

$K_2^*(1430)$

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

We consider that phase-shift analyses provide more reliable determinations of the mass and width.

$K_2^*(1430)$ MASS

CHARGED ONLY, WITH FINAL STATE $K\pi$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1425.6 ± 1.5 OUR AVERAGE Error includes scale factor of 1.1.					
1420 ± 4	1587	BAUBILLIER	84B HBC	-	8.25 $K^- p \rightarrow \bar{K}^0 \pi^- p$
1436 ± 5.5	400	^{1,2} CLELAND	82 SPEC	+	30 $K^+ p \rightarrow K_S^0 \pi^+ p$
1430 ± 3.2	1500	^{1,2} CLELAND	82 SPEC	+	50 $K^+ p \rightarrow K_S^0 \pi^+ p$
1430 ± 3.2	1200	^{1,2} CLELAND	82 SPEC	-	50 $K^+ p \rightarrow K_S^0 \pi^- p$
1423 ± 5	935	TOAFF	81 HBC	-	6.5 $K^- p \rightarrow \bar{K}^0 \pi^- p$
1428.0 ± 4.6		³ MARTIN	78 SPEC	+	10 $K^\pm p \rightarrow K_S^0 \pi p$
1423.8 ± 4.6		³ MARTIN	78 SPEC	-	10 $K^\pm p \rightarrow K_S^0 \pi p$
1420.0 ± 3.1	1400	AGUILAR-...	71B HBC	-	3.9, 4.6 $K^- p$
1425 ± 8.0	225	^{1,2} BARNHAM	71C HBC	+	$K^+ p \rightarrow K^0 \pi^+ p$
1416 ± 10	220	CRENNELL	69D DBC	-	3.9 $K^- N \rightarrow \bar{K}^0 \pi^- N$
1414 ± 13.0	60	¹ LIND	69 HBC	+	9 $K^+ p \rightarrow K^0 \pi^+ p$
1427 ± 12	63	¹ SCHWEING...	68 HBC	-	5.5 $K^- p \rightarrow \bar{K} \pi N$
1423 ± 11.0	39	¹ BASSANO	67 HBC	-	4.6-5.0 $K^- p \rightarrow \bar{K}^0 \pi^- p$

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

1423.4 ± 2 ± 3	24809 ± 820	⁴ BIRD	89 LASS	-	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
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NEUTRAL ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
1432.4 ± 1.3 OUR AVERAGE					
1431.2 ± 1.8 ± 0.7		⁵ ASTON	88 LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
1434 ± 4 ± 6		⁵ ASTON	87 LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
1433 ± 6 ± 10		⁵ ASTON	84B LASS	0	11 $K^- p \rightarrow \bar{K}^0 2\pi n$
1471 ± 12		⁵ BAUBILLIER	82B HBC	0	8.25 $K^- p \rightarrow NK_S^0 \pi \pi$
1428 ± 3		⁵ ASTON	81C LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
1434 ± 2		⁵ ESTABROOKS	78 ASPK	0	13 $K^\pm p \rightarrow p K \pi$
1440 ± 10		⁵ BOWLER	77 DBC	0	5.5 $K^+ d \rightarrow K \pi p p$

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

1420 ± 7	300	HENDRICK	76 DBC		8.25 $K^+ N \rightarrow K^+ \pi N$
1421.6 ± 4.2	800	MCCUBBIN	75 HBC	0	3.6 $K^- p \rightarrow K^- \pi^+ n$
1420.1 ± 4.3		⁶ LINGLIN	73 HBC	0	2-13 $K^+ p \rightarrow K^+ \pi^- X$

1419.1 ± 3.7	1800	AGUILAR-...	71B HBC	0	3.9,4.6 $K^- p$
1416 ± 6	600	CORDS	71 DBC	0	9 $K^+ n \rightarrow K^+ \pi^- p$
1421.1 ± 2.6	2200	DAVIS	69 HBC	0	12 $K^+ p \rightarrow K^+ \pi^- X$

¹ Errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.

