NODE=B010

$\Delta(1700)$ $3/2^-$

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

NODE=B010

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

$\Delta(1700)$ POLE POSITION

NODE=B010215

REAL PART

NODE=B010RE
NODE=B010RE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1640 to 1690 (≈ 1665) OUR ESTIMATE				
1655±15	SARANTSEV	25	DPWA	Multichannel
1637±32	ROENCHEN	22	DPWA	Multichannel
1643± 6±3	[1] SVARC	14	L+P	$\pi N \to \pi N$
1675±25	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1693	HUNT	19	DPWA	Multichannel
1677	ROENCHEN	15A	DPWA	Multichannel
1685±10	SOKHOYAN	15A	DPWA	Multichannel
1685±10	GUTZ	14	DPWA	Multichannel
1632	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
1726	VRANA	00	DPWA	Multichannel
1651	HOEHLER	93	SPED	$\pi N \to \pi N$

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B010RE;LINKAGE=SV

−2×IMAGINARY PART

NODE=B010IM
NODE=B010IM

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
200 to 300 (≈ 250) OUR ESTIMATE				
300±15	SARANTSEV	25	DPWA	Multichannel
295±29	ROENCHEN	22	DPWA	Multichannel
217±10±8	[1] SVARC	14	L+P	$\pi N \to \pi N$
220±40	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
213	HUNT	19	DPWA	Multichannel
305	ROENCHEN	15A	DPWA	Multichannel
300±15	SOKHOYAN	15A	DPWA	Multichannel
300±15	GUTZ	14	DPWA	Multichannel
253	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
118	VRANA	00	DPWA	Multichannel
159	HOEHLER	93	SPED	$\pi N \to \pi N$

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B010IM;LINKAGE=SV

$\Delta(1700)$ ELASTIC POLE RESIDUE

NODE=B010220

MODULUS $|r|$

NODE=B010RER
NODE=B010RER

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
10 to 40 (≈ 25) OUR ESTIMATE				
15±12	ROENCHEN	22	DPWA	Multichannel
40± 6	SOKHOYAN	15A	DPWA	Multichannel
13± 1±1	[1] SVARC	14	L+P	$\pi N \to \pi N$
13± 3	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
24	ROENCHEN	15A	DPWA	Multichannel
40± 6	GUTZ	14	DPWA	Multichannel
42± 7	ANISOVICH	12A	DPWA	Multichannel
18	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
10	HOEHLER	93	SPED	$\pi N \to \pi N$

→ UNCHECKED ←

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B010RER;LINKAGE=SV

PHASE θ

NODE=B010IMR
NODE=B010IMR

VALUE (°)	*DOCUMENT ID*		*TECN*	*COMMENT*
−40 to 0 (≈ −20) OUR ESTIMATE				
−13 ±74	ROENCHEN	22	DPWA	Multichannel
− 1 ±10	SOKHOYAN	15A	DPWA	Multichannel
−30 ± 4±3	[1] SVARC	14	L+P	$\pi N \to \pi N$
−40	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
−20 ±25	CUTKOSKY	80	IPWA	$\pi N \to \pi N$

→ UNCHECKED ←

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

− 7.3	ROENCHEN	15A	DPWA	Multichannel
− 1 ±10	GUTZ	14	DPWA	Multichannel
− 3 ±15	ANISOVICH	12A	DPWA	Multichannel

[1] Fit to the amplitudes of HOEHLER 79.

