$\rho(770)$

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

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$\rho(770)$ MASS

We no longer list S-wave Breit-Wigner fits, or data with high combinatorial background.

MIXED CHARGES

VALUE (MeV)	*DOCUMENT ID*	
768.4±0.6 OUR AVERAGE	Includes data from the 3 datablocks that follow this one. Error includes scale factor of 1.2.	

CHARGED ONLY

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.						
766.5±1.1 OUR AVERAGE						
763.7±3.2		ABELE	97	CBAR		$\overline{p}n \to \pi^-\pi^0\pi^0$
768 ±9		AGUILAR-...	91	EHS		400 pp
767 ±3	2935	[2] CAPRARO	87	SPEC	−	200 π^- Cu → $\pi^-\pi^0$ Cu
761 ±5	967	[2] CAPRARO	87	SPEC	−	200 π^- Pb → $\pi^-\pi^0$ Pb
771 ±4		HUSTON	86	SPEC	+	202 π^+ A → $\pi^+\pi^0$ A
766 ±7	6500	[3] BYERLY	73	OSPK	−	5 $\pi^- p$
766.8±1.5	9650	[4] PISUT	68	RVUE	−	1.7–3.2 $\pi^- p$, t <10
767 ±6	900	[2] EISNER	67	HBC	−	4.2 $\pi^- p$, t <10

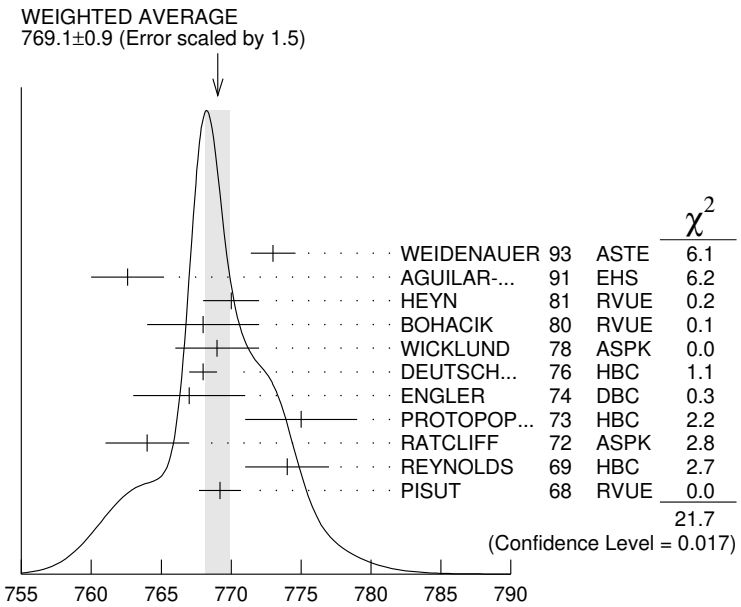
NEUTRAL ONLY, PHOTOPRODUCED

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.						
768.1± 1.3 OUR AVERAGE						
767.6± 2.7		BARTALUCCI	78	CNTR	0	$\gamma p \to e^+ e^- p$
775 ± 5		GLADDING	73	CNTR	0	2.9–4.7 γp
767 ± 4	1930	BALLAM	72	HBC	0	2.8 γp
770 ± 4	2430	BALLAM	72	HBC	0	4.7 γp
765 ±10		ALVENSLEB...	70	CNTR	0	γ A, t <0.01
767.7± 1.9	140k	BIGGS	70	CNTR	0	<4.1 γ C → $\pi^+\pi^-$ C
765 ± 5	4000	ASBURY	67B	CNTR	0	γ + Pb

NEUTRAL ONLY, OTHER REACTIONS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.						
769.1±0.9 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.				
773 ±1.6		WEIDENAUER	93	ASTE		$\overline{p}p \rightarrow \pi^+\pi^-\omega$
762.6±2.6		AGUILAR-...	91	EHS		400 pp
770 ±2		[5] HEYN	81	RVUE		Pion form factor
768 ±4		[6,7] BOHACIK	80	RVUE	0	
769 ±3		[3] WICKLUND	78	ASPK	0	3,4,6 $\pi^\pm N$
768 ±1	76000	DEUTSCH...	76	HBC	0	16 $\pi^+ p$
767 ±4	4100	ENGLER	74	DBC	0	6 $\pi^+ n \rightarrow \pi^+\pi^- p$
775 ±4	32000	[6] PROTOPOP...	73	HBC	0	7.1 $\pi^+ p$, t <0.4
764 ±3	6800	RATCLIFF	72	ASPK	0	15 $\pi^- p$, t <0.3
774 ±3	1700	REYNOLDS	69	HBC	0	2.26 $\pi^- p$
769.2±1.5	13300	[8] PISUT	68	RVUE	0	1.7–3.2 $\pi^- p$, t <10
• • • We do not use the following data for averages, fits, limits, etc. • • •						
770 ±2		BOGOLYUBSKY	97	MIRA		$\overline{p}p \rightarrow \pi^+\pi^+$ X
768 ±8		BOGOLYUBSKY	97	MIRA		$\overline{p}p \rightarrow \pi^+\pi^+$ X
757.5±1.5		[1] BERNICHA	94	RVUE		$e^+e^- \rightarrow \pi^+\pi^-$
761.1±2.9		DUBNICKA	89	RVUE		π form factor
768 ±1		[9] GESHKEN...	89	RVUE		π form factor
775.9±1.1		[10] BARKOV	85	OLYA	0	$e^+e^- \rightarrow \pi^+\pi^-$
777.4±2.0		[11] CHABAUD	83	ASPK	0	17 $\pi^- p$ polarized
769.5±0.7		[6,7] LANG	79	RVUE	0	
770 ±9		[7] ESTABROOKS	74	RVUE	0	17 $\pi^- p \rightarrow \pi^+\pi^- n$
773.5±1.7	11200	[2] JACOBS	72	HBC	0	2.8 $\pi^- p$
775 ±3	2250	HYAMS	68	OSPK	0	11.2 $\pi^- p$

[1] Applying the S-matrix formalism to the BARKOV 85 data.



$\rho(770)^0$ mass (MeV)

[2] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

[3] Phase shift analysis. Systematic errors added corresponding to spread of different fits.

[4] From fit of 3-parameter relativistic P-wave Breit-Wigner to total mass distribution. Includes BATON 68, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, BLIEDEN 65 and CARMONY 64.

[5] HEYN 81 includes all spacelike and timelike F_π values until 1978.

[6] From pole extrapolation.

[7] From phase shift analysis of GRAYER 74 data.

[8] Includes MALAMUD 69, ARMENISE 68, BACON 67, HUWE 67, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, GOLDHABER 64, ABOLINS 63.

[9] Includes BARKOV 85 data. Model-dependent width definition.

[10] From the Gounaris-Sakurai parametrization of the pion form factor.

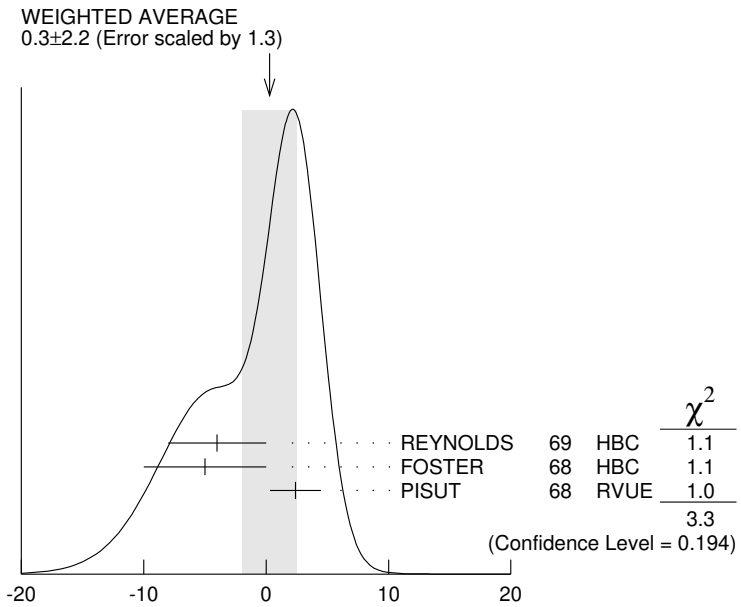
[11] From fit of 3-parameter relativistic Breit-Wigner to helicity-zero part of P-wave intensity. CHABAUD 83 includes data of GRAYER 74.

$m_{\rho(770)^0} - m_{\rho(770)^\pm}$

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
0.3±2.2 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.					
−4 ±4	3000	[12] REYNOLDS	69	HBC	−0	2.26 π^- p
−5 ±5	3600	[12] FOSTER	68	HBC	±0	0.0 $\overline{p}p$
2.4±2.1	22950	[13] PISUT	68	RVUE		$\pi N \rightarrow \rho N$

[12] From quoted masses of charged and neutral modes.

[13] Includes MALAMUD 69, ARMENISE 68, BATON 68, BACON 67, HUWE 67, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, BLIEDEN 65, CARMONY 64, GOLDHABER 64, ABOLINS 63.



$m_{\rho(770)^0} - m_{\rho(770)^\pm}$ (MeV)

$\rho(770)$ RANGE PARAMETER

The range parameter R enters an energy-dependent correction to the width, of the form $(1 + q_r^2\ R^2)\ /\ (1 + q^2\ R^2)$, where q is the momentum of one of the pions in the $\pi\pi$ rest system. At resonance, $q = q_r$.

VALUE (GeV^{-1})	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
$\mathbf{5.3^{+0.9}_{-0.7}}$	CHABAUD	83	ASPK	0	17 $\pi^-\ p$ polarized

$\rho(770)$ WIDTH

We no longer list S-wave Breit-Wigner fits, or data with high combinatorial background.

MIXED CHARGES

VALUE (MeV)	*DOCUMENT ID*
150.8±1.2 OUR AVERAGE	Includes data from the 3 datablocks that follow this one.

CHARGED ONLY

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.						
150.2± 2.4 OUR FIT						
150.2± 2.4 OUR AVERAGE						
152.8± 4.3		ABELE	97			$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
155 ±11	2935	[15] CAPRARO	87	SPEC	−	200 π^- Cu → $\pi^-\pi^0$ Cu
154 ±20	967	[15] CAPRARO	87	SPEC	−	200 π^- Pb → $\pi^-\pi^0$ Pb
150 ± 5		HUSTON	86	SPEC	+	202 π^+ A → $\pi^+\pi^0$ A
146 ±12	6500	[16] BYERLY	73	OSPK	−	5 $\pi^- p$
148.2± 4.1	9650	[17] PISUT	68	RVUE	−	1.7–3.2 $\pi^- p$, t <10
146 ±13	900	EISNER	67	HBC	−	4.2 $\pi^- p$, t <10

NEUTRAL ONLY, PHOTOPRODUCED

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
150.9± 3.0		BARTALUCCI 78	CNTR	0	$\gamma p \rightarrow e^+ e^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
147 ±11		GLADDING 73	CNTR	0	2.9–4.7 γp
155 ±12	2430	BALLAM 72	HBC	0	4.7 γp
145 ±13	1930	BALLAM 72	HBC	0	2.8 γp
140 ± 5		ALVENSLEB... 70	CNTR	0	γ A, t <0.01
146.1± 2.9	140k	BIGGS 70	CNTR	0	<4.1 γ C → $\pi^+\pi^-$ C
160 ±10		LANZEROTTI 68	CNTR	0	γp
130 ± 5	4000	ASBURY 67B	CNTR	0	γ + Pb

NEUTRAL ONLY, OTHER REACTIONS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.						
151.0± 2.0 OUR FIT Error includes scale factor of 1.3.						
151.0± 1.7 OUR AVERAGE Error includes scale factor of 1.1.						
145.7± 5.3		WEIDENAUER 93		ASTE		$\overline{p}p \rightarrow \pi^+\pi^-\omega$
144.9± 3.7		DUBNICKA 89		RVUE		π form factor
148 ± 6		[18,19] BOHACIK 80		RVUE	0	
152 ± 9		[16] WICKLUND 78		ASPK	0	3,4,6 $\pi^\pm pN$
154 ± 2	76000	DEUTSCH... 76		HBC	0	16 $\pi^+ p$
157 ± 8	6800	RATCLIFF 72		ASPK	0	15 $\pi^- p$, t <0.3
143 ± 8	1700	REYNOLDS 69		HBC	0	2.26 $\pi^- p$

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

142.5 ± 3.5		[14] BERNICHA	94	RVUE		$e^+e^- \to \pi^+\pi^-$
138 ± 1		[20] GESHKEN...	89	RVUE		π form factor
150.5 ± 3.0		[21] BARKOV	85	OLYA	0	$e^+e^- \to \pi^+\pi^-$
$160.0^{+4.1}_{-4.0}$		[22] CHABAUD	83	ASPK	0	17 π^-p polarized
155 ± 1		[23] HEYN	81	RVUE	0	π form factor
148.0 ± 1.3		[18,19] LANG	79	RVUE	0	
146 ± 14	4100	ENGLER	74	DBC	0	6 $\pi^+n \to \pi^+\pi^-p$
143 ± 13		[19] ESTABROOKS	74	RVUE	0	17 $\pi^-p \to \pi^+\pi^-n$
160 ± 10	32000	[18] PROTOPOP...	73	HBC	0	7.1 π^+p, t <0.4
145 ± 12	2250	[15] HYAMS	68	OSPK	0	11.2 π^-p
163 ± 15	13300	[24] PISUT	68	RVUE	0	1.7–3.2 π^-p, t <10

[14] Applying the S-matrix formalism to the BARKOV 85 data.