² Number of events in peak re-evaluated by us.

³ Systematic error added by us.

⁴ From a partial wave amplitude analysis.

⁵ From phase shift or partial-wave analysis.

⁶ From pole extrapolation, using world $K^+ p$ data summary tape.

$K_2^*(1430)$ WIDTH

CHARGED ONLY, WITH FINAL STATE $K\pi$

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
98.5 ± 2.7 OUR FIT	Error includes scale factor of 1.1.				
98.5 ± 2.9 OUR AVERAGE	Error includes scale factor of 1.1.				
109 ± 22	400	^{7,8} CLELAND	82 SPEC	+	30 $K^+ p \rightarrow K_S^0 \pi^+ p$
124 ± 12.8	1500	^{7,8} CLELAND	82 SPEC	+	50 $K^+ p \rightarrow K_S^0 \pi^+ p$
113 ± 12.8	1200	^{7,8} CLELAND	82 SPEC	-	50 $K^+ p \rightarrow K_S^0 \pi^- p$
85 ± 16	935	TOAFF	81 HBC	-	6.5 $K^- p \rightarrow \bar{K}^0 \pi^- p$
96.5 ± 3.8		MARTIN	78 SPEC	+	10 $K^\pm p \rightarrow K_S^0 \pi p$
97.7 ± 4.0		MARTIN	78 SPEC	-	10 $K^\pm p \rightarrow K_S^0 \pi p$
94.7 ^{+15.1} _{-12.5}	1400	AGUILAR-...	71B HBC	-	3.9,4.6 $K^- p$

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

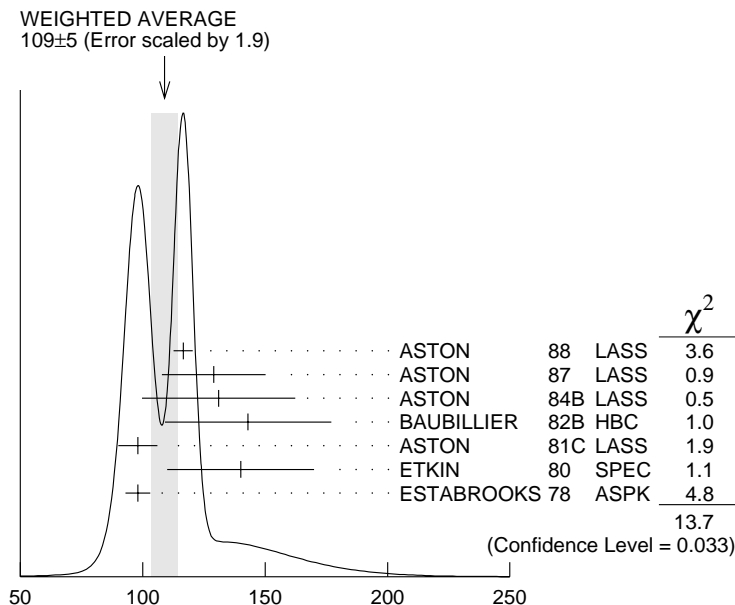
98 ± 4 ± 4	24809 ± 820	⁹ BIRD	89 LASS	-	11 $K^- p \rightarrow \bar{K}^0 \pi^- p$
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NEUTRAL ONLY

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
109 ± 5 OUR AVERAGE	Error includes scale factor of 1.9. See the ideogram below.				
116.5 ± 3.6 ± 1.7		¹⁰ ASTON	88 LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
129 ± 15 ± 15		¹⁰ ASTON	87 LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
131 ± 24 ± 20		¹⁰ ASTON	84B LASS	0	11 $K^- p \rightarrow \bar{K}^0 2\pi n$
143 ± 34		¹⁰ BAUBILLIER	82B HBC	0	8.25 $K^- p \rightarrow NK_S^0 \pi \pi$
98 ± 8		¹⁰ ASTON	81C LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
140 ± 30		¹⁰ ETKIN	80 SPEC	0	6 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
98 ± 5		¹⁰ ESTABROOKS	78 ASPK	0	13 $K^\pm p \rightarrow pK\pi$

