NODE=M009

$\rho(770)$

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

$\rho(770)$ T-MATRIX POLE $\sqrt{s}$

NODE=M009PP

Note that $\Gamma = -2\ \mathrm{Im}(\sqrt{s})$.

NODE=M009PP

NODE=M009PP

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
(761–765) − *i* (71–74) OUR ESTIMATE				
$(762.5 \pm 1.7) - i\ (73.2 \pm 1.1)$	[1] HOFERICHT...	24	RVUE	Compilation
$(763.7^{+1.7}_{-1.5}) - i\ (73.2^{+1.0}_{-1.1})$	[2] GARCIA-MAR..	11	RVUE	Compilation
$(754 \pm 18) - i\ (74 \pm 10)$	[3] PELAEZ	04A	RVUE	$\pi\pi \to \pi\pi$
$(762.4 \pm 1.8) - i\ (72.6 \pm 1.4)$	COLANGELO	01	RVUE	$\pi\pi \to \pi\pi$

→ UNCHECKED ←

OCCUR=2

OCCUR=2

[1] Update of GARCIA-MARTIN 11 with input for $\pi\pi$ T-matrix from HOFERICHTER 16.

NODE=M009PP;LINKAGE=D

[2] Reanalysis of the K_{e4} data of BATLEY 10C and the $\pi N \to \pi\pi N$ data of HYAMS 73, GRAYER 74, and PROTOPOPESCU 73 using GKPY equations.

NODE=M009PP;LINKAGE=C

[3] Reanalysis of data from PROTOPOPESCU 73, ESTABROOKS 74, GRAYER 74, and COHEN 80 in the unitarized ChPT model.

NODE=M009PP;LINKAGE=B

$\rho(770)$ MASS

NODE=M009205

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

NODE=M009205

NEUTRAL ONLY, e^+e^-

NODE=M009M0
NODE=M009M0

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
775.26±0.23 OUR AVERAGE					
775.3 ±0.5 ±0.6		[1] ACHASOV	21	SND	$e^+e^- \to \pi^+\pi^-$
775.02±0.35		[2] LEES	12G	BABR	$e^+e^- \to \pi^+\pi^-\gamma$
775.97±0.46±0.70	900k	[3] AKHMETSHIN	07		$e^+e^- \to \pi^+\pi^-$
774.6 ±0.4 ±0.5	800k	[4,5] ACHASOV	06	SND	$e^+e^- \to \pi^+\pi^-$
775.65±0.64±0.50	114k	[6,7] AKHMETSHIN	04	CMD2	$e^+e^- \to \pi^+\pi^-$
775.9 ±0.5 ±0.5	1.98M	[8] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
775.8 ±0.9 ±2.0	500k	[8] ACHASOV	02	SND	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
775.9 ±1.1		[9] BARKOV	85	OLYA	$e^+e^- \to \pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
775.4 ±0.1	34M	[10] IGNATOV	24	CMD3	$e^+e^- \to \pi^+\pi^-$
763.49±0.53		[11] BARTOS	17	RVUE	$e^+e^- \to \pi^+\pi^-$
758.23±0.46		[12] BARTOS	17A	RVUE	$e^+e^- \to \pi^+\pi^-$
775.8 ±0.5 ±0.3	1.98M	[13] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
775.9 ±0.6 ±0.5	1.98M	[14] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
775.0 ±0.6 ±1.1	500k	[15] ACHASOV	02	SND	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
775.1 ±0.7 ±5.3		[16] BENAYOUN	98	RVUE	$e^+e^- \to \pi^+\pi^-$, $\mu^+\mu^-$
770.5 ±1.9 ±5.1		[17] GARDNER	98	RVUE	0.28–0.92 $e^+e^- \to \pi^+\pi^-$
764.1 ±0.7		[18] O'CONNELL	97	RVUE	$e^+e^- \to \pi^+\pi^-$
757.5 ±1.5		[19] BERNICHA	94	RVUE	$e^+e^- \to \pi^+\pi^-$
768 ±1		[20] GESHKEN...	89	RVUE	$e^+e^- \to \pi^+\pi^-$

OCCUR=2
OCCUR=3
OCCUR=3

[1] From a fit of the cross section in the energy range $0.525 < \sqrt{s} < 0.883$ GeV parameterized by the sum of the Breit-Wigner amplitudes for the $\rho(770)$, ω and $\rho(1450)$ resonances.

NODE=M009M0;LINKAGE=D

[2] Using the GOUNARIS 68 parametrization with the complex phase of the $\rho-\omega$ interference and leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.

NODE=M009M0;LINKAGE=LE

[3] A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.

NODE=M009M0;LINKAGE=AK

[4] Supersedes ACHASOV 05A.

NODE=M009M0;LINKAGE=AC

[5] A fit of the SND data from 400 to 1000 MeV using parameters of the $\rho(1450)$ and $\rho(1700)$ from a fit of the data of BARKOV 85, BISELLO 89 and ANDERSON 00A.

NODE=M009M0;LINKAGE=SN

[6] Using the GOUNARIS 68 parametrization with the complex phase of the ρ-ω interference.

NODE=M009M0;LINKAGE=GS

[7] Update of AKHMETSHIN 02.

NODE=M009M0;LINKAGE=PT

[8] Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$.

NODE=M009M0;LINKAGE=CH

[9] From the GOUNARIS 68 parametrization of the pion form factor.

NODE=M009M0;LINKAGE=K

[10] From a fit of the pion form factor in the energy range $0.32 < \sqrt{s} < 1.2$ GeV using the GOUNARIS 68 parametrization with the complex phase of the $\rho-\omega$ interference with ω and ϕ masses and widths constrained by the values and their errors from PDG 22, and leaving $\rho(1450)$, $\rho(1700)$ resonances as free parameters of the fit. Systematic errors not estimated.

NODE=M009M0;LINKAGE=E

[11] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of LEES 12G and ABLIKIM 16C. NODE=M009M0;LINKAGE=A
[12] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, and AMBROSINO 11A. NODE=M009M0;LINKAGE=B
[13] Assuming $m_{\rho^+} = m_{\rho^-} = m_{\rho^0}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-} = \Gamma_{\rho^0}$. NODE=M009M0;LINKAGE=DF
[14] Without limitations on masses and widths. NODE=M009M0;LINKAGE=WO
[15] Assuming $m_{\rho^0} = m_{\rho^\pm}$, $g_{\rho^0\pi\pi} = g_{\rho^\pm\pi\pi}$. NODE=M009M0;LINKAGE=HC
[16] Using the data of BARKOV 85 in the hidden local symmetry model. NODE=M009M0;LINKAGE=K2
[17] From the fit to $e^+e^- \rightarrow \pi^+\pi^-$ data from the compilations of HEYN 81 and BARKOV 85, including the GOUNARIS 68 parametrization of the pion form factor. NODE=M009M0;LINKAGE=G8
[18] A fit of BARKOV 85 data assuming the direct $\omega\pi\pi$ coupling. NODE=M009M0;LINKAGE=AB
[19] Applying the S-matrix formalism to the BARKOV 85 data. NODE=M009M0;LINKAGE=AA
[20] Includes BARKOV 85 data. Model-dependent width definition. NODE=M009M0;LINKAGE=F

CHARGED ONLY, τ DECAYS and e^+e^-

NODE=M009M5
NODE=M009M5

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT	
775.11±0.34 OUR AVERAGE							
774.6 ±0.2 ±0.5	5.4M	[1,2] FUJIKAWA	08	BELL	±	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$	
775.5 ±0.7		[2,3] SCHAEL	05C	ALEP		$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$	
775.5 ±0.5 ±0.4	1.98M	[4] ALOISIO	03	KLOE		1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	
775.1 ±1.1 ±0.5	87k	[5,6] ANDERSON	00A	CLE2		$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$	
• • • We do not use the following data for averages, fits, limits, etc. • • •							
761.60±0.95		[7] BARTOS	17A	RVUE		$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$	
774.8 ±0.6 ±0.4	1.98M	[8] ALOISIO	03	KLOE	−	1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	OCCUR=2
776.3 ±0.6 ±0.7	1.98M	[8] ALOISIO	03	KLOE	+	1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	OCCUR=3
773.9 ±2.0 $^{+0.3}_{-1.0}$		[9] SANZ-CILLERO	03	RVUE		$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$	
774.5 ±0.7 ±1.5	500k	[4] ACHASOV	02	SND	±	1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	OCCUR=2
775.1 ±0.5		[10] PICH	01	RVUE		$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$	

[1] $|F_\pi(0)|^2$ fixed to 1. NODE=M009M5;LINKAGE=FU
[2] From the GOUNARIS 68 parametrization of the pion form factor. NODE=M009M5;LINKAGE=GO
[3] The error combines statistical and systematic uncertainties. Supersedes BARATE 97M. NODE=M009M5;LINKAGE=SC
[4] Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$. NODE=M009M5;LINKAGE=CH
[5] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively. NODE=M009M5;LINKAGE=A6
[6] From the GOUNARIS 68 parametrization of the pion form factor. The second error is a model error taking into account different parametrizations of the pion form factor. NODE=M009M5;LINKAGE=K1
[7] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of FUJIKAWA 08. NODE=M009M5;LINKAGE=A
[8] Without limitations on masses and widths. NODE=M009M5;LINKAGE=WO
[9] Using the data of BARATE 97M and the effective chiral Lagrangian. NODE=M009M5;LINKAGE=Z
[10] From a fit of the model-independent parameterization of the pion form factor to the data of BARATE 97M. NODE=M009M5;LINKAGE=PC

MIXED CHARGES, OTHER REACTIONS

NODE=M009M7
NODE=M009M7

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
763.0±0.3±1.2	600k	[1] ABELE	99E	CBAR	0±	0.0 $\bar{p}p \rightarrow \pi^+\pi^-\pi^0$

[1] Assuming the equality of ρ^+ and ρ^- masses and widths. NODE=M009M7;LINKAGE=LB

CHARGED ONLY, HADROPRODUCED

NODE=M009M2
NODE=M009M2

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT	
766.5±1.1 OUR AVERAGE							
763.7±3.2		ABELE	97	CBAR		$\bar{p}n \rightarrow \pi^-\pi^0\pi^0$	
768 ±9		AGUILAR-...	91	EHS		400 pp	
767 ±3	2935	[1] CAPRARO	87	SPEC	−	200 π^- Cu $\rightarrow \pi^-\pi^0$ Cu	
761 ±5	967	[1] CAPRARO	87	SPEC	−	200 π^- Pb $\rightarrow \pi^-\pi^0$ Pb	OCCUR=2
771 ±4		HUSTON	86	SPEC	+	202 π^+ A $\rightarrow \pi^+\pi^0$ A	
766 ±7	6500	[2] BYERLY	73	OSPK	−	5 $\pi^- p$	
766.8±1.5	9650	[3] PISUT	68	RVUE	−	1.7–3.2 $\pi^- p$, t <10	
767 ±6	900	[1] EISNER	67	HBC	−	4.2 $\pi^- p$, t <10	

