NODE=B065

$N(1680)\ 5/2^+$

$I(J^P) = \frac{1}{2}(\frac{5}{2}^+)$ Status: ****

Older and obsolete values are listed and referenced in the 2014 edition, Chinese Physics **C38** 070001 (2014).

NODE=B065

N(1680) POLE POSITION

NODE=B065215

REAL PART

NODE=B065RE
NODE=B065RE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1660 to 1680 (≈ 1670) OUR ESTIMATE				→ UNCHECKED ←
1657±2	ROENCHEN	22	DPWA	Multichannel
1678±5	SOKHOYAN	15A	DPWA	Multichannel
1674±2±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
1667±5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1668	HUNT	19	DPWA	Multichannel
1669	ROENCHEN	15A	DPWA	Multichannel
1660	SHKLYAR	13	DPWA	Multichannel
1676±6	ANISOVICH	12A	DPWA	Multichannel
1666±8	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$
1674	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
1667	VRANA	00	DPWA	Multichannel
1673	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B065RE;LINKAGE=SV

−2×IMAGINARY PART

NODE=B065IM
NODE=B065IM

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
110 to 135 (≈ 120) OUR ESTIMATE				→ UNCHECKED ←
120± 1	ROENCHEN	22	DPWA	Multichannel
113± 4	SOKHOYAN	15A	DPWA	Multichannel
129± 3±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
110±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
118	HUNT	19	DPWA	Multichannel
100	ROENCHEN	15A	DPWA	Multichannel
98	SHKLYAR	13	DPWA	Multichannel
113± 4	ANISOVICH	12A	DPWA	Multichannel
135± 6	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$
115	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
122	VRANA	00	DPWA	Multichannel
135	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B065IM;LINKAGE=SV

N(1680) ELASTIC POLE RESIDUE

NODE=B065220

MODULUS $|r|$

NODE=B065RER
NODE=B065RER

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
35 to 45 (≈ 40) OUR ESTIMATE				→ UNCHECKED ←
36±1	ROENCHEN	22	DPWA	Multichannel
45±4	SOKHOYAN	15A	DPWA	Multichannel
44±1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
34±2	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
34	ROENCHEN	15A	DPWA	Multichannel
33	SHKLYAR	13	DPWA	Multichannel
43±4	ANISOVICH	12A	DPWA	Multichannel
44	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$
42	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
44	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B065RER;LINKAGE=SV

PHASE θ

NODE=B065IMR
NODE=B065IMR

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−30 to −10 (≈ −20) OUR ESTIMATE				→ UNCHECKED ←
−31± 1	ROENCHEN	22	DPWA	Multichannel
5±10	SOKHOYAN	15A	DPWA	Multichannel
−16± 1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
−25± 5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−19	ROENCHEN	15A	DPWA	Multichannel
−32	SHKLYAR	13	DPWA	Multichannel
− 2±10	ANISOVICH	12A	DPWA	Multichannel
−19	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
− 4	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
−17	HOEHLER	93	ARGD	$\pi N \to \pi N$

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B065IMR;LINKAGE=SV

$N(1680)$ INELASTIC POLE RESIDUE

NODE=B065240

The "normalized residue" is the residue divided by $\Gamma_{pole}/2$.

NODE=B065240

Normalized residue in $N\pi \to N(1680) \to \Delta\pi$, P-wave

NODE=B065RS1
NODE=B065RS1

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.15±0.03	−60 ± 30	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.15±0.03	−70 ± 45	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1680) \to \Delta\pi$, F-wave

NODE=B065RS2
NODE=B065RS2

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.23±0.04	90 ± 12	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.23±0.04	85 ± 15	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1680) \to N\eta$

NODE=B065A00
NODE=B065A00

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.006±0.004	118 ± 1	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.027	136	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1680) \to \Lambda K$

NODE=B065A01
NODE=B065A01

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.006±0.001	−119 ± 2	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.001	90	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1680) \to \Sigma K$

NODE=B065A02
NODE=B065A02

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.001±0.001	−46 ± 15	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.004	148	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1680) \to N\,(\pi\pi)^{I=0}_{S-wave}$

NODE=B065RS3
NODE=B065RS3

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.29±0.06	−45 ± 15	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.26±0.04	−56 ± 15	ANISOVICH	12A	DPWA	Multichannel

