$N(2190)$ $7/2^-$

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

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

N(2190) POLE POSITION

REAL PART

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

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
400 to 520 (≈ 450) OUR ESTIMATE				
325± 25	SOKHOYAN	15A	DPWA	Multichannel
509± 7±16	[1] SVARC	14	L+P	$\pi N \to \pi N$
520	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
482	HOEHLER	93	SPED	$\pi N \to \pi N$
400±160	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
330± 30	ANISOVICH	12A	DPWA	Multichannel
428	SHRESTHA	12A	DPWA	Multichannel
330±101	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
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± 4	SOKHOYAN	15A	DPWA	Multichannel
54± 1±3	[1] SVARC	14	L+P	$\pi N \to \pi N$
72	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
45	HOEHLER	93	SPED	$\pi N \to \pi N$
25±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
30± 5	ANISOVICH	12A	DPWA	Multichannel
34	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$

PHASE θ

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

N(2190) INELASTIC POLE RESIDUE

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

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.03±0.01	20 ± 15	ANISOVICH	12A	DPWA	Multichannel

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.27±0.04	−165 ± 20	SOKHOYAN	15A	DPWA	Multichannel

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

MODULUS	PHASE (°)	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	$\pi N \to \pi N$, ηN
2200 ±70	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
2140 ±12	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • 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	$\pi N \to N\pi$, $N\eta$
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	$\pi N \to \pi N$, ηN
500±150	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
390± 30	HOEHLER	79	IPWA	$\pi N \to \pi N$

• • • 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	$N\omega$	
Γ_4	ΛK	0.2–0.8;%
Γ_5	$N\pi\pi$	22–80;%
Γ_6	$\Delta(1232)\pi$	
Γ_7	$\Delta(1232)\pi$, D-wave	19–31 %
Γ_8	$N\rho$	
Γ_9	$N\rho$, S=3/2, D-wave	seen
Γ_{10}	$N\sigma$	3–9 %
Γ_{11}	$p\gamma$	0.014–0.077 %
Γ_{12}	$p\gamma$, helicity=1/2	0.013–0.062;%
Γ_{13}	$p\gamma$, helicity=3/2	0.001–0.014;%
Γ_{14}	$n\gamma$	<0.04 %
Γ_{15}	$n\gamma$, helicity=1/2	<0.01;%
Γ_{16}	$n\gamma$, helicity=3/2	<0.03 %

N(2190) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ — 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	$\pi N \rightarrow \pi N$, ηN
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

$\Gamma(N\eta)/\Gamma_{total}$ — 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	$\pi N \to N\pi$, $N\eta$
0 ±1	VRANA	00	DPWA	Multichannel

$\Gamma(N\omega)/\Gamma_{total}$ — Γ_3/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
14±6	DENISENKO	16	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	WILLIAMS	09	IPWA	$\gamma p \to p\omega$

$\Gamma(\Lambda K)/\Gamma_{total}$ — Γ_4/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-wave$)/\Gamma_{total}$ — Γ_7/Γ

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

$\Gamma(N\rho$, S=3/2, D-wave$)/\Gamma_{total}$ — Γ_9/Γ

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

$\Gamma(N\sigma)/\Gamma_{total}$ — Γ_{10}/Γ

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

N(2190) PHOTON DECAY AMPLITUDES AT THE POLE

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

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.068±0.005	−170 ± 12	SOKHOYAN	15A	DPWA	Multichannel
$-0.083^{+0.007}_{-0.003}$	-11^{+6}_{-2}	ROENCHEN	14	DPWA	

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

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.025±0.010	22 ± 10	SOKHOYAN	15A	DPWA	Multichannel
$0.095^{+0.013}_{-0.010}$	-3^{+3}_{-5}	ROENCHEN	14	DPWA	

N(2190) BREIT-WIGNER PHOTON DECAY AMPLITUDES

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

VALUE ($GeV^{-1/2}$)	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) → $p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE ($GeV^{-1/2}$)	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) → $p\gamma$, 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	$\gamma p \to p\omega$

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

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

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

VALUE ($GeV^{-1/2}$)	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).

DENISENKO	16	PL B755 97	I. Denisenko *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.)
ROENCHEN	14	EPJ A50 101	D. Roenchen *et al.*	
Also		EPJ A51 63 (errat.)	D. Roenchen *et al.*	
SVARC	14	PR C89 045205	A. Svarc *et al.*	
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)
BATINIC	10	PR C82 038203	M. Batinic *et al.*	(ZAGR)
WILLIAMS	09	PR C80 065209	M. Williams *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