[1] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass. NODE=M009M2;LINKAGE=Z
[2] Phase shift analysis. Systematic errors added corresponding to spread of different fits. NODE=M009M2;LINKAGE=X
[3] 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. NODE=M009M2;LINKAGE=A

NEUTRAL ONLY, PHOTOPRODUCED

NODE=M009M0P

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
769.2± 0.9 OUR AVERAGE					
$770.8 \pm 1.3 ^{+2.3}_{-2.4}$	900k	ANDREEV	20	H1	$e p \rightarrow e \pi^+ \pi^- p$
$771 \pm 2 ^{+2}_{-1}$	63.5k	[1] ABRAMOWICZ	12	ZEUS	$e p \rightarrow e \pi^+ \pi^- p$
770 ±2 ±1	79k	[2] BREITWEG	98B	ZEUS	50–100 γp
767.6± 2.7		BARTALUCCI	78	CNTR	$\gamma p \rightarrow e^+ e^- p$
775 ± 5		GLADDING	73	CNTR	2.9–4.7 γp
767 ± 4	1930	BALLAM	72	HBC	2.8 γp
770 ± 4	2430	BALLAM	72	HBC	4.7 γp
765 ±10		ALVENSLEB...	70	CNTR	γA, t <0.01
767.7± 1.9	140k	BIGGS	70	CNTR	<4.1 $\gamma C \rightarrow \pi^+ \pi^- C$
765 ± 5	4000	ASBURY	67B	CNTR	$\gamma +$ Pb
• • • We do not use the following data for averages, fits, limits, etc. • • •					
771 ± 2	79k	[3] BREITWEG	98B	ZEUS	50–100 γp

OCCUR=2 (BALLAM 72, 4.7 γp); OCCUR=2 (BREITWEG 98B)

[1] Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho-\omega$ interference. NODE=M009M0P;LINKAGE=AB

[2] From the parametrization according to SOEDING 66. NODE=M009M0P;LINKAGE=B5

[3] From the parametrization according to ROSS 66. NODE=M009M0P;LINKAGE=B6

NEUTRAL ONLY, OTHER REACTIONS

NODE=M009M0R

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
769.0 ±0.9 OUR AVERAGE		Error includes scale factor of 1.4. See the ideogram below.			
765 ±6		BERTIN	97C	OBLX	0.0 $\overline{p} p \rightarrow \pi^+ \pi^- \pi^0$
773 ±1.6		WEIDENAUER	93	ASTE	$\overline{p} p \rightarrow \pi^+ \pi^- \omega$
762.6 ±2.6		AGUILAR-...	91	EHS	400 $p p$
770 ±2		[1] HEYN	81	RVUE	Pion form factor
768 ±4		[2,3] BOHACIK	80	RVUE	
769 ±3		[4] WICKLUND	78	ASPK	3,4,6 $\pi^{\pm} N$
768 ±1	76k	DEUTSCH...	76	HBC	16 $\pi^+ p$
767 ±4	4100	ENGLER	74	DBC	6 $\pi^+ n \rightarrow \pi^+ \pi^- p$
775 ±4	32k	[2] PROTOPOP...	73	HBC	7.1 $\pi^+ p$, t <0.4
764 ±3	6.8k	[5] RATCLIFF	72	ASPK	15 $\pi^- p$, t <0.3
774 ±3	1.7k	REYNOLDS	69	HBC	2.26 $\pi^- p$
769.2 ±1.5	13.3k	[6] PISUT	68	RVUE	1.7–3.2 $\pi^- p$, t <10
• • • We do not use the following data for averages, fits, limits, etc. • • •					
774.34±0.18±0.35	970k	[7] ABLIKIM	18C	BES3	$\eta'(958) \rightarrow \gamma \pi^+ \pi^-$
772.93±0.18±0.34	970k	[8] ABLIKIM	18C	BES3	$\eta'(958) \rightarrow \gamma \pi^+ \pi^-$
773.5 ±2.5		[9] COLANGELO	01	RVUE	$\pi \pi \rightarrow \pi \pi$
762.3 ±0.5 ±1.2	600k	[10] ABELE	99E	CBAR	0.0 $\overline{p} p \rightarrow \pi^+ \pi^- \pi^0$
777 ±2	4.9k	[11] ADAMS	97	E665	470 $\mu p \rightarrow \mu X B$
770 ±2		[12] BOGOLYUB...	97	MIRA	32 $\overline{p} p \rightarrow \pi^+ \pi^-$ X
768 ±8		[12] BOGOLYUB...	97	MIRA	32 $p p \rightarrow \pi^+ \pi^-$ X
761.1 ±2.9		DUBNICKA	89	RVUE	π form factor
777.4 ±2.0		[13] CHABAUD	83	ASPK	17 $\pi^- p$ polarized
769.5 ±0.7		[2,3] LANG	79	RVUE	
770 ±9		[3] ESTABROOKS	74	RVUE	17 $\pi^- p \rightarrow \pi^+ \pi^- n$
773.5 ±1.7	11.2k	[14] JACOBS	72	HBC	2.8 $\pi^- p$
775 ±3	2.2k	[15] HYAMS	68	OSPK	11.2 $\pi^- p$

OCCUR=2 (ABLIKIM 18C, 772.93); OCCUR=2 (BOGOLYUB... 97, 768)

[1] HEYN 81 includes all spacelike and timelike F_{π} values until 1978. NODE=M009M0R;LINKAGE=B0

[2] From pole extrapolation. NODE=M009M0R;LINKAGE=C0

[3] From phase shift analysis of GRAYER 74 data. NODE=M009M0R;LINKAGE=H

[4] Phase shift analysis. Systematic errors added corresponding to spread of different fits. NODE=M009M0R;LINKAGE=X

[5] Published values contain misprints. Corrected by private communication RATCLIFF 74. NODE=M009M0R;LINKAGE=03

[6] 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. NODE=M009M0R;LINKAGE=R

[7] From a fit to $\pi^+ \pi^-$ mass using $\rho(770)$ (parametrized with the Gounaris-Sakurai approach), $\omega(782)$, and box anomaly components. NODE=M009M0R;LINKAGE=B

[8] From a fit to $\pi^+ \pi^-$ mass using $\rho(770)$ (parametrized with the Gounaris-Sakurai approach), $\omega(782)$, and $\rho(1450)$ components. NODE=M009M0R;LINKAGE=C

[9] Breit-Wigner mass from a phase-shift analysis of HYAMS 73 and PROTOPOPESCU 73 data. NODE=M009M0R;LINKAGE=CL

[10] Using relativistic Breit-Wigner and taking into account ρ-ω interference. NODE=M009M0R;LINKAGE=BL

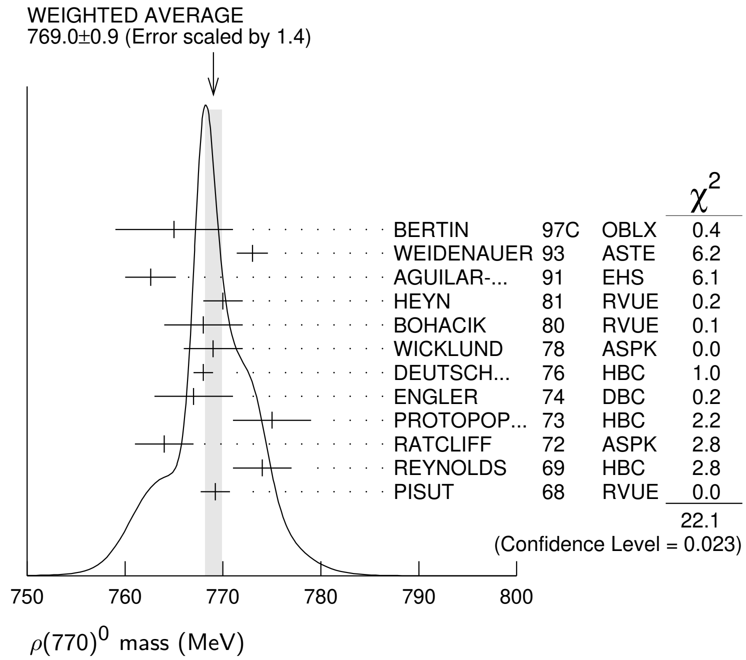
[11] Systematic errors not evaluated. NODE=M009M0R;LINKAGE=A1

[12] Systematic effects not studied. NODE=M009M0R;LINKAGE=QQ

[13] From fit of 3-parameter relativistic Breit-Wigner to helicity-zero part of P-wave intensity. CHABAUD 83 includes data of GRAYER 74. NODE=M009M0R;LINKAGE=G

[14] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass. NODE=M009M0R;LINKAGE=Z

[15] Of HYAMS 68 six parametrizations, this is theoretically soundest. MR NODE=M009M0R;LINKAGE=02



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

NODE=M009D

NODE=M009D

VALUE (MeV)			EVTS	DOCUMENT ID		TECN	CHG	COMMENT
−0.7	**±0.8**	**OUR AVERAGE**		Error includes scale factor of 1.5. See the ideogram below.				
−2.4	±0.8			[1] SCHAEL	05C	ALEP		$\tau^- \to \pi^- \pi^0 \nu_\tau$
0.4	±0.7	±0.6	1.98M	[2] ALOISIO	03	KLOE		1.02 $e^+ e^- \to \pi^+ \pi^- \pi^0$
1.3	±1.1	±2.0	500k	[2] ACHASOV	02	SND		1.02 $e^+ e^- \to \pi^+ \pi^- \pi^0$
1.6	±0.6	±1.7	600k	ABELE	99E	CBAR	±0	0.0 $\overline{p} p \to \pi^+ \pi^- \pi^0$
−4	±4		3000	[3] REYNOLDS	69	HBC	−0	2.26 $\pi^- p$
−5	±5		3600	[3] FOSTER	68	HBC	±0	0.0 $\overline{p} p$
2.4	±2.1		22950	[4] PISUT	68	RVUE		$\pi N \to \rho N$
• • • We do not use the following data for averages, fits, limits, etc. • • •								
−3.37	±1.06			[5] BARTOS	17A	RVUE		$e^+ e^- \to \pi^+ \pi^-$, $\tau^- \to \pi^- \pi^0 \nu_\tau$