NODE=B010IMR;LINKAGE=SV

Δ(1700) INELASTIC POLE RESIDUE

NODE=B010240

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

NODE=B010240

Normalized residue in $N\pi \to \Delta(1700) \to \Delta\eta$

NODE=B010RS1
NODE=B010RS1

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.12±0.02	−60 ± 12	GUTZ	14	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.12±0.03	−60 ± 15	ANISOVICH	12A	DPWA	Multichannel

OCCUR=2

Normalized residue in $N\pi \to \Delta(1700) \to \Sigma K$

NODE=B010A00
NODE=B010A00

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.007±0.008	**−176 ± 160**	ROENCHEN	22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.011	−147	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to \Delta(1700) \to N(1535)\pi$

NODE=B010RS2
NODE=B010RS2

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.035±0.015	−75 ± 30	GUTZ	14	DPWA	Multichannel

Normalized residue in $N\pi \to \Delta(1700) \to \Delta(1232)\pi$, S-wave

NODE=B010RS3
NODE=B010RS3

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.20±0.15	146 ± 133	ROENCHEN	22	DPWA	Multichannel
0.25±0.12	135 ± 45	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.39	151	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to \Delta(1700) \to \Delta(1232)\pi$, D-wave

NODE=B010RS4
NODE=B010RS4

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.038±0.039	127 ± 127	ROENCHEN	22	DPWA	Multichannel
0.12 ±0.06	−160 ± 30	SOKHOYAN	15A	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.054	166	ROENCHEN	15A	DPWA	Multichannel

Normalized residue in $N\pi \to \Delta(1700) \to N(1520)\pi$, P-wave

NODE=B010RS5
NODE=B010RS5

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.10±0.03	−10 ± 20	SOKHOYAN	15A	DPWA	Multichannel

Δ(1700) BREIT-WIGNER MASS

NODE=B010M

NODE=B010M

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
1690 to 1730 (≈ 1710) OUR ESTIMATE				
1690 ±15	SARANTSEV	25	DPWA	Multichannel
1704 ± 8	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+\pi^- p$
1720 ± 5	[1] HUNT	19	DPWA	Multichannel
1695.0± 1.3	[1] ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
1710 ±30	CUTKOSKY	80	IPWA	$\pi N \to \pi N$
1680 ±70	HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1715 ±20	SOKHOYAN	15A	DPWA	Multichannel
1715 ±20	GUTZ	14	DPWA	Multichannel
1691 ± 4	[1] SHRESTHA	12A	DPWA	Multichannel
1678 ± 1	PENNER	02C	DPWA	Multichannel
1732 ±23	VRANA	00	DPWA	Multichannel

→ UNCHECKED ←

[1] Statistical error only. NODE=B010M;LINKAGE=A

Δ(1700) BREIT-WIGNER WIDTH

NODE=B010W

VALUE (MeV)		DOCUMENT ID		TECN	COMMENT
220 to 380 (≈ 300) OUR ESTIMATE					
310 ±15		SARANTSEV	25	DPWA	Multichannel
295 ±35		GOLOVATCH	19	DPWA	$\gamma p \to \pi^+ \pi^- p$
226 ±14	[1]	HUNT	19	DPWA	Multichannel
375.5± 7.0	[1]	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
280 ±80		CUTKOSKY	80	IPWA	$\pi N \to \pi N$
230 ±80		HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
300 ±25		SOKHOYAN	15A	DPWA	Multichannel
300 ±25		GUTZ	14	DPWA	Multichannel
248 ± 9	[1]	SHRESTHA	12A	DPWA	Multichannel
606 ±15		PENNER	02C	DPWA	Multichannel
119 ±70		VRANA	00	DPWA	Multichannel

NODE=B010W
→ UNCHECKED ←

[1] Statistical error only. NODE=B010W;LINKAGE=A

Δ(1700) DECAY MODES

NODE=B010225;NODE=B010

The following branching fractions are our estimates, not fits or averages. NODE=B010