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

125 ± 29	300	⁷ HENDRICK	76 DBC		8.25 $K^+ N \rightarrow K^+ \pi N$
116 ± 18	800	MCCUBBIN	75 HBC	0	3.6 $K^- p \rightarrow K^- \pi^+ n$
61 ± 14		¹¹ LINGLIN	73 HBC	0	2-13 $K^+ p \rightarrow K^+ \pi^- X$
116.6 ^{+10.3} _{-15.5}	1800	AGUILAR-...	71B HBC	0	3.9,4.6 $K^- p$
144 ± 24.0	600	⁷ CORDS	71 DBC	0	9 $K^+ n \rightarrow K^+ \pi^- p$
101 ± 10	2200	DAVIS	69 HBC	0	12 $K^+ p \rightarrow K^+ \pi^- \pi^+ p$



$K_2^*(1430)^0$ width (MeV)

⁷ Errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

⁸ Number of events in peak re-evaluated by us.

⁹ From a partial wave amplitude analysis.

¹⁰ From phase shift or partial-wave analysis.

¹¹ From pole extrapolation, using world $K^+ p$ data summary tape.

$K_2^*(1430)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 $K\pi$	$(49.9 \pm 1.2) \%$	
Γ_2 $K^*(892)\pi$	$(24.7 \pm 1.5) \%$	
Γ_3 $K^*(892)\pi\pi$	$(13.4 \pm 2.2) \%$	
Γ_4 $K\rho$	$(8.7 \pm 0.8) \%$	S=1.2
Γ_5 $K\omega$	$(2.9 \pm 0.8) \%$	
Γ_6 $K^+\gamma$	$(2.4 \pm 0.5) \times 10^{-3}$	S=1.1
Γ_7 $K\eta$	$(1.5^{+3.4}_{-1.0}) \times 10^{-3}$	S=1.3
Γ_8 $K\omega\pi$	$< 7.2 \times 10^{-4}$	CL=95%
Γ_9 $K^0\gamma$	$< 9 \times 10^{-4}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and 10 branching ratios uses 31 measurements and one constraint to determine 8 parameters. The overall fit has a $\chi^2 = 20.2$ for 24 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	-9						
x_3	-40	-73					
x_4	-8	36	-52				
x_5	-11	-3	-26	-7			
x_6	-1	-1	-1	-1	0		
x_7	-4	-7	-5	-5	-2	0	
Γ	0	0	0	0	0	-13	0
	x_1	x_2	x_3	x_4	x_5	x_6	x_7

	Mode	Rate (MeV)	Scale factor
Γ_1	$K\pi$	49.1 ± 1.8	
Γ_2	$K^*(892)\pi$	24.3 ± 1.6	
Γ_3	$K^*(892)\pi\pi$	13.2 ± 2.2	
Γ_4	$K\rho$	8.5 ± 0.8	1.2
Γ_5	$K\omega$	2.9 ± 0.8	
Γ_6	$K^+\gamma$	0.24 ± 0.05	1.1
Γ_7	$K\eta$	$0.15^{+0.33}_{-0.10}$	1.3

$K_2^*(1430)$ PARTIAL WIDTHS

$\Gamma(K^+\gamma)$ Γ_6

VALUE (keV)	DOCUMENT ID	TECN	CHG	COMMENT
241 ± 50 OUR FIT				Error includes scale factor of 1.1.
240 ± 45	CIHANGIR	82	SPEC +	$200 K^+ Z \rightarrow Z K^+ \pi^0,$ $Z K_S^0 \pi^+$

