NODE=B062

$N(1520)\ 3/2^-$

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

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

NODE=B062

N(1520) POLE POSITION

NODE=B062215

REAL PART

NODE=B062RE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1505 to 1515 (≈ 1510) OUR ESTIMATE				
1482±3	ROENCHEN	22	DPWA	Multichannel
1507±2	SOKHOYAN	15A	DPWA	Multichannel
1506±1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
1510±5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1500	HUNT	19	DPWA	Multichannel
1512	ROENCHEN	15A	DPWA	Multichannel
1492	SHKLYAR	13	DPWA	Multichannel
1507±3	ANISOVICH	12A	DPWA	Multichannel
1506±9	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$
1515	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
1504	VRANA	00	DPWA	Multichannel
1510	HOEHLER	93	ARGD	$\pi N \to \pi N$

NODE=B062RE
NODE=B062RE
→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B062RE;LINKAGE=SV

−2×IMAGINARY PART

NODE=B062IM

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
105 to 120 (≈ 110) OUR ESTIMATE				
126± 9	ROENCHEN	22	DPWA	Multichannel
111± 3	SOKHOYAN	15A	DPWA	Multichannel
115± 2±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
114±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
117	HUNT	19	DPWA	Multichannel
89	ROENCHEN	15A	DPWA	Multichannel
94	SHKLYAR	13	DPWA	Multichannel
111± 5	ANISOVICH	12A	DPWA	Multichannel
122± 9	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$
113	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
112	VRANA	00	DPWA	Multichannel
120	HOEHLER	93	ARGD	$\pi N \to \pi N$

NODE=B062IM
NODE=B062IM
→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B062IM;LINKAGE=SV

N(1520) ELASTIC POLE RESIDUE

NODE=B062220

MODULUS $|r|$

NODE=B062RER

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
32 to 38 (≈ 35) OUR ESTIMATE				
27±11	ROENCHEN	22	DPWA	Multichannel
36± 2	SOKHOYAN	15A	DPWA	Multichannel
33± 1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
35± 2	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
37	ROENCHEN	15A	DPWA	Multichannel
27	SHKLYAR	13	DPWA	Multichannel
36± 3	ANISOVICH	12A	DPWA	Multichannel
35	BATINIC	10	DPWA	$\pi N \to N\pi,\ N\eta$
38	ARNDT	06	DPWA	$\pi N \to \pi N,\ \eta N$
32	HOEHLER	93	ARGD	$\pi N \to \pi N$

NODE=B062RER
NODE=B062RER
→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B062RER;LINKAGE=SV

PHASE θ

NODE=B062IMR
NODE=B062IMR

VALUE (°)	DOCUMENT ID		TECN	COMMENT
−15 to −5 (≈ − 10) OUR ESTIMATE				
−36±24	ROENCHEN	22	DPWA	Multichannel
−14± 3	SOKHOYAN	15A	DPWA	Multichannel
−15± 1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
−12± 5	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
− 6	ROENCHEN	15A	DPWA	Multichannel
−35	SHKLYAR	13	DPWA	Multichannel
−14± 3	ANISOVICH	12A	DPWA	Multichannel
− 7	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
− 5	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
− 8	HOEHLER	93	ARGD	$\pi N \to \pi N$

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B062IMR;LINKAGE=SV

$N(1520)$ INELASTIC POLE RESIDUE

NODE=B062240

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

NODE=B062240

Normalized residue in $N\pi \to N(1520) \to \Delta\pi$, S-wave

NODE=B062RS1
NODE=B062RS1

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.33±0.04	155 ± 15	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.33±0.05	150 ± 20	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1520) \to \Delta\pi$, D-wave

NODE=B062RS2
NODE=B062RS2

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.25±0.03	105 ± 18	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.25±0.03	100 ± 20	ANISOVICH	12A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1520) \to N\eta$

NODE=B062A00
NODE=B062A00

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.021±0.009	34 ± 27	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.026	95	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1520) \to \Lambda K$

NODE=B062A01
NODE=B062A01

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.026±0.010	127 ± 24	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.069	158	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1520) \to \Sigma K$

NODE=B062A02
NODE=B062A02

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.010±0.006	94 ± 34	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.049	−41	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to N(1520) \to N\sigma$

NODE=B062RS3
NODE=B062RS3

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.08±0.03	−45 ± 25	SOKHOYAN	15A	DPWA	Multichannel

