$N(2060)\ 5/2^-$

$I(J^P) = \frac{1}{2}(\frac{5}{2}^-)$ Status: **

OMITTED FROM SUMMARY TABLE

Before our 2012 *Review*, this state appeared in our Listings as the $N(2200)$.

$N(2060)$ POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2030 ± 15	SOKHOYAN	15A	DPWA	Multichannel
$2119 \pm 11 \pm 1$	[1] SVARC	14	L+P	$\pi N \to \pi N$
2100 ± 60	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2040 ± 15	ANISOVICH	12A	DPWA	Multichannel
2064	SHRESTHA	12A	DPWA	Multichannel
2144 ± 31	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$

$-2\times$IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
400 ± 35	SOKHOYAN	15A	DPWA	Multichannel
$370 \pm 20 \pm 5$	[1] SVARC	14	L+P	$\pi N \to \pi N$
360 ± 80	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
390 ± 25	ANISOVICH	12A	DPWA	Multichannel
267	SHRESTHA	12A	DPWA	Multichannel
438 ± 13	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$

$N(2060)$ ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
25 ± 8	SOKHOYAN	15A	DPWA	Multichannel
$19 \pm 1 \pm 1$	[1] SVARC	14	L+P	$\pi N \to \pi N$
20 ± 10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
19 ± 5	ANISOVICH	12A	DPWA	Multichannel
26	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$

PHASE θ

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
-130 ± 20	SOKHOYAN	15A	DPWA	Multichannel
$-\ 94 \pm 5 \pm 1$	[1] SVARC	14	L+P	$\pi N \to \pi N$
$-\ 90 \pm 50$	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-125 ± 20	ANISOVICH	12A	DPWA	Multichannel
$-\ 71$	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$

N(2060) INELASTIC POLE RESIDUE

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

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow N\eta$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.05±0.03	40 ± 25	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow \Lambda K$

MODULUS	DOCUMENT ID		TECN	COMMENT
0.01±0.005	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow \Sigma K$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.04±0.02	−70 ± 30	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow \Delta(1232)\pi$, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.06±0.03	−90 ± 40	SOKHOYAN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow N\sigma$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.12±0.06	80 ± 40	SOKHOYAN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow N(1440)\pi$

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.17±0.09	−60 ± 35	SOKHOYAN	15A	DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(2060) \rightarrow N(1520)\pi$, P-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.14±0.06	−45 ± 15	SOKHOYAN	15A	DPWA	Multichannel

N(2060) BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2045±15	SOKHOYAN	15A	DPWA	Multichannel
2180±80	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
2228±30	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2060±15	ANISOVICH	12A	DPWA	Multichannel
2116±21	SHRESTHA	12A	DPWA	Multichannel
2217±27	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$

N(2060) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
420± 30	SOKHOYAN	15A	DPWA	Multichannel
400±100	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
310± 50	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$

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

375± 25	ANISOVICH	12A	DPWA	Multichannel
307±112	SHRESTHA	12A	DPWA	Multichannel
481± 17	BATINIC	10	DPWA	$\pi N \to N\pi, N\eta$

$N(2060)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\pi$	7–12 %
Γ_2	$N\eta$	2–6 %
Γ_3	$N\omega$	
Γ_4	ΛK	seen
Γ_5	ΣK	1–5 %
Γ_6	$N\pi\pi$	
Γ_7	$\Delta(1232)\pi$	
Γ_8	$\Delta(1232)\pi$, D-wave	4–10 %
Γ_9	$N\rho$	
Γ_{10}	$N\rho$, S=1/2, P-wave	seen
Γ_{11}	$N\sigma$	3–9 %
Γ_{12}	$N(1440)\pi$	4–14 %
Γ_{13}	$N(1520)\pi$, P-wave	9–21 %
Γ_{14}	$N(1680)\pi$, S-wave	8–22 %
Γ_{15}	$p\gamma$	0.03–0.19 %
Γ_{16}	$p\gamma$, helicity=1/2	0.02–0.08 %
Γ_{17}	$p\gamma$, helicity=3/2	0.01–0.10 %
Γ_{18}	$n\gamma$	0.003–0.07 %
Γ_{19}	$n\gamma$, helicity=1/2	0.001–0.02 %
Γ_{20}	$n\gamma$, helicity=3/2	0.002–0.05 %