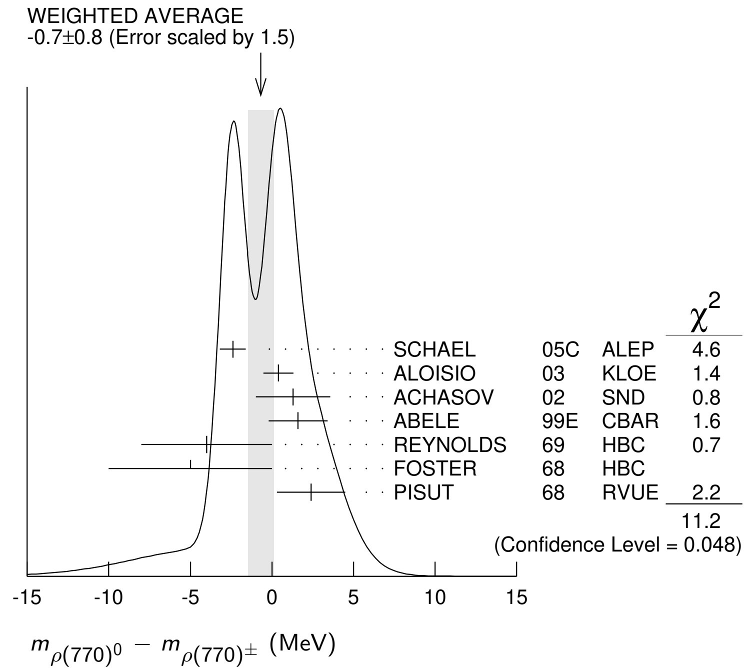
[1] From the combined fit of the τ^- data from ANDERSON 00A and SCHAEL 05C and $e^+ e^-$ data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. Supersedes BARATE 97M. NODE=M009D;LINKAGE=SC

[2] Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$. NODE=M009D;LINKAGE=CH

[3] From quoted masses of charged and neutral modes. NODE=M009D;LINKAGE=A

[4] 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. NODE=M009D;LINKAGE=R

[5] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, AMBROSINO 11A, and FUJIKAWA 08. NODE=M009D;LINKAGE=B



$m_{\rho(770)^+} - m_{\rho(770)^-}$

NODE=M009D1

NODE=M009D1

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.5±0.8±0.7	1.98M	[1] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$

[1] Without limitations on masses and widths.

NODE=M009D;LINKAGE=WO

ρ(770) RANGE PARAMETER

NODE=M009R

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, $q = q_r$.

NODE=M009R

NODE=M009R

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

[1] The old PISUT 68 value, properly corrected, was 3.2 ± 0.6.

NODE=M009R;LINKAGE=01

ρ(770) WIDTH

NODE=M009220

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

NODE=M009220

NEUTRAL ONLY, e^+e^-

NODE=M009W0
NODE=M009W0

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
147.4 ±0.8 OUR AVERAGE		Error includes scale factor of 2.0. See the ideogram below.			
145.6 ±0.6 ±0.8		[1] ACHASOV	21	SND	$e^+e^- \to \pi^+\pi^-$
149.59±0.67		[2] LEES	12G	BABR	$e^+e^- \to \pi^+\pi^-\gamma$
145.98±0.75±0.50	900k	[3] AKHMETSHIN	07		$e^+e^- \to \pi^+\pi^-$
146.1 ±0.8 ±1.5	800k	[4,5] ACHASOV	06	SND	$e^+e^- \to \pi^+\pi^-$
143.85±1.33±0.80	114k	[6,7] AKHMETSHIN	04	CMD2	$e^+e^- \to \pi^+\pi^-$
147.3 ±1.5 ±0.7	1.98M	[8] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
151.1 ±2.6 ±3.0	500k	[8] ACHASOV	02	SND	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
150.5 ±3.0		[9] BARKOV	85	OLYA	$e^+e^- \to \pi^+\pi^-$

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

148.76±0.17	34M	[10] IGNATOV	24	CMD3	$e^+e^- \rightarrow \pi^+\pi^-$	
144.06±0.85		[11] BARTOS	17	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	
144.56±0.80		[12] BARTOS	17A	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	
143.9 ±1.3 ±1.1	1.98M	[13] ALOISIO	03	KLOE	1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	OCCUR=2
147.4 ±1.5 ±0.7	1.98M	[14] ALOISIO	03	KLOE	1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	OCCUR=3
149.8 ±2.2 ±2.0	500k	[15] ACHASOV	02	SND	1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$	OCCUR=3
147.9 ±1.5 ±7.5		[16] BENAYOUN	98	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$, $\mu^+\mu^-$	
153.5 ±1.3 ±4.6		[17] GARDNER	98	RVUE	0.28–0.92 $e^+e^- \rightarrow \pi^+\pi^-$	
145.0 ±1.7		[18] O'CONNELL	97	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	
142.5 ±3.5		[19] BERNICHA	94	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	
138 ±1		[20] GESHKEN...	89	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$	

[1] From a fit of the cross section in the energy range $0.525 < \sqrt{s} < 0.883$ GeV parameterized by the sum of the Breit-Wigner amplitudes for the $\rho(770)$, ω and $\rho(1450)$ resonances. NODE=M009W0;LINKAGE=D

[2] Using the GOUNARIS 68 parametrization with the complex phase of the ρ–ω interference and leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit. NODE=M009W0;LINKAGE=LE

[3] A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05. NODE=M009W;LINKAGE=AK

[4] Supersedes ACHASOV 05A. NODE=M009W0;LINKAGE=AC

[5] A fit of the SND data from 400 to 1000 MeV using parameters of the $\rho(1450)$ and $\rho(1700)$ from a fit of the data of BARKOV 85, BISELLO 89 and ANDERSON 00A. NODE=M009W0;LINKAGE=SN

[6] Using the GOUNARIS 68 parametrization with the complex phase of the ρ-ω interference. NODE=M009W5;LINKAGE=GS

[7] From a fit in the energy range 0.61 to 0.96 GeV. Update of AKHMETSHIN 02. NODE=M009W5;LINKAGE=P2

[8] Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$. NODE=M009W;LINKAGE=CH

[9] From the GOUNARIS 68 parametrization of the pion form factor. NODE=M009W;LINKAGE=K

[10] From a fit of the pion form factor in the energy range $0.32 < \sqrt{s} < 1.2$ GeV using the GOUNARIS 68 parametrization with the complex phase of the $\rho-\omega$ interference with ω and ϕ masses and widths constrained by the values and their errors from PDG 22, and leaving $\rho(1450)$, $\rho(1700)$ resonances as free parameters of the fit. Systematic errors not estimated. NODE=M009W0;LINKAGE=E

[11] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of LEES 12G and ABLIKIM 16C. NODE=M009W0;LINKAGE=A

[12] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, and AMBROSINO 11A. NODE=M009W0;LINKAGE=B

[13] Assuming $m_{\rho^+} = m_{\rho^-} = m_{\rho^0}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-} = \Gamma_{\rho^0}$. NODE=M009W;LINKAGE=DF

[14] Without limitations on masses and widths. NODE=M009W;LINKAGE=WO

[15] Assuming $m_{\rho^0} = m_{\rho^\pm}$, $g_{\rho^0\pi\pi} = g_{\rho^\pm\pi\pi}$. NODE=M009W;LINKAGE=HC

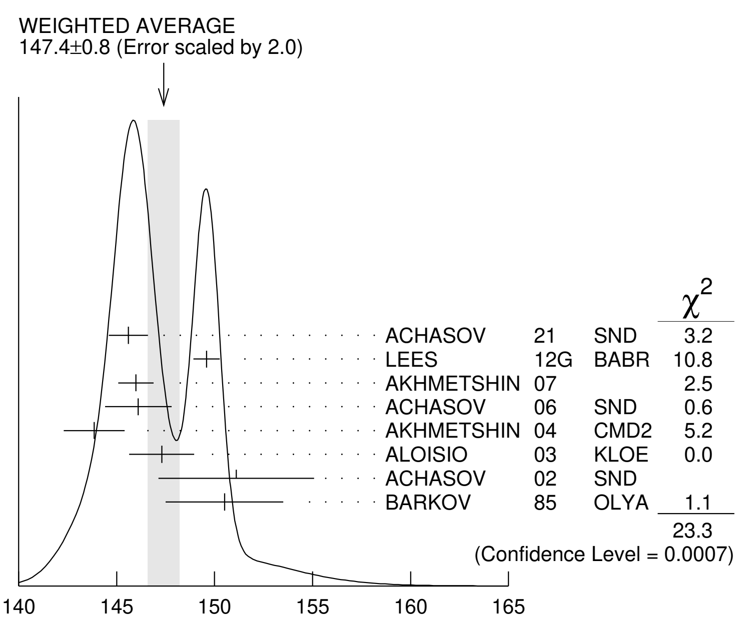
[16] Using the data of BARKOV 85 in the hidden local symmetry model. NODE=M009W;LINKAGE=K2

[17] From the fit to $e^+e^- \rightarrow \pi^+\pi^-$ data from the compilations of HEYN 81 and BARKOV 85, including the GOUNARIS 68 parametrization of the pion form factor. NODE=M009W;LINKAGE=G8

[18] A fit of BARKOV 85 data assuming the direct $\omega\pi\pi$ coupling. NODE=M009W;LINKAGE=AB

[19] Applying the S-matrix formalism to the BARKOV 85 data. NODE=M009W;LINKAGE=AA

[20] Includes BARKOV 85 data. Model-dependent width definition. NODE=M009W;LINKAGE=F



Neutral only, e^+e^- (MeV)

CHARGED ONLY, τ DECAYS and e^+e^-

NODE=M009W5

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
149.1 ±0.8 OUR FIT						
149.1 ±0.8 OUR AVERAGE						
148.1 ±0.4 ±1.7	5.4M	[1,2] FUJIKAWA	08	BELL	±	$\tau^- \to \pi^- \pi^0 \nu_\tau$
149.0 ±1.2		[2,3] SCHAEL	05C	ALEP		$\tau^- \to \pi^- \pi^0 \nu_\tau$
149.9 ±2.3 ±2.0	500k	[4] ACHASOV	02	SND	±	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
150.4 ±1.4 ±1.4	87k	[5,6] ANDERSON	00A	CLE2		$\tau^- \to \pi^- \pi^0 \nu_\tau$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
139.90±0.46		[7] BARTOS	17A	RVUE		$\tau^- \to \pi^- \pi^0 \nu_\tau$
143.7 ±1.3 ±1.2	1.98M	[4] ALOISIO	03	KLOE	±	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
142.9 ±1.3 ±1.4	1.98M	[8] ALOISIO	03	KLOE	−	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
144.7 ±1.4 ±1.2	1.98M	[8] ALOISIO	03	KLOE	+	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
150.2 ±2.0 $^{+0.7}_{-1.6}$		[9] SANZ-CILLERO	03	RVUE		$\tau^- \to \pi^- \pi^0 \nu_\tau$
150.9 ±2.2 ±2.0	500k	[10] ACHASOV	02	SND		1.02 $e^+e^- \to \pi^+\pi^-\pi^0$

OCCUR=2 (ACHASOV 02 ±), OCCUR=2 (ALOISIO 03 −), OCCUR=3 (ALOISIO 03 +), OCCUR=4 (ACHASOV 02)

[1] $|F_\pi(0)|^2$ fixed to 1. NODE=M009W5;LINKAGE=FU

[2] From the GOUNARIS 68 parametrization of the pion form factor. NODE=M009W5;LINKAGE=GO

[3] The error combines statistical and systematic uncertainties. Supersedes BARATE 97M. NODE=M009W5;LINKAGE=SC

[4] Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$. NODE=M009W5;LINKAGE=CH

[5] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively. NODE=M009W5;LINKAGE=A6

[6] From the GOUNARIS 68 parametrization of the pion form factor. The second error is a model error taking into account different parametrizations of the pion form factor. NODE=M009W5;LINKAGE=K1

[7] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of FUJIKAWA 08. NODE=M009W5;LINKAGE=A

[8] Without limitations on masses and widths. NODE=M009W5;LINKAGE=WO

[9] Using the data of BARATE 97M and the effective chiral Lagrangian. NODE=M009W5;LINKAGE=Z

[10] Assuming $m_{\rho^0} = m_{\rho^\pm}$, $g_{\rho^0\pi\pi} = g_{\rho^\pm\pi\pi}$. NODE=M009W5;LINKAGE=HC

MIXED CHARGES, OTHER REACTIONS

NODE=M009W7

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
149.5±1.3	600k	[1] ABELE	99E	CBAR	0±	0.0 $\bar{p}p \to \pi^+\pi^-\pi^0$

[1] Assuming the equality of ρ^+ and ρ^- masses and widths. NODE=M009W;LINKAGE=LB

CHARGED ONLY, HADROPRODUCED

NODE=M009W2

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
150.2± 2.4 OUR FIT						
150.2± 2.4 OUR AVERAGE						
152.8± 4.3		ABELE	97	CBAR		$\bar{p}n \to \pi^-\pi^0\pi^0$
155 ±11	2.9k	[1] CAPRARO	87	SPEC	−	200 π^- Cu $\to \pi^-\pi^0$ Cu
154 ±20	967	[1] CAPRARO	87	SPEC	−	200 π^- Pb $\to \pi^-\pi^0$ Pb
150 ± 5		HUSTON	86	SPEC	+	202 π^+ A $\to \pi^+\pi^0$ A
146 ±12	6.5k	[2] BYERLY	73	OSPK	−	5 $\pi^- p$
148.2± 4.1	9.6k	[3] PISUT	68	RVUE	−	1.7–3.2 $\pi^- p$, t <10
146 ±13	900	EISNER	67	HBC	−	4.2 $\pi^- p$, t <10
• • • We do not use the following data for averages, fits, limits, etc. • • •						
137.0± 0.4		[4] ABLIKIM	17	BES3		$J/\psi \to \gamma 3\pi$

OCCUR=2 (CAPRARO 87, Pb)

[1] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass. NODE=M009W2;LINKAGE=Z

[2] Phase shift analysis. Systematic errors added corresponding to spread of different fits. NODE=M009W2;LINKAGE=X

[3] 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. NODE=M009W2;LINKAGE=A1

[4] S-matrix pole at a fixed ρ meson mass of 775.49 MeV. NODE=M009W2;LINKAGE=A

NEUTRAL ONLY, PHOTOPRODUCED

NODE=M009W0P

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
151.5 $^{+1.9}_{-2.1}$ OUR AVERAGE					
151.3± 2.2 $^{+1.6}_{-2.8}$	900k	ANDREEV	20	H1	$ep \to e\pi^+\pi^- p$
155 ± 5 ± 2	63.5k	[1] ABRAMOWICZ	12	ZEUS	$ep \to e\pi^+\pi^- p$
146 ± 3 ±13	79k	[2] BREITWEG	98B	ZEUS	50–100 γp
150.9± 3.0		BARTALUCCI	78	CNTR	$\gamma p \to e^+e^- p$

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

138 ± 3	79k	[3] BREITWEG	98B	ZEUS	50–100 γp	OCCUR=2
147 ±11		GLADDING	73	CNTR	2.9–4.7 γp	
155 ±12	2430	BALLAM	72	HBC	4.7 γp	
145 ±13	1930	BALLAM	72	HBC	2.8 γp	OCCUR=2
140 ± 5		ALVENSLEB...	70	CNTR	γA, t <0.01	
146.1± 2.9	140k	BIGGS	70	CNTR	<4.1 γC → $\pi^+\pi^-$ C	
160 ±10		LANZEROTTI	68	CNTR	γp	
130 ± 5	4000	ASBURY	67B	CNTR	γ + Pb	

[1] Using the KUHN 90 parametrization of the pion form factor, neglecting ρ–ω interference. NODE=M009W0P;LINKAGE=AB
[2] From the parametrization according to SOEDING 66. NODE=M009W;LINKAGE=B5
[3] From the parametrization according to ROSS 66. NODE=M009W;LINKAGE=B6

NEUTRAL ONLY, OTHER REACTIONS

NODE=M009W0R
NODE=M009W0R

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
150.9 ± 1.7 OUR AVERAGE		Error includes scale factor of 1.1.			
122 ±20		BERTIN	97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
145.7 ± 5.3		WEIDENAUER	93	ASTE	$\overline{p}p \to \pi^+\pi^-\omega$
144.9 ± 3.7		DUBNICKA	89	RVUE	π form factor
148 ± 6		[1,2] BOHACIK	80	RVUE	
152 ± 9		[3] WICKLUND	78	ASPK	3,4,6 $\pi^\pm pN$
154 ± 2	76k	DEUTSCH...	76	HBC	16 $\pi^+ p$
157 ± 8	6.8k	[4] RATCLIFF	72	ASPK	15 $\pi^- p$, t <0.3
143 ± 8	1.7k	REYNOLDS	69	HBC	2.26 $\pi^- p$

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

150.85± 0.55±0.67	970k	[5] ABLIKIM	18C	BES3	$\eta'(958) \to \gamma\pi^+\pi^-$	
150.18± 0.55±0.65	970k	[6] ABLIKIM	18C	BES3	$\eta'(958) \to \gamma\pi^+\pi^-$	OCCUR=2
147.0 ± 2.5	600k	[7] ABELE	99E	CBAR	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$	
146 ± 3	4.9k	[8] ADAMS	97	E665	470 $\mu p \to \mu XB$	
160.0 $^{+4.1}_{-4.0}$		[9] CHABAUD	83	ASPK	17 $\pi^- p$ polarized	
155 ± 1		[10] HEYN	81	RVUE	π form factor	
148.0 ± 1.3		[1,2] LANG	79	RVUE		
146 ±14	4.1k	ENGLER	74	DBC	6 $\pi^+ n \to \pi^+\pi^- p$	
143 ±13		[2] ESTABROOKS	74	RVUE	17 $\pi^- p \to \pi^+\pi^- n$	
160 ±10	32k	[1] PROTOPOP...	73	HBC	7.1 $\pi^+ p$, t <0.4	
145 ±12	2.2k	[3,11] HYAMS	68	OSPK	11.2 $\pi^- p$	
163 ±15	13.3k	[12] PISUT	68	RVUE	1.7–3.2 $\pi^- p$, t <10	

[1] From pole extrapolation. NODE=M009W;LINKAGE=C
[2] From phase shift analysis of GRAYER 74 data. NODE=M009W;LINKAGE=H
[3] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass. NODE=M009W;LINKAGE=Z
[4] Published values contain misprints. Corrected by private communication RATCLIFF 74. NODE=M009W;LINKAGE=03
[5] From a fit to $\pi^+\pi^-$ mass using $\rho(770)$ (parametrized with the Gounaris-Sakurai approach), $\omega(782)$, and box anomaly components. NODE=M009W0R;LINKAGE=B
[6] From a fit to $\pi^+\pi^-$ mass using $\rho(770)$ (parametrized with the Gounaris-Sakurai approach), $\omega(782)$, and $\rho(1450)$ components. NODE=M009W0R;LINKAGE=C
[7] Using relativistic Breit-Wigner and taking into account ρ-ω interference. NODE=M009W;LINKAGE=BL
[8] Systematic errors not evaluated. NODE=M009W;LINKAGE=A1
[9] From fit of 3-parameter relativistic Breit-Wigner to helicity-zero part of P-wave intensity. CHABAUD 83 includes data of GRAYER 74. NODE=M009W;LINKAGE=G
[10] HEYN 81 includes all spacelike and timelike F_π values until 1978. NODE=M009W;LINKAGE=B
[11] Of HYAMS 68 six parametrizations this is theoretically soundest. MR NODE=M009W;LINKAGE=02
[12] 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. NODE=M009W;LINKAGE=R

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

NODE=M009W6
NODE=M009W6

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.3 ±1.3 OUR AVERAGE		Error includes scale factor of 1.4.			
−0.2 ±1.0		[1] SCHAEL	05C	ALEP	$\tau^- \to \pi^-\pi^0\nu_\tau$
3.6 ±1.8 ±1.7	1.98M	[2] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$

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

4.66±0.85		[3] BARTOS	17A	RVUE	$e^+e^- \to \pi^+\pi^-$, $\tau^- \to \pi^-\pi^0\nu_\tau$

[1] From the combined fit of the τ^- data from ANDERSON 00A and SCHAEL 05C and $e^+ e^-$ data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. Supersedes BARATE 97M. NODE=M009W6;LINKAGE=SC

[2] Assuming $m_{\rho^+} = m_{\rho^-}$, $\Gamma_{\rho^+} = \Gamma_{\rho^-}$. NODE=M009W6;LINKAGE=CH

[3] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, AMBROSINO 11A, and FUJIKAWA 08. NODE=M009W6;LINKAGE=A

$\Gamma_{\rho(770)^+} - \Gamma_{\rho(770)^-}$

NODE=M009W16
NODE=M009W16

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.8±2.0±0.5	1.98M	[1] ALOISIO	03	KLOE	1.02 $e^+ e^- \to \pi^+ \pi^- \pi^0$

[1] Without limitations on masses and widths. NODE=M009W16;LINKAGE=WO

ρ(770) DECAY MODES

NODE=M009225;NODE=M009

	Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
Γ_1	$\pi\pi$		$\sim$ 100 %		DESIG=1;OUR EVAL;→ UNCHECKED ←
	$\rho(770)^\pm$ decays				NODE=M009;CLUMP=A
Γ_2	$\pi^\pm \pi^0$		$\sim$ 100 %		DESIG=11;OUR EVAL;→ UNCHECKED ←
Γ_3	$\pi^\pm \gamma$		$(4.5 \pm 0.5) \times 10^{-4}$	S=2.2	DESIG=3
Γ_4	$\pi^\pm \eta$		$< 6 \times 10^{-3}$	CL=84%	DESIG=5
Γ_5	$\pi^\pm \pi^+ \pi^- \pi^0$		$< 2.0 \times 10^{-3}$	CL=84%	DESIG=21
	$\rho(770)^0$ decays				NODE=M009;CLUMP=B
Γ_6	$\pi^+ \pi^-$		$\sim$ 100 %		DESIG=12;OUR EVAL;→ UNCHECKED ←
Γ_7	$\pi^+ \pi^- \gamma$		$(9.9 \pm 1.6) \times 10^{-3}$		DESIG=60
Γ_8	$\pi^0 \gamma$		$(4.7 \pm 0.8) \times 10^{-4}$	S=1.7	DESIG=40
Γ_9	$\eta\gamma$		$(3.00 \pm 0.21) \times 10^{-4}$		DESIG=8
Γ_{10}	$\pi^0 \pi^0 \gamma$		$(4.5 \pm 0.8) \times 10^{-5}$		DESIG=80
Γ_{11}	$\mu^+ \mu^-$	[a]	$(4.55 \pm 0.28) \times 10^{-5}$		DESIG=6
Γ_{12}	$e^+ e^-$	[a]	$(4.72 \pm 0.05) \times 10^{-5}$		DESIG=4
Γ_{13}	$\pi^+ \pi^- \pi^0$		$(9 \pm 4) \times 10^{-5}$		DESIG=7
Γ_{14}	$\pi^+ \pi^- \pi^+ \pi^-$		$(1.8 \pm 0.9) \times 10^{-5}$		DESIG=22
Γ_{15}	$\pi^+ \pi^- \pi^0 \pi^0$		$(1.6 \pm 0.8) \times 10^{-5}$		DESIG=30
Γ_{16}	$\pi^0 e^+ e^-$		$< 1.2 \times 10^{-5}$	CL=90%	DESIG=9
Γ_{17}	$\eta e^+ e^-$				DESIG=10

[a] The $\omega\rho$ interference is then due to $\omega\rho$ mixing only, and is expected to be small. If $e\mu$ universality holds, $\Gamma(\rho^0 \to \mu^+ \mu^-) = \Gamma(\rho^0 \to e^+ e^-) \times 0.99785$. LINKAGE=MD2

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 $\left\langle \delta p_i \delta p_j \right\rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i, including the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{total}$. 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 ± 2.4		DESIG=11
Γ_3	$\pi^\pm \gamma$	0.068 ± 0.007	2.3	DESIG=3

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, and 7 branching ratios uses 21 measurements and one constraint to determine 9 parameters. The overall fit has a $\chi^2 = 9.5$ for 13 degrees of freedom.

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

x_7	−100							
x_8	−5	0						
x_9	−1	0	1					
x_{10}	−1	0	0	0				
x_{11}	2	−3	0	0	0			
x_{12}	0	0	−6	−9	0	0		
x_{14}	−1	0	0	0	0	0	0	
Γ	0	0	3	5	0	0	−54	0
	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{14}

	Mode		Rate (MeV)	Scale factor	
Γ_6	$\pi^+\pi^-$		147.5 ±0.9		DESIG=12
Γ_7	$\pi^+\pi^-\gamma$		1.48 ±0.24		DESIG=60
Γ_8	$\pi^0\gamma$		0.070 ±0.012	1.7	DESIG=40
Γ_9	$\eta\gamma$		0.0447 ±0.0032		DESIG=8
Γ_{10}	$\pi^0\pi^0\gamma$		0.0066 ±0.0012		DESIG=80
Γ_{11}	$\mu^+\mu^-$	[a]	0.0068 ±0.0004		DESIG=6
Γ_{12}	e^+e^-	[a]	0.00704±0.00006		DESIG=4
Γ_{14}	$\pi^+\pi^-\pi^+\pi^-$		0.0027 ±0.0014		DESIG=22

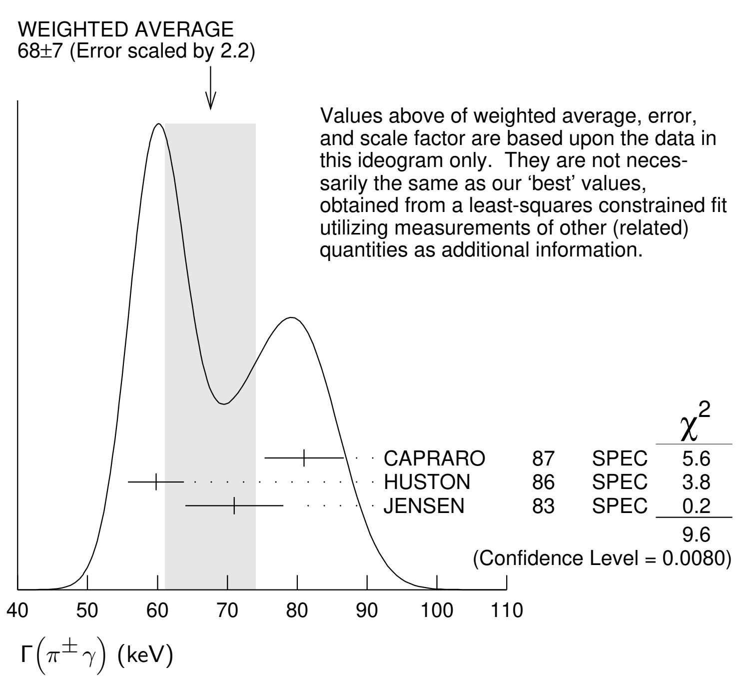
$\rho(770)$ PARTIAL WIDTHS

NODE=M009230

$\Gamma(\pi^{\pm}\gamma)$ Γ_3

NODE=M009W3
NODE=M009W3

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 $\pi^- A \to \pi^-\pi^0 A$
59.8±4.0	HUSTON	86	SPEC	+	202 $\pi^+ A \to \pi^+\pi^0 A$
71 ±7	JENSEN	83	SPEC	−	156–260 $\pi^- A \to \pi^-\pi^0 A$



$\Gamma(\pi^0\gamma)$ Γ_8

NODE=M009W31

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$77\pm17\pm11$	36500	[1] ACHASOV 03	SND	0.60–0.97 $e^+e^- \to \pi^0\gamma$
121 ± 31		DOLINSKY 89	ND	$e^+e^- \to \pi^0\gamma$

[1] Using Γ_{total}= 147.9 ± 1.3 MeV and B($\rho \to \pi^0\gamma$) from ACHASOV 03.

NODE=M009W31;LINKAGE=AV

$\Gamma(\eta\gamma)$ Γ_9

NODE=M009W32

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
62 ± 17	[1] DOLINSKY 89	ND	$e^+e^- \to \eta\gamma$

[1] Solution corresponding to constructive ω-ρ interference.

NODE=M009W32;LINKAGE=L

$\Gamma(e^+e^-)$ Γ_{12}

NODE=M009W4

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
7.04 ±0.06 OUR FIT				
7.04 ±0.06 OUR AVERAGE				
$7.048\pm0.057\pm0.050$	900k	[1] AKHMETSHIN 07		$e^+e^- \to \pi^+\pi^-$
$7.06\pm0.11\pm0.05$	114k	[2,3] AKHMETSHIN 04	CMD2	$e^+e^- \to \pi^+\pi^-$
$6.77\pm0.10\pm0.30$		BARKOV 85	OLYA	$e^+e^- \to \pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$7.12\pm0.02\pm0.11$	800k	[4] ACHASOV 06	SND	$e^+e^- \to \pi^+\pi^-$
6.3 ± 0.1		[5] BENAYOUN 98	RVUE	$e^+e^- \to \pi^+\pi^-$, $\mu^+\mu^-$

OCCUR=2

[1] A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.
[2] Using the GOUNARIS 68 parametrization with the complex phase of the ρ-ω interference.
[3] From a fit in the energy range 0.61 to 0.96 GeV. Update of AKHMETSHIN 02.
[4] Supersedes ACHASOV 05A.
[5] Using the data of BARKOV 85 in the hidden local symmetry model.

NODE=M009W4;LINKAGE=AK
NODE=M009W4;LINKAGE=GS
NODE=M009W4;LINKAGE=P2
NODE=M009W4;LINKAGE=AC
NODE=M009W4;LINKAGE=K2

$\Gamma(\pi^+\pi^-\pi^+\pi^-)$ Γ_{14}

NODE=M009W33

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$2.8\pm1.4\pm0.5$	153	AKHMETSHIN 00	CMD2	0.6–0.97 $e^+e^- \to \pi^+\pi^-\pi^+\pi^-$

$\rho(770)$ $\Gamma(e^+e^-)\Gamma(i)/\Gamma^2(\text{total})$

NODE=M009233

$\Gamma(e^+e^-)/\Gamma_{total} \times \Gamma(\pi^+\pi^-)/\Gamma_{total}$ $\Gamma_{12}/\Gamma \times \Gamma_6/\Gamma$

NODE=M009G4

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
4.89 ±0.04 OUR AVERAGE				
$4.889\pm0.015\pm0.039$		[1] ACHASOV 21	SND	$e^+e^- \to \pi^+\pi^-$
$4.876\pm0.023\pm0.064$	800k	[2,3] ACHASOV 06	SND	$e^+e^- \to \pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.72 ± 0.02		[4] BENAYOUN 10	RVUE	0.4–1.05 e^+e^-

[1] From a fit of the cross section in the energy range $0.525 < \sqrt{s} < 0.883$ GeV parameterized by the sum of the Breit-Wigner amplitudes for the $\rho(770)$, ω and $\rho(1450)$ resonances.

NODE=M009G4;LINKAGE=A

[2] Supersedes ACHASOV 05A.
[3] A fit of the SND data from 400 to 1000 MeV using parameters of the $\rho(1450)$ and $\rho(1700)$ from a fit of the data of BARKOV 85, BISELLO 89 and ANDERSON 00A.
[4] A simultaneous fit of $e^+e^- \to \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data.

NODE=M009G4;LINKAGE=AC
NODE=M009G4;LINKAGE=SN
NODE=M009G4;LINKAGE=BE

$\Gamma(e^+e^-)/\Gamma_{total} \times \Gamma(\eta\gamma)/\Gamma_{total}$ $\Gamma_{12}/\Gamma \times \Gamma_9/\Gamma$

NODE=M009G1

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT
1.42±0.10 OUR FIT				
1.45±0.12 OUR AVERAGE				
$1.32\pm0.14\pm0.08$	33k	[1] ACHASOV 07B	SND	0.6–1.38 $e^+e^- \to \eta\gamma$
$1.50\pm0.65\pm0.09$	17.4k	[2] AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \to \eta\gamma$
$1.61\pm0.20\pm0.11$	23k	[3,4] AKHMETSHIN 01B	CMD2	$e^+e^- \to \eta\gamma$
1.85 ± 0.49		[5] DOLINSKY 89	ND	$e^+e^- \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.05 ± 0.02		[6] BENAYOUN 10	RVUE	0.4–1.05 e^+e^-

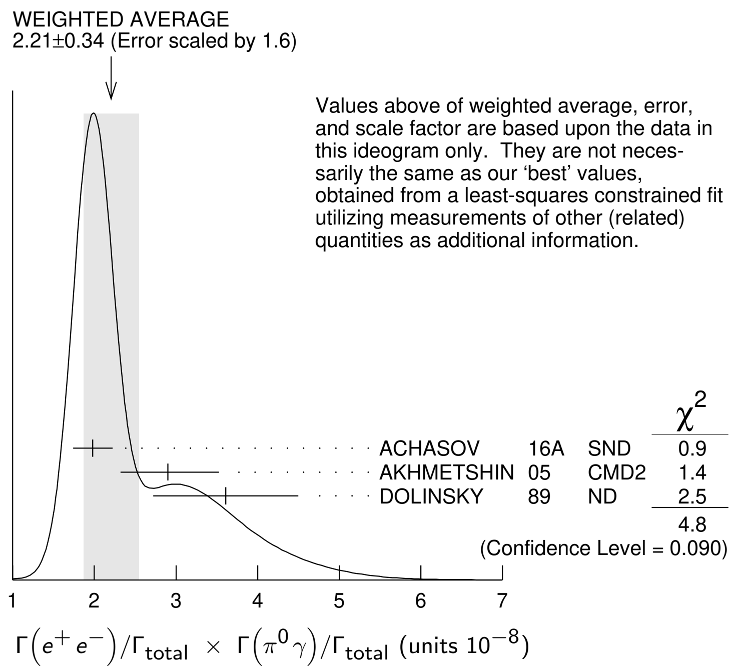
[1] From a combined fit of $\sigma(e^+e^- \to \eta\gamma)$ with $\eta \to 3\pi^0$ and $\eta \to \pi^+\pi^-\pi^0$, and fixing $B(\eta \to 3\pi^0)$ / $B(\eta \to \pi^+\pi^-\pi^0) = 1.44 \pm 0.04$. Recalculated by us from the cross section at the peak. Supersedes ACHASOV 00D and ACHASOV 06A. NODE=M009G1;LINKAGE=AH
[2] From the $\eta \to 2\gamma$ decay and using $B(\eta \to \gamma\gamma) = 39.43 \pm 0.26\%$. NODE=M009G;LINKAGE=AH
[3] From the $\eta \to 3\pi^0$ decay and using $B(\eta \to 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$. NODE=M009G;LINKAGE=AK
[4] The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively). NODE=M009G;LINKAGE=BQ
[5] Recalculated by us from the cross section in the peak. NODE=M009G;LINKAGE=LP
[6] A simultaneous fit of $e^+e^- \to \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data. NODE=M009G1;LINKAGE=BE

$\Gamma(e^+e^-)/\Gamma_{total} \times \Gamma(\pi^0\gamma)/\Gamma_{total}$ — $\Gamma_{12}/\Gamma \times \Gamma_8/\Gamma$

NODE=M009G2
NODE=M009G2

VALUE (units 10^{-8})	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
2.2 ±0.4 OUR FIT Error includes scale factor of 1.7.				
2.21 ±0.34 OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.				
1.98 ±0.22 ±0.10		[1] ACHASOV 16A	SND	0.60-1.38 $e^+e^- \to \pi^0\gamma$
2.90 $^{+0.60}_{-0.55}$ ±0.18	18k	AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \to \pi^0\gamma$
3.61 ±0.74 ±0.49	10k	[2] DOLINSKY 89	ND	$e^+e^- \to \pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.875±0.026		[3] BENAYOUN 10	RVUE	0.4–1.05 e^+e^-
2.37 ±0.53 ±0.33	36k	[4] ACHASOV 03	SND	0.60–0.97 $e^+e^- \to \pi^0\gamma$

[1] From the VMD model with the prho(770), $\omega(782)$, $\phi(1020)$ resonances, and an additional resonance describing the total contribution of the $\rho(1450)$ and $\omega(1420)$ states. Supersedes ACHASOV 03. NODE=M009G2;LINKAGE=B
[2] Recalculated by us from the cross section in the peak. NODE=M009G2;LINKAGE=LP
[3] A simultaneous fit of $e^+e^- \to \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data. NODE=M009G2;LINKAGE=BE
[4] Using $\sigma_{\phi \to \pi^0\gamma}$ from ACHASOV 00 and $m_\rho = 775.97$ MeV in the model with the energy-independent phase of ρ-ω interferenceequal to $(-10.2 \pm 7.0)^\circ$. NODE=M009G;LINKAGE=SH



$\Gamma(e^+e^-)/\Gamma_{total} \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — $\Gamma_{12}/\Gamma \times \Gamma_{13}/\Gamma$

NODE=M009G3
NODE=M009G3

VALUE (units 10^{-9})	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.903±0.076		[1] BENAYOUN 10	RVUE	0.4–1.05 e^+e^-
4.58 $^{+2.46}_{-1.64}$ ±1.56	1.2M	[2] ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$

[1] A simultaneous fit of $e^+e^- \to \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data. NODE=M009G3;LINKAGE=BE
[2] Statistical significance is less than $3\,\sigma$. NODE=M009G3;LINKAGE=AC

$\rho(770)$ BRANCHING RATIOS

NODE=M009235

$\Gamma(\pi^\pm\eta)/\Gamma(\pi\pi)$ — Γ_4/Γ_1

NODE=M009R4
NODE=M009R4

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

NODE=M009R1
NODE=M009R1

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 $\pi^{+} p$

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

NODE=M009R12
NODE=M009R12

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.0099±0.0016 OUR FIT					
0.0099±0.0016		[1] DOLINSKY	91	ND	$e^{+}e^{-} \rightarrow \pi^{+}\pi^{-}\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0111 ± 0.0014		[2] VASSERMAN	88	ND	$e^{+}e^{-} \rightarrow \pi^{+}\pi^{-}\gamma$
<0.005	90	[3] VASSERMAN	88	ND	$e^{+}e^{-} \rightarrow \pi^{+}\pi^{-}\gamma$

OCCUR=2

[1] Bremsstrahlung from a decay pion and for photon energy above 50 MeV. NODE=M009R12;LINKAGE=J

[2] Superseded by DOLINSKY 91. NODE=M009R12;LINKAGE=I

[3] Structure radiation due to quark rearrangement in the decay. NODE=M009R12;LINKAGE=N

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

NODE=M009R9
NODE=M009R9

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.20 ± 0.52		[1] ACHASOV	16A	SND	0.60–1.38 $e^{+}e^{-} \rightarrow \pi^{0}\gamma$
$6.21^{+1.28}_{-1.18}\pm0.39$	18k	[2,3] AKHMETSHIN	05	CMD2	0.60-1.38 $e^{+}e^{-} \rightarrow \pi^{0}\gamma$
$5.22\pm1.17\pm0.75$	36k	[3,4] ACHASOV	03	SND	0.60–0.97 $e^{+}e^{-} \rightarrow \pi^{0}\gamma$
$6.8\ \pm1.7$		[5] BENAYOUN	96	RVUE	0.54-1.04 $e^{+}e^{-} \rightarrow \pi^{0}\gamma$
$7.9\ \pm2.0$		[3] DOLINSKY	89	ND	$e^{+}e^{-} \rightarrow \pi^{0}\gamma$

[1] Using B($\rho \rightarrow e^{+}e^{-}$) from PDG 15. Supersedes ACHASOV 03. NODE=M009R9;LINKAGE=C

[2] Using B($\rho \rightarrow e^{+}e^{-}$) = $(4.67 \pm 0.09) \times 10^{-5}$. NODE=M009R9;LINKAGE=AK

[3] Not independent of the corresponding $\Gamma(e^{+}e^{-}) \times \Gamma(\pi^{0}\gamma)/\Gamma^{2}_{\text{total}}$. NODE=M009R9;LINKAGE=BZ

[4] Using B($\rho \rightarrow e^{+}e^{-}$) = $(4.54 \pm 0.10) \times 10^{-5}$. NODE=M009R9;LINKAGE=AS

[5] Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution. NODE=M009R9;LINKAGE=A

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

NODE=M009R7
NODE=M009R7

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
3.00±0.21 OUR FIT						
2.90±0.32 OUR AVERAGE						
$2.79\pm0.34\pm0.03$	33k	[1] ACHASOV	07B	SND		0.6–1.38 $e^{+}e^{-} \rightarrow \eta\gamma$
$3.6\ \pm0.9$		[2] ANDREWS	77	CNTR	0	6.7–10 γ Cu
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$3.21\pm1.39\pm0.20$	17.4k	[3,4] AKHMETSHIN	05	CMD2		0.60-1.38 $e^{+}e^{-} \rightarrow \eta\gamma$
$3.39\pm0.42\pm0.23$		[2,5,6] AKHMETSHIN	01B	CMD2		$e^{+}e^{-} \rightarrow \eta\gamma$
$1.9\ ^{+0.6}_{-0.8}$		[7] BENAYOUN	96	RVUE		0.54-1.04 $e^{+}e^{-} \rightarrow \eta\gamma$
$4.0\ \pm1.1$		[2,4] DOLINSKY	89	ND		$e^{+}e^{-} \rightarrow \eta\gamma$

[1] ACHASOV 07B reports $[\Gamma(\rho(770) \rightarrow \eta\gamma)/\Gamma_{\text{total}}] \times [B(\rho(770) \rightarrow e^{+}e^{-})] = (1.32 \pm 0.14 \pm 0.08) \times 10^{-8}$ which we divide by our best value B($\rho(770) \rightarrow e^{+}e^{-}$) = $(4.72 \pm 0.05) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Supersedes ACHASOV 00D and ACHASOV 06A. NODE=M009R7;LINKAGE=AO

[2] Solution corresponding to constructive ω-ρ interference. NODE=M009R7;LINKAGE=A

[3] Using B($\rho \rightarrow e^{+}e^{-}$) = $(4.67 \pm 0.09) \times 10^{-5}$ and B($\eta \rightarrow \gamma\gamma$) = $39.43 \pm 0.26\%$. NODE=M009R;LINKAGE=AK

[4] Not independent of the corresponding $\Gamma(e^{+}e^{-}) \times \Gamma(\eta\gamma)/\Gamma^{2}_{\text{total}}$. NODE=M009R7;LINKAGE=AZ

[5] The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively). NODE=M009R;LINKAGE=BQ

[6] Using B($\rho \rightarrow e^{+}e^{-}$) = $(4.75 \pm 0.10) \times 10^{-5}$ from AKHMETSHIN 02 and B($\eta \rightarrow 3\pi^{0}$) = $(32.24 \pm 0.29) \times 10^{-2}$. NODE=M009R;LINKAGE=BX

[7] Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution. Constructive ρ-ω interference solution. NODE=M009R7;LINKAGE=C

$\Gamma(\pi^0\pi^0\gamma)/\Gamma_{total}$ Γ_{10}/Γ

NODE=M009R14
NODE=M009R14

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
4.5±0.8 OUR FIT					
$4.5^{+0.9}_{-0.8}$ OUR AVERAGE					
$5.2^{+1.5}_{-1.3}\pm0.6$	190	[1] AKHMETSHIN	04B	CMD2	0.6–0.97 $e^+e^- \rightarrow \pi^0\pi^0\gamma$
$4.1^{+1.0}_{-0.9}\pm0.3$	295	[2] ACHASOV	02F	SND	0.36–0.97 $e^+e^- \rightarrow \pi^0\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$4.8^{+3.4}_{-1.8}\pm0.5$	63	[3] ACHASOV	00G	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$

OCCUR=2

[1] This branching ratio includes the conventional VMD mechanism $\rho \rightarrow \omega\pi^0$, $\omega \rightarrow \pi^0\gamma$, and the new decay mode $\rho \rightarrow f_0(500)\gamma$, $f_0(500) \rightarrow \pi^0\pi^0$ with a branching ratio $(2.0^{+1.1}_{-0.9} \pm 0.3) \times 10^{-5}$ differing from zero by 2.0 standard deviations. NODE=M009R14;LINKAGE=AH

[2] This branching ratio includes the conventional VMD mechanism $\rho \rightarrow \omega\pi^0$, $\omega \rightarrow \pi^0\gamma$ and the new decay mode $\rho \rightarrow f_0(500)\gamma$, $f_0(500) \rightarrow \pi^0\pi^0$ with a branching ratio $(1.9^{+0.9}_{-0.8} \pm 0.4) \times 10^{-5}$ differing from zero by 2.4 standard deviations. Supersedes ACHASOV 00G. NODE=M009R;LINKAGE=FF

[3] Superseded by ACHASOV 02F. NODE=M009R;LINKAGE=GF

$\Gamma(\mu^+\mu^-)/\Gamma(\pi^+\pi^-)$ Γ_{11}/Γ_6

NODE=M009R5
NODE=M009R5

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. • • •				
$8.2\ ^{+1.6}_{-3.6}$	[1] ROTHWELL	69	CNTR	Photoproduction
5.6 ±1.5	[2] WEHMANN	69	OSPK	12 π^- C, Fe
$9.7\ ^{+3.1}_{-3.3}$	[3,4] HYAMS	67	OSPK	11 π^- Li, H

[1] Possibly large ρ-ω interference leads us to increase the minus error. NODE=M009R5;LINKAGE=R

[2] 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. NODE=M009R5;LINKAGE=W

[3] But he even enlarges his error to take residual ω contamination into account. Since his value is high, seems the other experiments also can't have too many ω's. But maybe Hyams has additional μ's from $\rho \rightarrow \pi\pi$, decaying π's. NODE=M009R5;LINKAGE=01

[4] HYAMS 67's mass resolution is 20 MeV. The ω region was excluded. NODE=M009R5;LINKAGE=H

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

NODE=M009R3
NODE=M009R3

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.40±0.05	[1,2] BENAKSAS	72	OSPK	$e^+e^- \rightarrow \pi^+\pi^-$

[1] The ρ' contribution is not taken into account. NODE=M009R;LINKAGE=KS

[2] Barkov excludes Auslender and Benaksas for large statistical and systematic errors. NODE=M009R3;LINKAGE=01

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ Γ_{13}/Γ

NODE=M009R10
NODE=M009R10

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.88±0.23±0.30			[1] LEES	21B	BABR	10.5 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$1.01^{+0.54}_{-0.36}\pm0.34$		1.2M	[2] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
<1.2	90		VASSERMAN	88B	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$

[1] From the cross section for $e^+e^- \rightarrow \pi^+\pi^-\pi^0$ with contributions from $\rho(770)$, $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. Statistical evidence is more than 6 σ. NODE=M009R10;LINKAGE=A

[2] Statistical significance is less than 3σ. NODE=M009R;LINKAGE=NS

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma(\pi\pi)$ Γ_{13}/Γ_1

NODE=M009R6
NODE=M009R6

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	$J/\psi \rightarrow \omega\pi^0$
<0.01	84	[1] ABRAMS	71	HBC	0	3.7 $\pi^+ p$

[1] Model dependent, assumes I = 1, 2, or 3 for the 3π system. NODE=M009R6;LINKAGE=G

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

NODE=M009R13

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.8±0.9 OUR FIT						
1.8±0.9±0.3		153	AKHMETSHIN	00	CMD2	0.6–0.97 $e^+e^- \to \pi^+\pi^-\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<20	90		KURDADZE	88	OLYA	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma(\pi\pi)$ Γ_{14}/Γ_1

NODE=M009R11

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 $\pi^+ p$

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ Γ_{15}/Γ

NODE=M009R8

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
1.60±0.74±0.18		[1] ACHASOV	09A	SND	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 4	90	AULCHENKO	87C	ND	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
<20	90	KURDADZE	86	OLYA	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$

[1] Assuming no interference between the ρ and ω contributions. NODE=M009R8;LINKAGE=AC

$\Gamma(\pi^0 e^+e^-)/\Gamma_{total}$ Γ_{16}/Γ

NODE=M009R15

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<1.2	90	ACHASOV	08	SND	0.36–0.97 $e^+e^- \to \pi^0 e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.6		AKHMETSHIN	05A	CMD2	0.72-0.84 e^+e^-

$\Gamma(\eta e^+e^-)/\Gamma_{total}$ Γ_{17}/Γ

NODE=M009R16

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.7	AKHMETSHIN	05A	CMD2	0.72-0.84 e^+e^-

ρ(770) REFERENCES

NODE=M009

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ANDREEV 20 EPJ C80 1189 V. Andreev *et al.* (H1 Collab.) REFID=60773
ABLIKIM 18C PRL 120 242003 M. Ablikim *et al.* (BESIII Collab.) REFID=58843
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HOFERICHT... 16 PRPL 625 1 M. Hoferichter *et al.* (WASH, BONN) REFID=63224
PDG 15 RPP 2015 at pdg.lbl.gov (PDG Collab.) REFID=56977;ERROR=1
ABRAMOWICZ 12 EPJ C72 1869 H. Abramowicz *et al.* (ZEUS Collab.) REFID=54274
LEES 12G PR D86 032013 J.P. Lees *et al.* (BABAR Collab.) REFID=54299
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GARCIA-MAR... 11 PRL 107 072001 R. Garcia-Martin *et al.* (MADR, CRAC) REFID=16761
BATLEY 10C EPJ C70 635 J.R. Batley *et al.* (CERN NA48/2 Collab.) REFID=53567
BENAYOUN 10 EPJ C65 211 M. Benayoun *et al.* REFID=53212
DUBNICKA 10 APS 60 1 S. Dubnicka, A.Z. Dubnickova REFID=58797
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AKHMETSHIN 07 PL B648 28 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.) REFID=51615
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AULCHENKO 06 JETPL 84 413 V.M. Aulchenko *et al.* (Novosibirsk CMD-2 Collab.) REFID=51513
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ACHASOV 05A JETP 101 1053 M.N. Achasov *et al.* (Novosibirsk SND Collab.) REFID=51045
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AKHMETSHIN 05 PL B605 26 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.) REFID=50330
AKHMETSHIN 05A PL B613 29 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.) REFID=50508
ALOISIO 05 PL B606 12 A. Aloisio *et al.* (KLOE Collab.) REFID=51112
AULCHENKO 05 JETPL 82 743 V.M. Aulchenko *et al.* (Novosibirsk CMD-2 Collab.) REFID=51060
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SCHAEL	05C	PRPL 421 191	S. Schael *et al.*	(ALEPH Collab.)	REFID=50845
AKHMETSHIN	04	PL B578 285	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=49609
AKHMETSHIN	04B	PL B580 119	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=49610
PELAEZ	04A	MPL A19 2879	J.R. Pelaez	(MADU)	REFID=50347
ACHASOV	03	PL B559 171	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=49187
ACHASOV	03D	PR D68 052006	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=49577
ALOISIO	03	PL B561 55	A. Aloisio *et al.*	(KLOE Collab.)	REFID=49404
SANZ-CILLERO	03	EPJ C27 587	J.J. Sanz-Cillero, A. Pich		REFID=49399
ACHASOV	02	PR D65 032002	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=48549
ACHASOV	02F	PL B537 201	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=48816
AKHMETSHIN	02	PL B527 161	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=48565
AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=48167
COLANGELO	01	NP B603 125	G. Colangelo, J. Gasser, H. Leytwyler		REFID=49180
PICH	01	PR D63 093005	A. Pich, J. Portoles		REFID=48313
ACHASOV	00	EPJ C12 25	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=47417
ACHASOV	00D	JETPL 72 282	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=47882
		Translated from ZETFP 72 411.			
ACHASOV	00G	JETPL 71 355	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=47929
		Translated from ZETFP 71 519.			
AKHMETSHIN	00	PL B475 190	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=47421
ANDERSON	00A	PR D61 112002	S. Anderson *et al.*	(CLEO Collab.)	REFID=47468
ABELE	99E	PL B469 270	A. Abele *et al.*	(Crystal Barrel Collab.)	REFID=47414
BENAYOUN	98	EPJ C2 269	M. Benayoun *et al.*	(IPNP, NOVO, ADLD+)	REFID=45859
BREITWEG	98B	EPJ C2 247	J. Breitweg *et al.*	(ZEUS Collab.)	REFID=46354
GARDNER	98	PR D57 2716	S. Gardner, H.B. O'Connell		REFID=46366
Also		PR D62 019903 (errat.)	S. Gardner, H.B. O'Connell		REFID=47981
ABELE	97	PL B391 191	A. Abele *et al.*	(Crystal Barrel Collab.)	REFID=45415
ADAMS	97	ZPHY C74 237	M.R. Adams *et al.*	(E665 Collab.)	REFID=45533
BARATE	97M	ZPHY C76 15	R. Barate *et al.*	(ALEPH Collab.)	REFID=45622
BERTIN	97C	PL B408 476	A. Bertin *et al.*	(OBELIX Collab.)	REFID=45701
BOGOLYUB...	97	PAN 60 46	M.Y. Bogolyubsky *et al.*	(MOSU, SERP)	REFID=45393
		Translated from YAF 60 53.			
O'CONNELL	97	NP A623 559	H.B. O'Connell *et al.*	(ADLD)	REFID=45860
BENAYOUN	96	ZPHY C72 221	M. Benayoun *et al.*	(IPNP, NOVO)	REFID=45753
BERNICHA	94	PR D50 4454	A. Bernicha, G. Lopez Castro, J. Pestieau	(LOUV+)	REFID=44097
WEIDENAUER	93	ZPHY C59 387	P. Weidenauer *et al.*	(ASTERIX Collab.)	REFID=43585
AGUILAR-...	91	ZPHY C50 405	M. Aguilar-Benitez *et al.*	(LEBC-EHS Collab.)	REFID=41637
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky *et al.*	(NOVO)	REFID=41369
KUHN	90	ZPHY C48 445	J.H. Kuhn *et al.*	(MPIM)	REFID=45862
ANTIPOV	89	ZPHY C42 185	Y.M. Antipov *et al.*	(SERP, JINR, BGNA+)	REFID=40739
BISELLO	89	PL B220 321	D. Bisello *et al.*	(DM2 Collab.)	REFID=40740
DOLINSKY	89	ZPHY C42 511	S.I. Dolinsky *et al.*	(NOVO)	REFID=41003
DUBNICKA	89	JP G15 1349	S. Dubnicka *et al.*	(JINR, SLOV)	REFID=44082
GESHKEN...	89	ZPHY C45 351	B.V. Geshkenbein	(ITEP)	REFID=41017
KURDADZE	88	JETPL 47 512	L.M. Kurdadze *et al.*	(NOVO)	REFID=41121
		Translated from ZETFP 47 432.			
VASSERMAN	88	SJNP 47 1035	I.B. Vasserman *et al.*	(NOVO)	REFID=41019
		Translated from YAF 47 1635.			
VASSERMAN	88B	SJNP 48 480	I.B. Vasserman *et al.*	(NOVO)	REFID=41020
		Translated from YAF 48 753.			
AULCHENKO	87C	IYF 87-90 Preprint	V.M. Aulchenko *et al.*	(NOVO)	REFID=41370
CAPRARO	87	NP B288 659	L. Capraro *et al.*	(CLER, FRAS, MILA+)	REFID=40003
BRAMON	86	PL B173 97	A. Bramon, J. Casulleras	(BARC)	REFID=22102
HUSTON	86	PR D33 3199	J. Huston *et al.*	(ROCH, FNAL, MINN)	REFID=20137
KURDADZE	86	JETPL 43 643	L.M. Kurdadze *et al.*	(NOVO)	REFID=40287
		Translated from ZETFP 43 497.			
BARKOV	85	NP B256 365	L.M. Barkov *et al.*	(NOVO)	REFID=20134
DRUZHININ	84	PL 144B 136	V.P. Druzhinin *et al.*	(NOVO)	REFID=20561
CHABAUD	83	NP B223 1	V. Chabaud *et al.*	(CERN, CRAC, MPIM)	REFID=20131
JENSEN	83	PR D27 26	T. Jensen *et al.*	(ROCH, FNAL, MINN)	REFID=20132
HEYN	81	ZPHY C7 169	M.F. Heyn, C.B. Lang	(GRAZ)	REFID=20129
BOHACIK	80	PR D21 1342	J. Bohacik, H. Kuhnelt	(SLOV, WIEN)	REFID=20128
COHEN	80	PR D22 2595	D. Cohen *et al.*	(ANL)	REFID=20381
LANG	79	PR D19 956	C.B. Lang, A. Mas-Parareda	(GRAZ)	REFID=20126
BARTALUCCI	78	NC 44A 587	S. Bartalucci *et al.*	(DESY, FRAS)	REFID=20122
WICKLUND	78	PR D17 1197	A.B. Wicklund *et al.*	(ANL)	REFID=20124
ANDREWS	77	PRL 38 198	D.E. Andrews *et al.*	(ROCH)	REFID=20120
DEUTSCH...	76	NP B103 426	M. Deutschmann *et al.*	(AACH3, BERL, BONN+)	REFID=20119
ENGLER	74	PR D10 2070	A. Engler *et al.*	(CMU, CASE)	REFID=20110
ESTABROOKS	74	NP B79 301	P.G. Estabrooks, A.D. Martin	(DURH)	REFID=20111
GRAYER	74	NP B75 189	G. Grayer *et al.*	(CERN, MPIM)	REFID=20113
RATCLIFF	74	Private Comm.			REFID=40128;ERROR=2
BYERLY	73	PR D7 637	W.L. Byerly *et al.*	(MICH)	REFID=20104
GLADDING	73	PR D8 3721	G.E. Gladding *et al.*	(HARV)	REFID=20106
HYAMS	73	NP B64 134	B.D. Hyams *et al.*	(CERN, MPIM)	REFID=20107
PROTOPOP...	73	PR D7 1279	S.D. Protopopescu *et al.*	(LBL)	REFID=20108
BALLAM	72	PR D5 545	J. Ballam *et al.*	(SLAC, LBL, TUFTS)	REFID=20094
BENAKSAS	72	PL 39B 289	D. Benaksas *et al.*	(ORSAY)	REFID=20096
JACOBS	72	PR D6 1291	L.D. Jacobs	(SACL)	REFID=20101
RATCLIFF	72	PL 38B 345	B.N. Ratcliff *et al.*	(SLAC)	REFID=20102
ABRAMS	71	PR D4 653	G.S. Abrams *et al.*	(LBL)	REFID=20090
ALVENSLEB...	70	PRL 24 786	H. Alvensleben *et al.*	(DESY)	REFID=20085
BIGGS	70	PRL 24 1197	P.J. Biggs *et al.*	(DARE)	REFID=20087
ERBE	69	PR 188 2060	R. Erbe *et al.*	(German Bubble Chamber Collab.)	REFID=20074
MALAMUD	69	Argonne Conf. 93	E.I. Malamud, P.E. Schlein	(UCLA)	REFID=20077
REYNOLDS	69	PR 184 1424	B.G. Reynolds *et al.*	(FSU)	REFID=20080
ROTHWELL	69	PRL 23 1521	P.L. Rothwell *et al.*	(NEAS)	REFID=20082
WEHMANN	69	PR 178 2095	A.A. Wehmann *et al.*	(HARV, CASE, SLAC+)	REFID=20084
ARMENISE	68	NC 54A 999	N. Armenise *et al.*	(BARI, BGNA, FIRZ+)	REFID=20054
BATON	68	PR 176 1574	J.P. Baton, G. Laurens	(SACL)	REFID=20056
CHUNG	68	PR 165 1491	S.U. Chung *et al.*	(LRL)	REFID=20059
FOSTER	68	NP B6 107	M. Foster *et al.*	(CERN, CDEF)	REFID=20061
GOUNARIS	68	PRL 21 244	G.J. Gounaris, J.J. Sakurai		REFID=48054
HUSON	68	PL 28B 208	R. Huson *et al.*	(ORSAY, MILA, UCLA)	REFID=20062
HYAMS	68	NP B7 1	B.D. Hyams *et al.*	(CERN, MPIM)	REFID=20063
LANZEROTTI	68	PR 166 1365	L.J. Lanzerotti *et al.*	(HARV)	REFID=20068
PISUT	68	NP B6 325	J. Pisut, M. Roos	(CERN)	REFID=20070
ASBURY	67B	PRL 19 865	J.G. Asbury *et al.*	(DESY, COLU)	REFID=20038
BACON	67	PR 157 1263	T.C. Bacon *et al.*	(BNL)	REFID=20039
EISNER	67	PR 164 1699	R.L. Eisner *et al.*	(PURD)	REFID=20046
HUWE	67	PL 24B 252	D.O. Huwe *et al.*	(COLU)	REFID=20049
HYAMS	67	PL 24B 634	B.D. Hyams *et al.*	(CERN, MPIM)	REFID=20050
MILLER	67B	PR 153 1423	D.H. Miller *et al.*	(PURD)	REFID=20051
ALFF-...	66	PR 145 1072	C. Alff-Steinberger *et al.*	(COLU, RUTG)	REFID=10762
FERBEL	66	PL 21 111	T. Ferbel	(ROCH)	REFID=20028
HAGOPIAN	66	PR 145 1128	V. Hagopian *et al.*	(PENN, SACL)	REFID=20030
HAGOPIAN	66B	PR 152 1183	V. Hagopian, Y.L. Pan	(PENN, LRL)	REFID=20031
JACOBS	66B	UCRL 16877	L.D. Jacobs	(LRL)	REFID=20033
JAMES	66	PR 142 896	F.E. James, H.L. Kraybill	(YALE, BNL)	REFID=10770
ROSS	66	PR 149 1172	M. Ross, L. Stodolsky		REFID=46380
SOEDING	66	PL B19 702	P. Soeding		REFID=46385
WEST	66	PR 149 1089	E. West *et al.*	(WISC)	REFID=20035
BLIEDEN	65	PL 19 444	H.R. Blieden *et al.*	(CERN MMS Collab.)	REFID=20016
CARMONY	64	PRL 12 254	D.D. Carmony *et al.*	(UCB)	REFID=20578
GOLDHABER	64	PRL 12 336	G. Goldhaber *et al.*	(LRL, UCB)	REFID=20013
ABOLINS	63	PRL 11 381	M.A. Abolins *et al.*	(UCSD)	REFID=20006