

$N(1535) 1/2^-$ $I(J^P) = \frac{1}{2}(\frac{1}{2}^-)$ Status: ****Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics **C38** 070001 (2014). **$N(1535)$ POLE POSITION****REAL PART**

<i>VALUE</i> (MeV)	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
1500 to 1520 (\approx 1510) OUR ESTIMATE			
1496 \pm 4	AFZAL	20	DPWA Multichannel
1500 \pm 4	SOKHOYAN	15A	DPWA Multichannel
1509 \pm 4 \pm 2	¹ SVARC	14	L+P $\pi N \rightarrow \pi N$
1510 \pm 50	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1496	HUNT	19	DPWA Multichannel
1499	ROENCHEN	15A	DPWA Multichannel
1490	SHKLYAR	13	DPWA Multichannel
1501 \pm 4	ANISOVICH	12A	DPWA Multichannel
1521 \pm 14	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1502	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
1525	VRANA	00	DPWA Multichannel
1487	HOEHLER	93	SPED $\pi N \rightarrow \pi N$

¹ Fit to the amplitudes of HOEHLER 79.**-2xIMAGINARY PART**

<i>VALUE</i> (MeV)	<i>DOCUMENT ID</i>	<i>TECN</i>	<i>COMMENT</i>
110 to 150 (\approx 130) OUR ESTIMATE			
125 \pm 6	AFZAL	20	DPWA Multichannel
128 \pm 9	SOKHOYAN	15A	DPWA Multichannel
118 \pm 9 \pm 2	² SVARC	14	L+P $\pi N \rightarrow \pi N$
260 \pm 80	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
119	HUNT	19	DPWA Multichannel
104	ROENCHEN	15A	DPWA Multichannel
100	SHKLYAR	13	DPWA Multichannel
134 \pm 11	ANISOVICH	12A	DPWA Multichannel
190 \pm 28	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
95	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$
102	VRANA	00	DPWA Multichannel

² Fit to the amplitudes of HOEHLER 79.

$N(1535)$ ELASTIC POLE RESIDUE**MODULUS $|r|$**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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15 to 35 (≈ 25) OUR ESTIMATE

29 ± 4	SOKHOYAN	15A	DPWA Multichannel
$22 \pm 2 \pm 0.4$	³ SVARC	14	L+P $\pi N \rightarrow \pi N$
120 ± 40	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
22	ROENCHEN	15A	DPWA Multichannel
15	SHKLYAR	13	DPWA Multichannel
31 ± 4	ANISOVICH	12A	DPWA Multichannel
68	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
16	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$

³Fit to the amplitudes of HOEHLER 79.**PHASE θ**

<u>VALUE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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-30 to 0 (≈ -15) OUR ESTIMATE

-20 ± 10	SOKHOYAN	15A	DPWA Multichannel
$-5 \pm 5 \pm 3$	⁴ SVARC	14	L+P $\pi N \rightarrow \pi N$
$+15 \pm 45$	CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-46	ROENCHEN	15A	DPWA Multichannel
-51	SHKLYAR	13	DPWA Multichannel
-29 ± 5	ANISOVICH	12A	DPWA Multichannel
12	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
-16	ARNDT	06	DPWA $\pi N \rightarrow \pi N, \eta N$

⁴Fit to the amplitudes of HOEHLER 79. **$N(1535)$ INELASTIC POLE RESIDUE**The "normalized residue" is the residue divided by $\Gamma_{pole}/2$.**Normalized residue in $N\pi \rightarrow N(1535) \rightarrow N\eta$**

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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0.43 ± 0.03	-76 ± 5	ANISOVICH	12A	DPWA Multichannel
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● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●

0.51	112	ROENCHEN	15A	DPWA Multichannel
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Normalized residue in $N\pi \rightarrow N(1535) \rightarrow \Lambda K$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●

0.05	32	ROENCHEN	15A	DPWA Multichannel
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Normalized residue in $N\pi \rightarrow N(1535) \rightarrow \Sigma K$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●