$\Gamma(K^0\gamma)$ Γ_9

VALUE (keV)	CL%	DOCUMENT ID	TECN	CHG	COMMENT
< 5.4 (CL = 90%)					[< 84 keV (CL = 90%) OUR 2002 BEST LIMIT]
< 5.4	90	ALAVI-HARATI02B	KTEV		$K + A \rightarrow K^* + A$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 84	90	CARLSMITH	87	SPEC 0	$60-200 K_L^0 A \rightarrow$ $K_S^0 \pi^0 A$

$K_2^*(1430)$ BRANCHING RATIOS **$\Gamma(K\pi)/\Gamma_{\text{total}}$ Γ_1/Γ**

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.499±0.012 OUR FIT					
0.488±0.014 OUR AVERAGE					
0.485±0.006±0.020	¹² ASTON	88	LASS	0	11 $K^- p \rightarrow K^- \pi^+ n$
0.49 ±0.02	¹² ESTABROOKS	78	ASPK	±	13 $K^\pm p \rightarrow p K \pi$

 $\Gamma(K^*(892)\pi)/\Gamma(K\pi)$ Γ_2/Γ_1

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.496±0.034 OUR FIT					
0.47 ±0.04 OUR AVERAGE					
0.44 ±0.09	ASTON	84B	LASS	0	11 $K^- p \rightarrow \bar{K}^0 2\pi n$
0.62 ±0.19	LAUSCHER	75	HBC	0	10,16 $K^- p \rightarrow K^- \pi^+ n$
0.54 ±0.16	DEHM	74	DBC	0	4.6 $K^+ N$
0.47 ±0.08	AGUILAR-...	71B	HBC		3.9,4.6 $K^- p$
0.47 ±0.10	BASSANO	67	HBC	-0	4.6,5.0 $K^- p$
0.45 ±0.13	BADIER	65C	HBC	-	3 $K^- p$

 $\Gamma(K\omega)/\Gamma(K\pi)$ Γ_5/Γ_1

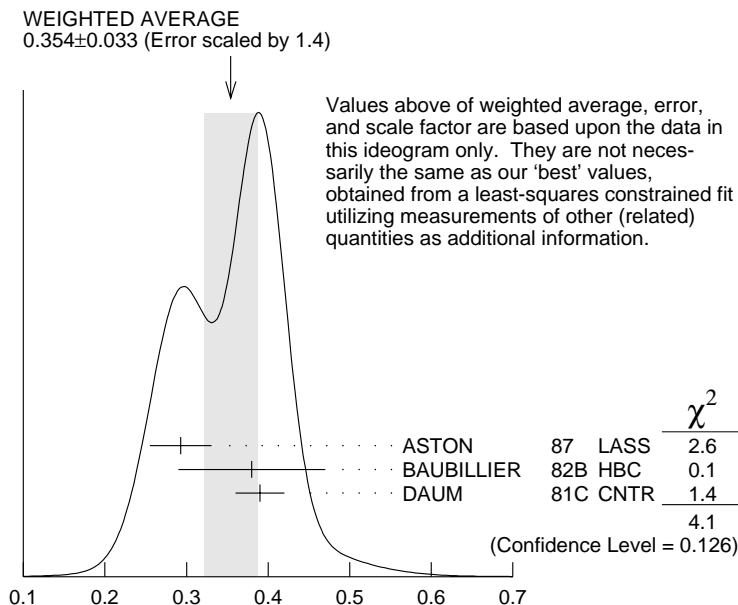
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.059±0.017 OUR FIT					
0.070±0.035 OUR AVERAGE					
0.05 ±0.04	AGUILAR-...	71B	HBC		3.9,4.6 $K^- p$
0.13 ±0.07	BASSOMPIE...	69	HBC	0	5 $K^+ p$