[15] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

[16] Phase shift analysis. Systematic errors added corresponding to spread of different fits.

[17] From fit of 3-parameter relativistic P-wave Breit-Wigner to total mass distribution. Includes BATON 68, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, BLIEDEN 65 and CARMONY 64.

[18] From pole extrapolation.

[19] From phase shift analysis of GRAYER 74 data.

[20] Includes BARKOV 85 data. Model-dependent width definition.

[21] From the Gounaris-Sakurai parametrization of the pion form factor.

[22] From fit of 3-parameter relativistic Breit-Wigner to helicity-zero part of P-wave intensity. CHABAUD 83 includes data of GRAYER 74.

[23] HEYN 81 includes all spacelike and timelike F_π values until 1978.

[24] Includes MALAMUD 69, ARMENISE 68, BACON 67, HUWE 67, MILLER 67B, ALFF-STEINBERGER 66, HAGOPIAN 66, HAGOPIAN 66B, JACOBS 66B, JAMES 66, WEST 66, GOLDHABER 64, ABOLINS 63.

$\rho(770)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$\pi\pi$	~ 100 %	
	$\rho(770)^\pm$ decays		
Γ_2	$\pi^\pm\pi^0$	~ 100 %	
Γ_3	$\pi^\pm\gamma$	(4.5 ±0.5) $\times 10^{-4}$	S=2.2
Γ_4	$\pi^\pm\eta$	< 6 $\times 10^{-3}$	CL=84%
Γ_5	$\pi^\pm\pi^+\pi^-\pi^0$	< 2.0 $\times 10^{-3}$	CL=84%

$\rho(770)^0$ decays

Γ_6	$\pi^+\pi^-$		$\sim$	100	%	
Γ_7	$\pi^+\pi^-\gamma$		(	9.9 $\pm$1.6)	$\times 10^{-3}$	
Γ_8	$\pi^0\gamma$		(	7.9 $\pm$2.0)	$\times 10^{-4}$	
Γ_9	$\eta\gamma$		(	3.8 $\pm$0.7)	$\times 10^{-4}$	
Γ_{10}	$\mu^+\mu^-$	[a]	(	4.60$\pm$0.28)	$\times 10^{-5}$	
Γ_{11}	e^+e^-	[a]	(	4.48$\pm$0.22)	$\times 10^{-5}$	
Γ_{12}	$\pi^+\pi^-\pi^0$		$<$	1.2	$\times 10^{-4}$	CL=90%
Γ_{13}	$\pi^+\pi^-\pi^+\pi^-$		$<$	2	$\times 10^{-4}$	CL=90%
Γ_{14}	$\pi^+\pi^-\pi^0\pi^0$		$<$	4	$\times 10^{-5}$	CL=90%

[a] The e^+e^- branching fraction is from $e^+e^- \to \pi^+\pi^-$ experiments only. The $\omega\rho$ interference is then due to $\omega\rho$ mixing only, and is expected to be small. If $e\mu$ universality holds, $\Gamma(\rho^0 \to \mu^+\mu^-) = \Gamma(\rho^0 \to e^+e^-) \times 0.99785$.

CONSTRAINED FIT INFORMATION

An overall fit to the total width and a partial width uses 10 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 = 10.7$ for 8 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_3	-100	
Γ	15	-15
	x_2	x_3

	Mode	Rate (MeV)	Scale factor
Γ_2	$\pi^\pm\pi^0$	150.2 $\pm$2.4	
Γ_3	$\pi^\pm\gamma$	0.068$\pm$0.007	2.3

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and a branching ratio uses 9 measurements and one constraint to determine 4 parameters. The overall fit has a $\chi^2 = 7.8$ for 6 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.

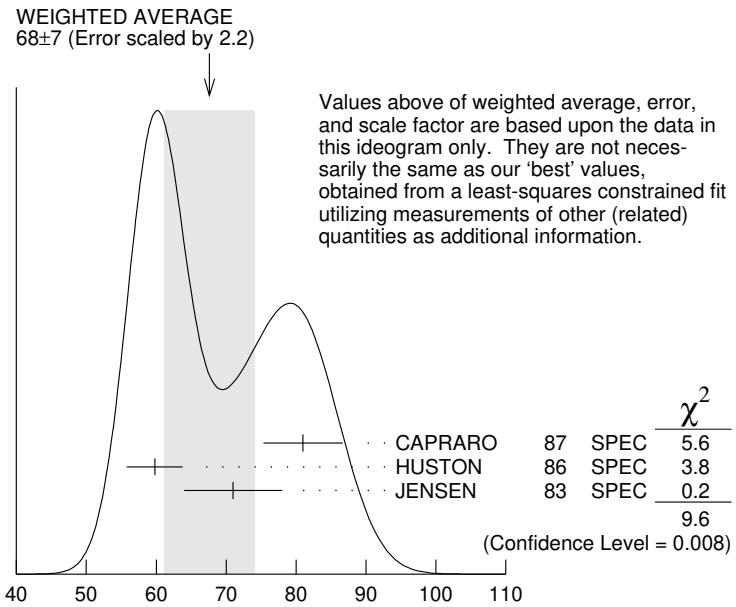
x_{10}	−79		
x_{11}	−61	0	
Γ	16	0	−27
	x_6	x_{10}	x_{11}

	Mode		Rate (MeV)		Scale factor
Γ_6	$\pi^+ \pi^-$		151.0	±2.0	1.3
Γ_{10}	$\mu^+ \mu^-$	[a]	0.0069	±0.0004	
Γ_{11}	$e^+ e^-$	[a]	0.00677	±0.00032	

$\rho(770)$ PARTIAL WIDTHS

$\Gamma(\pi^\pm \gamma)$ Γ_3

VALUE (keV)	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
68 ±7 OUR FIT Error includes scale factor of 2.3.					
68 ±7 OUR AVERAGE Error includes scale factor of 2.2. See the ideogram below.					
81 ±4 ±4	CAPRARO	87	SPEC	−	200 π^- A → $\pi^- \pi^0$ A
59.8±4.0	HUSTON	86	SPEC	+	202 π^+ A → $\pi^+ \pi^0$ A
71 ±7	JENSEN	83	SPEC	−	156–260 π^- A → $\pi^- \pi^0$ A



$\Gamma\left(\pi^{\pm}\gamma\right)$ (keV)

$\Gamma\left(e^{+}e^{-}\right)$ Γ_{11}

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
6.77±0.32 OUR FIT				
6.77±0.10±0.30	BARKOV	85	OLYA	$e^{+}e^{-} \rightarrow \pi^{+}\pi^{-}$

$\Gamma\left(\pi^{0}\gamma\right)$ Γ_{8}

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
121±31	DOLINSKY	89	ND	$e^{+}e^{-} \rightarrow \pi^{0}\gamma$

$\Gamma\left(\eta\gamma\right)$ Γ_{9}

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*

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

62±17	[25] DOLINSKY	89	ND	$e^{+}e^{-} \rightarrow \eta\gamma$
111±22	[26] DOLINSKY	89	ND	$e^{+}e^{-} \rightarrow \eta\gamma$

[25] Solution corresponding to constructive ω-ρ interference. The quark model predicts a relative decay phase of zero. Also much favored by the ALDE 93 model-independent measurement of B($\omega \rightarrow \eta\gamma$).

[26] Solution corresponding to destructive ρ-ω interference.

$\rho(770)$ BRANCHING RATIOS

$\Gamma\left(\pi^{\pm}\eta\right)/\Gamma\left(\pi\pi\right)$ Γ_{4}/Γ_{1}

VALUE (units 10^{-4})	*CL%*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
<60	84	FERBEL	66	HBC	±	$\pi^{\pm}$ p above 2.5

$\Gamma(\pi^{\pm}\pi^{+}\pi^{-}\pi^{0})/\Gamma(\pi\pi)$ Γ_5/Γ_1

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	CHG	COMMENT
<20	84	FERBEL	66	HBC	$\pm$	$\pi^{\pm}$ p above 2.5
• • • We do not use the following data for averages, fits, limits, etc. • • •						
35 ± 40		JAMES	66	HBC	+	2.1 π^{+} p

$\Gamma(\mu^{+}\mu^{-})/\Gamma(\pi^{+}\pi^{-})$ Γ_{10}/Γ_6

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
4.60±0.28 OUR FIT				
4.6 ±0.2 ±0.2	ANTIPOV	89	SIGM	π^{-} Cu $\rightarrow$ $\mu^{+}\mu^{-}\pi^{-}$ Cu
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$8.2\ ^{+1.6}_{-3.6}$	[27] ROTHWELL	69	CNTR	Photoproduction
$5.6\ \pm1.5$	[28] WEHMANN	69	OSPK	12 π^{-} C, Fe
$9.7\ ^{+3.1}_{-3.3}$	[29] HYAMS	67	OSPK	11 π^{-} Li, H

[27] Possibly large ρ-ω interference leads us to increase the minus error.

[28] Result contains 11 ± 11% correction using SU(3) for central value. The error on the correction takes account of possible ρ-ω interference and the upper limit agrees with the upper limit of $\omega \rightarrow \mu^{+}\mu^{-}$ from this experiment.

[29] HYAMS 67's mass resolution is 20 MeV. The ω region was excluded.

$\Gamma(e^{+}e^{-})/\Gamma(\pi\pi)$ Γ_{11}/Γ_1

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
0.41±0.05	BENAKSAS	72	OSPK	$e^{+}e^{-}$

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

VALUE (units 10^{-4})	DOCUMENT ID		TECN	CHG	COMMENT
3.8±0.7 OUR AVERAGE					
4.0 ± 1.1	[30] DOLINSKY	89	ND		$e^{+}e^{-} \rightarrow \eta\gamma$
3.6 ± 0.9	[30] ANDREWS	77	CNTR	0	6.7–10 γ Cu
• • • We do not use the following data for averages, fits, limits, etc. • • •					
7.3 ± 1.5	[31] DOLINSKY	89	ND		$e^{+}e^{-} \rightarrow \eta\gamma$
5.4 ± 1.1	[31] ANDREWS	77	CNTR	0	6.7–10 γ Cu

[30] Solution corresponding to constructive ω-ρ interference. The quark model predicts a relative phase of zero. Also much favored by the ALDE 93 model-independent measurement of B($\omega \rightarrow \eta\gamma$).

[31] Solution corresponding to destructive ω-ρ interference.

$\Gamma(\pi^{+}\pi^{-}\pi^{+}\pi^{-})/\Gamma_{total}$ Γ_{13}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	KURDADZE	88	OLYA	$e^{+}e^{-} \rightarrow \pi^{+}\pi^{-}\pi^{+}\pi^{-}$

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma(\pi\pi)$ Γ_{13}/Γ_1

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<15	90	ERBE	69	HBC	0	2.5–5.8 γp
<20		CHUNG	68	HBC	0	3.2,4.2 $\pi^- p$
<20	90	HUSON	68	HLBC	0	16.0 $\pi^- p$
<80		JAMES	66	HBC	0	2.1 $\pi^+ p$

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.2	90	VASSERMAN	88B	ND	$e^+e^- \to \pi^+\pi^-\pi^0$

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma(\pi\pi)$ Γ_{12}/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
~ 0.01		BRAMON	86	RVUE	0	$J/\psi \to \omega\pi^0$
<0.01	84	[32] ABRAMS	71	HBC	0	3.7 $\pi^+ p$

[32] Model dependent, assumes $I = 1$, 2, or 3 for the 3π system.

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	CHG	COMMENT
<0.4	90	AULCHENKO	87C	ND	0	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2	90	KURDADZE	86	OLYA	0	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$

$\Gamma(\pi^+\pi^-\gamma)/\Gamma_{total}$ Γ_7/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.0099±0.0016		[33] DOLINSKY	91	ND	$e^+e^- \to \pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0111±0.0014		[34] VASSERMAN	88	ND	$e^+e^- \to \pi^+\pi^-\gamma$
<0.005	90	[35] VASSERMAN	88	ND	$e^+e^- \to \pi^+\pi^-\gamma$

[33] Bremsstrahlung from a decay pion and for photon energy above 50 MeV.
[34] Superseded by DOLINSKY 91.
[35] Structure radiation due to quark rearrangement in the decay.

$\Gamma(\pi^0\gamma)/\Gamma_{total}$ Γ_8/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
7.9±2.0	DOLINSKY	89	ND	$e^+e^- \to \pi^0\gamma$

$\rho(770)$ REFERENCES

ABELE	97	PL B391 191	+Adomeit, Amsler+	(Crystal Barrel)
BOGOLYUBSKY	97	PAN 60 46	+Bravina, Kiryunin	(MOSU)
		Translated from YAF 60 53.		
BERNICHA	94	PR D50 4454	+Lopez Castro, Pestieau	(LOUV, CINV)
ALDE	93	PAN 56 1229	+Binon+ (SERP, LAPP, LANL, BELG, BRUX, CERN)	
		Translated from YAF 56 137.		
WEIDENAUER	93	ZPHY C59 387	+Duch+	(ASTERIX Collab.)
AGUILAR-...	91	ZPHY C50 405	Aguilar-Benitez, Allison, Batalor+	(LEBC-EHS Collab.)
DOLINSKY	91	PRPL 202 99	+Druzhinin, Dubrovin+	(NOVO)
ANTIPOV	89	ZPHY C42 185	+Batarin+ (SERP, JINR, BGNA, MILA, TBIL)	
DOLINSKY	89	ZPHY C42 511	+Druzhinin, Dubrovin, Golubev+	(NOVO)
DUBNICKA	89	JPG 15 1349	+Martinovic+	(JINR, SLOV)
GESHKEN...	89	ZPHY 45 351	Geshkenbein	(ITEP)
KURDADZE	88	JETPL 47 512	+Leltchouk, Pakhtusova, Sidorov+	(NOVO)
		Translated from ZETFP 47 432.		
VASSERMAN	88	SJNP 47 1035	+Golubev, Dolinsky+	(NOVO)
		Translated from YAF 47 1635.		
VASSERMAN	88B	SJNP 48 480	+Golubev, Dolinsky+	(NOVO)
		Translated from YAF 48 753.		
AULCHENKO	87C	IYF 87-90 Preprint	+Dolinsky, Druzhinin+	(NOVO)
CAPRARO	87	NP B288 659	+Levy+ (CLER, FRAS, MILA, PISA, LCGT, TRST+)	
BRAMON	86	PL B173 97	+Casulleras	(BARC)
HUSTON	86	PR 33 3199	+Berg, Collick, Jonckheere+ (ROCH, FNAL, MINN)	
KURDADZE	86	JETPL 43 643	+Lelchuk, Pakhtusova, Sidorov, Skrinskii+	(NOVO)
		Translated from ZETFP 43 497.		
BARKOV	85	NP B256 365	+Chilingarov, Eidelman, Khazin, Lelchuk+	(NOVO)
CHABAUD	83	NP B223 1	+Gorlich, Cerrada+ (CERN, CRAC, MPIM)	
JENSEN	83	PR D27 26	+Berg, Biel, Collick+ (ROCH, FNAL, MINN)	
HEYN	81	ZPHY C7 169	+Lang	(GRAZ)
BOHACIK	80	PR D21 1342	+Kuhnelt	(SLOV, WIEN)
LANG	79	PR D19 956	+Mas-Parareda	(GRAZ)
BARTALUCCI	78	NC 44A 587	+Basini, Bertolucci+	(DESY, FRAS)
WICKLUND	78	PR D17 1197	+Ayres, Diebold, Greene, Kramer, Pawlicki	(ANL)
ANDREWS	77	PRL 38 198	+Fukushima, Harvey, Lobkowicz, May+	(ROCH)
DEUTSCH...	76	NP B103 426	Deutschmann+ (AACH3, BERL, BONN, CERN+)	
ENGLER	74	PR D10 2070	+Kraemer, Toaff, Weisser, Diaz+	(CMU, CASE)
ESTABROOKS	74	NP B79 301	+Martin	(DURH)
GRAYER	74	NP B75 189	+Hyams, Blum, Dietl+	(CERN, MPIM)
BYERLY	73	PR D7 637	+Anthony, Coffin, Meanley, Meyer, Rice+	(MICH)
GLADDING	73	PR D8 3721	+Russell, Tannenbaum, Weiss, Thomson	(HARV)
PROTOPOP...	73	PR D7 1279	Protopopescu, Alston-Garnjost, Galtieri, Flatte+	(LBL)
BALLAM	72	PR D5 545	+Chadwick, Bingham, Milburn+ (SLAC, LBL, TUFTS)	
BENAKSAS	72	PL 39B 289	+Cosme, Jean-Marie, Jullian, Laplanche+	(ORSAY)
JACOBS	72	PR D6 1291		(SACL)
RATCLIFF	72	PL 38B 345	+Bulos, Carnegie, Kluge, Leith, Lynch+	(SLAC)
ABRAMS	71	PR D4 653	+Barnham, Butler, Coyne, Goldhaber, Hall+	(LBL)
ALVENSLEB...	70	PRL 24 786	Alvensleben, Becker, Bertram, Chen, Cohen	(DESY)
BIGGS	70	PRL 24 1197	+Braben, Clifft, Gabathuler, Kitching+	(DARE)
ERBE	69	PR 188 2060	+Hilpert+ (German Bubble Chamber Collab.)	
MALAMUD	69	Argonne Conf. 93	+Schlein	(UCLA)
REYNOLDS	69	PR 184 1424	+Albright, Bradley, Brucker, Harms+	(FSU)
ROTHWELL	69	PRL 23 1521	+Chase, Earles, Gettner, Glass, Weinstein+	(NEAS)
WEHMANN	69	PR 178 2095	+ (HARV, CASE, SLAC, CORN, MCGI)	
ARMENISE	68	NC 54A 999	+Ghidini, Forino+ (BARI, BGNA, FIRZ, ORSAY)	
BATON	68	PR 176 1574	+Laurens	(SACL)
CHUNG	68	PR 165 1491	+Dahl, Kirz, Miller	(LRL)
FOSTER	68	NP B6 107	+Gavillet, Labrosse, Montanet+	(CERN, CDEF)
HUSON	68	PL 28B 208	+Lubatti, Six, Veillet+ (ORSAY, MILA, UCLA)	
HYAMS	68	NP B7 1	+Koch, Potter, Wilson, VonLindern+	(CERN, MPIM)
LANZEROTTI	68	PR 166 1365	+Blumenthal, Ehn, Faissler+	(HARV)
PISUT	68	NP B6 325	+Roos	(CERN)
ASBURY	67B	PRL 19 865	+Becker, Bertram, Joos, Jordan+	(DESY, COLU)
BACON	67	PR 157 1263	+Fickinger, Hill, Hopkins, Robinson+	(BNL)
EISNER	67	PR 164 1699	+Johnson, Klein, Peters, Sahni, Yen+	(PURD)