$N(1520)$ BREIT-WIGNER MASS

NODE=B062M

NODE=B062M

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1510 to 1520 (≈ 1515) OUR ESTIMATE				
1512.0± 1.5	[1] HUNT	19	DPWA	Multichannel
1516 ± 2	SOKHOYAN	15A	DPWA	Multichannel
1505 ± 4	[1] SHKLYAR	13	DPWA	Multichannel
1514.5± 0.2	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
1525 ±10	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
1519 ± 4	HOEHLER	79	IPWA	$\pi N \to \pi N$

→ UNCHECKED ←

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

1517 ± 3	ANISOVICH	12A	DPWA	Multichannel
1512.6± 0.5	[1] SHRESTHA	12A	DPWA	Multichannel
1522 ± 8	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
1509 ± 1	PENNER	02C	DPWA	Multichannel
1518 ± 3	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B062M;LINKAGE=A

N(1520) BREIT-WIGNER WIDTH

NODE=B062W

NODE=B062W

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
100 to 120 (≈ 110) OUR ESTIMATE				→ UNCHECKED ←
121 ± 3	[1] HUNT	19	DPWA	Multichannel
113 ± 4	SOKHOYAN	15A	DPWA	Multichannel
100 ± 2	[1] SHKLYAR	13	DPWA	Multichannel
103.6± 0.4	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
120 ±15	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
114 ± 7	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
114 ± 5	ANISOVICH	12A	DPWA	Multichannel
117 ± 1	[1] SHRESTHA	12A	DPWA	Multichannel
132 ±11	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
100 ± 2	PENNER	02C	DPWA	Multichannel
124 ± 4	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B062W;LINKAGE=A

N(1520) DECAY MODES

NODE=B062225;NODE=B062

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

NODE=B062

	Mode	Fraction (Γ_i/Γ)	
Γ_1	$N\pi$	55–65 %	DESIG=1;OUR EST
Γ_2	$N\eta$	0.07–0.09 %	DESIG=2;OUR EST
Γ_3	$N\pi\pi$	25–35 %	DESIG=4;OUR EST
Γ_4	$\Delta(1232)\pi$	22–34 %	DESIG=181;OUR EST
Γ_5	$\Delta(1232)\pi$, S-wave	15–23 %	DESIG=5;OUR EST
Γ_6	$\Delta(1232)\pi$, D-wave	7–11 %	DESIG=6;OUR EST
Γ_7	$N\rho$	10–16 %	DESIG=186;OUR EVAL
Γ_8	$N\rho$, S=3/2 , S-wave	10–16 %	DESIG=187
Γ_9	$N\rho$, S=1/2 , D-wave	0.2–0.4 %	DESIG=188
Γ_{10}	$N\sigma$	<10 %	DESIG=10
Γ_{11}	$p\gamma$	0.31–0.52 %	DESIG=184;OUR EST
Γ_{12}	$p\gamma$, helicity=1/2	0.01–0.02 %	DESIG=11;OUR EST
Γ_{13}	$p\gamma$, helicity=3/2	0.30–0.50 %	DESIG=12;OUR EST
Γ_{14}	$n\gamma$	0.30–0.53 %	DESIG=185;OUR EST
Γ_{15}	$n\gamma$, helicity=1/2	0.04–0.10 %	DESIG=13;OUR EST
Γ_{16}	$n\gamma$, helicity=3/2	0.25–0.45 %	DESIG=14;OUR EST

N(1520) BRANCHING RATIOS

NODE=B062230

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

NODE=B062R1

NODE=B062R1

VALUE (%)	DOCUMENT ID		TECN	COMMENT
55 to 65 (≈ 60) OUR ESTIMATE				→ UNCHECKED ←
58.3±1.5	[1] HUNT	19	DPWA	Multichannel
61 ±2	SOKHOYAN	15A	DPWA	Multichannel
57 ±2	[1] SHKLYAR	13	DPWA	Multichannel
63.2±0.1	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
58 ±3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
54 ±3	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
62 ±3	ANISOVICH	12A	DPWA	Multichannel
62.7±0.5	[1] SHRESTHA	12A	DPWA	Multichannel
55 ±5	BATINIC	10	DPWA	$\pi N \to N\pi$, $N\eta$
56 ±1	PENNER	02C	DPWA	Multichannel
63 ±2	VRANA	00	DPWA	Multichannel

OCCUR=2

[1] Statistical error only.

