$N(2080)$ D_{13}

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$ Status: **

OMITTED FROM SUMMARY TABLE

There is some evidence for two resonances in this wave between 1800 and 2200 MeV (see CUTKOSKY 80). However, the solution of HOEHLER 79 is quite different.

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(2080) BREIT-WIGNER MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
≈ 2080 OUR ESTIMATE				
1804± 55	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
1920	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
1880±100	[1] CUTKOSKY	80	IPWA	$\pi N \to \pi N$
2060± 80	[1] CUTKOSKY	80	IPWA	$\pi N \to \pi N$
1900	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
2081± 20	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1895	MART	00	DPWA	$\gamma p \to \Lambda K^+$
2003± 18	VRANA	00	DPWA	Multichannel
1986± 75	BATINIC	95	DPWA	$\pi N \to N\pi$, $N\eta$
1880	BAKER	79	DPWA	$\pi^- p \to n\eta$

N(2080) BREIT-WIGNER WIDTH

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
450±185	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
320	BELL	83	DPWA	$\pi^- p \to \Lambda K^0$
180± 60	[1] CUTKOSKY	80	IPWA	$\pi N \to \pi N$ (lower m)
300±100	[1] CUTKOSKY	80	IPWA	$\pi N \to \pi N$ (higher m)
240	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
265± 40	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
372	MART	00	DPWA	$\gamma p \to \Lambda K^+$
1070±858	VRANA	00	DPWA	Multichannel
1050±225	BATINIC	95	DPWA	$\pi N \to N\pi$, $N\eta$
87	BAKER	79	DPWA	$\pi^- p \to n\eta$

N(2080) POLE POSITION

REAL PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1880±100	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (lower m)
2050± 70	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (higher m)
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1824	VRANA	00	DPWA	Multichannel
not seen	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

−2×IMAGINARY PART

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
160±80	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (lower m)
200±80	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (higher m)
• • • We do not use the following data for averages, fits, limits, etc. • • •				
614	VRANA	00	DPWA	Multichannel
not seen	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

N(2080) ELASTIC POLE RESIDUE

MODULUS $|r|$

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
10± 5	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (lower m)
30±20	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (higher m)

PHASE θ

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
100± 80	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (lower m)
0±100	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (higher m)

N(2080) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\pi$	
Γ_2	$N\eta$	(0.0±2.0) %
Γ_3	ΛK	
Γ_4	ΣK	
Γ_5	$N\pi\pi$	
Γ_6	$\Delta(1232)\pi$, S-wave	
Γ_7	$\Delta(1232)\pi$, D-wave	
Γ_8	$N\rho$, S=3/2, S-wave	
Γ_9	$N(\pi\pi)^{I=0}_{S\text{-wave}}$	
Γ_{10}	$p\gamma$, helicity=1/2	
Γ_{11}	$p\gamma$, helicity=3/2	
Γ_{12}	$n\gamma$, helicity=1/2	
Γ_{13}	$n\gamma$, helicity=3/2	
Γ_{14}	$p\gamma$	

N(2080) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.23±0.03	MANLEY	92	IPWA	$\pi N \rightarrow \pi N$ & $N\pi\pi$
0.10±0.04	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (lower m)
0.14±0.07	[1] CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$ (higher m)
0.06±0.02	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13±0.03	VRANA	00	DPWA	Multichannel
0.09±0.02	BATINIC	95	DPWA	$\pi N \rightarrow N\pi$, $N\eta$

$\Gamma(N\eta)/\Gamma_{total}$ Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.00 ±0.02	VRANA	00	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.07 ±0.04	BATINIC	95	DPWA	$\pi N \rightarrow N\pi$, $N\eta$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2080) \rightarrow N\eta$ $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

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

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2080) \rightarrow \Lambda K$ $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+0.04	BELL	83	DPWA	$\pi^- p \rightarrow \Lambda K^0$
+0.03	SAXON	80	DPWA	$\pi^- p \rightarrow \Lambda K^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2080) \rightarrow \Sigma K$ $(\Gamma_1\Gamma_4)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.014 to 0.037	[2] DEANS	75	DPWA	$\pi N \rightarrow \Sigma K$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2080) \rightarrow \Delta(1232)\pi$, *S*-wave $(\Gamma_1\Gamma_6)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.09±0.09	MANLEY	92	IPWA	$\pi N \rightarrow \pi N$ & $N\pi\pi$