$N(1680)$ BREIT-WIGNER MASS

NODE=B065M

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1680 to 1690 (≈ 1685) OUR ESTIMATE				→ UNCHECKED ←
1686 ± 5	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+\pi^- p$
1681.0± 0.1	[1] HUNT	19	DPWA	Multichannel
1690 ± 5	SOKHOYAN	15A	DPWA	Multichannel
1676 ± 2	[1] SHKLYAR	13	DPWA	Multichannel
1680.1± 0.2	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
1680 ±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
1684 ± 3	HOEHLER	79	IPWA	$\pi N \to \pi N$

NODE=B065M
OCCUR=2

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

1689 ± 6	ANISOVICH	12A	DPWA	Multichannel
1682.7± 0.5	[1] SHRESTHA	12A	DPWA	Multichannel
1680 ± 7	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
1679 ± 3	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065M;LINKAGE=A

$N(1680)$ BREIT-WIGNER WIDTH

NODE=B065W

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
115 to 130 (≈ 120) OUR ESTIMATE				
118 ±20	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+\pi^- p$
123 ± 3	[1] HUNT	19	DPWA	Multichannel
119 ± 4	SOKHOYAN	15A	DPWA	Multichannel
115 ± 1	[1] SHKLYAR	13	DPWA	Multichannel
128.0± 1.1	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
120 ±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
128 ± 8	HOEHLER	79	IPWA	$\pi N \to \pi N$

NODE=B065W

NODE=B065W

→ UNCHECKED ←

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

118 ± 6	ANISOVICH	12A	DPWA	Multichannel
126 ± 1	[1] SHRESTHA	12A	DPWA	Multichannel
142 ± 7	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
128 ± 9	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065W;LINKAGE=A

$N(1680)$ DECAY MODES

NODE=B065225;NODE=B065

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

NODE=B065

	Mode	Fraction (Γ_i/Γ)	
Γ_1	$N\pi$	60–70 %	DESIG=1;OUR EST
Γ_2	$N\eta$	<1 %	DESIG=2;OUR EST
Γ_3	$N\pi\pi$	28–53 %	DESIG=5
Γ_4	$\Delta(1232)\pi$	11–23 %	DESIG=181;OUR EST
Γ_5	$\Delta(1232)\pi$, P-wave	4–10 %	DESIG=6;OUR EST
Γ_6	$\Delta(1232)\pi$, F-wave	1–13 %	DESIG=7;OUR EST
Γ_7	$N\rho$	8–11 %	DESIG=187;OUR EST
Γ_8	$N\rho$, S=3/2 , P-wave	6–8 %	DESIG=188
Γ_9	$N\rho$, S=3/2 , F-wave	2–3 %	DESIG=189
Γ_{10}	$N\sigma$	9–19 %	DESIG=11;OUR EST
Γ_{11}	$p\gamma$	0.21–0.32 %	DESIG=184;OUR EST
Γ_{12}	$p\gamma$, helicity=1/2	0.001–0.011 %	DESIG=12;OUR EST
Γ_{13}	$p\gamma$, helicity=3/2	0.20–0.32 %	DESIG=13;OUR EST
Γ_{14}	$n\gamma$	0.021–0.046 %	DESIG=185;OUR EST
Γ_{15}	$n\gamma$, helicity=1/2	0.004–0.029 %	DESIG=14;OUR EST
Γ_{16}	$n\gamma$, helicity=3/2	0.01–0.024 %	DESIG=15;OUR EST

$N(1680)$ BRANCHING RATIOS

NODE=B065230

$\Gamma(N\pi)/\Gamma_{\text{total}}$ Γ_1/Γ

NODE=B065R1

VALUE (%)	DOCUMENT ID		TECN	COMMENT
60 to 70 (≈ 65) OUR ESTIMATE				
68.0±0.1	[1] HUNT	19	DPWA	Multichannel
62 ±4	SOKHOYAN	15A	DPWA	Multichannel
68 ±1	[1] SHKLYAR	13	DPWA	Multichannel
70.1±0.1	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
62 ±5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
65 ±2	HOEHLER	79	IPWA	$\pi N \to \pi N$

NODE=B065R1

→ UNCHECKED ←

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

64 ±5	ANISOVICH	12A	DPWA	Multichannel
68.0±0.5	[1] SHRESTHA	12A	DPWA	Multichannel
67 ±3	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
69 ±2	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R1;LINKAGE=A