NODE=B062R1;LINKAGE=A

$\Gamma(N\eta)/\Gamma_{total}$ Γ_2/Γ

NODE=B062R7
NODE=B062R7

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<0.1	MUELLER	20	DPWA	Multichannel
0.03±0.01	[1] HUNT	19	DPWA	Multichannel
0.08±0.01	TIATOR	99	DPWA	$\gamma p \rightarrow p\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1	SHKLYAR	13	DPWA	Multichannel
0.1 ±0.1	BATINIC	10	DPWA	$\pi N \rightarrow N\pi$, $N\eta$
0.2 ±0.1	THOMA	08	DPWA	Multichannel
0.08 to 0.12	ARNDT	05	DPWA	Multichannel
0.23±0.04	PENNER	02C	DPWA	Multichannel
0 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B062R7;LINKAGE=A

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

NODE=B062R10
NODE=B062R10

VALUE (%)	DOCUMENT ID		TECN	COMMENT
12.1±2.1	ADAMCZEW...	20	DPWA	Multichannel
21 ±2	[1] HUNT	19	DPWA	Multichannel
19 ±4	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
19 ±4	ANISOVICH	12A	DPWA	Multichannel
9.3±0.7	[1] SHRESTHA	12A	DPWA	Multichannel
15 ±2	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B062R10;LINKAGE=A

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

NODE=B062R9
NODE=B062R9

VALUE (%)	DOCUMENT ID		TECN	COMMENT
6 ±2	ADAMCZEW...	20	DPWA	Multichannel
6 ±1	[1] HUNT	19	DPWA	Multichannel
9 ±2	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9 ±2	ANISOVICH	12A	DPWA	Multichannel
6.3±0.5	[1] SHRESTHA	12A	DPWA	Multichannel
11 ±2	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B062R9;LINKAGE=A

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

NODE=B062R00
NODE=B062R00

VALUE (%)	DOCUMENT ID		TECN	COMMENT
10–16 % OUR EVALUATION				→ UNCHECKED ←
11.8±1.9	ADAMCZEW...	20	DPWA	Multichannel
14.1±1.5	[1] HUNT	19	DPWA	Multichannel

[1] Statistical error only

NODE=B062R00;LINKAGE=A

$\Gamma(N\rho, S{=}1/2, D\text{-wave})/\Gamma_{total}$ Γ_9/Γ

NODE=B062R01
NODE=B062R01

VALUE (%)	DOCUMENT ID		TECN	COMMENT
0.2–0.4 % OUR EVALUATION				→ UNCHECKED ←
0.4±0.2	ADAMCZEW...	20	DPWA	Multichannel

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

NODE=B062R11
NODE=B062R11

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<10 % OUR ESTIMATE				→ UNCHECKED ←
7 ±3	ADAMCZEW...	20	DPWA	Multichannel
<0.7	[1] HUNT	19	DPWA	Multichannel
<2	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1	[1] SHRESTHA	12A	DPWA	Multichannel
<4	THOMA	08	DPWA	Multichannel
1 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B062R11;LINKAGE=A

$N(1520)$ PHOTON DECAY AMPLITUDES AT THE POLE

NODE=B062260

$N(1520) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B062PA1
NODE=B062PA1

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.043 ± 0.013	-47 ± 10	ROENCHEN	22	DPWA	Multichannel
-0.023 ± 0.004	-6 ± 5	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
-0.031	-17	ROENCHEN	15A	DPWA	Multichannel

$N(1520) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B062PA2
NODE=B062PA2

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.112 ± 0.032	1.8 ± 19	ROENCHEN	22	DPWA	Multichannel
0.131 ± 0.006	4 ± 4	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.075	1.7	ROENCHEN	15A	DPWA	Multichannel

$N(1520) \to n\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B062PA3
NODE=B062PA3

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.045 ± 0.005	-5 ± 4	ANISOVICH	17E	DPWA	Multichannel

$N(1520) \to n\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B062PA4
NODE=B062PA4

MODULUS ($GeV^{-1/2}$)	PHASE (°)	DOCUMENT ID		TECN	COMMENT
-0.119 ± 0.005	5 ± 4	ANISOVICH	17E	DPWA	Multichannel

$N(1520)$ BREIT-WIGNER PHOTON DECAY AMPLITUDES

NODE=B062235

$N(1520) \to p\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B062A1
NODE=B062A1

