$N(1860)\ 5/2^+$

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

OMITTED FROM SUMMARY TABLE

Before the 2012 *Review*, all the evidence for a $J^P = 5/2^+$ state with a mass above 1800 MeV was filed under a two-star $N(2000)$. There is now some evidence from ANISOVICH 12A for two $5/2^+$ states in this region, so we have split the older data (according to mass) between two two-star $5/2^+$ states, an $N(1860)$ and an $N(2000)$.

N(1860) BREIT-WIGNER MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1820 to 1960 (≈ 1860) OUR ESTIMATE				
$1860\ ^{+120}_{-\ 60}$	ANISOVICH	12A	DPWA	Multichannel
1817.7	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
1903 ± 87	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
1882 ± 10	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1814	ARNDT	95	DPWA	$\pi N \to N\pi$

N(1860) BREIT-WIGNER WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$270\ ^{+140}_{-\ 50}$	ANISOVICH	12A	DPWA	Multichannel
117.6	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
490 ±310	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
95 ± 20	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
176	ARNDT	95	DPWA	$\pi N \to N\pi$

N(1860) POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$1830^{+120}_{-\ 60}$	ANISOVICH	12A	DPWA	Multichannel
1807	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$250^{+150}_{-\ 50}$	ANISOVICH	12A	DPWA	Multichannel
109	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$

N(1860) ELASTIC POLE RESIDUE

MODULUS |r|

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
50±20	ANISOVICH	12A	DPWA	Multichannel
60	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN

PHASE θ

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−80±40	ANISOVICH	12A	DPWA	Multichannel
−67	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN

N(1860) DECAY MODES

	Mode
Γ_1	$N\pi$
Γ_2	$N\pi\pi$
Γ_3	$\Delta(1232)\pi$, P-wave
Γ_4	$N\rho$, S=3/2, P-wave
Γ_5	$N\rho$, S=3/2, F-wave

N(1860) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
20 ±6	ANISOVICH	12A	DPWA	Multichannel
12.7	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
8 ±5	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
4 ±2	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10	ARNDT	95	DPWA	$\pi N \to N\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(1860) \to \Delta(1232)\pi$, P-wave $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+0.10±0.06	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(1860) \to N\rho$, S=3/2, P-wave $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.22±0.08	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(1860) \to N\rho$, S=3/2, F-wave $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+0.11±0.06	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

N(1860) PHOTON DECAY AMPLITUDES

N(1860) → $p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE ($GeV^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
0.020 ± 0.012	[1] ANISOVICH	12A	DPWA	Phase = $(120 \pm 50)^\circ$

N(1860) → $p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.050 ± 0.020	[1] ANISOVICH	12A	DPWA	Phase = $(-80 \pm 60)^\circ$

N(1860) FOOTNOTES

[1] This ANISOVICH 12A value is the complex helicity amplitude at the pole position.

N(1860) REFERENCES

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich *et al.*	(BONN, PNPI)
ARNDT	06	PR C74 045205	R.A. Arndt *et al.*	(GWU)
ARNDT	95	PR C52 2120	R.A. Arndt *et al.*	(VPI, BRCO)
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KENT)
Also		PR D30 904	D.M. Manley *et al.*	(VPI)
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT)