

$N(2220) \ 9/2^+$

$$I(J^P) = \frac{1}{2}(\frac{9}{2}^+) \text{ Status: } ****$$

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

NODE=B090

NODE=B090

NODE=B090215

NODE=B090RE
NODE=B090RE

→ UNCHECKED ←

NODE=B090RE;LINKAGE=SV

NODE=B090IM
NODE=B090IM

→ UNCHECKED ←

NODE=B090IM;LINKAGE=SV

NODE=B090220

NODE=B090RER
NODE=B090RER

→ UNCHECKED ←

NODE=B090RER;LINKAGE=SV

NODE=B090IMR
NODE=B090IMR

→ UNCHECKED ←

NODE=B090IMR;LINKAGE=SV

 $N(2220)$ POLE POSITION**REAL PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2130 to 2200 ($\approx$ 2150) OUR ESTIMATE			
2131 $\pm$ 6	ROENCHEN	22	DPWA Multichannel
2127 $\pm$ 3 $\pm$ 24	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
2150 $\pm$ 35	ANISOVICH	12A	DPWA Multichannel
2160 $\pm$ 80	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2171	ROENCHEN	15A	DPWA Multichannel
2199	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
2135	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$

¹ Fit to the amplitudes of HOEHLER 79.**−2×IMAGINARY PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
360 to 480 ($\approx$ 400) OUR ESTIMATE			
388 $\pm$ 6	ROENCHEN	22	DPWA Multichannel
380 $\pm$ 7 $\pm$ 22	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
440 $\pm$ 40	ANISOVICH	12A	DPWA Multichannel
480 $\pm$ 100	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
593	ROENCHEN	15A	DPWA Multichannel
372	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
400	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$

¹ Fit to the amplitudes of HOEHLER 79. **$N(2220)$ ELASTIC POLE RESIDUE****MODULUS $|r|$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
35 to 60 ($\approx$ 45) OUR ESTIMATE			
48 $\pm$ 5	ROENCHEN	22	DPWA Multichannel
38 $\pm$ 1 $\pm$ 5	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
60 $\pm$ 12	ANISOVICH	12A	DPWA Multichannel
45 $\pm$ 20	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
62	ROENCHEN	15A	DPWA Multichannel
33	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
40	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$

¹ Fit to the amplitudes of HOEHLER 79.**PHASE θ**

VALUE (°)	DOCUMENT ID	TECN	COMMENT
−60 to −10 ($\approx$ −40) OUR ESTIMATE			
−13 $\pm$ 2	ROENCHEN	22	DPWA Multichannel
−52 $\pm$ 1 $\pm$ 14	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
−58 $\pm$ 12	ANISOVICH	12A	DPWA Multichannel
−45 $\pm$ 25	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
−59	ROENCHEN	15A	DPWA Multichannel
−33	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
−50	HOEHLER	93	ARGD $\pi N \rightarrow \pi N$

¹ Fit to the amplitudes of HOEHLER 79.

$N(2220)$ INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(2220) \rightarrow N\eta$

MODULUS	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.042 ± 0.006	-48 ± 2	ROENCHEN 22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.004	-101	ROENCHEN 15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2220) \rightarrow \Lambda K$

MODULUS	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.020 ± 0.003	-60 ± 2	ROENCHEN 22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.007	62	ROENCHEN 15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2220) \rightarrow \Sigma K$

MODULUS	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.003 ± 0.008	-70 ± 2	ROENCHEN 22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.009	-128	ROENCHEN 15A	DPWA	Multichannel

 $N(2220)$ BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2200 to 2300 (≈ 2250) OUR ESTIMATE			
2316.3 ± 2.9	¹ ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$
2230 ± 80	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$
2205 ± 10	HOEHLER 79	IPWA	$\pi N \rightarrow \pi N$

¹ Statistical error only.

 $N(2220)$ BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
350 to 500 (≈ 400) OUR ESTIMATE			
633 ± 17	¹ ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$
500 ± 150	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$
365 ± 30	HOEHLER 79	IPWA	$\pi N \rightarrow \pi N$

¹ Statistical error only.

 $N(2220)$ DECAY MODES

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

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 \quad N\pi$	15–30 %

 $N(2220)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
15 to 30 (≈ 25) OUR ESTIMATE					
24 ± 5	ANISOVICH 12A	DPWA	Multichannel		
24.6 ± 0.1	¹ ARNDT 06	DPWA	$\pi N \rightarrow \pi N, \eta N$		
15 ± 3	CUTKOSKY 80	IPWA	$\pi N \rightarrow \pi N$		
18.0 ± 1.5	HOEHLER 79	IPWA	$\pi N \rightarrow \pi N$		

¹ Statistical error only.

 $N(2220)$ PHOTON DECAY AMPLITUDES AT THE POLE **$N(2220) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$**

MODULUS ($\text{GeV}^{-1/2}$)	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.357 ± 0.020	-91 ± 4	ROENCHEN 22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.135	114	ROENCHEN 15A	DPWA	Multichannel

NODE=B090250

NODE=B090250

NODE=B090A00
NODE=B090A00

NODE=B090A01
NODE=B090A01

NODE=B090A02
NODE=B090A02

NODE=B090M

NODE=B090M
→ UNCHECKED ←

NODE=B090M;LINKAGE=A

NODE=B090W

NODE=B090W
→ UNCHECKED ←

NODE=B090W;LINKAGE=A

NODE=B090225;NODE=B090

NODE=B090

DESIG=1;OUR EST

NODE=B090230

NODE=B090R1
NODE=B090R1
→ UNCHECKED ←

NODE=B090R1;LINKAGE=A

NODE=B090260

NODE=B090PA1
NODE=B090PA1

$N(2220) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

<i>MODULUS (GeV^{-1/2})</i>	<i>PHASE (°)</i>	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
−0.273±0.025	−102 ± 3	ROENCHEN	22 DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.082	−41	ROENCHEN	15A DPWA	Multichannel

NODE=B090PA2
NODE=B090PA2

$N(2220)$ REFERENCES

NODE=B090

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

NODE=B090

ROENCHEN	22	EPJ A58 229	D. Roenchen <i>et al.</i>	(JULI, GWU, BONN+)
ROENCHEN	15A	EPJ A51 70	D. Roenchen <i>et al.</i>	
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	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
ARNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)
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

REFID=61999
REFID=58183
REFID=55687
REFID=55775
REFID=54041
REFID=51535
REFID=43821
REFID=30064
REFID=40096
REFID=30058
REFID=30859