$a_2(1320)$

$I^G(J^{PC}) = 1^-(2^{++})$

$a_2(1320)$ MASS

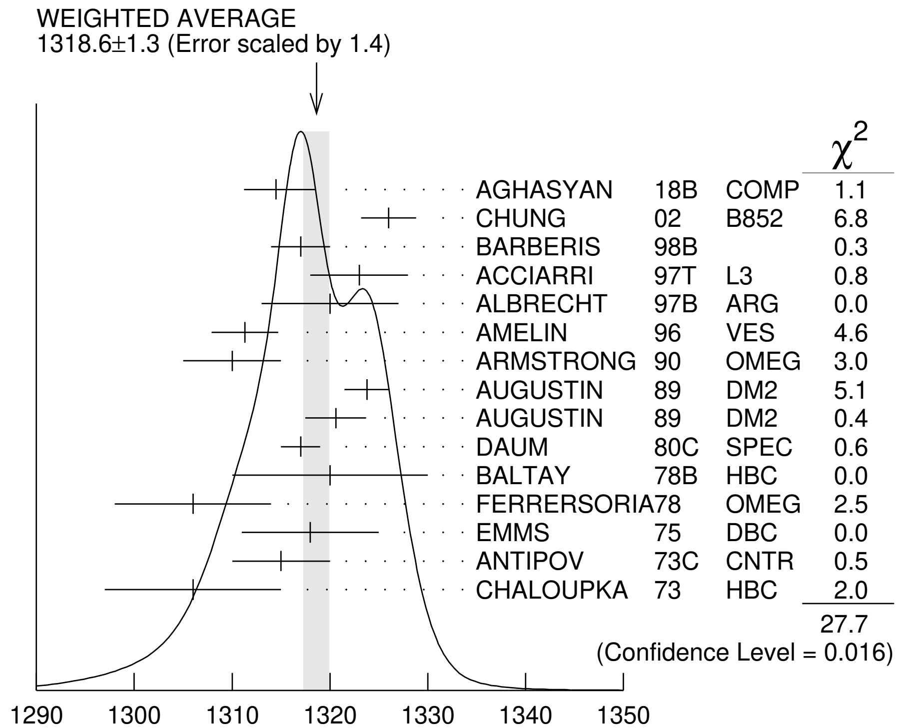
VALUE (MeV)	*DOCUMENT ID*

1318.2±0.6 OUR AVERAGE Includes data from the 4 datablocks that follow this one. Error includes scale factor of 1.2.

3π MODE

The data in this block is included in the average printed for a previous datablock.

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
1318.6± 1.3 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.						
$1314.5^{+4.0}_{-3.3}$	46M	[1] AGHASYAN	18B	COMP		190 $\pi^- p \to \pi^- \pi^+ \pi^- p$
1326 ± 2 ±2		CHUNG	02	B852		18.3 $\pi^- p \to \pi^+ \pi^- \pi^- p$
1317 ± 3		BARBERIS	98B			450 $p p \to p_f \pi^+ \pi^- \pi^0 p_s$
1323 ± 4 ±3		ACCIARRI	97T	L3		$e^+ e^- \to e^+ e^- \pi^+ \pi^- \pi^0$
1320 ± 7		ALBRECHT	97B	ARG		$e^+ e^- \to e^+ e^- \pi^+ \pi^- \pi^0$
1311.3± 1.6±3.0	72.4k	AMELIN	96	VES		36 $\pi^- p \to \pi^+ \pi^- \pi^0 n$
1310 ± 5		ARMSTRONG	90	OMEG	0	300.0$p p \to p p \pi^+ \pi^- \pi^0$
1323.8± 2.3	4022	AUGUSTIN	89	DM2	±	$J/\psi \to \rho^\pm a_2^\mp$
1320.6± 3.1	3562	AUGUSTIN	89	DM2	0	$J/\psi \to \rho^0 a_2^0$
1317 ± 2	25k	[2] DAUM	80C	SPEC	−	63,94 $\pi^- p \to 3\pi p$
1320 ±10	1097	[2] BALTAY	78B	HBC	+0	15 $\pi^+ p \to p 4\pi$
1306 ± 8		FERRERSORIA	78	OMEG	−	9 $\pi^- p \to p 3\pi$
1318 ± 7	1.6k	[2] EMMS	75	DBC	0	4 $\pi^+ n \to p (3\pi)^0$
1315 ± 5		[2] ANTIPOV	73C	CNTR	−	25,40 $\pi^- p \to p \eta \pi^-$
1306 ± 9	1580	CHALOUPKA	73	HBC	−	3.9 $\pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1321 ± 1 $^{+0}_{-7}$	420k	[3] ALEKSEEV	10	COMP		190 $\pi^- Pb \to \pi^- \pi^- \pi^+ Pb'$
1300 ± 2 ±4	18k	[4] SCHEGELSKY	06	RVUE	0	$\gamma\gamma \to \pi^+ \pi^- \pi^0$
1305 ±14		CONDO	93	SHF		$\gamma p \to n \pi^+ \pi^+ \pi^-$
1310 ± 2		[2] EVANGELIS...	81	OMEG	−	12 $\pi^- p \to 3\pi p$
1343 ±11	490	BALTAY	78B	HBC	0	15 $\pi^+ p \to \Delta 3\pi$
1309 ± 5	5k	BINNIE	71	MMS	−	$\pi^- p$ near a_2 threshold
1299 ± 6	28k	BOWEN	71	MMS	−	5 $\pi^- p$
1300 ± 6	24k	BOWEN	71	MMS	+	5 $\pi^+ p$
1309 ± 4	17k	BOWEN	71	MMS	−	7 $\pi^- p$
1306 ± 4	941	ALSTON-...	70	HBC	+	7.0 $\pi^+ p \to 3\pi p$



[1] Statistical error negligible.
[2] From a fit to $J^P = 2^+$ $\rho\pi$ partial wave.
[3] Superseded by AGHASYAN 2018B.
[4] From analysis of L3 data at 183–209 GeV.
$a_2(1320)$ mass, 3π mode (MeV)

$K\overline{K}$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
The data in this block is included in the average printed for a previous datablock.					
1318.1± 0.7 OUR AVERAGE					
1319 ± 5	4700	[1,2] CLELAND 82B	SPEC	+	50 $\pi^+ p \to K^0_S K^+ p$
1324 ± 6	5200	[1,2] CLELAND 82B	SPEC	−	50 $\pi^- p \to K^0_S K^- p$
1320 ± 2	4000	CHABAUD 80	SPEC	−	17 $\pi^- A \to K^0_S K^- A$
1312 ± 4	11000	CHABAUD 78	SPEC	−	9.8 $\pi^- p \to K^- K^0_S p$
1316 ± 2	4730	CHABAUD 78	SPEC	−	18.8 $\pi^- p \to K^- K^0_S p$
1318 ± 1		[1,3] MARTIN 78D	SPEC	−	10 $\pi^- p \to K^0_S K^- p$
1320 ± 2	2724	MARGULIE 76	SPEC	−	23 $\pi^- p \to K^- K^0_S p$
1313 ± 4	730	FOLEY 72	CNTR	−	20.3 $\pi^- p \to K^- K^0_S p$
1319 ± 3	1500	[3] GRAYER 71	ASPK	−	17.2 $\pi^- p \to K^- K^0_S p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1304 ±10	870	[4] SCHEGELSKY 06A	RVUE	0	$\gamma\gamma \to K^0_S K^0_S$
1330 ±11	1000	[1,2] CLELAND 82B	SPEC	+	30 $\pi^+ p \to K^0_S K^+ p$
1324 ± 5	350	HYAMS 78	ASPK	+	12.7 $\pi^+ p \to K^+ K^0_S p$

[1] From a fit to $J^P = 2^+$ partial wave.
[2] Number of events evaluated by us.
[3] Systematic error in mass scale subtracted.
[4] From analysis of L3 data at 91 and 183–209 GeV.

$\eta\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
The data in this block is included in the average printed for a previous datablock.					
1317.7± 1.4 OUR AVERAGE					
1308 ± 9		BARBERIS 00H			450 $pp \to p_f \eta\pi^0 p_s$
1316 ± 9		BARBERIS 00H			450 $pp \to \Delta_f^{++} \eta\pi^- p_s$
1317 ± 1 ±2		THOMPSON 97	MPS		18 $\pi^- p \to \eta\pi^- p$
1315 ± 5 ±2		[1] AMSLER 94D	CBAR		0.0 $\overline{p}p \to \pi^0\pi^0\eta$
1325.1± 5.1		AOYAGI 93	BKEI		$\pi^- p \to \eta\pi^- p$
1317.7± 1.4±2.0		BELADIDZE 93	VES		$37\pi^- N \to \eta\pi^- N$
1323 ± 8	1000	[2] KEY 73	OSPK	−	6 $\pi^- p \to p\pi^-\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1318.7\pm 1.9^{+1.3}_{-1.3}$		[3] KOPF 21	RVUE		0.9 $p\overline{p} \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$ and 191 $\pi^- p \to \pi^-\pi^-\pi^+ p$
1312.5± 0.7±2.6		[4] ALBRECHT 20	RVUE		0.9 $\overline{p}p \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$
1306.0± 0.8±1.3		[5] RODAS 19	JPAC		191 $\pi^- p \to \eta^{(\prime)}\pi^- p$
1307 ± 1 ±6		[6] JACKURA 18	JPAC		$\pi^- p \to \eta\pi^- p$
1315 ±12		[7] ADOLPH 15	COMP		191 $\pi^- p \to \eta^{(\prime)}\pi^- p$
1309 ± 4		ANISOVICH 09	RVUE		$\overline{p}p$, πN
1324 ± 5		ARMSTRONG 93C	E760	0	$\overline{p}p \to \pi^0\eta\eta \to 6\gamma$
1336.2± 1.7	2561	DELFOSSE 81	SPEC	+	$\pi^\pm p \to p\pi^\pm\eta$
1330.7± 2.4	1653	DELFOSSE 81	SPEC	−	$\pi^\pm p \to p\pi^\pm\eta$
1324 ± 8	6200	[2,8] CONFORTO 73	OSPK	−	6 $\pi^- p \to p\mathrm{MM}^-$

[1] The systematic error of 2 MeV corresponds to the spread of solutions.
[2] Error includes 5 MeV systematic mass-scale error.
[3] From T-matrix pole based on combined fit of Crystal Barrel and $\pi\pi$ scattering data (ALBRECHT 20), and COMPASS data (ADOLPH 15), using a coupled-channel model of $\eta\pi$, $\eta'\pi$ and $K\overline{K}$ systems.
[4] T-matrix pole with 2 poles, 2 channels ($\pi^0\eta$ and $K\overline{K}$).
[5] The coupled-channel analysis of both the $\eta\pi$ and $\eta'\pi$ systems using ADOLPH 15 data. The mass is extracted from the T-matrix pole.
[6] Superseded by RODAS 19.
[7] ADOLPH 15 value is derived from a Breit-Wigner fit with mass-dependent width taking the $\eta\pi$ and $\rho\pi$ channels into account.
[8] Missing mass with enriched MMS = $\eta\pi^-$, $\eta = 2\gamma$.

$\eta'\pi$ MODE

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.			
1322 ± 7 OUR AVERAGE			
$1318 \pm 8 ^{+3}_{-5}$	IVANOV 01	B852	18 $\pi^- p \to \eta'\pi^- p$
1327.0±10.7	BELADIDZE 93	VES	$37\pi^- N \to \eta'\pi^- N$

a_2(1320) WIDTH

3π MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
$105.0^{+1.7}_{-1.9}$ OUR AVERAGE						
$106.6^{+3.4}_{-7.0}$	46M	[1] AGHASYAN	18B	COMP		190 $\pi^- p \to \pi^- \pi^+ \pi^- p$
108 $\pm$ 3 $\pm$15		CHUNG	02	B852		18.3 $\pi^- p \to \pi^+ \pi^- \pi^- p$
120 $\pm$10		BARBERIS	98B			450 $p p \to p_f \pi^+ \pi^- \pi^0 p_s$
105 $\pm$10 $\pm$11		ACCIARRI	97T	L3		$e^+ e^- \to e^+ e^- \pi^+ \pi^- \pi^0$
120 $\pm$10		ALBRECHT	97B	ARG		$e^+ e^- \to e^+ e^- \pi^+ \pi^- \pi^0$
103.0$\pm$ 6.0$\pm$ 3.3	72.4k	AMELIN	96	VES		36 $\pi^- p \to \pi^+ \pi^- \pi^0 n$
120 $\pm$10		ARMSTRONG	90	OMEG	0	300.0$p p \to p p \pi^+ \pi^- \pi^0$
107.0$\pm$ 9.7	4022	AUGUSTIN	89	DM2	$\pm$	$J/\psi \to \rho^\pm a_2^\mp$
118.5$\pm$12.5	3562	AUGUSTIN	89	DM2	0	$J/\psi \to \rho^0 a_2^0$
97 $\pm$ 5		[2] EVANGELIS...	81	OMEG	$-$	12 $\pi^- p \to 3\pi p$
96 $\pm$ 9	25k	[2] DAUM	80C	SPEC	$-$	63,94 $\pi^- p \to 3\pi p$
110 $\pm$15	1097	[2] BALTAY	78B	HBC	+0	15 $\pi^+ p \to p 4\pi$
112 $\pm$18	1.6k	[2] EMMS	75	DBC	0	4 $\pi^+ n \to p (3\pi)^0$
122 $\pm$14	1.2k	[2,3] WAGNER	75	HBC	0	7 $\pi^+ p \to \Delta^{++} (3\pi)^0$
115 $\pm$15		[2] ANTIPOV	73C	CNTR	$-$	25,40 $\pi^- p \to p \eta \pi^-$
99 $\pm$15	1580	CHALOUPKA	73	HBC	$-$	3.9 $\pi^- p$
105 $\pm$ 5	28k	BOWEN	71	MMS	$-$	5 $\pi^- p$
99 $\pm$ 5	24k	BOWEN	71	MMS	+	5 $\pi^+ p$
103 $\pm$ 5	17k	BOWEN	71	MMS	$-$	7 $\pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
110 $\pm$ 2 $^{+2}_{-15}$	420k	[4] ALEKSEEV	10	COMP		190 $\pi^- Pb \to \pi^- \pi^- \pi^+ Pb'$
117 $\pm$ 6 $\pm$20	18k	[5] SCHEGELSKY	06	RVUE	0	$\gamma\gamma \to \pi^+ \pi^- \pi^0$
120 $\pm$40		CONDO	93	SHF		$\gamma p \to n \pi^+ \pi^+ \pi^-$
115 $\pm$14	490	BALTAY	78B	HBC	0	15 $\pi^+ p \to \Delta 3\pi$
72 $\pm$16	5k	BINNIE	71	MMS	$-$	$\pi^- p$ near a_2 threshold
79 $\pm$12	941	ALSTON-...	70	HBC	+	7.0 $\pi^+ p \to 3\pi p$

[1] Statistical error negligible.
[2] From a fit to $J^P = 2^+$ $\rho\pi$ partial wave.
[3] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
[4] Superseded by AGHASYAN 2018B.
[5] From analysis of L3 data at 183–209 GeV.

$K\overline{K}$ AND $\eta\pi$ MODES

VALUE (MeV)	DOCUMENT ID
107 ±5 OUR ESTIMATE	
110.4±1.7 OUR AVERAGE	Includes data from the 2 datablocks that follow this one.

$K\overline{K}$ MODE

The data in this block is included in the average printed for a previous datablock.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
109.8± 2.4 OUR AVERAGE						
112 ±20	4700	[1,2] CLELAND	82B	SPEC	+	50 $\pi^+ p \rightarrow K^0_S K^+ p$
120 ±25	5200	[1,2] CLELAND	82B	SPEC	−	50 $\pi^- p \rightarrow K^0_S K^- p$
106 ± 4	4000	CHABAUD	80	SPEC	−	17 $\pi^- A \rightarrow K^0_S K^- A$
126 ±11	11000	CHABAUD	78	SPEC	−	9.8 $\pi^- p \rightarrow K^- K^0_S p$
101 ± 8	4730	CHABAUD	78	SPEC	−	18.8 $\pi^- p \rightarrow K^- K^0_S p$
113 ± 4		[1,3] MARTIN	78D	SPEC	−	10 $\pi^- p \rightarrow K^0_S K^- p$
105 ± 8	2724	[3] MARGULIE	76	SPEC	−	23 $\pi^- p \rightarrow K^- K^0_S p$
113 ±19	730	FOLEY	72	CNTR	−	20.3 $\pi^- p \rightarrow K^- K^0_S p$
123 ±13	1500	[3] GRAYER	71	ASPK	−	17.2 $\pi^- p \rightarrow K^- K^0_S p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
120 ±15	870	[4] SCHEGELSKY	06A	RVUE	0	$\gamma\gamma \rightarrow K^0_S K^0_S$
121 ±51	1000	[1,2] CLELAND	82B	SPEC	+	30 $\pi^+ p \rightarrow K^0_S K^+ p$
110 ±18	350	HYAMS	78	ASPK	+	12.7 $\pi^+ p \rightarrow K^+ K^0_S p$

[1] From a fit to $J^P = 2^+$ partial wave.
[2] Number of events evaluated by us.
[3] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
[4] From analysis of L3 data at 91 and 183–209 GeV.

$\eta\pi$ MODE

The data in this block is included in the average printed for a previous datablock.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
111.1± 2.4 OUR AVERAGE						
115 ±20		BARBERIS	00H			450 $p p \rightarrow p_f \eta \pi^0 p_s$
112 ±14		BARBERIS	00H			450 $p p \rightarrow \Delta^{++}_f \eta \pi^- p_s$
112 ± 3 ±2		[1] AMSLER	94D	CBAR		0.0 $\overline{p} p \rightarrow \pi^0 \pi^0 \eta$
103 ± 6 ±3		BELADIDZE	93	VES		$37 \pi^- N \rightarrow \eta \pi^- N$
112.2± 5.7	2561	DELFOSSE	81	SPEC	+	$\pi^\pm p \rightarrow p \pi^\pm \eta$
116.6± 7.7	1653	DELFOSSE	81	SPEC	−	$\pi^\pm p \rightarrow p \pi^\pm \eta$
108 ± 9	1000	KEY	73	OSPK	−	6 $\pi^- p \rightarrow p \pi^- \eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
107.5± 4.6$^{+3.3}_{-1.8}$		[2] KOPF	21	RVUE		0.9 $p \overline{p} \rightarrow \pi^0 \pi^0 \eta$, $\pi^0 \eta \eta$, $\pi^0 K^+ K^-$ and 191 $\pi^- p \rightarrow \pi^- \pi^- \pi^+ p$

106.9± 1.2±3.7		[3] ALBRECHT	20	RVUE		0.9 $\overline{p}p \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$
114.4± 1.6±0.0		[4] RODAS	19	JPAC		191 $\pi^- p \to \eta^{(\prime)}\pi^- p$
112 ± 1 ±8		[5] JACKURA	18	JPAC		$\pi^- p \to \eta\pi^- p$
119 ±14		[6] ADOLPH	15	COMP		191 $\pi^- p \to \eta^{(\prime)}\pi^- p$
110 ± 4		ANISOVICH	09	RVUE		$\overline{p}p$, πN
127 ± 2 ±2		[7] THOMPSON	97	MPS		18 $\pi^- p \to \eta\pi^- p$
118 ±10		ARMSTRONG	93C	E760	0	$\overline{p}p \to \pi^0\eta\eta \to 6\gamma$
104 ± 9	6200	[8] CONFORTO	73	OSPK	−	6 $\pi^- p \to p\text{MM}^-$

[1] The systematic error of 2 MeV corresponds to the spread of solutions.
[2] From T-matrix pole based on combined fit of Crystal Barrel and $\pi\pi$ scattering data (ALBRECHT 20), and COMPASS data (ADOLPH 15), using a coupled-channel model of $\eta\pi$, $\eta'\pi$ and $K\overline{K}$ systems.
[3] T-matrix pole with 2 poles, 2 channels ($\pi^0\eta$ and $K\overline{K}$).
[4] The coupled-channel analysis of both the $\eta\pi$ and $\eta'\pi$ systems using ADOLPH 15 data. The width is extracted from the T-matrix pole.
[5] Superseded by RODAS 19.
[6] ADOLPH 15 value is derived from a Breit-Wigner fit with mass-dependent width taking the $\eta\pi$ and $\rho\pi$ channels into account.
[7] Resolution is not unfolded.
[8] Missing mass with enriched MMS = $\eta\pi^-$, $\eta = 2\gamma$.

$\eta'\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
119±25 OUR AVERAGE				
140±35±20	IVANOV	01	B852	18 $\pi^- p \to \eta'\pi^- p$
106±32	BELADIDZE	93	VES	37$\pi^- N \to \eta'\pi^- N$

a_2(1320) DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	3π	(70.1 ±2.7) %	S=1.2
Γ_2	$\rho(770)\pi$		
Γ_3	$f_2(1270)\pi$		
Γ_4	$\rho(1450)\pi$		
Γ_5	$\eta\pi$	(14.5 ±1.2) %	
Γ_6	$\omega\pi\pi$	(10.6 ±3.2) %	S=1.3
Γ_7	$K\overline{K}$	(4.9 ±0.8) %	
Γ_8	$\eta'(958)\pi$	(5.5 ±0.9) $\times 10^{-3}$	
Γ_9	$\pi^\pm\gamma$	(2.91±0.27) $\times 10^{-3}$	
Γ_{10}	$\gamma\gamma$	(9.4 ±0.7) $\times 10^{-6}$	
Γ_{11}	e^+e^-	< 5 $\times 10^{-9}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 5 branching ratios uses 18 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 =$ 9.3 for 15 degrees of freedom.

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

x_5	10		
x_6	−89	−46	
x_7	−1	−2	−24
	x_1	x_5	x_6

$a_2(1320)$ PARTIAL WIDTHS

$\Gamma(\eta\pi)$ — Γ_5

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
18.5 ± 3.0	870	[1] SCHEGELSKY 06A	RVUE	0	$\gamma\gamma \to K^0_S K^0_S$

[1] From analysis of L3 data at 91 and 183–209 GeV, using $\Gamma(a_2(1320) \to \gamma\gamma) = 0.91$ keV and SU(3) relations.

$\Gamma(K\overline{K})$ — Γ_7

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$7.0^{+2.0}_{-1.5}$	870	[1] SCHEGELSKY 06A	RVUE	0	$\gamma\gamma \to K^0_S K^0_S$

[1] From analysis of L3 data at 91 and 183–209 GeV, using $\Gamma(a_2(1320) \to \gamma\gamma) = 0.91$ keV and SU(3) relations.

$\Gamma(\pi^\pm\gamma)$ — Γ_9

VALUE (keV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
311± 25 OUR AVERAGE					
$358 \pm 6 \pm 42$		[1] ADOLPH 14	COMP	−	190 $\pi^- \mathrm{Pb} \to \pi^+\pi^-\pi^- \mathrm{Pb}'$
$284 \pm 25 \pm 25$	7.1k	MOLCHANOV 01	SELX		600 $\pi^- A \to \pi^+\pi^-\pi^- A$
295 ± 60		CIHANGIR 82	SPEC	+	200 π^+ A
• • • We do not use the following data for averages, fits, limits, etc. • • •					
461 ± 110		[2] MAY 77	SPEC	±	9.7 γ A

[1] Primakoff reaction using $a_2(1320) \to 3\pi$ branching ratio of 70.1%.

[2] Assuming one-pion exchange.

$\Gamma(\gamma\gamma)$ Γ_{10}

VALUE (keV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
1.00±0.06 OUR AVERAGE						
0.98±0.05±0.09		ACCIARRI	97T	L3		$e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$
0.96±0.03±0.13		ALBRECHT	97B	ARG		$e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$
1.26±0.26±0.18	36	BARU	90	MD1		$e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$
1.00±0.07±0.15	415	BEHREND	90C	CELL	0	$e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$
1.03±0.13±0.21		BUTLER	90	MRK2		$e^+e^- \to e^+e^-\pi^+\pi^-\pi^0$
1.01±0.14±0.22	85	OEST	90	JADE		$e^+e^- \to e^+e^-\pi^0\eta$
0.90±0.27±0.15	56	[1] ALTHOFF	86	TASS	0	$e^+e^- \to e^+e^-3\pi$
1.14±0.20±0.26		[2] ANTREASYAN	86	CBAL	0	$e^+e^- \to e^+e^-\pi^0\eta$
1.06±0.18±0.19		BERGER	84C	PLUT	0	$e^+e^- \to e^+e^-3\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$0.81\pm0.19^{+0.42}_{-0.11}$	35	[1] BEHREND	82C	CELL	0	$e^+e^- \to e^+e^-3\pi$
0.77±0.18±0.27	22	[2] EDWARDS	82F	CBAL	0	$e^+e^- \to e^+e^-\pi^0\eta$

[1] From $\rho\pi$ decay mode.
[2] From $\eta\pi^0$ decay mode.

$\Gamma(e^+e^-)$ Γ_{11}

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
< 0.56	90	ACHASOV	00K	SND	$e^+e^- \to \pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<25	90	VOROBYEV	88	ND	$e^+e^- \to \pi^0\eta$

$a_2(1320)$ $\Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

$\Gamma(3\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_1\Gamma_{10}/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.65±0.02±0.02	18k	[1] SCHEGELSKY	06	RVUE	$\gamma\gamma \to \pi^+\pi^-\pi^0$

[1] From analysis of L3 data at 183–209 GeV.

$\Gamma(\eta\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_5\Gamma_{10}/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.145^{+0.097}_{-0.034}$	[1] UEHARA	09A	BELL	$e^+e^- \to e^+e^-\eta\pi^0$

[1] From the D_2-wave. The fraction of the D_0-wave is $3.4^{+2.3}_{-1.1}$%.

$\Gamma(K\overline{K}) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_7\Gamma_{10}/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
0.126±0.007±0.028	[1] ALBRECHT	90G	ARG	$e^+e^- \to e^+e^-K^+K^-$

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

0.081±0.006±0.027	[2] ALBRECHT	90G	ARG	$e^+e^- \to e^+e^-K^+K^-$

[1] Using an incoherent background.
[2] Using a coherent background.

$a_2(1320)$ BRANCHING RATIOS

$[\Gamma(f_2(1270)\pi)+\Gamma(\rho(1450)\pi)]/\Gamma(\rho(770)\pi)$ $(\Gamma_3+\Gamma_4)/\Gamma_2$

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
<0.12	90	ABRAMOVI...	70B	HBC	−	3.93 $\pi^- p$

$\Gamma(\rho(770)\pi)/\Gamma(f_2(1270)\pi)$ Γ_2/Γ_3

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$16.5^{+1.2}_{-2.4}$	46M	[1] AGHASYAN	18B	COMP	190 $\pi^- p \to \pi^-\pi^+\pi^- p$

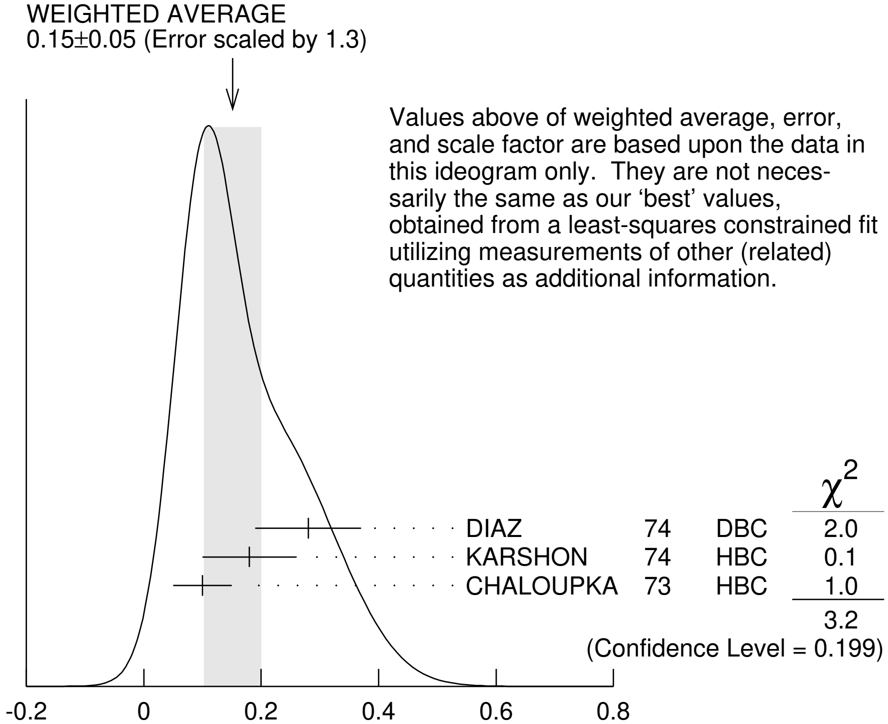
[1] Statistical error negligible.

$\Gamma(\eta\pi)/\Gamma(3\pi)$ Γ_5/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
0.207±0.018 OUR FIT						
0.213±0.020 OUR AVERAGE						
0.18 ±0.05		FORINO	76	HBC		11 $\pi^- p$
0.22 ±0.05	52	ANTIPOV	73	CNTR	−	40 $\pi^- p$
0.211±0.044	149	CHALOUPKA	73	HBC	−	3.9 $\pi^- p$
0.246±0.042	167	ALSTON-...	71	HBC	+	7.0 $\pi^+ p$
0.25 ±0.09	15	BOECKMANN	70	HBC	+	5.0 $\pi^+ p$
0.23 ±0.08	22	ASCOLI	68	HBC	−	5 $\pi^- p$
0.12 ±0.08		CHUNG	68	HBC	−	3.2 $\pi^- p$
0.22 ±0.09		CONTE	67	HBC	−	11.0 $\pi^- p$

$\Gamma(\omega\pi\pi)/\Gamma(3\pi)$ Γ_6/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
0.15±0.05 OUR FIT Error includes scale factor of 1.3.						
0.15±0.05 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.						
0.28±0.09	60	DIAZ	74	DBC	0	6 $\pi^+ n$
0.18±0.08		[1] KARSHON	74	HBC		Avg. of above two
0.10±0.05	279	[2] CHALOUPKA	73	HBC	−	3.9 $\pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.29±0.08	140	[1] KARSHON	74	HBC	0	4.9 $\pi^+ p$
0.10±0.04	60	[1] KARSHON	74	HBC	+	4.9 $\pi^+ p$
0.19±0.08		DEFOIX	73	HBC	0	0.7 $\bar{p}p$



[1] KARSHON 74 suggest an additional $I = 0$ state strongly coupled to $\omega\pi\pi$ which could explain discrepancies in branching ratios and masses. We use a central value and a systematic spread.

[2] Decays to $b_1(1040)\pi$, $b_1 \to \omega\pi$. Error increased to account for possible systematic errors of complicated analysis.

$\Gamma(\omega\pi\pi)/\Gamma(3\pi)$

$\Gamma(K\overline{K})/\Gamma(3\pi)$ Γ_7/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
0.070±0.012 OUR FIT						
0.078±0.017		CHABAUD	78	RVUE		
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.011±0.003		[1] BERTIN	98B	OBLX		0.0 $\overline{p}p \to K^{\pm}K_S\pi^{\mp}$
0.056±0.014	50	[2] CHALOUPKA	73	HBC	−	3.9 $\pi^- p$
0.097±0.018	113	[2] ALSTON-...	71	HBC	+	7.0 $\pi^+ p$
0.06 ±0.03		[2] ABRAMOVI...	70B	HBC	−	3.93 $\pi^- p$
0.054±0.022		[2] CHUNG	68	HBC	−	3.2 $\pi^- p$

[1] Using 4π data from BERTIN 97D.

[2] Included in CHABAUD 78 review.

$\Gamma(K\overline{K})/\Gamma(\eta\pi)$ Γ_7/Γ_5

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.31 \pm 0.22 {}^{+0.09}_{-0.11}$	[1] KOPF	21	RVUE	0.9 $p\overline{p} \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$ and 191 $\pi^- p \to \pi^-\pi^-\pi^+ p$

0.352±0.011±0.175	[2] ALBRECHT	20	RVUE	0.9 $\overline{p}p \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$
0.08 ±0.02	[3] BERTIN	98B	OBLX	0.0 $\overline{p}p \to K^\pm K_s \pi^\mp$

[1] From T-matrix pole based on combined fit of Crystal Barrel and $\pi\pi$ scattering data (ALBRECHT 20), and COMPASS data (ADOLPH 15), using a coupled-channel model of $\eta\pi$, $\eta'\pi$ and $K\overline{K}$ systems.
[2] Residues from T-matrix pole with 2 poles, 2 channels ($\pi^0\eta$ and $K\overline{K}$).
[3] Using $\eta\pi\pi$ data from AMSLER 94D.

$\Gamma(\eta\pi)/[\Gamma(3\pi)+\Gamma(\eta\pi)+\Gamma(K\overline{K})]$ $\Gamma_5/(\Gamma_1+\Gamma_5+\Gamma_7)$

VALUE	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
0.162±0.012 OUR FIT						
0.140±0.028 OUR AVERAGE						
0.13 ±0.04		ESPIGAT	72	HBC	±	0.0 $\overline{p}p$
0.15 ±0.04	34	BARNHAM	71	HBC	+	3.7 $\pi^+ p$

$\Gamma(K\overline{K})/[\Gamma(3\pi)+\Gamma(\eta\pi)+\Gamma(K\overline{K})]$ $\Gamma_7/(\Gamma_1+\Gamma_5+\Gamma_7)$

VALUE	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
0.054±0.009 OUR FIT						
0.048±0.012 OUR AVERAGE						
0.05 ±0.02		TOET	73	HBC	+	5 $\pi^+ p$
0.09 ±0.04		TOET	73	HBC	0	5 $\pi^+ p$
0.03 ±0.02	8	[1] DAMERI	72	HBC	−	11 $\pi^- p$
0.06 ±0.03	17	BARNHAM	71	HBC	+	3.7 $\pi^+ p$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.020±0.004		[2] ESPIGAT	72	HBC	±	0.0 $\overline{p}p$

[1] Montanet agrees. Vlada.
[2] Not averaged because of discrepancy between masses from $K\overline{K}$ and $\rho\pi$ modes.

$\Gamma(\eta'(958)\pi)/\Gamma_{total}$ Γ_8/Γ

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.006	95	ALDE	92B	GAM2		38,100 $\pi^- p \to \eta' \pi^0 n$
<0.02	97	BARNHAM	71	HBC	+	3.7 $\pi^+ p$
0.004±0.004		[1] BOESEBECK	68	HBC	+	8 $\pi^+ p$

[1] No longer valid since $\Gamma(K\overline{K})/\Gamma(3\pi)$ value has changed (MORRISON 71).

$\Gamma(\eta'(958)\pi)/\Gamma(3\pi)$ Γ_8/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<0.011	90	EISENSTEIN	73	HBC	−	5 $\pi^- p$
<0.04		ALSTON-...	71	HBC	+	7.0 $\pi^+ p$
$0.04\ ^{+0.03}_{-0.04}$		BOECKMANN	70	HBC	0	5.0 $\pi^+ p$

$\Gamma(\eta'(958)\pi)/\Gamma(\eta\pi)$ — Γ_8/Γ_5

VALUE	DOCUMENT ID		TECN	COMMENT
0.038±0.005 OUR AVERAGE				
0.05 ±0.02	ADOLPH	15	COMP	191 $\pi^- p \to \eta^{(\prime)}\pi^- p$
0.032±0.009	ABELE	97C	CBAR	0.0 $\overline{p}p \to \pi^0\pi^0\eta'$
0.047±0.010±0.004	[1] BELADIDZE	93	VES	$37\pi^- N \to a_2^- N$
0.034±0.008±0.005	BELADIDZE	92	VES	$36\pi^- C \to a_2^- C$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.046\pm0.015^{+0.07}_{-0.006}$	[2] KOPF	21	RVUE	0.9 $p\overline{p} \to \pi^0\pi^0\eta$, $\pi^0\eta\eta$, $\pi^0 K^+ K^-$ and 191 $\pi^- p \to \pi^-\pi^-\pi^+ p$

[1] Using B($\eta' \to \pi^+\pi^-\eta$) = 0.441, B($\eta \to \gamma\gamma$) = 0.389 and B($\eta \to \pi^+\pi^-\pi^0$) = 0.236.

[2] From T-matrix pole based on combined fit of Crystal Barrel and $\pi\pi$ scattering data (ALBRECHT 20), and COMPASS data (ADOLPH 15), using a coupled-channel model of $\eta\pi$, $\eta'\pi$ and $K\overline{K}$ systems.

$\Gamma(\pi^\pm\gamma)/\Gamma_{total}$ — Γ_9/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.005^{+0.005}_{-0.003}$	[1] EISENBERG	72	HBC	4.3,5.25,7.5 γp

[1] Pion-exchange model used in this estimation.

$\Gamma(e^+e^-)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (units 10^{-9})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<6	90	ACHASOV	00K	SND	$e^+e^- \to \pi^0\pi^0$

$a_2(1320)$ REFERENCES

KOPF	21	EPJ C81 1056	B. Kopf et al.	(BOCH)
ALBRECHT	20	EPJ C80 453	M. Albrecht et al.	(Crystal Barrel Collab.)
RODAS	19	PRL 122 042002	A. Rodas et al.	(JPAC Collab.)
AGHASYAN	18B	PR D98 092003	M. Aghasyan et al.	(COMPASS Collab.)
JACKURA	18	PL B779 464	A. Jackura et al.	(JPAC and COMPASS Collab.)
ADOLPH	15	PL B740 303	M. Adolph et al.	(COMPASS Collab.)
ADOLPH	14	EPJ A50 79	C. Adolph et al.	(COMPASS Collab.)
ALEKSEEV	10	PRL 104 241803	M.G. Alekseev et al.	(COMPASS Collab.)
ANISOVICH	09	IJMP A24 2481	V.V. Anisovich, A.V. Sarantsev	
UEHARA	09A	PR D80 032001	S. Uehara et al.	(BELLE Collab.)
SCHEGELSKY	06	EPJ A27 199	V.A. Schegelsky et al.	
SCHEGELSKY	06A	EPJ A27 207	V.A. Schegelsky et al.	
CHUNG	02	PR D65 072001	S.U. Chung et al.	(BNL E852 Collab.)
IVANOV	01	PRL 86 3977	E.I. Ivanov et al.	(BNL E852 Collab.)
MOLCHANOV	01	PL B521 171	V.V. Molchanov et al.	(FNAL SELEX Collab.)
ACHASOV	00K	PL B492 8	M.N. Achasov et al.	(Novosibirsk SND Collab.)
BARBERIS	00H	PL B488 225	D. Barberis et al.	(WA 102 Collab.)
BARBERIS	98B	PL B422 399	D. Barberis et al.	(WA 102 Collab.)
BERTIN	98B	PL B434 180	A. Bertin et al.	(OBELIX Collab.)
ABELE	97C	PL B404 179	A. Abele et al.	(Crystal Barrel Collab.)
ACCIARRI	97T	PL B413 147	M. Acciarri et al.	(L3 Collab.)
ALBRECHT	97B	ZPHY C74 469	H. Albrecht et al.	(ARGUS Collab.)
THOMPSON	97	PRL 79 1630	D.R. Thompson et al.	(BNL E852 Collab.)
AMELIN	96	ZPHY C70 71	D.V. Amelin et al.	(SERP, TBIL)
AMSLER	94D	PL B333 277	C. Amsler et al.	(Crystal Barrel Collab.)

AOYAGI	93	PL B314 246	H. Aoyagi *et al.*	(BKEI Collab.)
ARMSTRONG	93C	PL B307 394	T.A. Armstrong *et al.*	(FNAL, FERR, GENO+)
BELADIDZE	93	PL B313 276	G.M. Beladidze *et al.*	(VES Collab.)
CONDO	93	PR D48 3045	G.T. Condo *et al.*	(SLAC Hybrid Collab.)
ALDE	92B	ZPHY C54 549	D.M. Alde *et al.*	(SERP, BELG, LANL, LAPP+)
BELADIDZE	92	ZPHY C54 235	G.M. Beladidze *et al.*	(VES Collab.)
ALBRECHT	90G	ZPHY C48 183	H. Albrecht *et al.*	(ARGUS Collab.)
ARMSTRONG	90	ZPHY C48 213	T.A. Armstrong, M. Benayoun, W. Beusch	(WA76 Coll.)
BARU	90	ZPHY C48 581	S.E. Baru *et al.*	(MD-1 Collab.)
BEHREND	90C	ZPHY C46 583	H.J. Behrend *et al.*	(CELLO Collab.)
BUTLER	90	PR D42 1368	F. Butler *et al.*	(Mark II Collab.)
OEST	90	ZPHY C47 343	T. Oest *et al.*	(JADE Collab.)
AUGUSTIN	89	NP B320 1	J.E. Augustin, G. Cosme	(DM2 Collab.)
VOROBYEV	88	SJNP 48 273	P.V. Vorobiev *et al.*	(NOVO)
		Translated from YAF 48 436.		
ALTHOFF	86	ZPHY C31 537	M. Althoff *et al.*	(TASSO Collab.)
ANTREASYAN	86	PR D33 1847	D. Antreasyan *et al.*	(Crystal Ball Collab.)
BERGER	84C	PL 149B 427	C. Berger *et al.*	(PLUTO Collab.)
BEHREND	82C	PL 114B 378	H.J. Behrend *et al.*	(CELLO Collab.)
Also		PL 125B 518 (erratum)	H.J. Behrend *et al.*	(CELLO Collab.)
CIHANGIR	82	PL 117B 123	S. Cihangir *et al.*	(FNAL, MINN, ROCH)
CLELAND	82B	NP B208 228	W.E. Cleland *et al.*	(DURH, GEVA, LAUS+)
EDWARDS	82F	PL 110B 82	C. Edwards *et al.*	(CIT, HARV, PRIN+)
DELFOSSE	81	NP B183 349	A. Delfosse *et al.*	(GEVA, LAUS)
EVANGELIS...	81	NP B178 197	C. Evangelista *et al.*	(BARI, BONN, CERN+)
CHABAUD	80	NP B175 189	V. Chabaud *et al.*	(CERN, MPIM, AMST)
DAUM	80C	PL 89B 276	C. Daum *et al.*	(AMST, CERN, CRAC, MPIM+) JP
BALTAY	78B	PR D17 62	C. Baltay *et al.*	(COLU, BING)
CHABAUD	78	NP B145 349	V. Chabaud *et al.*	(CERN, MPIM)
FERRERSORIA	78	PL 74B 287	A. Ferrer Soria *et al.*	(ORSAY, CERN, CDEF+)
HYAMS	78	NP B146 303	B.D. Hyams *et al.*	(CERN, MPIM, ATEN)
MARTIN	78D	PL 74B 417	A.D. Martin *et al.*	(DURH, GEVA) JP
MAY	77	PR D16 1983	E.N. May *et al.*	(ROCH, CORN)
FORINO	76	NC 35A 465	A. Forino *et al.*	(BGNA, FIRZ, GENO, MILA+)
MARGULIE	76	PR D14 667	M. Margulies *et al.*	(BNL, CUNY)
EMMS	75	PL 58B 117	M.J. Emms *et al.*	(BIRM, DURH, RHEL) JP
WAGNER	75	PL 58B 201	F. Wagner, M. Tabak, D.M. Chew	(LBL) JP
DIAZ	74	PRL 32 260	J. Diaz *et al.*	(CASE, CMU)
KARSHON	74	PRL 32 852	U. Karshon *et al.*	(REHO)
ANTIPOV	73	NP B63 175	Y.M. Antipov *et al.*	(CERN, SERP) JP
ANTIPOV	73C	NP B63 153	Y.M. Antipov *et al.*	(CERN, SERP) JP
CHALOUPKA	73	PL 44B 211	V. Chaloupka *et al.*	(CERN)
CONFORTO	73	PL 45B 154	G. Conforto *et al.*	(EFI, FNAL, TNTO+)
DEFOIX	73	PL 43B 141	C. Defoix *et al.*	(CDEF)
EISENSTEIN	73	PR D7 278	L. Eisenstein *et al.*	(ILL)
KEY	73	PRL 30 503	A.W. Key *et al.*	(TNTO, EFI, FNAL, WISC)
TOET	73	NP B63 248	D.Z. Toet *et al.*	(NIJM, BONN, DURH, TORI)
DAMERI	72	NC 9A 1	M. Dameri *et al.*	(GENO, MILA, SACL)
EISENBERG	72	PR D5 15	Y. Eisenberg *et al.*	(REHO, SLAC, TELA)
ESPIGAT	72	NP B36 93	P. Espigat *et al.*	(CERN, CDEF)
FOLEY	72	PR D6 747	K.J. Foley *et al.*	(BNL, CUNY)
ALSTON-...	71	PL 34B 156	M. Alston-Garnjost *et al.*	(LRL)
BARNHAM	71	PRL 26 1494	K.W.J. Barnham *et al.*	(LBL)
BINNIE	71	PL 36B 257	D.M. Binnie *et al.*	(LOIC, SHMP)
BOWEN	71	PRL 26 1663	D.R. Bowen *et al.*	(NEAS, STON)
GRAYER	71	PL 34B 333	G. Grayer *et al.*	(CERN, MPIM)
ABRAMOVI...	70B	NP B23 466	M. Abramovich *et al.*	(CERN) JP
ALSTON-...	70	PL 33B 607	M. Alston-Garnjost *et al.*	(LRL)
BOECKMANN	70	NP B16 221	K. Boeckmann *et al.*	(BONN, DURH, NIJM+)
ASCOLI	68	PRL 20 1321	G. Ascoli *et al.*	(ILL) JP
BOESEBECK	68	NP B4 501	K. Boesebeck *et al.*	(AACH, BERL, CERN)
CHUNG	68	PR 165 1491	S.U. Chung *et al.*	(LRL)
CONTE	67	NC 51A 175	F. Conte *et al.*	(GENO, HAMB, MILA, SACL)