 $\Gamma(K\rho)/\Gamma(K\pi)$ Γ_4/Γ_1

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.174±0.017 OUR FIT	Error includes scale factor of 1.2.				
0.150^{+0.029}_{-0.017} OUR AVERAGE					
0.18 ±0.05	ASTON	84B	LASS	0	11 $K^- p \rightarrow \bar{K}^0 2\pi n$
0.02 ^{+0.10} _{-0.02}	DEHM	74	DBC	0	4.6 $K^+ N$
0.16 ±0.05	AGUILAR-...	71B	HBC		3.9,4.6 $K^- p$
0.14 ±0.10	BASSANO	67	HBC	-0	4.6,5.0 $K^- p$
0.14 ±0.07	BADIER	65C	HBC	-	3 $K^- p$

 $\Gamma(K\rho)/\Gamma(K^*(892)\pi)$ Γ_4/Γ_2

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
0.350±0.031 OUR FIT	Error includes scale factor of 1.4.				
0.354±0.033 OUR AVERAGE	Error includes scale factor of 1.4. See the ideogram below.				
0.293±0.032±0.020	ASTON	87	LASS	0	11 $K^- p \rightarrow \bar{K}^0 \pi^+ \pi^- n$
0.38 ±0.09	BAUBILLIER	82B	HBC	0	8.25 $K^- p \rightarrow N K_S^0 \pi \pi$
0.39 ±0.03	DAUM	81C	CNTR		63 $K^- p \rightarrow K^- 2\pi p$



$$\Gamma(K\rho)/\Gamma(K^*(892)\pi)$$

$$\Gamma(K\omega)/\Gamma(K^*(892)\pi)$$

Γ_5/Γ_2

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.118±0.034 OUR FIT				
0.10 ±0.04	FIELD	67	HBC	— 3.8 $K^- p$

$$\Gamma(K\eta)/\Gamma(K^*(892)\pi)$$

Γ_7/Γ_2

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.006^{+0.014}_{-0.004} OUR FIT				Error includes scale factor of 1.2.
0.07 ±0.04	FIELD	67	HBC	— 3.8 $K^- p$

$$\Gamma(K\eta)/\Gamma(K\pi)$$

Γ_7/Γ_1

VALUE	CL%	DOCUMENT ID	TECN	CHG	COMMENT
0.0030^{+0.0068}_{-0.0020} OUR FIT					Error includes scale factor of 1.3.
0 ±0.0056		¹³ ASTON	88B LASS	—	11 $K^- p \rightarrow K^- \eta p$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<0.04	95	AGUILAR-...	71B HBC		3.9,4.6 $K^- p$
<0.065		¹⁴ BASSOMPIE...	69 HBC		5.0 $K^+ p$
<0.02		BISHOP	69 HBC		3.5 $K^+ p$

$$\Gamma(K^*(892)\pi\pi)/\Gamma_{total}$$

Γ_3/Γ

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.134±0.022 OUR FIT				
0.12 ±0.04	¹⁵ GOLDBERG	76	HBC	— 3 $K^- p \rightarrow p \bar{K}^0 \pi \pi \pi$

$\Gamma(K^*(892)\pi\pi)/\Gamma(K\pi)$ Γ_3/Γ_1

VALUE	DOCUMENT ID	TECN	CHG	COMMENT
0.27±0.05 OUR FIT				
0.21±0.08	^{14,15} JONGEJANS	78	HBC	— 4 $K^- p \rightarrow p \bar{K}^0 \pi \pi \pi$

 $\Gamma(K\omega\pi)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<0.72	95	0	JONGEJANS	78	HBC 4 $K^- p \rightarrow p \bar{K}^0 4\pi$

¹² From phase shift analysis.¹³ ASTON 88B quote < 0.0092 at CL=95%. We convert this to a central value and 1 sigma error in order to be able to use it in our constrained fit.¹⁴ Restated by us.¹⁵ Assuming $\pi\pi$ system has isospin 1, which is supported by the data. $K_2^*(1430)$ REFERENCES