$\Gamma(N\eta)/\Gamma_{total}$ Γ_2/Γ

NODE=B065R3
NODE=B065R3

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.2 ±0.1	MUELLER	20	DPWA	Multichannel
0.09±0.02	[1] HUNT	19	DPWA	Multichannel
<1	SHKLYAR	13	DPWA	Multichannel
$0.15^{+0.35}_{-0.10}$	TIATOR	99	DPWA	$\gamma p \to p\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.0 ±0.3	[1] SHRESTHA	12A	DPWA	Multichannel
0.4 ±0.2	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
<1	THOMA	08	DPWA	Multichannel
0 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R3;LINKAGE=A

$\Gamma(N\pi\pi)/\Gamma_{total}$ Γ_3/Γ

NODE=B065R00
NODE=B065R00

VALUE (%)	DOCUMENT ID		TECN	COMMENT
28–53 % OUR ESTIMATE				→ UNCHECKED ←
24±4	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+\pi^- p$

$\Gamma(\Delta(1232)\pi, P\text{-wave})/\Gamma_{total}$ Γ_5/Γ

NODE=B065R15
NODE=B065R15

VALUE (%)	DOCUMENT ID		TECN	COMMENT
13 ±1	[1] HUNT	19	DPWA	Multichannel
7 ±3	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5 ±3	ANISOVICH	12A	DPWA	Multichannel
10.5±0.9	[1] SHRESTHA	12A	DPWA	Multichannel
14 ±3	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R15;LINKAGE=A

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

NODE=B065R14
NODE=B065R14

VALUE (%)	DOCUMENT ID		TECN	COMMENT
< 0.3	[1] HUNT	19	DPWA	Multichannel
10 ±3	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10 ±3	ANISOVICH	12A	DPWA	Multichannel
1.0±0.1	[1] SHRESTHA	12A	DPWA	Multichannel
1 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R14;LINKAGE=A

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

NODE=B065R02
NODE=B065R02

VALUE (%)	DOCUMENT ID		TECN	COMMENT
6–8 % OUR ESTIMATE				→ UNCHECKED ←
7±1	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R02;LINKAGE=A

$\Gamma(N\rho, S{=}3/2, F\text{-wave})/\Gamma_{total}$ Γ_9/Γ

NODE=B065R03
NODE=B065R03

VALUE (%)	DOCUMENT ID		TECN	COMMENT
2–3 % OUR ESTIMATE				→ UNCHECKED ←
2.4±0.4	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R03;LINKAGE=A

$\Gamma(N\sigma)/\Gamma_{total}$ Γ_{10}/Γ

NODE=B065R16
NODE=B065R16

VALUE (%)	DOCUMENT ID		TECN	COMMENT
8.7±1.5	[1] HUNT	19	DPWA	Multichannel
14 ±5	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
14 ±7	ANISOVICH	12A	DPWA	Multichannel
9.4±0.8	[1] SHRESTHA	12A	DPWA	Multichannel
9 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B065R16;LINKAGE=A

$N(1680)$ PHOTON DECAY AMPLITUDES AT THE POLE

NODE=B065260

$N(1680) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B065PA1
NODE=B065PA1

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.017 ± 0.003	70 ± 7	ROENCHEN	22	DPWA	Multichannel
-0.013 ± 0.003	-20 ± 17	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
-0.022	-28	ROENCHEN	15A	DPWA	Multichannel

$N(1680) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B065PA2
NODE=B065PA2

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.095 ± 0.003	-57 ± 4	ROENCHEN	22	DPWA	Multichannel
0.135 ± 0.005	1 ± 3	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.102	-11	ROENCHEN	15A	DPWA	Multichannel

$N(1680) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B065PA3
NODE=B065PA3

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.032 ± 0.003	-7 ± 5	ANISOVICH	17E	DPWA	Multichannel

$N(1680) \to n\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B065PA4
NODE=B065PA4

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.063 ± 0.004	-10 ± 5	ANISOVICH	17E	DPWA	Multichannel

$N(1680)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES

NODE=B065235

$N(1680) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B065A1
NODE=B065A1

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
-0.018 to -0.005 (≈ -0.010) OUR ESTIMATE				→ UNCHECKED ←
-0.0278 ± 0.0036	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+ \pi^- p$
-0.026 ± 0.004	[1] HUNT	19	DPWA	Multichannel
-0.015 ± 0.002	SOKHOYAN	15A	DPWA	Multichannel
0.003 ± 0.001	[1] SHKLYAR	13	DPWA	Multichannel
-0.007 ± 0.002	[1] WORKMAN	12A	DPWA	$\gamma N \to N\pi$
-0.017 ± 0.001	[1] DUGGER	07	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.013 ± 0.003	ANISOVICH	12A	DPWA	Multichannel
-0.017 ± 0.001	[1] SHRESTHA	12A	DPWA	Multichannel
-0.025	DRECHSEL	07	DPWA	$\gamma N \to \pi N$

[1] Statistical error only.