	Mode	Fraction (Γ_i/Γ)	
Γ_1	$N\pi$	10–20 %	DESIG=1;OUR EST
Γ_2	$N\pi\pi$	>31 %	DESIG=3;OUR EST
Γ_3	$\Delta(1232)\pi$	9–70 %	DESIG=181;OUR EST
Γ_4	$\Delta(1232)\pi$, S-wave	5–54 %	DESIG=4;OUR EST
Γ_5	$\Delta(1232)\pi$, D-wave	4–16 %	DESIG=5;OUR EST
Γ_6	$N\rho$	(15 ±4) %	DESIG=189
Γ_7	$N\rho$, S=3/2, S-wave	22–32%	DESIG=7;OUR EST
Γ_8	$N(1440)\pi$	(3.0±2.0) %	DESIG=188
Γ_9	$N(1520)\pi$, P-wave	1–5 %	DESIG=11;OUR EST
Γ_{10}	$N(1535)\pi$	0.5–1.5 %	DESIG=186;OUR EST
Γ_{11}	$\Delta(1232)\eta$	3–7 %	DESIG=187;OUR EST
Γ_{12}	$N\gamma$	0.22–0.60 %	DESIG=185;OUR EST
Γ_{13}	$N\gamma$, helicity=1/2	0.12–0.30 %	DESIG=9;OUR EST
Γ_{14}	$N\gamma$, helicity=3/2	0.10–0.30 %	DESIG=10;OUR EST

Δ(1700) BRANCHING RATIOS

NODE=B010230

$\Gamma(N\pi)/\Gamma_{total}$ Γ_1/Γ

NODE=B010R1
NODE=B010R1
→ UNCHECKED ←

VALUE (%)		DOCUMENT ID		TECN	COMMENT
10 to 20 OUR ESTIMATE					
22 ±6		SEIFEN	25	DPWA	Multichannel
15 ±2	[1]	HUNT	19	DPWA	Multichannel
15.6±0.1	[1]	ARNDT	06	DPWA	$\pi N \to \pi N$, ηN
12 ±3		CUTKOSKY	80	IPWA	$\pi N \to \pi N$
20 ±3		HOEHLER	79	IPWA	$\pi N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
22 ±4		SOKHOYAN	15A	DPWA	Multichannel
22 ±4		GUTZ	14	DPWA	Multichannel
14 ±1	[1]	SHRESTHA	12A	DPWA	Multichannel
14 ±1		PENNER	02C	DPWA	Multichannel
5 ±1		VRANA	00	DPWA	Multichannel

[1] Statistical error only. NODE=B010R1;LINKAGE=A

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

NODE=B010R00
NODE=B010R00

VALUE	DOCUMENT ID		TECN	COMMENT
0.89±0.11	GOLOVATCH	19	DPWA	$\gamma p \to \pi^+ \pi^- p$

$\Gamma(\Delta(1232)\pi)/\Gamma_{total}$ Γ_3/Γ

NODE=B010R02
NODE=B010R02

VALUE (%)	DOCUMENT ID		TECN	COMMENT
35±13	SARANTSEV	25	DPWA	Multichannel

$\Gamma(\Delta(1232)\pi, S\text{-wave})/\Gamma_{total}$ Γ_4/Γ

NODE=B010R10
NODE=B010R10

VALUE (%)	DOCUMENT ID		TECN	COMMENT
23±13	SARANTSEV	25	DPWA	Multichannel
16±15	SEIFEN	25	DPWA	Multichannel
49± 5	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
20±15	SOKHOYAN	15A	DPWA	Multichannel
54± 3	[1] SHRESTHA	12A	DPWA	Multichannel
90± 2	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B010R10;LINKAGE=A

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

NODE=B010R9
NODE=B010R9

VALUE (%)	DOCUMENT ID		TECN	COMMENT
12 ±8	SARANTSEV	25	DPWA	Multichannel
8 ±6	SEIFEN	25	DPWA	Multichannel
7.6±0.3	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10 ±6	SOKHOYAN	15A	DPWA	Multichannel
1 ±1	[1] SHRESTHA	12A	DPWA	Multichannel
4 ±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B010R9;LINKAGE=A

$\Gamma(N\rho)/\Gamma_{total}$ Γ_6/Γ

NODE=B010R03
NODE=B010R03

VALUE (%)	DOCUMENT ID		TECN	COMMENT
15±4	SARANTSEV	25	DPWA	Multichannel

$\Gamma(N\rho, S=3/2, S\text{-wave})/\Gamma_{total}$ Γ_7/Γ

NODE=B010R8
NODE=B010R8

VALUE (%)	DOCUMENT ID		TECN	COMMENT
15±4	SARANTSEV	25	DPWA	Multichannel
27±5	[1] HUNT	19	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
30±3	[1] SHRESTHA	12A	DPWA	Multichannel
1±1	VRANA	00	DPWA	Multichannel

[1] Statistical error only.

