$N(1990)\ 7/2^+$

$I(J^P) = \frac{1}{2}(\frac{7}{2}^+)$ Status: **

OMITTED FROM SUMMARY TABLE

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

N(1990) POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1861± 5	ROENCHEN	22	DPWA	Multichannel
2030±65	ANISOVICH	12A	DPWA	Multichannel
1900±30	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1913	HUNT	19	DPWA	Multichannel
1738	ROENCHEN	15A	DPWA	Multichannel
2301	VRANA	00	DPWA	Multichannel

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
72± 3	ROENCHEN	22	DPWA	Multichannel
240±60	ANISOVICH	12A	DPWA	Multichannel
260±60	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
163	HUNT	19	DPWA	Multichannel
188	ROENCHEN	15A	DPWA	Multichannel
202	VRANA	00	DPWA	Multichannel

N(1990) ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.16±0.01	ROENCHEN	22	DPWA	Multichannel
2 ±1	ANISOVICH	12A	DPWA	Multichannel
9 ±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.3	ROENCHEN	15A	DPWA	Multichannel

PHASE θ

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
−119± 2	ROENCHEN	22	DPWA	Multichannel
125±65	ANISOVICH	12A	DPWA	Multichannel
− 60±30	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
− 70	ROENCHEN	15A	DPWA	Multichannel

$\Delta(1990)$ INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(1990) \rightarrow N\eta$

MODULUS	*PHASE (°)*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.048±0.001	**−43 ± 2**	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.013	−82	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1990) \rightarrow \Lambda K$

MODULUS	*PHASE (°)*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.004±0.001	**133 ± 2**	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.022	−111	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1990) \rightarrow \Sigma K$

MODULUS	*PHASE (°)*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.010±0.002	−54 ± 2	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.005	24	ROENCHEN	15A	DPWA	Multichannel

$N(1990)$ BREIT-WIGNER MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1950 to 2100 (≈ 2020) OUR ESTIMATE				
2028± 19	[1] HUNT	19	DPWA	Multichannel
2060± 65	ANISOVICH	12A	DPWA	Multichannel
1970± 50	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
2005±150	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1990± 45	[1] SHRESTHA	12A	DPWA	Multichannel
2311± 16	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

$N(1990)$ BREIT-WIGNER WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
200 to 400 (≈ 300) OUR ESTIMATE				
490±110	[1] HUNT	19	DPWA	Multichannel
240± 50	ANISOVICH	12A	DPWA	Multichannel
350±120	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
350±100	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
203±161	[1] SHRESTHA	12A	DPWA	Multichannel
205± 72	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

N(1990) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\pi$	2–6 %
Γ_2	$N\eta$	<3 %
Γ_3	ΛK	5.9–6.1 %
Γ_4	$p\gamma$	0.01–0.12%
Γ_5	$p\gamma$, helicity=1/2	0.003–0.042%
Γ_6	$p\gamma$, helicity=3/2	0.009–0.075 %
Γ_7	$n\gamma$	0.01–0.16 %
Γ_8	$n\gamma$, helicity=1/2	0.003–0.066 %
Γ_9	$n\gamma$, helicity=3/2	0.003–0.098 %

N(1990) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
2–6 % OUR ESTIMATE				
1.9± 0.4	[1] HUNT	19	DPWA	Multichannel
2 ± 1	ANISOVICH	12A	DPWA	Multichannel
6 ± 2	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
4 ± 2	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2 ± 1	[1] SHRESTHA	12A	DPWA	Multichannel
22 ±11	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

$\Gamma(N\eta)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<3 % OUR ESTIMATE				
1 ±1	MUELLER	20	DPWA	Multichannel
1.7±0.9	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5.9–6.1 % OUR ESTIMATE				
6.0±0.1	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

N(1990) PHOTON DECAY AMPLITUDES AT THE POLE

$N(1990) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
−0.030±0.008	−135 ± 13	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.029	67	ROENCHEN	15A	DPWA	Multichannel

$N(1990) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.018 ± 0.006	53 ± 16	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.033	39	ROENCHEN	15A	DPWA	Multichannel

$N(1990) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.032 ± 0.015	5 ± 20	ANISOVICH	17E	DPWA	Multichannel

$N(1990) \to n\gamma$, helicity-3/2 amplitude $A_{3/2}$

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.070 ± 0.025	0 ± 20	ANISOVICH	17E	DPWA	Multichannel

N(1990) BREIT-WIGNER PHOTON DECAY AMPLITUDES

$N(1990) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.006 ± 0.003	[1] HUNT	19	DPWA	Multichannel
0.040 ± 0.012	ANISOVICH	12A	DPWA	Multichannel

[1] Statistical error only.

$N(1990) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
-0.055 ± 0.008	[1] HUNT	19	DPWA	Multichannel
0.057 ± 0.012	ANISOVICH	12A	DPWA	Multichannel

[1] Statistical error only.

$N(1990) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
-0.027 ± 0.024	[1] HUNT	19	DPWA	Multichannel
-0.032 ± 0.015	ANISOVICH	17E	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.045 ± 0.020	ANISOVICH	13B	DPWA	Multichannel

[1] Statistical error only.

$N(1990) \to n\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.051 ± 0.020	[1] HUNT	19	DPWA	Multichannel
-0.072 ± 0.025	ANISOVICH	17E	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.052 ± 0.027	ANISOVICH	13B	DPWA	Multichannel

[1] Statistical error only.

N(1990) 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	
ANISOVICH	17E	PR C96 055202	A.V. Anisovich *et al.*	(BONN, PNPI, JLAB+)
ROENCHEN	15A	EPJ A51 70	D. Roenchen *et al.*	
PDG	14	CP C38 070001	K. Olive *et al.*	(PDG Collab.)
ANISOVICH	13B	EPJ A49 67	A.V. Anisovich *et al.*	
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich *et al.*	(BONN, PNPI)
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT, ANL)
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