HUWE	67	PL 24B 252	+Marquit, Oppenheimer, Schultz, Wilson	(COLU)
HYAMS	67	PL 24B 634	+Koch, Pellett, Potter, VonLindern+	(CERN, MPIM)
MILLER	67B	PR 153 1423	+Gutay, Johnson, Loeffler+	(PURD)
ALFF-...	66	PR 145 1072	Alff-Steinberger, Berley+	(COLU, RUTG)
FERBEL	66	PL 21 111		(ROCH)
HAGOPIAN	66	PR 145 1128	+Selove, Alitti, Baton+	(PENN, SACL)
HAGOPIAN	66B	PR 152 1183	+Pan	(PENN, LRL)
JACOBS	66B	UCRL 16877		(LRL)
JAMES	66	PR 142 896	+Kraybill	(YALE, BNL)
WEST	66	PR 149 1089	+Boyd, Erwin, Walker	(WISC)
BLIEDEN	65	PL 19 444	+Freytag, Geibel+ (CERN Missing Mass Spect. Collab.)	
CARMONY	64	PRL 12 254	+Lander, Rindfleisch, Xuong, Yager	(UCB)
GOLDHABER	64	PRL 12 336	+Brown, Kadyk, Shen+	(LRL, UCB)
ABOLINS	63	PRL 11 381	+Lander, Mehlhop, Nguyen, Yager	(UCSD)

OTHER RELATED PAPERS

BENAYOUN	93	ZPHY 58 31	+Feindt, Girone+	(CDEF, CERN, BARI)
LAFFERTY	93	ZPHY C60 659		(MCHS)
KAMAL	92	PL B284 421	+Xu	(ALBE)
ERKAL	85	ZPHY C29 485	+Olsson	(WISC)
RYBICKI	85	ZPHY C28 65	+Sakrejda	(CRAC)
KURDADZE	83	JETPL 37 733	+Lelchuk, Pakhtusova+	(NOVO)
		Translated from ZETFP 37 613.		
ALEKSEEV	82	JETP 55 591	+Kartamyshev, Makarin+	(KIAE)
		Translated from ZETF 82 1007.		
KENNEY	62	PR 126 736	+Shephard, Gall	(KNTY)
SAMIOS	62	PRL 9 139	+Bachman, Lea+	(BNL, CUNY, COLU, KNTY)
XUONG	62	PR 128 1849	+Lynch	(LRL)
ANDERSON	61	PRL 6 365	+Bang, Burke, Carmony, Schmitz	(LRL)
ERWIN	61	PRL 6 628	+March, Walker, West	(WISC)