0.05	-69	ROENCHEN	15A	DPWA Multichannel
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Normalized residue in $N\pi \rightarrow N(1535) \rightarrow \Delta\pi$, D -wave

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.11±0.02	160 ± 20	SOKHOYAN	15A DPWA	Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.12±0.03	145 ± 17	ANISOVICH	12A DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1535) \rightarrow N\sigma$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.16±0.07	25 ± 40	SOKHOYAN	15A DPWA	Multichannel

Normalized residue in $N\pi \rightarrow N(1535) \rightarrow N(1440)\pi$

<u>MODULUS</u>	<u>PHASE ($^\circ$)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.21±0.14	-45 ± 50	SOKHOYAN	15A DPWA	Multichannel

 $N(1535)$ BREIT-WIGNER MASS

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1515 to 1545 (\approx 1530) OUR ESTIMATE			
1525 ± 2	⁵ HUNT	19 DPWA	Multichannel
1528 ± 6	KASHEVAROV	17 DPWA	$\gamma p \rightarrow \eta p, \eta' p$
1517 ± 4	SOKHOYAN	15A DPWA	Multichannel
1526 ± 2	⁵ SHKLYAR	13 DPWA	Multichannel
1547.0± 0.7	⁵ ARNDT	06 DPWA	$\pi N \rightarrow \pi N, \eta N$
1550 ± 40	CUTKOSKY	80 IPWA	$\pi N \rightarrow \pi N$
1526 ± 7	HOEHLER	79 IPWA	$\pi N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1519 ± 5	ANISOVICH	12A DPWA	Multichannel
1538 ± 1	⁵ SHRESTHA	12A DPWA	Multichannel
1553 ± 8	BATINIC	10 DPWA	$\pi N \rightarrow N\pi, N\eta$
1546.7± 2.2	ARNDT	04 DPWA	$\pi N \rightarrow \pi N, \eta N$
1526 ± 2	PENNER	02C DPWA	Multichannel
1530 ± 10	BAI	01B BES	$J/\psi \rightarrow p\bar{p}\eta$
1522 ± 11	THOMPSON	01 CLAS	$\gamma^* p \rightarrow p\eta$
1542 ± 3	VRANA	00 DPWA	Multichannel
1532 ± 5	ARMSTRONG	99B DPWA	$\gamma^* p \rightarrow p\eta$

⁵Statistical error only. **$N(1535)$ BREIT-WIGNER WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
125 to 175 (\approx 150) OUR ESTIMATE			
147 ± 5	⁶ HUNT	19 DPWA	Multichannel
163 ± 25	KASHEVAROV	17 DPWA	$\gamma p \rightarrow \eta p, \eta' p$
120 ± 10	SOKHOYAN	15A DPWA	Multichannel
131 ± 12	⁶ SHKLYAR	13 DPWA	Multichannel
188.4± 3.8	⁶ ARNDT	06 DPWA	$\pi N \rightarrow \pi N, \eta N$
240 ± 80	CUTKOSKY	80 IPWA	$\pi N \rightarrow \pi N$
120 ± 20	HOEHLER	79 IPWA	$\pi N \rightarrow \pi N$

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

128 ± 14	ANISOVICH	12A	DPWA	Multichannel
141 ± 4	⁶ SHRESTHA	12A	DPWA	Multichannel
182 ± 25	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
129 ± 8	PENNER	02C	DPWA	Multichannel
95 ± 25	BAI	01B	BES	$J/\psi \rightarrow p\bar{p}\eta$
143 ± 18	THOMPSON	01	CLAS	$\gamma^* p \rightarrow p\eta$
112 ± 19	VRANA	00	DPWA	Multichannel
154 ± 20	ARMSTRONG	99B	DPWA	$\gamma^* p \rightarrow p\eta$

⁶Statistical error only.

N(1535) DECAY MODES

The following branching fractions are our estimates, not fits or averages.

