$(\Gamma_i\Gamma_f)^{½}/\Gamma_{total}$ in $N\pi \to N(1535) \to N\rho$, S=1/2, S-wave $\qquad (\Gamma_1\Gamma_7)^{½}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.14 to −0.06 OUR ESTIMATE				
-0.10 ± 0.03	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
-0.10	[1] LONGACRE	77	IPWA	$\pi N \to N\pi\pi$
-0.09	[2] LONGACRE	75	IPWA	$\pi N \to N\pi\pi$

$(\Gamma_i\Gamma_f)^{½}/\Gamma_{total}$ in $N\pi \to N(1535) \to N(\pi\pi)^{I=0}_{S\text{-wave}}$ $\qquad (\Gamma_1\Gamma_9)^{½}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+0.03 to +0.13 OUR ESTIMATE				
$+0.07\pm0.04$	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
$+0.08$	[1] LONGACRE	77	IPWA	$\pi N \to N\pi\pi$
$+0.09$	[2] LONGACRE	75	IPWA	$\pi N \to N\pi\pi$

$(\Gamma_i\Gamma_f)^{½}/\Gamma_{total}$ in $N\pi \to N(1535) \to N(1440)\pi$ $\qquad (\Gamma_1\Gamma_{10})^{½}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
$+0.10\pm0.05$	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$

$N(1535)$ PHOTON DECAY AMPLITUDES

$N(1535) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
+0.068 ±0.010 OUR ESTIMATE				
0.061 ± 0.003	LI	93	IPWA	$\gamma N \to \pi N$
0.095 ± 0.011	[5] BENMERROU..	91		$\gamma p \to p\eta$
0.053 ± 0.015	CRAWFORD	83	IPWA	$\gamma N \to \pi N$
0.077 ± 0.021	AWAJI	81	DPWA	$\gamma N \to \pi N$
0.083 ± 0.007	ARAI	80	DPWA	$\gamma N \to \pi N$ (fit 1)
0.080 ± 0.007	ARAI	80	DPWA	$\gamma N \to \pi N$ (fit 2)
0.029 ± 0.007	BRATASHEV...	80	DPWA	$\gamma N \to \pi N$
0.065 ± 0.016	CRAWFORD	80	DPWA	$\gamma N \to \pi N$
0.0704 ± 0.0091	ISHII	80	DPWA	Compton scattering
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.078	ARNDT	90B	IPWA	See LI 93
0.050	ARNDT	90B	FIT	See LI 93
0.055	WADA	84	DPWA	Compton scattering
$+0.082\pm0.019$	BARBOUR	78	DPWA	$\gamma N \to \pi N$
0.046	[6] NOELLE	78		$\gamma N \to \pi N$
$+0.034$	BERENDS	77	IPWA	$\gamma N \to \pi N$
$+0.070\pm0.004$	FELLER	76	DPWA	$\gamma N \to \pi N$

$N(1535) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV$^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
−0.059±0.022 OUR ESTIMATE				
-0.046 ± 0.005	LI	93	IPWA	$\gamma N \to \pi N$
0.035 ± 0.014	AWAJI	81	DPWA	$\gamma N \to \pi N$
-0.062 ± 0.003	FUJII	81	DPWA	$\gamma N \to \pi N$
-0.075 ± 0.019	ARAI	80	DPWA	$\gamma N \to \pi N$ (fit 1)
-0.075 ± 0.018	ARAI	80	DPWA	$\gamma N \to \pi N$ (fit 2)
-0.098 ± 0.026	CRAWFORD	80	DPWA	$\gamma N \to \pi N$
-0.011 ± 0.017	TAKEDA	80	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.050	ARNDT	90B	IPWA	See LI 93
-0.037	ARNDT	90B	FIT	See LI 93
-0.112 ± 0.034	BARBOUR	78	DPWA	$\gamma N \to \pi N$
-0.048	[6] NOELLE	78		$\gamma N \to \pi N$

$N(1535)$ FOOTNOTES

[1] LONGACRE 77 pole positions are from a search for poles in the unitarized T-matrix; the first (second) value uses, in addition to $\pi N \to N\pi\pi$ data, elastic amplitudes from a Saclay (CERN) partial-wave analysis. The other LONGACRE 77 values are from eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.

[2] From method II of LONGACRE 75: eyeball fits with Breit-Wigner circles to the T-matrix amplitudes.

[3] See HOEHLER 93 and HOEHLER 94 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.

[4] LONGACRE 78 values are from a search for poles in the unitarized T-matrix. The first (second) value uses, in addition to $\pi N \to N\pi\pi$ data, elastic amplitudes from a Saclay (CERN) partial-wave analysis.

[5] BENMERROUCHE 91 uses an effective Lagrangian approach to analyze η photoproduction data.

[6] Converted to our conventions using $M = 1548$ MeV, $\Gamma = 73$ MeV from NOELLE 78.

