$\rho(1700)$

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

THE $\rho(1450)$ AND THE $\rho(1700)$

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In our 1988 edition, we replaced the $\rho(1600)$ entry with two new ones, the $\rho(1450)$ and the $\rho(1700)$, because there was emerging evidence that the 1600-MeV region actually contains two ρ-like resonances. ERKAL 86 had pointed out this possibility with a theoretical analysis on the consistency of 2π and 4π electromagnetic form factors and the $\pi\pi$ scattering length. DONNACHIE 87, with a full analysis of data on the 2π and 4π final states in e^+e^- annihilation and photoproduction reactions, had also argued that in order to obtain a consistent picture two resonances were necessary. The existence of $\rho(1450)$ was supported by the analysis of $\eta\rho^0$ mass spectra obtained in photoproduction and e^+e^- annihilation (DONNACHIE 87B) as well as that of $e^+e^- \to \omega\pi$ (DONNACHIE 91).

The analysis of DONNACHIE 87 was further extended by CLEGG 88, 94 to include new data on 4π systems produced in e^+e^- annihilation and in τ decays (τ decays to 4π and e^+e^- annihilation to 4π can be related by the Conserved Vector Current assumption). These systems were successfully analyzed using interfering contributions from two ρ-like states, and from the tail of the $\rho(770)$ decaying into two-body states. While specific conclusions on $\rho(1450) \to 4\pi$ were obtained, little could be said about the $\rho(1700)$.

An analysis by CLEGG 90 of 6π mass spectra from e^+e^- annihilation and from diffractive photoproduction provides evidence for two ρ mesons at about 2.1 and 1.8 GeV that decay strongly into 6π states. While the former is a candidate for a new resonance ($\rho(2150)$), the latter could be a manifestation of the $\rho(1700)$ distorted by threshold effects.

Independent evidence for two 1^- states is provided by KILLIAN 80 in 4π electroproduction at $\langle Q^2\rangle = 1$ $(\mathrm{GeV}/c)^2$, and by FUKUI 88 in a high-statistics sample of the $\eta\pi\pi$ system in $\pi^- p$ charge exchange.

This scenario with two overlapping resonances is supported by other data. BISELLO 89 measured the pion form factor in the interval 1.35–2.4 GeV and observed a deep minimum around 1.6 GeV. The best fit was obtained with the hypothesis of ρ-like resonances at 1420 and 1770 MeV with widths of about 250 MeV. ANTONELLI 88 found that the $e^+e^- \rightarrow \eta\pi^+\pi^-$ cross section is better fitted with two fully interfering Breit-Wigners, with parameters in fair agreement with those of DONNACHIE 87 and BISELLO 89. These results can be considered as a confirmation of the $\rho(1450)$.

Decisive evidence for the $\pi\pi$ decay mode of both $\rho(1450)$ and $\rho(1700)$ came from recent results in $\overline{p}p$ annihilation at rest (ABELE 97). According to ABELE 98 these resonances also possess a $K\overline{K}$ decay mode. High statistics studies of the $\tau \rightarrow \pi\pi\nu_\tau$ decay also require the $\rho(1450)$ (BARATE 97M, URHEIM 97), but are not sensitive to the $\rho(1700)$ because it is too close to the τ mass.

The structure of these ρ states is not yet completely clear. BARNES 97 and CLOSE 97C claim that $\rho(1450)$ has a mass consistent with radial $2S$, but its decays show characteristics of hybrids and suggest that this state may be a $2S$-hybrid mixture.

We also list under the $\rho(1450)$ the $\phi\pi$ state with $J^{PC} = 1^{--}$ or $C(1480)$ observed by BITYUKOV 87. While ACHASOV 96B shows that it may be a threshold effect, CLEGG 88 and LANDSBERG 92 suggest two independent vector states with this decay mode. Note, however, that $C(1480)$

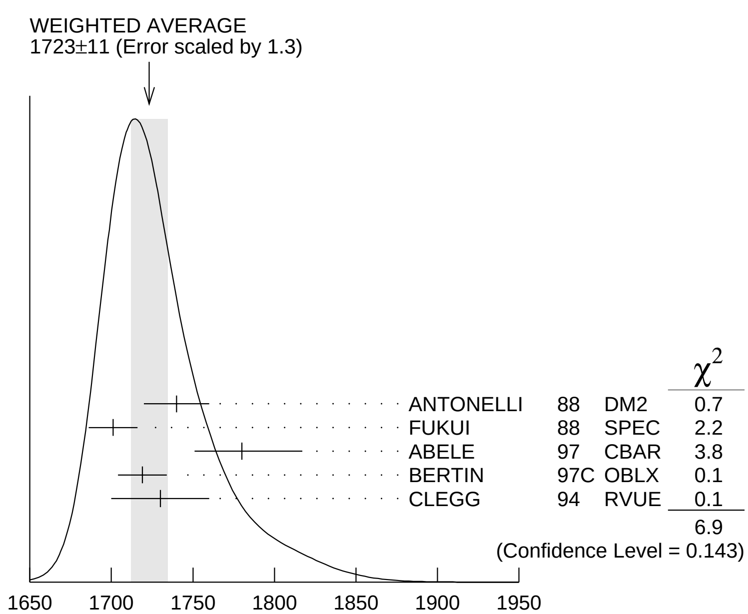
in its $\phi\pi$ decay mode was not confirmed by e^+e^- (DOLINSKY 91, BISELLO 91C) and $\overline{p}p$ (ABELE 97H) experiments.

Several observations on the $\omega\pi$ system in the 1200-MeV region (FRENKIEL 72, COSME 76, BARBER 80C, ASTON 80C, ATKINSON 84C, BRAU 88, AMSLER 93B) may be interpreted in terms of either $J^P = 1^-$ $\rho(770) \to \omega\pi$ production (LAYSSAC 71) or $J^P = 1^+$ $b_1(1235)$ production (BRAU 88, AMSLER 93B). We argue that no special entry for a $\rho(1250)$ is needed. The LASS amplitude analysis (ASTON 91B) showing evidence for $\rho(1270)$ is preliminary and needs confirmation. For completeness, the relevant observations are listed under the $\rho(1450)$.

ρ(1700) MASS

$\eta\rho^0$ AND $\pi^+\pi^-$ MODES

VALUE (MeV)	*DOCUMENT ID*
1700±20 OUR ESTIMATE	
1723±11 OUR AVERAGE	Includes data from the 2 datablocks that follow this one. Error includes scale factor of 1.3. See the ideogram below.



ρ(1700) mass, $\eta\rho^0$ and $\pi^+\pi^-$ modes (MeV)

$\eta\rho^0$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
1740±20	ANTONELLI	88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
1701±15	[1] FUKUI	88	SPEC	8.95 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

$\pi\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
1780 $^{+37}_{-29}$	[2] ABELE	97	CBAR	$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
1719 ±15	[2] BERTIN	97C	OBLX	0.0 $\overline{p}p \rightarrow \pi^+\pi^-\pi^0$
1730 ±30	CLEGG	94	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1768 ±21	BISELLO	89	DM2	$e^+e^- \rightarrow \pi^+\pi^-$
1745.7±91.9	DUBNICKA	89	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1546 ±26	GESHKEN...	89	RVUE	
1650	[3] ERKAL	85	RVUE	20–70 $\gamma p \rightarrow \gamma\pi$
1550 ±70	ABE	84B	HYBR	20 $\gamma p \rightarrow \pi^+\pi^- p$
1590 ±20	[4] ASTON	80	OMEG	20–70 $\gamma p \rightarrow p 2\pi$
1600 ±10	[5] ATIYA	79B	SPEC	50 γC $\rightarrow$ C2π
1598 $^{+24}_{-22}$	BECKER	79	ASPK	17 $\pi^- p$ polarized
1659 ±25	[3] LANG	79	RVUE	
1575	[3] MARTIN	78C	RVUE	17 $\pi^- p \rightarrow \pi^+\pi^- n$
1610 ±30	[3] FROGGATT	77	RVUE	17 $\pi^- p \rightarrow \pi^+\pi^- n$
1590 ±20	[6] HYAMS	73	ASPK	17 $\pi^- p \rightarrow \pi^+\pi^- n$

$\pi\omega$ MODE

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1710±90	ACHASOV	97	RVUE	$e^+e^- \rightarrow \omega\pi^0$

$K\overline{K}$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1582±36	1600	CLELAND	82B	SPEC	±	50 $\pi p \rightarrow K^0_S K^\pm p$

$2(\pi^+\pi^-)$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1851^{+27}_{-24}		ACHASOV	97	RVUE	$e^+e^- \to 2(\pi^+\pi^-)$
1570 ± 20		[7] CORDIER	82	DM1	$e^+e^- \to 2(\pi^+\pi^-)$
1520 ± 30		[4] ASTON	81E	OMEG	20–70 $\gamma p \to p4\pi$
1654 ± 25		[8] DIBIANCA	81	DBC	$\pi^+ d \to pp2(\pi^+\pi^-)$
1666 ± 39		[7] BACCI	80	FRAG	$e^+e^- \to 2(\pi^+\pi^-)$
1780	34	KILLIAN	80	SPEC	11 $e^- p \to 2(\pi^+\pi^-)$
1500		[9] ATIYA	79B	SPEC	50 γC $\to$ C$4\pi^\pm$
1570 ± 60	65	[10] ALEXANDER	75	HBC	7.5 $\gamma p \to p4\pi$
1550 ± 60		[4] CONVERSI	74	OSPK	$e^+e^- \to 2(\pi^+\pi^-)$
1550 ± 50	160	SCHACHT	74	STRC	5.5–9 $\gamma p \to p4\pi$
1450 ± 100	340	SCHACHT	74	STRC	9–18 $\gamma p \to p4\pi$
1430 ± 50	400	BINGHAM	72B	HBC	9.3 $\gamma p \to p4\pi$

$\pi^+\pi^-\pi^0\pi^0$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1660 ± 30	ATKINSON	85B	OMEG	20–70 γp

$3(\pi^+\pi^-)$ AND $2(\pi^+\pi^-\pi^0)$ MODES

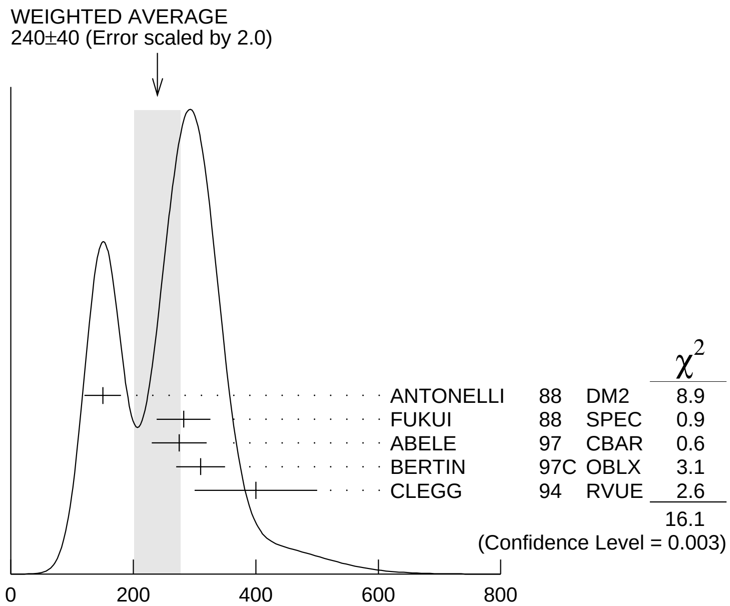
VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1783 ± 15	CLEGG	90	RVUE	$e^+e^- \to 3(\pi^+\pi^-)2(\pi^+\pi^-\pi^0)$

[1] Assuming $\rho^+ f_0(1370)$ decay mode interferes with $a_1(1260)^+\pi$ background. From a two Breit-Wigner fit.
[2] T-matrix pole.
[3] From phase shift analysis of HYAMS 73 data.
[4] Simple relativistic Breit-Wigner fit with constant width.
[5] An additional 40 MeV uncertainty in both the mass and width is present due to the choice of the background shape.
[6] Included in BECKER 79 analysis.
[7] Simple relativistic Breit-Wigner fit with model dependent width.
[8] One peak fit result.
[9] Parameters roughly estimated, not from a fit.
[10] Skew mass distribution compensated by Ross-Stodolsky factor.

$\rho(1700)$ WIDTH

$\eta\rho^0$ AND $\pi^+\pi^-$ MODES

VALUE (MeV)	*DOCUMENT ID*
240±60 OUR ESTIMATE	
240±40 OUR AVERAGE	Includes data from the 2 datablocks that follow this one. Error includes scale factor of 2.0. See the ideogram below.



$\rho(1700)$ width, $\eta\rho^0$ and $\pi^+\pi^-$ modes (MeV)

$\eta\rho^0$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
150±30	ANTONELLI	88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
282±44	[11] FUKUI	88	SPEC	8.95 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

$\pi\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
275 ± 45	[12] ABELE	97	CBAR	$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
310 ± 40	[12] BERTIN	97C	OBLX	0.0 $\overline{p}p \rightarrow \pi^+\pi^-\pi^0$
400 ±100	CLEGG	94	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$

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

224 ± 22	BISELLO	89	DM2	$e^+e^- \to \pi^+\pi^-$
242.5±163.0	DUBNICKA	89	RVUE	$e^+e^- \to \pi^+\pi^-$
620 ± 60	GESHKEN...	89	RVUE	
<315	[13] ERKAL	85	RVUE	20–70 $\gamma p \to \gamma\pi$
280^{+30}_{-80}	ABE	84B	HYBR	20 $\gamma p \to \pi^+\pi^- p$
230 ± 80	[14] ASTON	80	OMEG	20–70 $\gamma p \to p 2\pi$
283 ± 14	[15] ATIYA	79B	SPEC	50 $\gamma C \to C 2\pi$
175^{+98}_{-53}	BECKER	79	ASPK	17 $\pi^- p$ polarized
232 ± 34	[13] LANG	79	RVUE	
340	[13] MARTIN	78C	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
300 ±100	[13] FROGGATT	77	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
180 ± 50	[16] HYAMS	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$

$K\overline{K}$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •						
265±120	1600	CLELAND	82B	SPEC	±	50 $\pi p \to K^0_S K^\pm p$

$2(\pi^+\pi^-)$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
510± 40		[17] CORDIER	82	DM1	$e^+e^- \to 2(\pi^+\pi^-)$
400± 50		[14] ASTON	81E	OMEG	20–70 $\gamma p \to p 4\pi$
400±146		[18] DIBIANCA	81	DBC	$\pi^+ d \to p p 2(\pi^+\pi^-)$
700±160		[17] BACCI	80	FRAG	$e^+e^- \to 2(\pi^+\pi^-)$
100	34	KILLIAN	80	SPEC	11 $e^- p \to 2(\pi^+\pi^-)$
600		[19] ATIYA	79B	SPEC	50 $\gamma C \to C 4\pi^\pm$
340±160	65	[20] ALEXANDER	75	HBC	7.5 $\gamma p \to p 4\pi$
360±100		[14] CONVERSI	74	OSPK	$e^+e^- \to 2(\pi^+\pi^-)$
400±120	160	[21] SCHACHT	74	STRC	5.5–9 $\gamma p \to p 4\pi$
850±200	340	[21] SCHACHT	74	STRC	9–18 $\gamma p \to p 4\pi$
650±100	400	BINGHAM	72B	HBC	9.3 $\gamma p \to p 4\pi$

$\pi^+\pi^-\pi^0\pi^0$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300±50	ATKINSON	85B	OMEG	20–70 γp

$3(\pi^+\pi^-)$ AND $2(\pi^+\pi^-\pi^0)$ MODES

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
285±20	CLEGG	90	RVUE	$e^+e^- \to 3(\pi^+\pi^-) 2(\pi^+\pi^-\pi^0)$

[11] Assuming $\rho^+ f_0(1370)$ decay mode interferes with $a_1(1260)^+\pi$ background. From a two Breit-Wigner fit.

[12] T-matrix pole.

[13] From phase shift analysis of HYAMS 73 data.
[14] Simple relativistic Breit-Wigner fit with constant width.
[15] An additional 40 MeV uncertainty in both the mass and width is present due to the choice of the background shape.
[16] Included in BECKER 79 analysis.
[17] Simple relativistic Breit-Wigner fit with model-dependent width.
[18] One peak fit result.
[19] Parameters roughly estimated, not from a fit.
[20] Skew mass distribution compensated by Ross-Stodolsky factor.
[21] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

$\rho(1700)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\rho\pi\pi$	dominant
Γ_2	$2(\pi^+\pi^-)$	large
Γ_3	$\rho^0\pi^+\pi^-$	large
Γ_4	$\rho^0\pi^0\pi^0$	
Γ_5	$\rho^\pm\pi^\mp\pi^0$	large
Γ_6	$\pi^+\pi^-$	seen
Γ_7	$\pi^-\pi^0$	seen
Γ_8	$K\overline{K}^*(892)+$ c.c.	seen
Γ_9	$\eta\rho$	seen
Γ_{10}	$K\overline{K}$	seen
Γ_{11}	e^+e^-	seen
Γ_{12}	$\pi^0\omega$	seen

$\rho(1700)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

This combination of a partial width with the partial width into e^+e^- and with the total width is obtained from the cross-section into channel$_I$ in e^+e^- annihilation.

$\Gamma(2(\pi^+\pi^-)) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_2\Gamma_{11}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2.83±0.42	BACCI	80	FRAG	$e^+e^- \rightarrow 2(\pi^+\pi^-)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.6 ±0.2	DELCOURT	81B	DM1	$e^+e^- \rightarrow 2(\pi^+\pi^-)$

$\Gamma(\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_6\Gamma_{11}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13	[22] DIEKMAN	88	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$

[22] Using total width = 220 MeV.

$\Gamma(K\overline{K}^*(892)+\text{c.c.}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_8\Gamma_{11}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.305±0.071	[23] BIZOT	80	DM1	e^+e^-

$\Gamma(\eta\rho) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_9\Gamma_{11}/\Gamma$

VALUE (eV)	*DOCUMENT ID*		*TECN*	*COMMENT*
7 ±3	ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$

$\Gamma(K\overline{K}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_{10}\Gamma_{11}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.035±0.029	[23] BIZOT	80	DM1	e^+e^-

$\Gamma(\rho\pi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_1\Gamma_{11}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.510±0.090	[23] BIZOT	80	DM1	e^+e^-

[23] Model dependent.

ρ(1700) BRANCHING RATIOS

$\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ — Γ_6/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.287^{+0.043}_{-0.042}$	BECKER	79	ASPK	17 $\pi^- p$ polarized
0.15 to 0.30	[24] MARTIN	78C	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
<0.20	[25] COSTA...	77B	RVUE	$e^+e^- \to 2\pi,\ 4\pi$
0.30 ±0.05	[24] FROGGATT	77	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
<0.15	[26] EISENBERG	73	HBC	5 $\pi^+ p \to \Delta^{++} 2\pi$
0.25 ±0.05	[27] HYAMS	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$

[24] From phase shift analysis of HYAMS 73 data.
[25] Estimate using unitarity, time reversal invariance, Breit-Wigner.
[26] Estimated using one-pion-exchange model.
[27] Included in BECKER 79 analysis.

$\Gamma(\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$ — Γ_6/Γ_2

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13±0.05	ASTON	80	OMEG	20–70 $\gamma p \to p 2\pi$
<0.14	[28] DAVIER	73	STRC	6–18 $\gamma p \to p 4\pi$
<0.2	[29] BINGHAM	72B	HBC	9.3 $\gamma p \to p 2\pi$

[28] Upper limit is estimate.
[29] 2σ upper limit.

$\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma(2(\pi^+\pi^-))$ Γ_8/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.15 ± 0.03	[30] DELCOURT	81B	DM1	$e^+e^- \to \overline{K}K\pi$

[30] Assuming $\rho(1700)$ and ω radial excitations to be degenerate in mass.

$\Gamma(\eta\rho)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.04		DONNACHIE	87B	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.02	58	ATKINSON	86B	OMEG	20–70 γp

$\Gamma(\eta\rho)/\Gamma(2(\pi^+\pi^-))$ Γ_9/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.123 ± 0.027	DELCOURT	82	DM1	$e^+e^- \to \pi^+\pi^-$ MM
~ 0.1	ASTON	80	OMEG	20–70 γp

$\Gamma(\pi^+\pi^-\text{neutrals})/\Gamma(2(\pi^+\pi^-))$ $(\Gamma_4+\Gamma_5+0.714\Gamma_9)/\Gamma_2$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.6 ± 0.4	[31] BALLAM	74	HBC	9.3 γp

[31] Upper limit. Background not subtracted.

$\Gamma(\pi^0\omega)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	ACHASOV	97	RVUE	$e^+e^- \to \omega\pi^0$

$\Gamma(K\overline{K})/\Gamma(2(\pi^+\pi^-))$ Γ_{10}/Γ_2

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.015 ± 0.010		[32] DELCOURT	81B	DM1		$e^+e^- \to \overline{K}K$
<0.04	95	BINGHAM	72B	HBC	0	9.3 γp

[32] Assuming $\rho(1700)$ and ω radial excitations to be degenerate in mass.

$\Gamma(K\overline{K})/\Gamma(K\overline{K}^*(892)+\text{c.c.})$ Γ_{10}/Γ_8

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.052 ± 0.026	BUON	82	DM1	$e^+e^- \to$ hadrons

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$ Γ_3/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 1.0		DELCOURT	81B	DM1	$e^+e^- \to 2(\pi^+\pi^-)$
$0.7\ \pm0.1$	500	SCHACHT	74	STRC	5.5–18 $\gamma p \to p4\pi$
0.80		[33] BINGHAM	72B	HBC	9.3 $\gamma p \to p4\pi$

[33] The $\pi\pi$ system is in S-wave.

$\Gamma(\rho^0\pi^0\pi^0)/\Gamma(\rho^\pm\pi^\mp\pi^0)$ Γ_4/Γ_5

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.10	ATKINSON	85B	OMEG		20–70 γp
<0.15	ATKINSON	82	OMEG	0	20–70 $\gamma p \rightarrow p 4\pi$

$\rho(1700)$ REFERENCES

ABELE	97	PL B391 191	A. Abele, Adomeit, Amsler+	(Crystal Barrel Collab.)
ACHASOV	97	PR D55 2663	+Kozhevnikov+	(NOVM)
BERTIN	97C	PL B408 476	A. Bertin, Bruschi+	(OBELIX Collab.)
CLEGG	94	ZPHY C62 455	+Donnachie	(LANC, MCHS)
CLEGG	90	ZPHY C45 677	+Donnachie	(LANC, MCHS)
BISELLO	89	PL B220 321	+Busetto+	(DM2 Collab.)
DUBNICKA	89	JPG 15 1349	+Martinovic+	(JINR, SLOV)
GESHKEN...	89	ZPHY 45 351	Geshkenbein	(ITEP)
ANTONELLI	88	PL B212 133	+Baldini+	(DM2 Collab.)
DIEKMAN	88	PRPL 159 101		(BONN)
FUKUI	88	PL B202 441	+Horikawa+	(SUGI, NAGO, KEK, KYOT, MIYA)
DONNACHIE	87B	ZPHY C34 257	+Clegg	(MCHS, LANC)
ATKINSON	86B	ZPHY C30 531	+	(BONN, CERN, GLAS, LANC, MCHS, CURIN+)
ATKINSON	85B	ZPHY C26 499	+	(BONN, CERN, GLAS, LANC, MCHS, CURIN+)
ERKAL	85	ZPHY C29 485	+Olsson	(WISC)
ABE	84B	PRL 53 751	+Bacon, Ballam+	(SLAC Hybrid Facility Photon Collab.)
ATKINSON	82	PL 108B 55	+	(BONN, CERN, GLAS, LANC, MCHS, CURIN+)
BUON	82	PL 118B 221	+Bisello, Bizot, Cordier, Delcourt+	(LALO, MONP)
CLELAND	82B	NP B208 228	+Delfosse, Dorsaz, Gloor	(DURH, GEVA, LAUS, PITT)
CORDIER	82	PL 109B 129	+Bisello, Bizot, Buon, Delcourt	(LALO)
DELCOURT	82	PL 113B 93	+Bisello, Bizot, Buon, Cordier, Mane	(LALO)
ASTON	81E	NP B189 15		(BONN, CERN, EPOL, GLAS, LANC, MCHS+)
DELCOURT	81B	Bonn Conf. 205		(ORSAY)
Also	82	PL 109B 129	Cordier, Bisello, Bizot, Buon, Delcourt	(LALO)
DIBIANCA	81	PR D23 595	+Fickinger, Malko, Dado, Engler+	(CASE, CMU)
ASTON	80	PL 92B 215		(BONN, CERN, EPOL, GLAS, LANC, MCHS+)
BACCI	80	PL 95B 139	+DeZorzi, Penso, Baldini-Celio+	(ROMA, FRAS)
BIZOT	80	Madison Conf. 546	+Bisello, Buon, Cordier, Delcourt+	(LALO, MONP)
KILLIAN	80	PR D21 3005	+Treadwell, Ahrens, Berkelman, Cassel+	(CORN)
ATIYA	79B	PRL 43 1691	+Holmes, Knapp, Lee, Seto+	(COLU, ILL, FNAL)
BECKER	79	NP B151 46	+Blanar, Blum+	(MPIM, CERN, ZEEM, CRAC)
LANG	79	PR D19 956	+Mas-Parareda	(GRAZ)
MARTIN	78C	ANP 114 1	+Pennington	(CERN)
COSTA...	77B	PL 71B 345	Costa De Beauregard, Pire, Truong	(EPOL)
FROGGATT	77	NP B129 89	+Petersen	(GLAS, NORD)
ALEXANDER	75	PL 57B 487	+Benary, Gandsman, Lissauer+	(TELA)
BALLAM	74	NP B76 375	+Chadwick, Bingham, Fretter+	(SLAC, LBL, MPIM)
CONVERSI	74	PL 52B 493	+Paoluzi, Ceradini, Grilli+	(ROMA, FRAS)
SCHACHT	74	NP B81 205	+Derado, Fries, Park, Yount	(MPIM)
DAVIER	73	NP B58 31	+Derado, Fries, Liu, Mozley, Odian, Park+	(SLAC)
EISENBERG	73	PL 43B 149	+Karshon, Mikenberg, Pitluck+	(REHO)
HYAMS	73	NP B64 134	+Jones, Weilhammer, Blum, Dietl+	(CERN, MPIM)
BINGHAM	72B	PL 41B 635	+Rabin, Rosenfeld, Smadja+	(LBL, UCB, SLAC) IGJP

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