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
-0.030 to -0.015 (≈ -0.025) OUR ESTIMATE				→ UNCHECKED ←
-0.034 ± 0.003	[1] HUNT	19	DPWA	Multichannel
-0.024 ± 0.004	SOKHOYAN	15A	DPWA	Multichannel
-0.015 ± 0.001	[1] SHKLYAR	13	DPWA	Multichannel
-0.019 ± 0.002	[1] WORKMAN	12A	DPWA	$\gamma N \to N\pi$
-0.028 ± 0.002	[1] DUGGER	07	DPWA	$\gamma N \to \pi N$
-0.038 ± 0.003	[1] AHRENS	02	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.022 ± 0.004	ANISOVICH	12A	DPWA	Multichannel
-0.034 ± 0.001	[1] SHRESTHA	12A	DPWA	Multichannel
-0.027	DRECHSEL	07	DPWA	$\gamma N \to \pi N$
-0.003	PENNER	02D	DPWA	Multichannel
$-0.052 \pm 0.010 \pm 0.007$	[1] MUKHOPAD...	98		$\gamma p \to \eta p$

[1] Statistical error only.

NODE=B062A1;LINKAGE=A

$N(1520) \to p\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B062A2
NODE=B062A2

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
0.135 to 0.145 ($\approx$ 0.140) OUR ESTIMATE				→ UNCHECKED ←
0.142 ± 0.003	[1] HUNT	19	DPWA	Multichannel
0.130 ± 0.006	SOKHOYAN	15A	DPWA	Multichannel
0.146 ± 0.001	[1] SHKLYAR	13	DPWA	Multichannel
0.141 ± 0.002	[1] WORKMAN	12A	DPWA	$\gamma N \to N\pi$
0.143 ± 0.002	[1] DUGGER	07	DPWA	$\gamma N \to \pi N$
0.147 ± 0.010	[1] AHRENS	02	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.131 ± 0.010	ANISOVICH	12A	DPWA	Multichannel
0.127 ± 0.003	[1] SHRESTHA	12A	DPWA	Multichannel
0.161	DRECHSEL	07	DPWA	$\gamma N \to \pi N$
0.151	PENNER	02D	DPWA	Multichannel
$0.130 \pm 0.020 \pm 0.015$	[1] MUKHOPAD...	98		$\gamma p \to \eta p$

[1] Statistical error only.

NODE=B062A2;LINKAGE=A

$N(1520) \rightarrow n\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B062A3
NODE=B062A3

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
−0.055 to −0.040 (≈ −0.050) OUR ESTIMATE				→ UNCHECKED ←
−0.072±0.003	[1] HUNT	19	DPWA	Multichannel
−0.046±0.005	ANISOVICH	17E	DPWA	Multichannel
−0.046±0.006	[1] CHEN	12A	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.049±0.008	ANISOVICH	13B	DPWA	Multichannel
−0.038±0.003	[1] SHRESTHA	12A	DPWA	Multichannel
−0.077	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$
−0.084	PENNER	02D	DPWA	Multichannel

[1] Statistical error only.

NODE=B062A3;LINKAGE=A

$N(1520) \rightarrow n\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B062A4
NODE=B062A4

VALUE ($GeV^{-1/2}$)	DOCUMENT ID		TECN	COMMENT
−0.120 to −0.100 (≈ −0.115) OUR ESTIMATE				→ UNCHECKED ←
−0.123±0.006	[1] HUNT	19	DPWA	Multichannel
−0.118±0.005	ANISOVICH	17E	DPWA	Multichannel
−0.115±0.005	[1] CHEN	12A	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.113±0.012	ANISOVICH	13B	DPWA	Multichannel
−0.101±0.004	[1] SHRESTHA	12A	DPWA	Multichannel
−0.154	DRECHSEL	07	DPWA	$\gamma N \rightarrow \pi N$
−0.159	PENNER	02D	DPWA	Multichannel

[1] Statistical error only.

NODE=B062A4;LINKAGE=A

N(1520) REFERENCES

NODE=B062

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

NODE=B062

ROENCHEN	22	EPJ A58 229	D. Roenchen *et al.*	(JULI, GWU, BONN+)	REFID=61999
ADAMCZEW...	20	PR C102 024001	J. Adamczewski-Musch *et al.*	(HADES Collab.)	REFID=60589
MUELLER	20	PL B803 135323	J. Mueller *et al.*	(CBELSA/TAPS Collab.)	REFID=60391
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
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CHEN	12A	PR C86 015206	W. Chen *et al.*	(DUKE, GWU, MSST, ITEP+)	REFID=54337
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DUGGER	07	PR C76 025211	M. Dugger *et al.*	(JLab CLAS Collab.)	REFID=52039
ARNDT	06	PR C74 045205	R.A. Arndt *et al.*	(GWU)	REFID=51535
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VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT, ANL)	REFID=47593
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