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

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

OMITTED FROM SUMMARY TABLE

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

The latest GWU analysis (ARNDT 06) finds no evidence for this resonance.

$N(2060)$ BREIT-WIGNER MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
≈ 2060 OUR ESTIMATE				
2060±15	ANISOVICH	12A	DPWA	Multichannel
1900	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
2180±80	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
1920	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
2228±30	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2116±21	SHRESTHA	12A	DPWA	Multichannel
2217±27	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$

$N(2060)$ BREIT-WIGNER WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
375± 25	ANISOVICH	12A	DPWA	Multichannel
130	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
400±100	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
220	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
310± 50	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
307±112	SHRESTHA	12A	DPWA	Multichannel
481± 17	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$

$N(2060)$ POLE POSITION

REAL PART

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

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
370±20±5	[1] SVARC	14	MLS	$\pi N \to \pi N$
390±25	ANISOVICH	12A	DPWA	Multichannel
360±80	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
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
19± 1±1	[1] SVARC	14	MLS	$\pi N \to \pi N$
19± 5	ANISOVICH	12A	DPWA	Multichannel
20±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
26	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$

PHASE θ

VALUE (°)	DOCUMENT ID		TECN	COMMENT
− 94± 5±1	[1] SVARC	14	MLS	$\pi N \to \pi N$
−125±20	ANISOVICH	12A	DPWA	Multichannel
− 90±50	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
− 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 $N\pi \to N(2060) \to N\eta$

MODULUS (%)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
5±3	40 ± 25	ANISOVICH	12A	DPWA	Multichannel

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

MODULUS (%)	DOCUMENT ID		TECN	COMMENT
1±0.5	ANISOVICH	12A	DPWA	Multichannel

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

MODULUS (%)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
4±2	−70 ± 30	ANISOVICH	12A	DPWA	Multichannel

$N(2060)$ DECAY MODES

	Mode
Γ_1	$N\pi$
Γ_2	$N\eta$
Γ_3	ΛK
Γ_4	ΣK
Γ_5	$N\pi\pi$
Γ_6	$\Delta\pi$
Γ_7	$\Delta(1232)\pi$, D-wave
Γ_8	$N\rho$
Γ_9	$N\rho$, S=1/2
Γ_{10}	$N\rho$, S=3/2, D-wave
Γ_{11}	$p\gamma$
Γ_{12}	$p\gamma$, helicity=1/2
Γ_{13}	$p\gamma$, helicity=3/2
Γ_{14}	$n\gamma$
Γ_{15}	$n\gamma$, helicity=1/2
Γ_{16}	$n\gamma$, helicity=3/2

$N(2060)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
8±2	ANISOVICH	12A	DPWA	Multichannel
10±3	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
7±2	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9±2	SHRESTHA	12A	DPWA	Multichannel
13±4	BATINIC	10	DPWA	$\pi N \rightarrow N\pi$, $N\eta$

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2060) \rightarrow N\eta$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.066	BAKER	79	DPWA	$\pi^- p \rightarrow n\eta$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2060) \to \Lambda K$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.03	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
−0.05	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.00±0.03	SHRESTHA	12A	DPWA	Multichannel

$\Gamma(\Sigma K)/\Gamma_{total}$ Γ_4/Γ

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

$\Gamma(\Delta(1232)\pi, D\text{-wave})/\Gamma_{total}$ Γ_7/Γ

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

$\Gamma(N\rho, S=1/2)/\Gamma_{total}$ Γ_9/Γ

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

$\Gamma(N\rho, S=3/2, D\text{-wave})/\Gamma_{total}$ Γ_{10}/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<9	SHRESTHA	12A	DPWA	Multichannel

N(2060) PHOTON DECAY AMPLITUDES

Papers on γN amplitudes predating 1981 may be found in our 2006 edition, Journal of Physics **G33** 1 (2006).

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

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.065±0.012	[2] ANISOVICH	12A	DPWA	Phase = (15 ± 8)°
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.018±0.004	SHRESTHA	12A	DPWA	Multichannel

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

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.055^{+15}_{-35}	[2] ANISOVICH	12A	DPWA	Phase = (15 ± 10)°
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.010± 0.004	SHRESTHA	12A	DPWA	Multichannel

$N(2060) \to n\gamma$, 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

$N(2060) \to n\gamma$, 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.
[2] This ANISOVICH 12A value is the complex helicity amplitude at the pole position.

N(2060) REFERENCES

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)
ARNDT	06	PR C74 045205	R.A. Arndt *et al.*	(GWU)
PDG	06	JP G33 1	W.-M. Yao *et al.*	(PDG Collab.)
BELL	83	NP B222 389	K.W. Bell *et al.*	(RL) IJP
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky *et al.*	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky *et al.*	(CMU, LBL)
SAXON	80	NP B162 522	D.H. Saxon *et al.*	(RHEL, BRIS) IJP
BAKER	79	NP B156 93	R.D. Baker *et al.*	(RHEL) IJP
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP