

$\Sigma(1670) \ 3/2^-$  $I(J^P) = 1(\frac{3}{2}^-)$  Status: \*\*\*\*

For most results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).

Results from production experiments are listed separately in the next entry.

 **$\Sigma(1670)$  POLE POSITION****REAL PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$1669^{+7}_{-7}$	<sup>1</sup> KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1674	ZHANG	13A	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.			

**-2×IMAGINARY PART**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$64^{+10}_{-14}$	<sup>1</sup> KAMANO	15	DPWA Multichannel
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
54	ZHANG	13A	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.			

 **$\Sigma(1670)$  POLE RESIDUES**

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

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow N\bar{K}$** 

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.129	-20	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.				

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Sigma\pi$** 

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.249	-21	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.				

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Lambda\pi$** 

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.0818	-7	<sup>1</sup> KAMANO	15	DPWA Multichannel
<sup>1</sup> From the preferred solution A in KAMANO 15.				

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Sigma(1385)\pi$ , S-wave**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</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. • • •

0.228	167	<sup>1</sup> KAMANO	15	DPWA Multichannel
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<sup>1</sup>From the preferred solution A in KAMANO 15.

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Sigma(1385)\pi$ , D-wave**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</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. • • •

0.0915	141	KAMANO	15	DPWA Multichannel
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 **$\Sigma(1670)$  MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1665 to 1685 ( $\approx 1670$ ) OUR ESTIMATE**

1678 $\pm 2$	ZHANG	13A	DPWA Multichannel
1673 $\pm 1$	GAO	12	DPWA $\bar{K}N \rightarrow \Lambda\pi$
1665.1 $\pm 4.1$	KOISO	85	DPWA $K^-p \rightarrow \Sigma\pi$
1682 $\pm 5$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1679 $\pm 10$	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1670 $\pm 5$	GOPAL	77	DPWA $\bar{K}N$ multichannel
1670 $\pm 6$	HEPP	76B	DPWA $K^-N \rightarrow \Sigma\pi$
1685 $\pm 20$	BAILLON	75	IPWA $\bar{K}N \rightarrow \Lambda\pi$
1659 $+^{12}_{-5}$	VANHORN	75	DPWA $K^-p \rightarrow \Lambda\pi^0$
1670 $\pm 2$	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$

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

1667 or 1668	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
1650	DEBELLEFON	76	IPWA $K^-p \rightarrow \Lambda\pi^0$
1671 $\pm 3$	PONTE	75	DPWA $K^-p \rightarrow \Lambda\pi^0$ (sol. 1)
1655 $\pm 2$	PONTE	75	DPWA $K^-p \rightarrow \Lambda\pi^0$ (sol. 2)

<sup>1</sup>The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

 **$\Sigma(1670)$  WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**40 to 80 ( $\approx 60$ ) OUR ESTIMATE**

55 $\pm 4$	ZHANG	13A	DPWA Multichannel
52 $+^5_{-2}$	GAO	12	DPWA $\bar{K}N \rightarrow \Lambda\pi$
65.0 $\pm 7.3$	KOISO	85	DPWA $K^-p \rightarrow \Sigma\pi$
79 $\pm 10$	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
56 $\pm 20$	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
50 $\pm 5$	GOPAL	77	DPWA $\bar{K}N$ multichannel
56 $\pm 3$	HEPP	76B	DPWA $K^-N \rightarrow \Sigma\pi$
85 $\pm 25$	BAILLON	75	IPWA $\bar{K}N \rightarrow \Lambda\pi$
32 $\pm 11$	VANHORN	75	DPWA $K^-p \rightarrow \Lambda\pi^0$
79 $\pm 6$	KANE	74	DPWA $K^-p \rightarrow \Sigma\pi$

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

46 or 46	<sup>1</sup> MARTIN	77	DPWA	$\overline{K}N$ multichannel
80	DEBELLEFON	76	IPWA	$K^- p \rightarrow \Lambda \pi^0$
44 $\pm 11$	PONTE	75	DPWA	$K^- p \rightarrow \Lambda \pi^0$ (sol. 1)
76 $\pm 5$	PONTE	75	DPWA	$K^- p \rightarrow \Lambda \pi^0$ (sol. 2)

<sup>1</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

### $\Sigma(1670)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\overline{K}$	7–13 %
$\Gamma_2$ $\Lambda\pi$	5–15 %
$\Gamma_3$ $\Sigma\pi$	30–60 %
$\Gamma_4$ $\Lambda\pi\pi$	
$\Gamma_5$ $\Sigma\pi\pi$	
$\Gamma_6$ $\Sigma(1385)\pi$	
$\Gamma_7$ $\Sigma(1385)\pi$ , S-wave	
$\Gamma_8$ $\Sigma(1385)\pi$ , S-wave	
$\Gamma_9$ $\Sigma(1385)\pi$ , D-wave	
$\Gamma_{10}$ $N\overline{K}^*(892)$ , S=1/2, D-wave	
$\Gamma_{11}$ $N\overline{K}^*(892)$ , S=3/2, S-wave	
$\Gamma_{12}$ $N\overline{K}^*(892)$ , S=3/2, D-wave	
$\Gamma_{13}$ $\Lambda(1405)\pi$	
$\Gamma_{14}$ $\Lambda(1520)\pi$	

### $\Sigma(1670)$ BRANCHING RATIOS

See “Sign conventions for resonance couplings” in the Note on  $\Lambda$  and  $\Sigma$  Resonances.

$\Gamma(N\overline{K})/\Gamma_{\text{total}}$					$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT		
<b>0.07 to 0.13 OUR ESTIMATE</b>					
0.062 $\pm$ 0.007	ZHANG	13A	DPWA	Multichannel	
0.10 $\pm$ 0.03	GOPAL	80	DPWA	$\overline{K}N \rightarrow \overline{K}N$	
0.11 $\pm$ 0.03	ALSTON-...	78	DPWA	$\overline{K}N \rightarrow \overline{K}N$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.121	<sup>1</sup> KAMANO	15	DPWA	Multichannel	
0.08 $\pm$ 0.03	GOPAL	77	DPWA	See GOPAL 80	
0.07 or 0.07	<sup>2</sup> MARTIN	77	DPWA	$\overline{K}N$ multichannel	

<sup>1</sup> From the preferred solution A in KAMANO 15.

<sup>2</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$\Gamma(\Lambda\pi)/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$ 

<u>VALUE</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. • • •

0.058 <sup>1</sup>KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15. $\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$   $\Gamma_3/\Gamma$ 

<u>VALUE</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. • • •

0.465 <sup>1</sup>KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15. $\Gamma(\Lambda\pi\pi)/\Gamma_{\text{total}}$   $\Gamma_4/\Gamma$ 

<u>VALUE</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. • • •

<0.11 ARMENTEROS68E HBC  $K^- p$  ( $\Gamma_1=0.09$ ) $\Gamma(\Sigma\pi\pi)/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$ 

<u>VALUE</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. • • •

<0.14 <sup>1</sup>ARMENTEROS68E HBC  $K^- p, K^- d$  ( $\Gamma_1=0.09$ )<sup>1</sup>Ratio only for  $\Sigma 2\pi$  system in  $l = 1$ , which cannot be  $\Sigma(1385)$ . $\Gamma(\Sigma(1385)\pi, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_8/\Gamma$ 

<u>VALUE</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. • • •

0.309 <sup>1</sup>KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15. $\Gamma(\Sigma(1385)\pi, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_9/\Gamma$ 

<u>VALUE</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. • • •

0.044 <sup>1</sup>KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15. $\Gamma(N\bar{K}^*(892), S=1/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{10}/\Gamma$ 

<u>VALUE</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. • • •

0.001 <sup>1</sup>KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15. $\Gamma(N\bar{K}^*(892), S=3/2, S\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{11}/\Gamma$ 

<u>VALUE</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. • • •

0.002 <sup>1</sup>KAMANO 15 DPWA Multichannel<sup>1</sup>From the preferred solution A in KAMANO 15.

$\Gamma(N\bar{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{12}/\Gamma$ 

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

0.001	<sup>1</sup> KAMANO	15	DPWA Multichannel
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<sup>1</sup> From the preferred solution A in KAMANO 15. $\Gamma(\Lambda(1405)\pi)/\Gamma_{\text{total}}$   $\Gamma_{13}/\Gamma$ 

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

<0.06	ARMENTEROS68E	HBC	$K^- p, K^- d$ ( $\Gamma_1=0.09$ )
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 $\Gamma(\Lambda(1405)\pi)/\Gamma(\Sigma(1385)\pi)$   $\Gamma_{13}/\Gamma_6$ 

VALUE	DOCUMENT ID	TECN	COMMENT
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0.23±0.08	BRUCKER	70	DBC $K^- N \rightarrow \Sigma \pi \pi$
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 $(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Lambda\pi$   $(\Gamma_1 \Gamma_2)^{1/2}/\Gamma$ 

VALUE	DOCUMENT ID	TECN	COMMENT
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+0.08 ±0.01	ZHANG	13A	DPWA Multichannel
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+0.081 <sup>+0.002</sup> <sub>-0.004</sub>	GAO	12	DPWA $\bar{K} N \rightarrow \Lambda\pi$
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+0.17 ±0.03	<sup>1</sup> MORRIS	78	DPWA $K^- n \rightarrow \Lambda\pi^-$
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+0.13 ±0.02	<sup>1</sup> MORRIS	78	DPWA $K^- n \rightarrow \Lambda\pi^-$
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+0.10 ±0.02	GOPAL	77	DPWA $\bar{K} N$ multichannel
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+0.06 ±0.02	BAILLON	75	IPWA $\bar{K} N \rightarrow \Lambda\pi$
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+0.09 ±0.02	VANHORN	75	DPWA $K^- p \rightarrow \Lambda\pi^0$
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+0.018±0.060	DEVENISH	74B	Fixed- $t$ dispersion rel.
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• • • We do not use the following data for averages, fits, limits, etc. • • •

+0.08 or +0.08	<sup>2</sup> MARTIN	77	DPWA $\bar{K} N$ multichannel
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+0.05	DEBELLEFON	76	IPWA $K^- p \rightarrow \Lambda\pi^0$
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+0.08 ±0.01	PONTE	75	DPWA $K^- p \rightarrow \Lambda\pi^0$ (sol. 1)
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+0.17 ±0.01	PONTE	75	DPWA $K^- p \rightarrow \Lambda\pi^0$ (sol. 2)
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<sup>1</sup> Results are with and without an  $S_{11}$   $\Sigma(1620)$  in the fit.<sup>2</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit. $(\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Sigma\pi$   $(\Gamma_1 \Gamma_3)^{1/2}/\Gamma$ 

VALUE	DOCUMENT ID	TECN	COMMENT
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+0.20±0.01	ZHANG	13A	DPWA Multichannel
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+0.20±0.02	KOISO	85	DPWA $K^- p \rightarrow \Sigma\pi$
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+0.21±0.02	GOPAL	77	DPWA $\bar{K} N$ multichannel
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+0.20±0.01	HEPP	76B	DPWA $K^- N \rightarrow \Sigma\pi$
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+0.21±0.03	KANE	74	DPWA $K^- p \rightarrow \Sigma\pi$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

+0.18 or +0.17	<sup>1</sup> MARTIN	77	DPWA $\bar{K} N$ multichannel
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<sup>1</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.

$$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}} \text{ in } N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Sigma(1385)\pi, \text{ S-wave} \quad (\Gamma_1 \Gamma_7)^{1/2} / \Gamma$$

VALUE	DOCUMENT ID	TECN	COMMENT
+0.11±0.03	PREVOST	74	DPWA $K^- N \rightarrow \Sigma(1385)\pi$

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

0.17±0.02 <sup>1</sup>SIMS 68 DBC  $K^- N \rightarrow \Lambda\pi\pi$

<sup>1</sup>SIMS 68 uses only cross-section data. Result used as upper limit only.

$$\Gamma_i \Gamma_f / \Gamma_{\text{total}}^2 \text{ in } N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Lambda(1405)\pi \quad \Gamma_1 \Gamma_{13} / \Gamma^2$$

VALUE	DOCUMENT ID	TECN	COMMENT
0.007±0.002	<sup>1</sup> BRUCKER	70	DBC $K^- N \rightarrow \Sigma\pi\pi$

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

<0.03 BERLEY 69 HBC  $K^- p$  0.6–0.82 GeV/c

<sup>1</sup>Assuming the  $\Lambda(1405)\pi$  cross-section bump is due only to  $3/2^-$  resonance.

$$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}} \text{ in } N\bar{K} \rightarrow \Sigma(1670) \rightarrow \Lambda(1520)\pi \quad (\Gamma_1 \Gamma_{14})^{1/2} / \Gamma$$

VALUE	DOCUMENT ID	TECN	COMMENT
0.081±0.016	<sup>1</sup> CAMERON	77	DPWA $P$ -wave decay

<sup>1</sup>The CAMERON 77 upper limit on  $F$ -wave decay is 0.03.

## Σ(1670) REFERENCES

KAMANO	15	PR C92 025205	H. Kamano <i>et al.</i>	(ANL, OSAK)
ZHANG	13A	PR C88 035205	H. Zhang <i>et al.</i>	(KSU)
GAO	12	PR C86 025201	P. Gao, J. Shi, B.S. Zou	(BHEP, BEIJT)
Also		NP A867 41	P. Gao, B.S. Zou, A. Sibirtsev	(BHEP, BEIJT+)
KOISO	85	NP A433 619	H. Koiso <i>et al.</i>	(TOKY, MASA)
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
ALSTON-...	78	PR D18 182	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
Also		PRL 38 1007	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
MORRIS	78	PR D17 55	W.A. Morris <i>et al.</i>	(FSU) IJP
CAMERON	77	NP B131 399	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
GOPAL	77	NP B119 362	G.P. Gopal <i>et al.</i>	(LOIC, RHEL) IJP
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also		NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also		NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
DEBELLEFON	76	NP B109 129	A. de Bellefon, A. Berthon	(CDEF) IJP
HEPP	76B	PL 65B 487	V. Hepp <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP
PONTE	75	PR D12 2597	R.A. Ponte <i>et al.</i>	(MASA, TENN, UCR) IJP
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP
Also		NP B87 157	A.J. van Horn	(LBL) IJP
DEVENISH	74B	NP B81 330	R.C.E. Devenish, C.D. Froggatt, B.R. Martin	(DESY+) IJP
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
PREVOST	74	NP B69 246	J. Prevost <i>et al.</i>	(SACL, CERN, HEID)
BRUCKER	70	Duke Conf. 155	E.B. Brucker <i>et al.</i>	(FSU) I
Hyperon Resonances, 1970				
BERLEY	69	PL 30B 430	D. Berley <i>et al.</i>	(BNL)
ARMENTEROS	68E	PL 28B 521	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) I
SIMS	68	PRL 21 1413	W.H. Sims <i>et al.</i>	(FSU, TUFTS, BRAN)