$N(1535)$ REFERENCES

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

HOEHLER	94	πN Newsletter 10 (to be pub.)		(KARL)
HOEHLER	93	πN Newsletter 9 1		(KARL)
LI	93	PR C47 2759	+Arndt, Roper, Workman	(VPI)
MANLEY	92	PR D45 4002	+Saleski	(KENT) IJP
Also	84	PR D30 904	Manley, Arndt, Goradia, Teplitz	(VPI)
ARNDT	91	PR D43 2131	+Li, Roper, Workman, Ford	(VPI, TELE) IJP
BENMERROU...	91	PRL 67 1070	Benmerrouche, Mukhopadhyay	(RPI)
ARNDT	90B	PR C42 1864	+Workman, Li, Roper	(VPI)
ARNDT	85	PR D32 1085	+Ford, Roper	(VPI)
WADA	84	NP B247 313	+Egawa, Imanishi, Ishii, Kato, Ukai+	(INUS)
CRAWFORD	83	NP B211 1	+Morton	(GLAS)
PDG	82	PL 111B	Roos, Porter, Aguilar-Benitez+	(HELS, CIT, CERN)
AWAJI	81	Bonn Conf. 352	+Kajikawa	(NAGO)
Also	82	NP B197 365	Fujii, Hayashii, Iwata, Kajikawa+	(NAGO)
FUJII	81	NP B187 53	+Hayashii, Iwata, Kajikawa+	(NAGO, OSAK)
ARAI	80	Toronto Conf. 93		(INUS)
Also	82	NP B194 251	Arai, Fujii	(INUS)
BRATASHEV...	80	NP B166 525	Bratashevskij, Gorbenko, Derebchinskij+	(KFTI)
CRAWFORD	80	Toronto Conf. 107		(GLAS)
CUTKOSKY	80	Toronto Conf. 19	+Forsyth, Babcock, Kelly, Hendrick	(CMU, LBL) IJP
Also	79	PR D20 2839	Cutkosky, Forsyth, Hendrick, Kelly	(CMU, LBL) IJP
ISHII	80	NP B165 189	+Egawa, Kato, Miyachi+	(KYOT, INUS)
TAKEDA	80	NP B168 17	+Arai, Fujii, Ikeda, Iwasaki+	(TOKY, INUS)
BAKER	79	NP B156 93	+Brown, Clark, Davies, Depagter, Evans+	(RHEL) IJP
HOEHLER	79	PDAT 12-1	+Kaiser, Koch, Pietarinen	(KARLT) IJP
Also	80	Toronto Conf. 3	Koch	(KARLT) IJP
BARBOUR	78	NP B141 253	+Crawford, Parsons	(GLAS)
LONGACRE	78	PR D17 1795	+Lasinski, Rosenfeld, Smadja+	(LBL, SLAC)
NOELLE	78	PTP 60 778		(NAGO)
BERENDS	77	NP B136 317	+Donnachie	(LEID, MCHS) IJP
BHANDARI	77	PR D15 192	+Chao	(CMU) IJP
LONGACRE	77	NP B122 493	+Dolbeau	(SACL) IJP
Also	76	NP B108 365	Dolbeau, Triantis, Neveu, Cadiet	(SACL) IJP
FELLER	76	NP B104 219	+Fukushima, Horikawa, Kajikawa+	(NAGO, OSAK) IJP
FELTESSE	75	NP B93 242	+Ayed, Bareyre, Borgeaud, David+	(SACL) IJP
LONGACRE	75	PL 55B 415	+Rosenfeld, Lasinski, Smadja+	(LBL, SLAC) IJP

$N(1650)$ S_{11}

$I(J^P) = \frac{1}{2}(\frac{1}{2}^-)$ 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).

$N(1650)$ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1640 to 1680 (≈ 1650) OUR ESTIMATE				
1659 ± 9	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
1650 ± 30	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
1670 ± 8	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1674	LI	93	IPWA	$\gamma N \to \pi N$
1688	CRAWFORD	80	DPWA	$\gamma N \to \pi N$
1672	MUSETTE	80	IPWA	$\pi^- p \to \Lambda K^0$
1680	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
1680	BAKER	78	DPWA	$\pi^- p \to \Lambda K^0$
1694	BARBOUR	78	DPWA	$\gamma N \to \pi N$
1700 ± 5	[1] BAKER	77	IPWA	$\pi^- p \to \Lambda K^0$
1680	[1] BAKER	77	DPWA	$\pi^- p \to \Lambda K^0$
1700	[2] LONGACRE	77	IPWA	$\pi N \to N\pi\pi$
1675	KNASEL	75	DPWA	$\pi^- p \to \Lambda K^0$
1660	[3] LONGACRE	75	IPWA	$\pi N \to N\pi\pi$

$N(1650)$ WIDTH

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
145 to 190 (≈ 150) OUR ESTIMATE				
173 ± 12	MANLEY	92	IPWA	$\pi N \to \pi N$ & $N\pi\pi$
150 ± 40	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
180 ± 20	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
225	LI	93	IPWA	$\gamma N \to \pi N$
183	CRAWFORD	80	DPWA	$\gamma N \to \pi N$
179	MUSETTE	80	IPWA	$\pi^- p \to \Lambda K^0$
120	SAXON	80	DPWA	$\pi^- p \to \Lambda K^0$
90	BAKER	78	DPWA	$\pi^- p \to \Lambda K^0$
193	BARBOUR	78	DPWA	$\gamma N \to \pi N$
130 ± 10	[1] BAKER	77	IPWA	$\pi^- p \to \Lambda K^0$
90	[1] BAKER	77	DPWA	$\pi^- p \to \Lambda K^0$
170	[2] LONGACRE	77	IPWA	$\pi N \to N\pi\pi$
170	KNASEL	75	DPWA	$\pi^- p \to \Lambda K^0$
130	[3] LONGACRE	75	IPWA	$\pi N \to N\pi\pi$