Mode	Fraction (Γ_i/Γ)
Γ_1 $N\pi$	32–52 %
Γ_2 $N\eta$	30–55 %
Γ_3 $N\pi\pi$	3–14 %
Γ_4 $\Delta(1232)\pi$	
Γ_5 $\Delta(1232)\pi, D\text{-wave}$	1–4 %
Γ_6 $N\rho$	
Γ_7 $N\rho, S=1/2$	
Γ_8 $N\rho, S=3/2, D\text{-wave}$	
Γ_9 $N\sigma$	2–10 %
Γ_{10} $N(1440)\pi$	5–12 %
Γ_{11} $p\gamma, \text{ helicity}=1/2$	0.15–0.30 %
Γ_{12} $n\gamma, \text{ helicity}=1/2$	0.01–0.25 %

N(1535) BRANCHING RATIOS

$\Gamma(N\pi)/\Gamma_{\text{total}}$	Γ_1/Γ		
VALUE (%)	DOCUMENT ID	TECN	COMMENT

32 to 52 (≈ 42) OUR ESTIMATE

42 ± 2	⁷ HUNT	19	DPWA	Multichannel
52 ± 5	SOKHOYAN	15A	DPWA	Multichannel
35 ± 3	⁷ SHKLYAR	13	DPWA	Multichannel
35.5 ± 0.2	⁷ ARNDT	06	DPWA	$\pi N \rightarrow \pi N, \eta N$
50 ± 10	CUTKOSKY	80	IPWA	$\pi N \rightarrow \pi N$
38 ± 4	HOEHLER	79	IPWA	$\pi N \rightarrow \pi N$

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

54 ± 5	ANISOVICH	12A	DPWA	Multichannel
37 ± 1	⁷ SHRESTHA	12A	DPWA	Multichannel
46 ± 7	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
36 ± 1	PENNER	02C	DPWA	Multichannel
35 ± 8	VRANA	00	DPWA	Multichannel

⁷Statistical error only.

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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30 to 55 (≈ 42) OUR ESTIMATE

41 \pm 4	MUELLER	20	DPWA Multichannel
43 \pm 3	⁸ HUNT	19	DPWA Multichannel
41 \pm 4	⁹ KASHEVAROV	17	DPWA $\gamma p \rightarrow \eta p, \eta' p$
58 \pm 4	⁸ SHKLYAR	13	DPWA Multichannel
33 \pm 5	ANISOVICH	12A	DPWA Multichannel
53 \pm 1	PENNER	02C	DPWA Multichannel
51 \pm 5	VRANA	00	DPWA Multichannel

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

41 \pm 2	⁸ SHRESTHA	12A	DPWA Multichannel
50 \pm 7	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$

⁸Statistical error only.

⁹Assuming $A_{1/2} = 0.115 \text{ GeV}^{-1/2}$.

 $\Gamma(N\eta)/\Gamma(N\pi)$ Γ_2/Γ_1

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.95 \pm 0.03	AZNAURYAN	09	CLAS π, η electroproduction
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 $\Gamma(\Delta(1232)\pi, D\text{-wave})/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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3 \pm 1	ADAMCZEW...	20	DPWA Multichannel
<1.1	¹⁰ HUNT	19	DPWA Multichannel
2.5 \pm 1.5	SOKHOYAN	15A	DPWA Multichannel

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

2.5 \pm 1.5	ANISOVICH	12A	DPWA Multichannel
1.8 \pm 0.8	¹⁰ SHRESTHA	12A	DPWA Multichannel
1 \pm 1	VRANA	00	DPWA Multichannel

¹⁰Statistical error only.

 $\Gamma(N\rho, S=1/2)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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2.7 \pm 0.6	ADAMCZEW...	20	DPWA Multichannel
14 \pm 2	¹¹ HUNT	19	DPWA Multichannel

¹¹Statistical error only.

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

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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0.5 \pm 0.5	ADAMCZEW...	20	DPWA Multichannel
<0.3	¹² HUNT	19	DPWA Multichannel

¹²Statistical error only.

 $\Gamma(N\sigma)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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<1	¹³ HUNT	19	DPWA Multichannel
6 \pm 4	SOKHOYAN	15A	DPWA Multichannel

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

1.5 ± 0.5	¹³ SHRESTHA	12A	DPWA	Multichannel
2 ± 1	VRANA	00	DPWA	Multichannel

¹³ Statistical error only.

$\Gamma(N(1440)\pi)/\Gamma_{\text{total}}$

Γ_{10}/Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
< 0.01	¹⁴ HUNT	19	DPWA Multichannel
12 ± 8	SOKHOYAN	15A	DPWA Multichannel
8 ± 2	¹⁴ STAROSTIN	03	$\pi^- p \rightarrow n 3\pi^0$

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

< 1	¹⁴ SHRESTHA	12A	DPWA	Multichannel
10 ± 9	VRANA	00	DPWA	Multichannel

¹⁴ This value is an estimate made using simplest assumptions.

N(1535) PHOTON DECAY AMPLITUDES AT THE POLE

N(1535) → pγ, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($\text{GeV}^{-1/2}$)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.093 ± 0.009	8 ± 4	ANISOVICH	17D	DPWA Multichannel
0.050 ± 0.004	-14^{+12}_{-10}	¹⁵ ROENCHEN	14	DPWA

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

0.114 ± 0.008	10 ± 5	ANISOVICH	15A	DPWA Multichannel
0.106	5.2	ROENCHEN	15A	DPWA Multichannel
0.114 ± 0.008	10 ± 5	SOKHOYAN	15A	DPWA Multichannel

¹⁵ T-Matrix amplitude

N(1535) → nγ, helicity-1/2 amplitude $A_{1/2}$

MODULUS ($\text{GeV}^{-1/2}$)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
-0.088 ± 0.004	5 ± 4	ANISOVICH	17D	DPWA Multichannel
-0.095 ± 0.006	8 ± 5	ANISOVICH	15A	DPWA Multichannel

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

N(1535) BREIT-WIGNER PHOTON DECAY AMPLITUDES

N(1535) → pγ, helicity-1/2 amplitude $A_{1/2}$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.090 to 0.120 (≈ 0.105) OUR ESTIMATE			
0.107 ± 0.003	¹⁶ HUNT	19	DPWA Multichannel
0.101 ± 0.007	SOKHOYAN	15A	DPWA Multichannel
0.091 ± 0.004	¹⁶ SHKLYAR	13	DPWA Multichannel
0.128 ± 0.004	¹⁶ WORKMAN	12A	DPWA $\gamma N \rightarrow N\pi$
0.091 ± 0.002	¹⁶ DUGGER	07	DPWA $\gamma N \rightarrow \pi N$
0.105 ± 0.010	ANISOVICH	12A	DPWA Multichannel
0.059 ± 0.003	¹⁶ SHRESTHA	12A	DPWA Multichannel
0.066	DRECHSEL	07	DPWA $\gamma N \rightarrow \pi N$
0.090	PENNER	02D	DPWA Multichannel

¹⁶ Statistical error only.

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

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
–0.095 to –0.055 (\approx –0.075) OUR ESTIMATE			
–0.055 \pm 0.006	¹⁷ HUNT	19	DPWA Multichannel
–0.093 \pm 0.011	ANISOVICH	13B	DPWA Multichannel
–0.058 \pm 0.006	¹⁷ CHEN	12A	DPWA $\gamma N \rightarrow \pi N$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
–0.049 \pm 0.003	¹⁷ SHRESTHA	12A	DPWA Multichannel
–0.051	DRECHSEL	07	DPWA $\gamma N \rightarrow \pi N$
–0.024	PENNER	02D	DPWA Multichannel
¹⁷ Statistical error only.			