$\Gamma(\Delta(1232)\pi, S\text{-wave})/\Gamma_{total}$ Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.40±0.10	VRANA	00	DPWA	Multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \rightarrow N(2080) \rightarrow \Delta(1232)\pi$, *D*-wave $(\Gamma_1\Gamma_7)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+0.22±0.07	MANLEY	92	IPWA	$\pi N \rightarrow \pi N$ & $N\pi\pi$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.17±0.10	VRANA	00	DPWA	Multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2080) \to N\rho$, S=3/2, S-wave $(\Gamma_1\Gamma_8)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
-0.24 ± 0.06	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

$\Gamma(N\rho, S$=3/2, S-wave$)/\Gamma_{total}$ Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.06 ± 0.06	VRANA	00	DPWA	Multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\pi \to N(2080) \to N(\pi\pi)^{I=0}_{S\text{-wave}}$ $(\Gamma_1\Gamma_9)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.25\pm0.06$	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

$\Gamma(N(\pi\pi)^{I=0}_{S\text{-wave}})/\Gamma_{total}$ Γ_9/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.24 ± 0.24	VRANA	00	DPWA	Multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $p\gamma \to N(2080) \to N\eta$ $(\Gamma_{14}\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.0037	HICKS	73	MPWA	$\gamma p \to p\eta$

$N(2080)$ PHOTON DECAY AMPLITUDES

$N(2080) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
-0.020 ± 0.008	AWAJI	81	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.026 ± 0.052	DEVENISH	74	DPWA	$\gamma N \to \pi N$

$N(2080) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.017 ± 0.011	AWAJI	81	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.128 ± 0.057	DEVENISH	74	DPWA	$\gamma N \to \pi N$

$N(2080) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.007 ± 0.013	AWAJI	81	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.053 ± 0.083	DEVENISH	74	DPWA	$\gamma N \to \pi N$

$N(2080) \to n\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
-0.053 ± 0.034	AWAJI	81	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.100 ± 0.141	DEVENISH	74	DPWA	$\gamma N \to \pi N$

$N(2080)$ $\gamma p \to \Lambda K^+$ AMPLITUDES

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $p\gamma \to N(2080) \to \Lambda K^+$ (E_{2-} amplitude)

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$2.29^{+0.7}_{-0.2}$	MART	00	DPWA	$\gamma p \to \Lambda K^+$
5.5 ± 0.3	WORKMAN	90	DPWA	
4.09	TANABE	89	DPWA	

$p\gamma \to N(2080) \to \Lambda K^+$ phase angle θ (E_{2-} amplitude)

VALUE (degrees)	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-48 ± 5	WORKMAN	90	DPWA
-35.9	TANABE	89	DPWA

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $p\gamma \to N(2080) \to \Lambda K^+$ (M_{2-} amplitude)

VALUE (units 10^{-3})	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-6.7 ± 0.2	WORKMAN	90	DPWA
-4.09	TANABE	89	DPWA

$N(2080)$ FOOTNOTES

[1] CUTKOSKY 80 finds a lower mass D_{13} resonance, as well as one in this region. Both are listed here.

[2] The range given for DEANS 75 is from the four best solutions. Disagrees with $\pi^+ p \to \Sigma^+ K^+$ data of WINNIK 77 around 1920 MeV.

$N(2080)$ REFERENCES

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

MART	00	PR C61 012201	T. Mart, C. Bennhold	
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman,, T.-S.H. Lee	(PITT+)
BATINIC	95	PR C51 2310	M. Batinic *et al.*	(BOSK, UCLA)
Also	98	PR C57 1004 (erratum)	M. Batinic *et al.*	
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KENT) IJP
Also	84	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	89	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	M. Roos *et al.*	(HELS, CIT, CERN)
AWAJI	81	Bonn Conf. 352	N. Awaji, R. Kajikawa	(NAGO)
Also	82	NP B197 365	K. Fujii *et al.*	(NAGO)
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
WINNIK	77	NP B128 66	M. Winnik *et al.*	(HAIF) I
DEANS	75	NP B96 90	S.R. Deans *et al.*	(SFLA, ALAH) IJP
DEVENISH	74	PL 52B 227	R.C.E. Devenish, D.H. Lyth, W.A. Rankin	(DESY+) IJP
HICKS	73	PR D7 2614	H.R. Hicks *et al.*	(CMU, ORNL, SFLA) IJP