

$N(2190) \ 7/2^-$ $I(J^P) = \frac{1}{2}(\frac{7}{2}^-)$ Status: ****Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics C **38** 070001 (2014). **$N(2190)$ POLE POSITION****REAL PART**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2050 to 2100 (≈ 2075) OUR ESTIMATE			
2150 $\pm$ 25	SOKHOYAN	15A	DPWA Multichannel
2079 $\pm$ 4 $\pm$ 9	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
2070	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
2042	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
2100 $\pm$ 50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2150 $\pm$ 25	ANISOVICH	12A	DPWA Multichannel
2062	SHRESTHA	12A	DPWA Multichannel
2063 $\pm$ 32	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
2107	VRANA	00	DPWA Multichannel

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
400 to 520 (≈ 450) OUR ESTIMATE			
325 $\pm$ 25	SOKHOYAN	15A	DPWA Multichannel
509 $\pm$ 7 $\pm$ 16	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
520	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
482	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
400 $\pm$ 160	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
330 $\pm$ 30	ANISOVICH	12A	DPWA Multichannel
428	SHRESTHA	12A	DPWA Multichannel
330 $\pm$ 101	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
380	VRANA	00	DPWA Multichannel

 $N(2190)$ ELASTIC POLE RESIDUE**MODULUS $|r|$**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
25 to 70 (≈ 50) OUR ESTIMATE			
30 $\pm$ 4	SOKHOYAN	15A	DPWA Multichannel
54 $\pm$ 1 $\pm$ 3	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
72	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
45	HOEHLER	93	SPED $\pi N \rightarrow \pi N$
25 $\pm$ 10	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
30 $\pm$ 5	ANISOVICH	12A	DPWA Multichannel
34	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$

PHASE θ

VALUE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
−30 to 30 (≈ 0) OUR ESTIMATE			
28 ± 10	SOKHOYAN	15A	DPWA Multichannel
$-18 \pm 1 \pm 3$	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
-32	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
-30 ± 50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
30 ± 10	ANISOVICH	12A	DPWA Multichannel
-19	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$

 $N(2190)$ INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(2190) \rightarrow \Lambda K$

MODULUS	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.03 ± 0.01	20 ± 15	ANISOVICH	12A	DPWA Multichannel

Normalized residue in $N\pi \rightarrow N(2190) \rightarrow \Delta(1232)\pi$, D -wave

MODULUS	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.27 ± 0.04	-165 ± 20	SOKHOYAN	15A	DPWA Multichannel

Normalized residue in $N\pi \rightarrow N(2190) \rightarrow N\sigma$

MODULUS	PHASE ($^{\circ}$)	DOCUMENT ID	TECN	COMMENT
0.13 ± 0.05	50 ± 15	SOKHOYAN	15A	DPWA Multichannel

 $N(2190)$ BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2100 to 2200 (≈ 2190) OUR ESTIMATE			
2205 ± 18	SOKHOYAN	15A	DPWA Multichannel
2152.4 ± 1.4	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
2200 ± 70	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
2140 ± 12	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2180 ± 20	ANISOVICH	12A	DPWA Multichannel
2150 ± 26	SHRESTHA	12A	DPWA Multichannel
2125 ± 61	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
2168 ± 18	VRANA	00	DPWA Multichannel

 $N(2190)$ BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
300 to 700 (≈ 500) OUR ESTIMATE			
355 ± 30	SOKHOYAN	15A	DPWA Multichannel
484 ± 13	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
500 ± 150	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
390 ± 30	HOEHLER	79	IPWA $\pi N \rightarrow \pi N$

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

335 ± 40	ANISOVICH	12A	DPWA	Multichannel
500 ± 74	SHRESTHA	12A	DPWA	Multichannel
381 ± 160	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
453 ± 101	VRANA	00	DPWA	Multichannel