NODE=B065A1;LINKAGE=A

$N(1680) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B065A2
NODE=B065A2

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.130 to 0.140 (≈ 0.135) OUR ESTIMATE				→ UNCHECKED ←
0.128 ± 0.011	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+ \pi^- p$
0.112 ± 0.005	[1] HUNT	19	DPWA	Multichannel
0.136 ± 0.005	SOKHOYAN	15A	DPWA	Multichannel
0.116 ± 0.001	[1] SHKLYAR	13	DPWA	Multichannel
0.140 ± 0.002	[1] WORKMAN	12A	DPWA	$\gamma N \to N\pi$
0.134 ± 0.002	[1] DUGGER	07	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.135 ± 0.006	ANISOVICH	12A	DPWA	Multichannel
0.136 ± 0.001	[1] SHRESTHA	12A	DPWA	Multichannel
0.134	DRECHSEL	07	DPWA	$\gamma N \to \pi N$

[1] Statistical error only.

NODE=B065A2;LINKAGE=A

$N(1680) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B065A3
NODE=B065A3

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.020 to 0.040 (≈ 0.030) OUR ESTIMATE				→ UNCHECKED ←
0.005 ± 0.004	[1] HUNT	19	DPWA	Multichannel
0.033 ± 0.003	ANISOVICH	17E	DPWA	Multichannel
0.026 ± 0.004	[1] CHEN	12A	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.034 ± 0.006	ANISOVICH	13B	DPWA	Multichannel
0.029 ± 0.002	[1] SHRESTHA	12A	DPWA	Multichannel
0.028	DRECHSEL	07	DPWA	$\gamma N \to \pi N$

[1] Statistical error only.

NODE=B065A3;LINKAGE=A

$N(1680) \to\ n\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B065A4
NODE=B065A4

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
−0.050 to −0.025 (≈ − 0.035) OUR ESTIMATE				→ UNCHECKED ←
−0.061±0.004	[1] HUNT	19	DPWA	Multichannel
−0.063±0.004	ANISOVICH	17E	DPWA	Multichannel
−0.029±0.002	[1] CHEN	12A	DPWA	$\gamma N \to\ \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.044±0.009	ANISOVICH	13B	DPWA	Multichannel
−0.059±0.002	[1] SHRESTHA	12A	DPWA	Multichannel
−0.038	DRECHSEL	07	DPWA	$\gamma N \to\ \pi N$

[1] Statistical error only.

NODE=B065A4;LINKAGE=A

N(1680) REFERENCES

NODE=B065

For early references, see Physics Letters **111B** 1 (1982). For very early references, see Reviews of Modern Physics **37** 633 (1965).

NODE=B065

ROENCHEN	22	EPJ A58 229	D. Roenchen *et al.*	(JULI, GWU, BONN+)		REFID=61999
MUELLER	20	PL B803 135323	J. Mueller *et al.*	(CBELSA/TAPS Collab.)		REFID=60391
GOLOVATCH	19	PL B788 371	E. Golovatch *et al.*	(CLAS Collab.)		REFID=59418
HUNT	19	PR C99 055205	B.C. Hunt, D.M. Manley			REFID=59985
ANISOVICH	17E	PR C96 055202	A.V. Anisovich *et al.*	(BONN, PNPI, JLAB+)		REFID=62311
ROENCHEN	15A	EPJ A51 70	D. Roenchen *et al.*			REFID=58183
SOKHOYAN	15A	EPJ A51 95	V. Sokhoyan *et al.*	(CBELSA/TAPS Collab.)		REFID=56757
PDG	14	CP C38 070001	K. Olive *et al.*	(PDG Collab.)		REFID=55687
SVARC	14	PR C89 045205	A. Svarc *et al.*	(RBI Zagreb, UNI Tuzla)		REFID=55775
ANISOVICH	13B	EPJ A49 67	A.V. Anisovich *et al.*			REFID=56147
SHKLYAR	13	PR C87 015201	V. Shklyar, H. Lenske, U. Mosel	(GIES)		REFID=55104
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich *et al.*	(BONN, PNPI)		REFID=54041
CHEN	12A	PR C86 015206	W. Chen *et al.*	(DUKE, GWU, MSST, ITEP+)		REFID=54337
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)		REFID=54862
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