NODE=B010R8;LINKAGE=A

$\Gamma(N(1440)\pi)/\Gamma_{total}$ Γ_8/Γ

NODE=B010R01
NODE=B010R01

VALUE (%)	DOCUMENT ID		TECN	COMMENT
3±2	SEIFEN	25	DPWA	Multichannel

$\Gamma(N(1520)\pi, P\text{-wave})/\Gamma_{total}$ Γ_9/Γ

NODE=B010R14
NODE=B010R14

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<1	SEIFEN	25	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3±2	SOKHOYAN	15A	DPWA	Multichannel

$\Gamma(N(1535)\pi)/\Gamma_{total}$ Γ_{10}/Γ

NODE=B010R11
NODE=B010R11

VALUE (%)	DOCUMENT ID		TECN	COMMENT
<1	SEIFEN	25	DPWA	Multichannel
1.0±0.5	GUTZ	14	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4 ±2	HORN	08A	DPWA	Multichannel

$\Gamma(\Delta(1232)\eta)/\Gamma_{total}$ Γ_{11}/Γ

NODE=B010R12
NODE=B010R12

VALUE (%)	DOCUMENT ID		TECN	COMMENT
5±2	GUTZ	14	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5±2	ANISOVICH	12A	DPWA	Multichannel

$\Gamma(N(1535)\pi)/\Gamma(\Delta(1232)\eta)$ Γ_{10}/Γ_{11}

NODE=B010R13
NODE=B010R13

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.67	KASHEVAROV 09	CBAL	$\gamma p \to p \pi^0 \eta$

Δ(1700) PHOTON DECAY AMPLITUDES AT THE POLE

NODE=B010260

Δ(1700) → $N\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B010PA1
NODE=B010PA1

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.150±0.020	30 ± 15	SARANTSEV 25	DPWA	Multichannel
0.163±0.060	−4.4 ± 39	ROENCHEN 22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.123	1.1	ROENCHEN 15A	DPWA	Multichannel
0.175±0.020	50 ± 10	SOKHOYAN 15A	DPWA	Multichannel

Δ(1700) → $N\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B010PA2
NODE=B010PA2

MODULUS (GeV$^{-1/2}$)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
0.155±0.020	40 ± 15	SARANTSEV 25	DPWA	Multichannel
0.221±0.093	−12 ± 40	ROENCHEN 22	DPWA	Multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.124	22	ROENCHEN 15A	DPWA	Multichannel
0.180±0.020	45 ± 10	SOKHOYAN 15A	DPWA	Multichannel

Δ(1700) BREIT-WIGNER PHOTON DECAY AMPLITUDES

NODE=B010235

Δ(1700) → $N\gamma$, helicity-1/2 amplitude $A_{1/2}$

NODE=B010A1
NODE=B010A1

→ UNCHECKED ←

VALUE (GeV$^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.100 to 0.160 (≈ 0.130) OUR ESTIMATE			
0.153 ±0.018	SARANTSEV 25	DPWA	Multichannel
0.0872±0.0189	GOLOVATCH 19	DPWA	$\gamma p \to \pi^+ \pi^- p$
0.156 ±0.017	[1] HUNT 19	DPWA	Multichannel
0.132 ±0.005	[1] DUGGER 13	DPWA	$\gamma N \to \pi N$
0.105 ±0.005	[1] WORKMAN 12A	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.165 ±0.020	SOKHOYAN 15A	DPWA	Multichannel
0.165 ±0.020	GUTZ 14	DPWA	Multichannel
0.058 ±0.010	[1] SHRESTHA 12A	DPWA	Multichannel
0.226	DRECHSEL 07	DPWA	$\gamma N \to \pi N$
0.125 ±0.003	DUGGER 07	DPWA	$\gamma N \to \pi N$
0.096	PENNER 02D	DPWA	Multichannel

[1] Statistical error only.

NODE=B010A1;LINKAGE=A

Δ(1700) → $N\gamma$, helicity-3/2 amplitude $A_{3/2}$

NODE=B010A2
NODE=B010A2

→ UNCHECKED ←

VALUE (GeV$^{-1/2}$)	DOCUMENT ID	TECN	COMMENT
0.090 to 0.170 (≈ 0.130) OUR ESTIMATE			
0.158 ±0.017	SARANTSEV 25	DPWA	Multichannel
0.0872±0.0164	GOLOVATCH 19	DPWA	$\gamma p \to \pi^+ \pi^- p$
0.0125±0.0016	[1] HUNT 19	DPWA	Multichannel
0.108 ±0.005	[1] DUGGER 13	DPWA	$\gamma N \to \pi N$
0.092 ±0.004	[1] WORKMAN 12A	DPWA	$\gamma N \to \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.170 ±0.025	SOKHOYAN 15A	DPWA	Multichannel
0.170 ±0.025	GUTZ 14	DPWA	Multichannel
0.097 ±0.008	[1] SHRESTHA 12A	DPWA	Multichannel
0.210	DRECHSEL 07	DPWA	$\gamma N \to \pi N$
0.105 ±0.003	DUGGER 07	DPWA	$\gamma N \to \pi N$
0.154	PENNER 02D	DPWA	Multichannel

[1] Statistical error only.

NODE=B010A2;LINKAGE=A

$\Delta(1700)$ REFERENCES

NODE=B010

For early references, see Physics Letters **111B** 1 (1982).

NODE=B010

SARANTSEV	25	PR C112 015202	A.V. Sarantsev *et al.*	(Bonn-Gatchina Collab.)	REFID=63294
SEIFEN	25	EPJ A61 173	T. Seifen *et al.*	(CBELSA/TAPS Collab.)	REFID=63593
ROENCHEN	22	EPJ A58 229	D. Roenchen *et al.*	(JULI, GWU, BONN+)	REFID=61999
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
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
GUTZ	14	EPJ A50 74	E. Gutz *et al.*	(CBELSA/TAPS Collab.)	REFID=55697
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
DUGGER	13	PR C88 065203	M. Dugger *et al.*	(JLab CLAS Collab.)	REFID=55645
ANISOVICH	12A	EPJ A48 15	A.V. Anisovich *et al.*	(BONN, PNPI)	REFID=54041
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)	REFID=54862
WORKMAN	12A	PR C86 015202	R. Workman *et al.*	(GWU)	REFID=54335
KASHEVAROV	09	EPJ A42 141	V.L. Kashevarov *et al.*	(MAMI Crystal Ball/TAPS)	REFID=53070
HORN	08A	EPJ A38 173	I. Horn *et al.*	(CB-ELSA Collab.)	REFID=52706
Also		PRL 101 202002	I. Horn *et al.*	(CB-ELSA Collab.)	REFID=52567
DRECHSEL	07	EPJ A34 69	D. Drechsel, S.S. Kamalov, L. Tiator	(MAINZ, JINR)	REFID=52105
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
PENNER	02C	PR C66 055211	G. Penner, U. Mosel	(GIES)	REFID=49129
PENNER	02D	PR C66 055212	G. Penner, U. Mosel	(GIES)	REFID=49130
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT, ANL)	REFID=47593
HOEHLER	93	πN Newsletter 9 1	G. Hohler	(KARL)	REFID=43821
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky *et al.*	(CMU, LBL) IJP	REFID=30064
Also		PR D20 2839	R.E. Cutkosky *et al.*	(CMU, LBL) IJP	REFID=40096
HOEHLER	79	PDAT 12-1	G. Hohler *et al.*	(KARLT) IJP	REFID=30058
Also		Toronto Conf. 3	R. Koch	(KARLT) IJP	REFID=30859