	Multichannel
1646	ROENCHEN	15A	DPWA	Multichannel
1640	SHKLYAR	13	DPWA	Multichannel
1654± 4	ANISOVICH	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*
120 to 150 (≈ 135) OUR ESTIMATE				
119± 1	ROENCHEN	22	DPWA	Multichannel
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. • • •				
146	HUNT	19	DPWA	Multichannel
125	ROENCHEN	15A	DPWA	Multichannel
108	SHKLYAR	13	DPWA	Multichannel
151± 5	ANISOVICH	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*
22 to 32 (≈ 26) OUR ESTIMATE				
22±1	ROENCHEN	22	DPWA	Multichannel
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	$\pi N \to N\pi$, $N\eta$
27	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
23	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

PHASE θ

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
−27 to −17 (≈ − 22) OUR ESTIMATE				
−17± 1	ROENCHEN	22	DPWA	Multichannel
−24± 4	SOKHOYAN	15A	DPWA	Multichannel
−25± 2	[1] SVARC	14	L+P	$\pi N \to \pi N$
−30±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • 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	$\pi N \to N\pi$, $N\eta$
−21	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
−22	HOEHLER	93	ARGD	$\pi N \to \pi N$

[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 $N\pi \to N(1675) \to \Delta\pi$, *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 $N\pi \to N(1675) \to N\eta$

MODULUS	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.063±0.005	−39 ± 1	ROENCHEN	22	DPWA	Multichannel
• • • 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*
0.001±0.001	174 ± 80	ROENCHEN	22	DPWA	Multichannel
• • • 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*
0.024±0.001	−166 ± 3	ROENCHEN	22	DPWA	Multichannel
• • • 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				
1669 ± 2	[1] HUNT	19	DPWA	Multichannel
1663 ± 4	SOKHOYAN	15A	DPWA	Multichannel
1666 ± 2	[1] SHKLYAR	13	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 ± 1	[1] SHRESTHA	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				
161 ± 8	[1] HUNT	19	DPWA	Multichannel
146 ± 6	SOKHOYAN	15A	DPWA	Multichannel
148 ± 1	[1] SHKLYAR	13	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
145 ± 4	[1] SHRESTHA	12A	DPWA	Multichannel

152	± 8	BATINIC	10	DPWA	$\pi N \to N\pi, N\eta$
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	ΛK	<0.04 %
Γ_4	$N\pi\pi$	25–45 %
Γ_5	$\Delta(1232)\pi$, *D*-wave	23–37 %
Γ_6	$N\rho$	0.1–0.9 %
Γ_7	$N\rho$, S=1/2	<0.2 %
Γ_8	$N\rho$, S=3/2 , *D*-wave	0.1–0.7 %
Γ_9	$N\sigma$	3–7 %
Γ_{10}	$p\gamma$	0–0.02 %
Γ_{11}	$p\gamma$, helicity=1/2	0–0.01 %
Γ_{12}	$p\gamma$, helicity=3/2	0–0.01 %
Γ_{13}	$n\gamma$	0–0.15 %
Γ_{14}	$n\gamma$, helicity=1/2	0–0.05 %
Γ_{15}	$n\gamma$, 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				
33 ±1	[1] HUNT	19	DPWA	Multichannel
41 ±2	SOKHOYAN	15A	DPWA	Multichannel
41 ±1	[1] SHKLYAR	13	DPWA	Multichannel
39.3±0.1	[1] ARNDT	06	DPWA	$\pi N \to \pi N, \eta N$
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
38.6±0.6	[1] SHRESTHA	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
0.5±0.5	MUELLER	20	DPWA	Multichannel
2.0±0.3	[1] HUNT	19	DPWA	Multichannel
<1	SHKLYAR	13	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1	[1] SHRESTHA	12A	DPWA	Multichannel
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

[1] Statistical error only.

$\Gamma(\Lambda K)/\Gamma_{total}$ Γ_3/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<0.04 % OUR ESTIMATE				
<0.04	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
58.3±0.2	[1] HUNT	19	DPWA	Multichannel
30 ±7	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
33 ±8	ANISOVICH	12A	DPWA	Multichannel
46 ±1	[1] SHRESTHA	12A	DPWA	Multichannel
63 ±2	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

$\Gamma(N\rho, S{=}1/2)/\Gamma_{total}$ Γ_7/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<0.2 % OUR ESTIMATE				
<0.2	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

$\Gamma(N\rho, S{=}3/2, D\text{-wave})/\Gamma_{total}$ Γ_8/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.1–0.7 % OUR ESTIMATE				
0.4±0.3	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

$\Gamma(N\sigma)/\Gamma_{total}$ Γ_9/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) → *pγ*, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($GeV^{-1/2}$)	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.025±0.002	−1.2 ± 3.9	ROENCHEN	22	DPWA	Multichannel
0.022±0.003	−12 ± 7	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.032	36	ROENCHEN	15A	DPWA	Multichannel

N(1675) → *pγ*, helicity-3/2 amplitude $A_{3/2}$

MODULUS ($GeV^{-1/2}$)	*PHASE* (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.051±0.002	−1.0 ± 1.9	ROENCHEN	22	DPWA	Multichannel
0.028±0.006	−17 ± 6	SOKHOYAN	15A	DPWA	Multichannel
• • • 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) → *pγ*, helicity-1/2 amplitude $A_{1/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.010 to 0.025 (≈ 0.018) OUR ESTIMATE				
0.026±0.002	[1] HUNT	19	DPWA	Multichannel
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	$\gamma N \to N\pi$
0.018±0.002	[1] DUGGER	07	DPWA	$\gamma N \to \pi N$
• • • 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	$\gamma N \to \pi N$

[1] Statistical error only.

N(1675) → *pγ*, helicity-3/2 amplitude $A_{3/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.015 to 0.030 (≈ 0.022) OUR ESTIMATE				
0.005±0.002	[1] HUNT	19	DPWA	Multichannel
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	$\gamma N \to N\pi$
0.021±0.001	[1] DUGGER	07	DPWA	$\gamma N \to \pi N$
• • • 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	$\gamma N \to \pi N$

[1] Statistical error only.

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

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
-0.065 to -0.055 (≈ -0.060) OUR ESTIMATE				
-0.069 ± 0.005	[1] HUNT	19	DPWA	Multichannel
-0.060 ± 0.007	ANISOVICH	13B	DPWA	Multichannel
-0.058 ± 0.002	[1] CHEN	12A	DPWA	$\gamma N \to \pi N$
• • • 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	$\gamma N \to \pi N$

[1] Statistical error only.

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

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
-0.095 to -0.075 (≈ -0.085) OUR ESTIMATE				
-0.031 ± 0.005	[1] HUNT	19	DPWA	Multichannel
-0.088 ± 0.010	ANISOVICH	13B	DPWA	Multichannel
-0.080 ± 0.005	[1] CHEN	12A	DPWA	$\gamma N \to \pi N$
• • • 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	$\gamma N \to \pi N$

[1] Statistical error only.

$N(1675)$ REFERENCES

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

ROENCHEN	22	EPJ A58 229	D. Roenchen *et al.*	(JULI, GWU, BONN+)
MUELLER	20	PL B803 135323	J. Mueller *et al.*	(CBELSA/TAPS Collab.)
HUNT	19	PR C99 055205	B.C. Hunt, D.M. Manley	
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.)
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