 $N(1535) \rightarrow N\gamma$, ratio $A_{1/2}^n/A_{1/2}^p$

VALUE ($\text{GeV}^{-1/2}$)	DOCUMENT ID	TECN
–0.84 \pm 0.15	MUKHOPAD... 95B	IPWA

 $N(1535)$ REFERENCESFor early references, see Physics Letters **111B** 1 (1982).

ADAMCZEW... 20	PR C102 024001	J. Adamczewski-Musch <i>et al.</i>	(HADES Collab.)
AFZAL 20	PRL 125 152002	F. Afzal <i>et al.</i>	(CBELSA/TAPS Collab.)
MUELLER 20	PL B803 135323	J. Mueller <i>et al.</i>	(CBELSA/TAPS Collab.)
HUNT 19	PR C99 055205	B.C. Hunt, D.M. Manley	
ANISOVICH 17D	PR C95 035211	A.V. Anisovich <i>et al.</i>	
KASHEVAROV 17	PRL 118 212001	V.L. Kashevarov <i>et al.</i>	(A2/MAMI Collab.)
ANISOVICH 15A	EPJ A51 72	A.V. Anisovich <i>et al.</i>	
ROENCHEN 15A	EPJ A51 70	D. Roenchen <i>et al.</i>	
SOKHOYAN 15A	EPJ A51 95	V. Sokhoyan <i>et al.</i>	(CBELSA/TAPS Collab.)
PDG 14	CP C38 070001	K. Olive <i>et al.</i>	(PDG Collab.)
ROENCHEN 14	EPJ A50 101	D. Roenchen <i>et al.</i>	
Also	EPJ A51 63 (errat.)	D. Roenchen <i>et al.</i>	
SVARC 14	PR C89 045205	A. Svarc <i>et al.</i>	(RBI Zagreb, UNI Tuzla)
ANISOVICH 13B	EPJ A49 67	A.V. Anisovich <i>et al.</i>	
SHKLYAR 13	PR C87 015201	V. Shklyar, H. Lenske, U. Mosel	(GIES)
ANISOVICH 12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
CHEN 12A	PR C86 015206	W. Chen <i>et al.</i>	(DUKE, GWU, MSST, ITEP+)
SHRESTHA 12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
WORKMAN 12A	PR C86 015202	R. Workman <i>et al.</i>	(GWU)
BATINIC 10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)
AZNAURYAN 09	PR C80 055203	I.G. Aznauryan <i>et al.</i>	(JLab CLAS Collab.)
DRECHSEL 07	EPJ A34 69	D. Drechsel, S.S. Kamalov, L. Tiator	(MAINZ, JINR)
DUGGER 07	PR C76 025211	M. Dugger <i>et al.</i>	(JLab CLAS Collab.)
ARNDT 06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)
ARNDT 04	PR C69 035213	R.A. Arndt <i>et al.</i>	(GWU, TRIU)
STAROSTIN 03	PR C67 068201	A. Starostin <i>et al.</i>	(BNL Crystal Ball Collab.)
PENNER 02C	PR C66 055211	G. Penner, U. Mosel	(GIES)
PENNER 02D	PR C66 055212	G. Penner, U. Mosel	(GIES)
BAI 01B	PL B510 75	J.Z. Bai <i>et al.</i>	(BES Collab.)
THOMPSON 01	PRL 86 1702	R. Thompson <i>et al.</i>	(JLab CLAS Collab.)
VRANA 00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT, ANL)
ARMSTRONG 99B	PR D60 052004	C.S. Armstrong <i>et al.</i>	
MUKHOPAD... 95B	PL B364 1	N.C. Mukhopadhyay, J.F. Zhang, M. Benmerrouche	
HOEHLER 93	πN Newsletter 9 1	G. Hohler	(KARL)
CUTKOSKY 80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
Also	PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
HOEHLER 79	PDAT 12-1	G. Hohler <i>et al.</i>	(KARLT) IJP
Also	Toronto Conf. 3	R. Koch	(KARLT) IJP