

$N(1990) 7/2^+$  $I(J^P) = \frac{1}{2}(7/2^+)$  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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2030 ± 65	ANISOVICH 12A	DPWA	Multichannel
1900 ± 30	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$
● ● ● 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**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
240 ± 60	ANISOVICH 12A	DPWA	Multichannel
260 ± 60	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$
● ● ● 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  $|r|$** 

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2 ± 1	ANISOVICH 12A	DPWA	Multichannel
9 ± 3	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
4.3	ROENCHEN 15A	DPWA	Multichannel

**PHASE  $\theta$** 

<u>VALUE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
125 ± 65	ANISOVICH 12A	DPWA	Multichannel
− 60 ± 30	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$
● ● ● 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  $N\pi \rightarrow N(1990) \rightarrow N\eta$** 

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.013	− 82	ROENCHEN 15A	DPWA	Multichannel

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

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.022	-111	ROENCHEN	15A DPWA	Multichannel

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

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.005	24	ROENCHEN	15A DPWA	Multichannel

 **$N(1990)$  BREIT-WIGNER MASS**

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

<sup>1</sup>Statistical error only. **$N(1990)$  BREIT-WIGNER WIDTH**

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

<sup>1</sup>Statistical error only. **$N(1990)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\pi$	2–6 %
$\Gamma_2$ $N\eta$	<3 %
$\Gamma_3$ $\Lambda K$	5.9–6.1 %
$\Gamma_4$ $p\gamma$	0.01–0.12%
$\Gamma_5$ $p\gamma$ , helicity=1/2	0.003–0.042%
$\Gamma_6$ $p\gamma$ , helicity=3/2	0.009–0.075 %
$\Gamma_7$ $n\gamma$	0.01–0.16 %
$\Gamma_8$ $n\gamma$ , helicity=1/2	0.003–0.066 %
$\Gamma_9$ $n\gamma$ , helicity=3/2	0.003–0.098 %

**$N(1990)$  BRANCHING RATIOS**

$\Gamma(N\pi)/\Gamma_{\text{total}}$					$\Gamma_1/\Gamma$
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
<b>2-6 % OUR ESTIMATE</b>					
$1.9 \pm 0.4$	<sup>1</sup> HUNT	19	DPWA	Multichannel	
$2 \pm 1$	ANISOVICH	12A	DPWA	Multichannel	
$6 \pm 2$	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$	
$4 \pm 2$	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2 \pm 1$	<sup>1</sup> SHRESTHA	12A	DPWA	Multichannel	
$22 \pm 11$	VRANA	00	DPWA	Multichannel	
<sup>1</sup> Statistical error only.					

$\Gamma(N\eta)/\Gamma_{\text{total}}$					$\Gamma_2/\Gamma$
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
<b>&lt;3 % OUR ESTIMATE</b>					
$1 \pm 1$	MUELLER	20	DPWA	Multichannel	
$1.7 \pm 0.9$	<sup>1</sup> HUNT	19	DPWA	Multichannel	
<sup>1</sup> Statistical error only.					

$\Gamma(\Lambda K)/\Gamma_{\text{total}}$					$\Gamma_3/\Gamma$
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
<b>5.9-6.1 % OUR ESTIMATE</b>					
$6.0 \pm 0.1$	<sup>1</sup> HUNT	19	DPWA	Multichannel	
<sup>1</sup> Statistical error only.					

 **$N(1990)$  PHOTON DECAY AMPLITUDES AT THE POLE** **$N(1990) \rightarrow p\gamma$ , helicity-1/2 amplitude  $A_{1/2}$** 

MODULUS ( $\text{GeV}^{-1/2}$ )	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
$0.010^{+0.011}_{-0.006}$	$-103^{+108}_{-155}$	ROENCHEN	14	DPWA
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.029	67	ROENCHEN	15A	DPWA Multichannel

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

MODULUS ( $\text{GeV}^{-1/2}$ )	PHASE ( $^\circ$ )	DOCUMENT ID	TECN	COMMENT
$0.053^{+0.023}_{-0.028}$	$36^{+17}_{-4}$	ROENCHEN	14	DPWA
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.033	39	ROENCHEN	15A	DPWA Multichannel

 **$N(1990)$  BREIT-WIGNER PHOTON DECAY AMPLITUDES** **$N(1990) \rightarrow p\gamma$ , helicity-1/2 amplitude  $A_{1/2}$** 

VALUE ( $\text{GeV}^{-1/2}$ )	DOCUMENT ID	TECN	COMMENT
$0.006 \pm 0.003$	<sup>1</sup> HUNT	19	DPWA Multichannel
$0.040 \pm 0.012$	ANISOVICH	12A	DPWA Multichannel
<sup>1</sup> Statistical error only.			

**$N(1990) \rightarrow p\gamma$ , 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>
-0.055 ± 0.008	<sup>1</sup> HUNT	19	DPWA Multichannel
0.057 ± 0.012	ANISOVICH	12A	DPWA Multichannel

<sup>1</sup> Statistical error only. **$N(1990) \rightarrow n\gamma$ , 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>
-0.027 ± 0.024	<sup>1</sup> HUNT	19	DPWA Multichannel
-0.045 ± 0.020	ANISOVICH	13B	DPWA Multichannel

<sup>1</sup> Statistical error only. **$N(1990) \rightarrow n\gamma$ , 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>
0.051 ± 0.020	<sup>1</sup> HUNT	19	DPWA Multichannel
-0.052 ± 0.027	ANISOVICH	13B	DPWA Multichannel

<sup>1</sup> Statistical error only. **$N(1990)$  REFERENCES**For early references, see Physics Letters **111B** 1 (1982).

MUELLER	20	PL B803 135323	J. Mueller <i>et al.</i>	(CBELSA/TAPS Collab.)
HUNT	19	PR C99 055205	B.C. Hunt, D.M. Manley	
ROENCHEN	15A	EPJ A51 70	D. Roenchen <i>et al.</i>	
PDG	14	CP C38 070001	K. Olive <i>et al.</i>	(PDG Collab.)
ROENCHEN	14	EPJ A50 101	D. Roenchen <i>et al.</i>	
Also		EPJ A51 63 (errat.)	D. Roenchen <i>et al.</i>	
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)
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 <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