$N(2190)\ G_{17}$

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

Most of the results published before 1975 were last included in our 1982 edition, Physics Letters **111B** 1 (1982). Some further obsolete results published before 1980 were last included in our 2006 edition, Journal of Physics, G **33** 1 (2006).

N(2190) BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2100 to 2200 (≈ 2190) OUR ESTIMATE				
2152.4± 1.4	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
2127 ± 9	MANLEY	92	IPWA	$\pi N \rightarrow \pi N$ & $N\pi\pi$
2200 ±70	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
2140 ±12	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
2140 ±40	HENDRY	78	MPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2192.1± 8.7	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
2168 ±18	VRANA	00	DPWA	Multichannel
2131	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
2198 ±68	BATINIC	95	DPWA	$\pi N \rightarrow N\pi, N\eta$
2098	CRAWFORD	80	DPWA	$\gamma N \rightarrow \pi N$
2180	SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$

N(2190) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
300 to 700 (≈ 500) OUR ESTIMATE				
484± 13	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
550± 50	MANLEY	92	IPWA	$\pi N \rightarrow \pi N$ & $N\pi\pi$
500±150	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
390± 30	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
270± 50	HENDRY	78	MPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
726± 62	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
453±101	VRANA	00	DPWA	Multichannel
476	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
805±140	BATINIC	95	DPWA	$\pi N \rightarrow N\pi, N\eta$
238	CRAWFORD	80	DPWA	$\gamma N \rightarrow \pi N$
80	SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$

N(2190) POLE POSITION

REAL PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
2050 to 2100 (≈ 2075) OUR ESTIMATE				
2070	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
2042	[1] HOEHLER	93	SPED	$\pi N \rightarrow \pi N$
2100±50	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$

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

2076	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
2107	VRANA	00	DPWA	Multichannel
2030	ARNDT	95	DPWA	$\pi N \rightarrow N \pi$
2060	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

−2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
400 to 520 (≈ 450) OUR ESTIMATE				
520	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
482	[1] HOEHLER	93	SPED	$\pi N \rightarrow \pi N$
400±160	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
502	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
380	VRANA	00	DPWA	Multichannel
460	ARNDT	95	DPWA	$\pi N \rightarrow N \pi$
464	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

N(2190) ELASTIC POLE RESIDUE

MODULUS |r|

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
72	ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
45	HOEHLER	93	SPED	$\pi N \rightarrow \pi N$
25±10	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
68	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
46	ARNDT	95	DPWA	$\pi N \rightarrow N \pi$
54	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

PHASE θ

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−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. • • •				
−32	ARNDT	04	DPWA	$\pi N \rightarrow \pi N, \eta N$
−23	ARNDT	95	DPWA	$\pi N \rightarrow N \pi$
−44	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

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	$N\eta$	(0.0±1.0) %
Γ_3	ΛK	
Γ_4	ΣK	
Γ_5	$N\pi\pi$	

Γ_6 $N\rho$
Γ_7 $N\rho$, S=3/2, D-wave
Γ_8 $p\gamma$, helicity=1/2
Γ_9 $p\gamma$, helicity=3/2
Γ_{10} $n\gamma$, helicity=1/2
Γ_{11} $n\gamma$, helicity=3/2

N(2190) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.1 to 0.2 OUR ESTIMATE				
0.238±0.001	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
0.22 ±0.01	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
0.12 ±0.06	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
0.14 ±0.02	HOEHLER	79	IPWA	$\pi N \to \pi N$
0.16 ±0.04	HENDRY	78	MPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.230±0.002	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
0.20 ±0.04	VRANA	00	DPWA	Multichannel
0.23	ARNDT	95	DPWA	$\pi N \to N\pi$
0.19 ±0.05	BATINIC	95	DPWA	$\pi N \to N\pi$, $N\eta$

$\Gamma(N\eta)/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.00 ±0.01	VRANA	00	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.001±0.003	BATINIC	95	DPWA	$\pi N \to N\pi$, $N\eta$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2190) \to \Lambda K$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.02	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
−0.02	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2190) \to N\rho$, S=3/2, D-wave — $(\Gamma_1\Gamma_7)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.25±0.03	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

$\Gamma(N\rho, S=3/2, D\text{-wave})/\Gamma_{total}$ — Γ_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.29±0.28	VRANA	00	DPWA	Multichannel

N(2190) PHOTON DECAY AMPLITUDES

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

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.055	CRAWFORD	80	DPWA	$\gamma N \to \pi N$

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

VALUE (GeV$^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.081	CRAWFORD	80	DPWA	$\gamma N \rightarrow \pi N$

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

VALUE (GeV$^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.042	CRAWFORD	80	DPWA	$\gamma N \rightarrow \pi N$

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

VALUE (GeV$^{-1/2}$)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.126	CRAWFORD	80	DPWA	$\gamma N \rightarrow \pi N$

$N(2190)$ $\gamma p \rightarrow \Lambda K^+$ AMPLITUDES

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{total}$ in $p\gamma \rightarrow N(2190) \rightarrow \Lambda K^+$ (E_{4-} amplitude)

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2.5 ± 1.0	WORKMAN	90	DPWA
2.04	TANABE	89	DPWA

$p\gamma \rightarrow N(2190) \rightarrow \Lambda K^+$ phase angle θ (E_{4-} amplitude)

VALUE (degrees)	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-4 ± 9	WORKMAN	90	DPWA
-27.5	TANABE	89	DPWA

$(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{total}$ in $p\gamma \rightarrow N(2190) \rightarrow \Lambda K^+$ (M_{4-} amplitude)

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-7.0 ± 0.7	WORKMAN	90	DPWA
-5.78	TANABE	89	DPWA

$N(2190)$ FOOTNOTES

[1] See HOEHLER 93 for a detailed discussion of the evidence for and the pole parameters of N and Δ resonances as determined from Argand diagrams of πN elastic partial-wave amplitudes and from plots of the speeds with which the amplitudes traverse the diagrams.

N(2190) REFERENCES

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

ARNDT	06	PR C74 045205	R.A. Arndt *et al.*	(GWU)
PDG	06	JPG 33 1	W.-M. Yao *et al.*	(PDG Collab.)
ARNDT	04	PR C69 035213	R.A. Arndt *et al.*	(GWU, TRIU)
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman,, T.-S.H. Lee	(PITT+)
ARNDT	95	PR C52 2120	R.A. Arndt *et al.*	(VPI, BRCO)
BATINIC	95	PR C51 2310	M. Batinic *et al.*	(BOSK, UCLA)
Also		PR C57 1004 (erratum)	M. Batinic *et al.*	
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KENT) IJP
Also		PR D30 904	D.M. Manley *et al.*	(VPI)
ARNDT	91	PR D43 2131	R.A. Arndt *et al.*	(VPI, TELE) IJP
WORKMAN	90	PR C42 781	R.L. Workman	(VPI)
TANABE	89	PR C39 741	H. Tanabe, M. Kohno, C. Bennhold	(MANZ)
Also		NC 102A 193	M. Kohno, H. Tanabe, C. Bennhold	(MANZ)
BELL	83	NP B222 389	K.W. Bell *et al.*	(RL) IJP
PDG	82	PL 111B 1	M. Roos *et al.*	(HELS, CIT, CERN)
CRAWFORD	80	Toronto Conf. 107	R.L. Crawford	(GLAS)
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
SAXON	80	NP B162 522	D.H. Saxon *et al.*	(RHEL, BRIS) IJP
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT) IJP
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP
HENDRY	78	PRL 41 222	A.W. Hendry	(IND, LBL) IJP
Also		ANP 136 1	A.W. Hendry	(IND)