ALAVI-HARATI 02B	PRL 89 072001	A. Alavi-Harati <i>et al.</i>	(FNAL KTeV Collab.)
BIRD 89	SLAC-332	P.F. Bird	(SLAC)
ASTON 88	NP B296 493	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON 88B	PL B201 169	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
ASTON 87	NP B292 693	D. Aston <i>et al.</i>	(SLAC, NAGO, CINC, INUS)
CARLSMITH 87	PR D36 3502	D. Carlsmith <i>et al.</i>	(EFI, SACL)
ASTON 84B	NP B247 261	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA)
BAUBILLIER 84B	ZPHY C26 37	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
BAUBILLIER 82B	NP B202 21	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
CIHANGIR 82	PL 117B 123	S. Cihangir <i>et al.</i>	(FNAL, MINN, ROCH)
CLELAND 82	NP B208 189	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)
ASTON 81C	PL 106B 235	D. Aston <i>et al.</i>	(SLAC, CARL, OTTA) JP
DAUM 81C	NP B187 1	C. Daum <i>et al.</i>	(AMST, CERN, CRAC, MPIM+)
TOAFF 81	PR D23 1500	S. Toaff <i>et al.</i>	(ANL, KANS)
ETKIN 80	PR D22 42	A. Etkin <i>et al.</i>	(BNL, CUNY) JP
ESTABROOKS 78	NP B133 490	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)
Also 78B	PR D17 658	P.G. Estabrooks <i>et al.</i>	(MCGI, CARL, DURH+)
JONGEJANS 78	NP B139 383	B. Jongejans <i>et al.</i>	(ZEEM, CERN, NIJM+)
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BOWLER 77	NP B126 31	M.G. Bowler <i>et al.</i>	(OXF)
GOLDBERG 76	LNC 17 253	J. Goldberg	(HAIF)
HENDRICK 76	NP B112 189	K. Hendrickx <i>et al.</i>	(MONS, SACL, PARIS+)
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DEHM 74	NP B75 47	G. Dehm <i>et al.</i>	(MPIM, BRUX, MONS, CERN)
LINGLIN 73	NP B55 408	D. Linglin	(CERN)
AGUILAR-... 71B	PR D4 2583	M. Aguilar-Benitez, R.L. Eisner, J.B. Kinson	(BNL)
BARNHAM 71C	NP B28 171	K.W.J. Barnham <i>et al.</i>	(BIRM, GLAS)
CORDS 71	PR D4 1974	D. Cords <i>et al.</i>	(PURD, UCD, IUPU)
BASSOMPIE... 69	NP B13 189	G. Bassompierre <i>et al.</i>	(CERN, BRUX) JP
BISHOP 69	NP B9 403	J.M. Bishop <i>et al.</i>	(WISC)
CRENNELL 69D	PRL 22 487	D.J. Crennell <i>et al.</i>	(BNL)
DAVIS 69	PRL 23 1071	P.J. Davis <i>et al.</i>	(LRL)
LIND 69	NP B14 1	V.G. Lind <i>et al.</i>	(LRL) JP
SCHWEING... 68	PR 166 1317	F. Schweingruber <i>et al.</i>	(ANL, NWES)
Also 67	Thesis	F.L. Schweingruber	(NWES, NWES)
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FIELD 67	PL 24B 638	J.H. Field <i>et al.</i>	(UCSD)
BADIER 65C	PL 19 612	J. Badier <i>et al.</i>	(EPOL, SACL, AMST)

————— **OTHER RELATED PAPERS** —————

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ATKINSON	86	ZPHY C30 521	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
BAUBILLIER	82B	NP B202 21	M. Baubillier <i>et al.</i>	(BIRM, CERN, GLAS+)
CHUNG	65	PRL 15 325	S.U. Chung <i>et al.</i>	(LRL)
FOCARDI	65	PL 16 351	S. Focardi <i>et al.</i>	(BGNA, SACL)
HAQUE	65	PL 14 338	N. Haque <i>et al.</i>	
HARDY	65	PRL 14 401	L.M. Hardy <i>et al.</i>	(LRL)