$N(2060)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
11±2	SOKHOYAN	15A	DPWA	Multichannel
10±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
7±2	HOEHLER	79	IPWA	$\pi N \to \pi N$

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

8±2	ANISOVICH	12A	DPWA	Multichannel
9±2	SHRESTHA	12A	DPWA	Multichannel
13±4	BATINIC	10	DPWA	$\pi N \to N\pi, N\eta$

$\Gamma(N\eta)/\Gamma_{total}$ Γ_2/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
4 ±2	ANISOVICH	12A	DPWA	Multichannel

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

<1	SHRESTHA	12A	DPWA	Multichannel
0.2±1.0	BATINIC	10	DPWA	$\pi N \to N\pi, N\eta$

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

VALUE (%)	DOCUMENT ID		TECN	COMMENT
4±3	DENISENKO	16	DPWA	Multichannel

$\Gamma(\Sigma K)/\Gamma_{total}$ Γ_5/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3±2	ANISOVICH	12A	DPWA	Multichannel

$\Gamma(\Delta(1232)\pi$, D-wave$)/\Gamma_{total}$ Γ_8/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
7± 3	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
40±13	SHRESTHA	12A	DPWA	Multichannel

$\Gamma(N\rho$, S=1/2, P-wave$)/\Gamma_{total}$ Γ_{10}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
21±15	SHRESTHA	12A	DPWA	Multichannel

$\Gamma(N\sigma)/\Gamma_{total}$ Γ_{11}/Γ

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

$\Gamma(N(1440)\pi)/\Gamma_{total}$ Γ_{12}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
9±5	SOKHOYAN	15A	DPWA	Multichannel

$\Gamma(N(1520)\pi$, P-wave$)/\Gamma_{total}$ Γ_{13}/Γ

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

$\Gamma(N(1680)\pi$, S-wave$)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
15±7	SOKHOYAN	15A	DPWA	Multichannel

$N(2060)$ PHOTON DECAY AMPLITUDES AT THE POLE

$N(2060) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.064±0.010	12 ± 8	SOKHOYAN	15A	DPWA	Multichannel

$N(2060) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.060±0.020	13 ± 10	SOKHOYAN	15A	DPWA	Multichannel

N(2060) BREIT-WIGNER PHOTON DECAY AMPLITUDES

N(2060) → *pγ*, helicity-1/2 amplitude $A_{1/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.062±0.010	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.018±0.004	SHRESTHA	12A	DPWA	Multichannel

N(2060) → *pγ*, helicity-3/2 amplitude $A_{3/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.062±0.020	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.010±0.004	SHRESTHA	12A	DPWA	Multichannel

N(2060) → *nγ*, helicity-1/2 amplitude $A_{1/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.025±0.011	ANISOVICH	13B	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.012±0.017	SHRESTHA	12A	DPWA	Multichannel

N(2060) → *nγ*, helicity-3/2 amplitude $A_{3/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
−0.037±0.017	ANISOVICH	13B	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.023±0.023	SHRESTHA	12A	DPWA	Multichannel

N(2060) FOOTNOTES

[1] Fit to the amplitudes of HOEHLER 79.

N(2060) REFERENCES

DENISENKO	16	PL B755 97	I. Denisenko *et al.*	
SOKHOYAN	15A	EPJ A51 95	V. Sokhoyan *et al.*	(CBELSA/TAPS Collab.)
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)
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky *et al.*	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky *et al.*	(CMU, LBL)
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP