$N(2220)$ H_{19}

$I(J^P) = \frac{1}{2}(\frac{9}{2}^+)$ Status: ∗∗∗∗

Most of the results published before 1975 are now obsolete and have been omitted. They may be found in our 1982 edition, Physics Letters **111B** (1982).

N(2220) BREIT-WIGNER MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2200 to 2300 (≈ 2250) OUR ESTIMATE				
2230±80	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
2205±10	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
2300±100	HENDRY	78	MPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2270±11	ARNDT	04	DPWA	$\pi N \rightarrow \pi N$, ηN
2258	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
2050	BAKER	79	DPWA	$\pi^- p \rightarrow n\eta$

N(2220) BREIT-WIGNER WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
350 to 500 (≈ 400) OUR ESTIMATE				
500±150	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
365±30	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
450±150	HENDRY	78	MPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
366±42	ARNDT	04	DPWA	$\pi N \rightarrow \pi N$, ηN
334	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$

N(2220) POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2130 to 2200 (≈ 2170) OUR ESTIMATE				
2135	[1] HOEHLER	93	ARGD	$\pi N \rightarrow \pi N$
2160±80	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2209	ARNDT	04	DPWA	$\pi N \rightarrow \pi N$, ηN
2203	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
2253	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
400 to 560 (≈ 480) OUR ESTIMATE				
400	[1] HOEHLER	93	ARGD	$\pi N \rightarrow \pi N$
480±100	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
564	ARNDT	04	DPWA	$\pi N \rightarrow \pi N$, ηN
536	ARNDT	95	DPWA	$\pi N \rightarrow N\pi$
640	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

$N(2220)$ ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
40	HOEHLER	93	ARGD	$\pi N \to \pi N$
45±20	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
96	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
68	ARNDT	95	DPWA	$\pi N \to N\pi$
85	ARNDT	91	DPWA	$\pi N \to \pi N$ Soln SM90

PHASE θ

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
−50	HOEHLER	93	ARGD	$\pi N \to \pi N$
−45±25	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−71	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
−43	ARNDT	95	DPWA	$\pi N \to N\pi$
−62	ARNDT	91	DPWA	$\pi N \to \pi N$ Soln SM90

$N(2220)$ 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	$N\eta$	
Γ_3	ΛK	

$N(2220)$ BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ — Γ_1/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.1 to 0.2 OUR ESTIMATE				
0.15 ±0.03	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
0.18 ±0.015	HOEHLER	79	IPWA	$\pi N \to \pi N$
0.12 ±0.04	HENDRY	78	MPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.200±0.006	ARNDT	04	DPWA	$\pi N \to \pi N$, ηN
0.26	ARNDT	95	DPWA	$\pi N \to N\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2220) \to N\eta$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.034	BAKER	79	DPWA	$\pi^- p \to n\eta$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2220) \rightarrow \Lambda K$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
not required	BELL	83	DPWA	$\pi^- p \rightarrow \Lambda K^0$
not seen	SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$

N(2220) 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(2220) REFERENCES

For early references, see Physics Letters **111B** 70 (1982).

ARNDT	04	PR C69 035213	R.A. Arndt *et al.*	(GWU, TRIU)
ARNDT	95	PR C52 2120	R.A. Arndt *et al.*	(VPI, BRCO)
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)
ARNDT	91	PR D43 2131	R.A. Arndt *et al.*	(VPI, TELE) IJP
BELL	83	NP B222 389	K.W. Bell *et al.*	(RL) IJP
PDG	82	PL 111B	M. Roos *et al.*	(HELS, CIT, CERN)
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky *et al.*	(CMU, LBL) IJP
Also	79	PR D20 2839	R.E. Cutkosky *et al.*	(CMU, LBL) IJP
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	80	Toronto Conf. 3	R. Koch	(KARLT) IJP
HENDRY	78	PRL 41 222	A.W. Hendry	(IND, LBL) IJP
Also	81	ANP 136 1	A.W. Hendry	(IND)