$N(2190)$ DECAY MODES

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

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	10–20 %
Γ_2 $N\eta$	seen
Γ_3 ΛK	0.2–0.8; %
Γ_4 $N\pi\pi$	22–80; %
Γ_5 $\Delta(1232)\pi$	
Γ_6 $\Delta(1232)\pi$, D -wave	19–31 %
Γ_7 $N\rho$	
Γ_8 $N\rho$, $S=3/2$, D -wave	seen
Γ_9 $N\sigma$	3–9 %
Γ_{10} $p\gamma$	0.014–0.077 %
Γ_{11} $p\gamma$, helicity=1/2	0.013–0.062; %
Γ_{12} $p\gamma$, helicity=3/2	0.001–0.014; %
Γ_{13} $n\gamma$	<0.04 %
Γ_{14} $n\gamma$, helicity=1/2	<0.01; %
Γ_{15} $n\gamma$, helicity=3/2	<0.03 %

$N(2190)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$					Γ_1/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
10 to 20 OUR ESTIMATE					
16 ± 2	SOKHOYAN	15A	DPWA	Multichannel	
23.8 ± 0.1	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$	
12 ± 6	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$	
14 ± 2	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
16 ± 2	ANISOVICH	12A	DPWA	Multichannel	
20 ± 1	SHRESTHA	12A	DPWA	Multichannel	
18 ± 12	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$	
20 ± 4	VRANA	00	DPWA	Multichannel	

$\Gamma(N\eta)/\Gamma_{\text{total}}$					Γ_2/Γ
VALUE (%)	DOCUMENT ID	TECN	COMMENT		
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2 ± 1	SHRESTHA	12A	DPWA	Multichannel	
0.1 ± 0.3	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$	
0 ± 1	VRANA	00	DPWA	Multichannel	

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
0.5 ± 0.3	ANISOVICH 12A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<1	SHRESTHA 12A	DPWA	Multichannel

 $\Gamma(\Delta(1232)\pi, D\text{-wave})/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
25 ± 6	SOKHOYAN 15A	DPWA	Multichannel

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
29 ± 28	VRANA 00	DPWA	Multichannel

 $\Gamma(N\sigma)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
6 ± 3	SOKHOYAN 15A	DPWA	Multichannel

 $N(2190)$ PHOTON DECAY AMPLITUDES AT THE POLE **$N(2190) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$**

MODULUS ($\text{GeV}^{-1/2}$)	PHASE ($^\circ$)	DOCUMENT ID	TECN	COMMENT
0.068 ± 0.005	-170 ± 12	SOKHOYAN 15A	DPWA	Multichannel

 $N(2190) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

MODULUS ($\text{GeV}^{-1/2}$)	PHASE ($^\circ$)	DOCUMENT ID	TECN	COMMENT
0.025 ± 0.010	22 ± 10	SOKHOYAN 15A	DPWA	Multichannel

 $N(2190)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES **$N(2190) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$**

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
-0.071 ± 0.006	SOKHOYAN 15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.065 ± 0.008	ANISOVICH 12A	DPWA	Multichannel

 $N(2190) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.027 ± 0.010	SOKHOYAN 15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.035 ± 0.017	ANISOVICH 12A	DPWA	Multichannel

 $N(2190) \rightarrow p\gamma$, ratio of helicity amplitudes $A_{3/2}/A_{1/2}$

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.17 ± 0.15	WILLIAMS 09	IPWA	$\gamma p \rightarrow p\omega$

$N(2190) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
-0.015 ± 0.013	ANISOVICH 13B	DPWA	Multichannel

 $N(2190) \rightarrow n\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
-0.034 ± 0.022	ANISOVICH 13B	DPWA	Multichannel

 $N(2190)$ FOOTNOTES

¹ Fit to the amplitudes of HOEHLER 79.

 $N(2190)$ REFERENCES

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

SOKHOYAN 15A	EPJ A51 95	V. Sokhoyan <i>et al.</i>	(CBELSA/TAPS Collab.)
PDG 14	CPC 38 070001	K. Olive <i>et al.</i>	(PDG Collab.)
SVARC 14	PR C89 045205	A. Svarc <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)
BATINIC 10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)
WILLIAMS 09	PR C80 065209	M. Williams <i>et al.</i>	(JLab CLAS Collab.)
ARNDT 06	PR C74 045205	R.A. Arndt <i>et al.</i>	(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 <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