

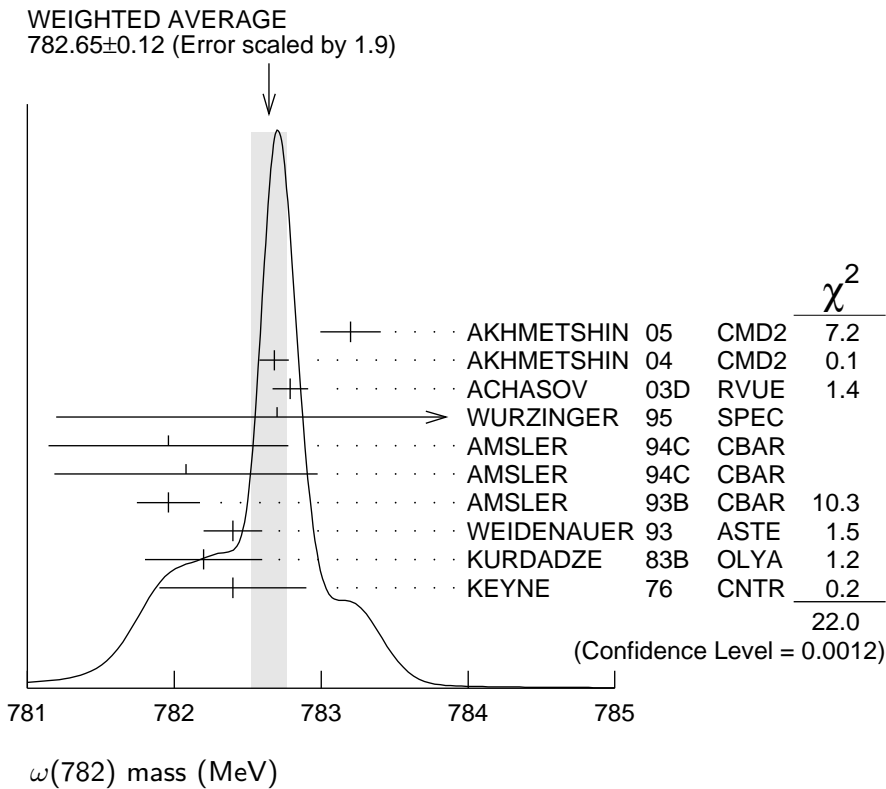
$\omega(782)$

$$I^G(J^{PC}) = 0^-(1^{--})$$

 $\omega(782)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
782.65±0.12 OUR AVERAGE		Error includes scale factor of 1.9. See the ideogram below.		
783.20±0.13±0.16	18680	AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \rightarrow \pi^0\gamma$
782.68±0.09±0.04	11200	¹ AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
782.79±0.08±0.09	1.2M	² ACHASOV 03D	RVUE	0.44-2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
782.7 ±0.1 ±1.5	19500	WURZINGER 95	SPEC	1.33 $pd \rightarrow {}^3\text{He}\omega$
781.96±0.17±0.80	11k	³ AMSLER 94C	CBAR	0.0 $\bar{p}p \rightarrow \omega\eta\pi^0$
782.08±0.36±0.82	3463	⁴ AMSLER 94C	CBAR	0.0 $\bar{p}p \rightarrow \omega\eta\pi^0$
781.96±0.13±0.17	15k	AMSLER 93B	CBAR	0.0 $\bar{p}p \rightarrow \omega\pi^0\pi^0$
782.4 ±0.2	270k	WEIDENAUER 93	ASTE	$\bar{p}p \rightarrow 2\pi^+2\pi^-\pi^0$
782.2 ±0.4	1488	KURDADZE 83B	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
782.4 ±0.5	7000	⁵ KEYNE 76	CNTR	$\pi^-p \rightarrow \omega n$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
781.91±0.24		⁶ LEES 12G	BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
781.78±0.10		⁷ BARKOV 87	CMD	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
783.3 ±0.4	433	CORDIER 80	DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
782.5 ±0.8	33260	ROOS 80	RVUE	0.0-3.6 $\bar{p}p$
782.6 ±0.8	3000	BENKHEIRI 79	OMEG	9-12 $\pi^\pm p$
781.8 ±0.6	1430	COOPER 78B	HBC	0.7-0.8 $\bar{p}p \rightarrow 5\pi$
782.7 ±0.9	535	VANAPEL... 78	HBC	7.2 $\bar{p}p \rightarrow \bar{p}p\omega$
783.5 ±0.8	2100	GESSAROLI 77	HBC	11 $\pi^-p \rightarrow \omega n$
782.5 ±0.8	418	AGUILAR-... 72B	HBC	3.9,4.6 K^-p
783.4 ±1.0	248	BIZZARRI 71	HBC	0.0 $p\bar{p} \rightarrow K^+K^-\omega$
781.0 ±0.6	510	BIZZARRI 71	HBC	0.0 $p\bar{p} \rightarrow K_1^+K_1^-\omega$
783.7 ±1.0	3583	⁸ COYNE 71	HBC	3.7 $\pi^+p \rightarrow p\pi^+\pi^+\pi^-\pi^0$
784.1 ±1.2	750	ABRAMOVI... 70	HBC	3.9 π^-p
783.2 ±1.6		⁹ BIGGS 70B	CNTR	<4.1 $\gamma C \rightarrow \pi^+\pi^-C$
782.4 ±0.5	2400	BIZZARRI 69	HBC	0.0 $\bar{p}p$

¹ Update of AKHMETSHIN 00C.² From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.³ From the $\eta \rightarrow \gamma\gamma$ decay.⁴ From the $\eta \rightarrow 3\pi^0$ decay.⁵ Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.⁶ From the $\rho-\omega$ interference in the $\pi^+\pi^-$ mass spectrum using the Breit-Wigner for the ω and leaving its mass and width as free parameters of the fit.⁷ Systematic uncertainties underestimated.⁸ From best-resolution sample of COYNE 71.⁹ From $\omega-\rho$ interference in the $\pi^+\pi^-$ mass spectrum assuming ω width 12.6 MeV.



$\omega(782)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
8.49±0.08 OUR AVERAGE				
8.68±0.23±0.10	11200	1 AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.68±0.04±0.15	1.2M	2 ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.2 ±0.3	19500	WURZINGER 95	SPEC	1.33 $pd \rightarrow {}^3\text{He}\omega$
8.4 ±0.1		3 AULCHENKO 87	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.30±0.40		BARKOV 87	CMD	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.8 ±0.9	1488	KURDADZE 83B	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.0 ±0.8	433	CORDIER 80	DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.1 ±0.8	451	BENAKSAS 72B	OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
8.13±0.45		4 LEES 12G	BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
12 ±2	1430	COOPER 78B	HBC	0.7–0.8 $\bar{p}p \rightarrow 5\pi$
9.4 ±2.5	2100	GESSAROLI 77	HBC	11 $\pi^-p \rightarrow \omega n$
10.22±0.43	20000	5 KEYNE 76	CNTR	$\pi^-p \rightarrow \omega n$
13.3 ±2	418	AGUILAR-... 72B	HBC	3.9,4.6 K^-p
10.5 ±1.5		BORENSTEIN 72	HBC	2.18 K^-p
7.70±0.9 ±1.15	940	BROWN 72	MMS	2.5 $\pi^-p \rightarrow nMM$
10.3 ±1.4	510	BIZZARRI 71	HBC	0.0 $p\bar{p} \rightarrow K_1^-K_1^-\omega$
12.8 ±3.0	248	BIZZARRI 71	HBC	0.0 $p\bar{p} \rightarrow K^+K^-\omega$
9.5 ±1.0	3583	COYNE 71	HBC	3.7 $\pi^+p \rightarrow p\pi^+\pi^+\pi^-\pi^0$

¹ Update of AKHMETSHIN 00C.

² From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

³ Relativistic Breit-Wigner includes radiative corrections.

⁴ From the $\rho-\omega$ interference in the $\pi^+\pi^-$ mass spectrum using the Breit-Wigner for the ω and leaving its mass and width as free parameters of the fit.

⁵ Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.

$\omega(782)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 $\pi^+\pi^-\pi^0$	(89.3 \pm 0.6) %	
Γ_2 $\pi^0\gamma$	(8.40 \pm 0.22) %	S=1.8
Γ_3 $\pi^+\pi^-$	(1.53 \pm 0.06) %	
Γ_4 neutrals (excluding $\pi^0\gamma$)	(7 $^{+7}_{-4}$) $\times 10^{-3}$	S=1.1
Γ_5 $\eta\gamma$	(4.5 \pm 0.4) $\times 10^{-4}$	S=1.1
Γ_6 $\pi^0e^+e^-$	(7.7 \pm 0.6) $\times 10^{-4}$	
Γ_7 $\pi^0\mu^+\mu^-$	(1.34 \pm 0.18) $\times 10^{-4}$	S=1.5
Γ_8 ηe^+e^-		
Γ_9 e^+e^-	(7.36 \pm 0.15) $\times 10^{-5}$	S=1.5
Γ_{10} $\pi^+\pi^-\pi^0\pi^0$	< 2 $\times 10^{-4}$	CL=90%
Γ_{11} $\pi^+\pi^-\gamma$	< 3.6 $\times 10^{-3}$	CL=95%
Γ_{12} $\pi^+\pi^-\pi^+\pi^-$	< 1 $\times 10^{-3}$	CL=90%
Γ_{13} $\pi^0\pi^0\gamma$	(6.7 \pm 1.1) $\times 10^{-5}$	
Γ_{14} $\eta\pi^0\gamma$	< 3.3 $\times 10^{-5}$	CL=90%
Γ_{15} $\mu^+\mu^-$	(7.4 \pm 1.8) $\times 10^{-5}$	
Γ_{16} 3γ	< 1.9 $\times 10^{-4}$	CL=95%
Charge conjugation (C) violating modes		
Γ_{17} $\eta\pi^0$	C < 2.2 $\times 10^{-4}$	CL=90%
Γ_{18} $2\pi^0$	C < 2.2 $\times 10^{-4}$	CL=90%
Γ_{19} $3\pi^0$	C < 2.3 $\times 10^{-4}$	CL=90%
Γ_{20} invisible	< 7 $\times 10^{-5}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 15 branching ratios uses 55 measurements and one constraint to determine 10 parameters. The overall fit has a $\chi^2 = 57.0$ for 46 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j)$, in percent, from the fit to 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_2	28								
x_3	-9	-3							
x_4	-95	-55	0						
x_5	7	15	-1	-12					
x_6	-1	0	0	0	0				
x_7	0	0	0	0	0	0			
x_9	-35	-70	3	52	-22	0	0		
x_{13}	1	3	0	-2	0	0	0	-2	
x_{15}	0	0	0	0	0	0	0	0	0
	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_9	x_{13}

$\omega(782)$ PARTIAL WIDTHS

$\Gamma(\pi^0 \gamma)$ Γ_2

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
880 ± 50	7815	¹ ACHASOV	13	SND 1.05–2.00 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$
$788 \pm 12 \pm 27$	36500	² ACHASOV	03	SND 0.60–0.97 $e^+ e^- \rightarrow \pi^0 \gamma$
764 ± 51	10625	DOLINSKY	89	ND $e^+ e^- \rightarrow \pi^0 \gamma$

¹ Systematic uncertainty not estimated.

² Using $\Gamma_\omega = 8.44 \pm 0.09$ MeV and $B(\omega \rightarrow \pi^0 \gamma)$ from ACHASOV 03.

$\Gamma(\eta \gamma)$ Γ_5

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
6.1 ± 2.5	¹ DOLINSKY	89	ND $e^+ e^- \rightarrow \eta \gamma$

¹ Using $\Gamma_\omega = 8.4 \pm 0.1$ MeV and $B(\omega \rightarrow \eta \gamma)$ from DOLINSKY 89.

$\Gamma(e^+ e^-)$ Γ_9

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.60 ± 0.02 OUR EVALUATION				
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.591 ± 0.015	11200	^{1,2} AKHMETSHIN	04	CMD2 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$0.653 \pm 0.003 \pm 0.021$	1.2M	³ ACHASOV	03D	RVUE 0.44–2.00 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.600 ± 0.031	10625	DOLINSKY	89	ND $e^+ e^- \rightarrow \pi^0 \gamma$

¹ Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = 0.891 \pm 0.007$ and $\Gamma_{\text{total}} = 8.44 \pm 0.09$ MeV.

² Update of AKHMETSHIN 00C.

³ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+ \pi^-) = (1.70 \pm 0.28)\%$.

$\omega(782) \Gamma(e^+ e^-) \Gamma(i) / \Gamma^2(\text{total})$

$\Gamma(e^+ e^-) / \Gamma_{\text{total}} \times \Gamma(\pi^+ \pi^- \pi^0) / \Gamma_{\text{total}}$ $\Gamma_g / \Gamma \times \Gamma_1 / \Gamma$

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

6.56 ± 0.12 OUR FIT Error includes scale factor of 1.6.

6.38 ± 0.10 OUR AVERAGE Error includes scale factor of 1.1.

6.24 ± 0.11 ± 0.08 11.2k ¹ AKHMETSHIN 04 CMD2 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

6.70 ± 0.06 ± 0.27 AUBERT,B 04N BABR $10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$

6.74 ± 0.04 ± 0.24 1.2M ^{2,3} ACHASOV 03D RVUE $0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

6.37 ± 0.35 ² DOLINSKY 89 ND $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

6.45 ± 0.24 ² BARKOV 87 CMD $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

5.79 ± 0.42 1488 ² KURDADZE 83B OLYA $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

5.89 ± 0.54 433 ² CORDIER 80 DM1 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

7.54 ± 0.84 451 ² BENAKSAS 72B OSPK $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

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

6.20 ± 0.13 ⁴ BENAYOUN 10 RVUE $0.4-1.05 e^+ e^-$

¹ Update of AKHMETSHIN 00C.

² Recalculated by us from the cross section in the peak.

³ From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+ \pi^- \pi^0$ and ANTONELLI 92 on the $\omega \pi^+ \pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

⁴ A simultaneous fit of $e^+ e^- \rightarrow \pi^+ \pi^-$, $\pi^+ \pi^- \pi^0$, $\pi^0 \gamma$, $\eta \gamma$ data.

$\Gamma(e^+ e^-) / \Gamma_{\text{total}} \times \Gamma(\pi^0 \gamma) / \Gamma_{\text{total}}$ $\Gamma_g / \Gamma \times \Gamma_2 / \Gamma$

VALUE (units 10^{-6}) EVTS DOCUMENT ID TECN COMMENT

6.18 ± 0.11 OUR FIT Error includes scale factor of 1.6.

6.37 ± 0.09 OUR AVERAGE

6.336 ± 0.056 ± 0.089 ¹ ACHASOV 16A SND $0.60-1.38 e^+ e^- \rightarrow \pi^0 \gamma$

6.47 ± 0.14 ± 0.39 18k AKHMETSHIN 05 CMD2 $0.60-1.38 e^+ e^- \rightarrow \pi^0 \gamma$

6.50 ± 0.11 ± 0.20 36k ² ACHASOV 03 SND $0.60-0.97 e^+ e^- \rightarrow \pi^0 \gamma$

6.34 ± 0.21 ± 0.21 10k ³ DOLINSKY 89 ND $e^+ e^- \rightarrow \pi^0 \gamma$

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

6.80 ± 0.13 ⁴ BENAYOUN 10 RVUE $0.4-1.05 e^+ e^-$

¹ From the VMD model with the interfering $\rho(770)$, $\omega(782)$, $\phi(1020)$, and an additional resonance describing the total contribution of the $\rho(1450)$ and $\omega(1420)$ states. Supersedes ACHASOV 03.

² Using $\sigma_{\phi \rightarrow \pi^0 \gamma}$ from ACHASOV 00 and $m_\omega = 782.57$ MeV in the model with the energy-independent phase of ρ - ω interference equal to $(-10.2 \pm 7.0)^\circ$.

³ Recalculated by us from the cross section in the peak.

⁴ A simultaneous fit of $e^+ e^- \rightarrow \pi^+ \pi^-$, $\pi^+ \pi^- \pi^0$, $\pi^0 \gamma$, $\eta \gamma$ data.

$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$ $\Gamma_9/\Gamma \times \Gamma_3/\Gamma$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
1.225±0.058±0.041	800k	¹ ACHASOV 06	SND	$e^+e^- \rightarrow \pi^+\pi^-$
1.166±0.036		² BENAYOUN 13	RVUE	0.4–1.05 e^+e^-
1.05 ±0.08		³ DAVIER 13	RVUE	$e^+e^- \rightarrow \pi^+\pi^-(\gamma)$

- • • We do not use the following data for averages, fits, limits, etc. • • •
- ¹Supersedes ACHASOV 05A.
- ²A simultaneous fit to $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma, K\bar{K}$, and $\tau^- \rightarrow \pi^-\pi^0\nu_\tau$ data. Supersedes BENAYOUN 10.
- ³From $e^+e^- \rightarrow \pi^+\pi^-(\gamma)$ data of LEES 12G.

$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}$ $\Gamma_9/\Gamma \times \Gamma_5/\Gamma$

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT
3.32±0.28 OUR FIT	Error includes scale factor of 1.1.			
3.18±0.28 OUR AVERAGE				
3.10±0.31±0.11	33k	¹ ACHASOV 07B	SND	0.6–1.38 $e^+e^- \rightarrow \eta\gamma$
3.17 ^{+1.85} _{-1.31} ±0.21	17.4k	² AKHMETSHIN 05	CMD2	0.60–1.38 $e^+e^- \rightarrow \eta\gamma$
3.41±0.52±0.21	23k	^{3,4} AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$

- • • We do not use the following data for averages, fits, limits, etc. • • •
- 4.50±0.10 ⁵BENAYOUN 10 RVUE 0.4–1.05 e^+e^-
- ¹From a combined fit of $\sigma(e^+e^- \rightarrow \eta\gamma)$ with $\eta \rightarrow 3\pi^0$ and $\eta \rightarrow \pi^+\pi^-\pi^0$, and fixing $B(\eta \rightarrow 3\pi^0) / B(\eta \rightarrow \pi^+\pi^-\pi^0) = 1.44 \pm 0.04$. Recalculated by us from the cross section at the peak. Supersedes ACHASOV 00D and ACHASOV 06A.
- ²From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.
- ³From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.
- ⁴The 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).
- ⁵A simultaneous fit of $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$ data.

$\Gamma(e^+e^-)/\Gamma_{\text{total}} \times \Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$ $\Gamma_9/\Gamma \times \Gamma_{15}/\Gamma$

VALUE (units 10^{-9})	EVTS	DOCUMENT ID	TECN	COMMENT
4.3±1.8±2.2	4.5M	¹ ANASTASI 17	KLOE	$e^+e^- \rightarrow \mu^+\mu^-\gamma$

- ¹From a fit of the real part of the vacuum polarization by a sum of the leptonic and hadronic contributions, where the hadronic contribution is parametrized as a sum of Breit-Wigner resonances $\omega(782)$, $\phi(1020)$ and using a GOUNARIS 68 parametrization for the $\rho(770)$, and a non-resonant term.

$\omega(782)$ BRANCHING RATIOS

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_1/Γ

NIECKNIG 12 describes final-state interactions between the three pions in a dispersive framework using data on the $\pi\pi$ *P*-wave scattering phase shift.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.9024±0.0019		¹ AMBROSINO 08G	KLOE	1.0–1.03 $e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$
0.8965±0.0016±0.0048	1.2M	^{2,3} ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.880 ±0.020 ±0.032	11200	^{3,4} AKHMETSHIN 00C	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.8942±0.0062		³ DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$

¹ Not independent of $\Gamma(\pi^0\gamma) / \Gamma(\pi^+\pi^-\pi^0)$ from AMBROSINO 08G.

² Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$.

³ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}^2$.

⁴ Using $\Gamma(e^+e^-) = 0.60 \pm 0.02$ keV.

$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
8.88±0.18		¹ ACHASOV 16A	SND	0.60–1.38 $e^+e^- \rightarrow \pi^0\gamma$
8.09±0.14		² AMBROSINO 08G	KLOE	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$
9.06±0.20±0.57	18k	^{3,4} AKHMETSHIN 05	CMD2	0.60–1.38 $e^+e^- \rightarrow \pi^0\gamma$
9.34±0.15±0.31	36k	⁴ ACHASOV 03	SND	0.60–0.97 $e^+e^- \rightarrow \pi^0\gamma$
8.65±0.16±0.42	1.2M	^{5,6} ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.39±0.24	9k	⁷ BENAYOUN 96	RVUE	$e^+e^- \rightarrow \pi^0\gamma$
8.88±0.62	10k	⁴ DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\gamma$

¹ Using $B(\omega \rightarrow e^+e^-)$ from PDG 15. Supersedes ACHASOV 03.

² Not independent of $\Gamma(\pi^0\gamma) / \Gamma(\pi^+\pi^-\pi^0)$ from AMBROSINO 08G.

³ Using $B(\omega \rightarrow e^+e^-) = (7.14 \pm 0.13) \times 10^{-5}$.

⁴ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$.

⁵ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$.

⁶ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}^2$.

⁷ Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.

$\Gamma(\pi^0\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_2/Γ_1

VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
9.41±0.23 OUR FIT	Error includes scale factor of 2.0.		
9.05±0.27 OUR AVERAGE	Error includes scale factor of 1.8.		
8.97±0.16	AMBROSINO 08G	KLOE	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$
9.94±0.36±0.38	¹ AULCHENKO 00A	SND	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$
8.4 ±1.3	KEYNE 76	CNTR	$\pi^-p \rightarrow \omega n$
10.9 ±2.5	BENAKSAS 72C	OSPK	$e^+e^- \rightarrow \pi^0\gamma$
8.1 ±2.0	BALDIN 71	HLBC	2.9 π^+p
13 ±4	JACQUET 69B	HLBC	2.05 $\pi^+p \rightarrow \pi^+p\omega$

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

9.7 ±0.2 ±0.5 ^{2,3} ACHASOV 03D RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$

9.9 ±0.7 ² DOLINSKY 89 ND $e^+e^- \rightarrow \pi^0\gamma$

¹ From $\sigma_0^{\omega\pi^0 \rightarrow \pi^0\pi^0\gamma}(m_\phi)/\sigma_0^{\omega\pi^0 \rightarrow \pi^+\pi^-\pi^0\pi^0}(m_\phi)$ with a phase-space correction factor of 1/1.023.

² Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$.

³ Using ACHASOV 03. Based on 1.2M events.

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

Γ_3/Γ

See also $\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.53±0.06 OUR FIT				
1.51±0.07 OUR AVERAGE				Error includes scale factor of 1.1.
1.52±0.08		¹ HANHART 18	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1.46±0.12±0.02	900k	² AKHMETSHIN 07		$e^+e^- \rightarrow \pi^+\pi^-$
1.30±0.24±0.05	11.2k	³ AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-$
2.38 ^{+1.77} _{-0.90} ±0.18	5.4k	⁴ ACHASOV 02E	SND	1.1–1.38 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
2.3 ±0.5		BARKOV 85	OLYA	$e^+e^- \rightarrow \pi^+\pi^-$
1.6 ^{+0.9} _{-0.7}		QUENZER 78	DM1	$e^+e^- \rightarrow \pi^+\pi^-$
3.6 ±1.9		BENAKSAS 72	OSPK	$e^+e^- \rightarrow \pi^+\pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1.24±0.21±0.06	970k	^{5,6} ABLIKIM 18C	BES3	$\eta'(958) \rightarrow \gamma\pi^+\pi^-$
1.23±0.21±0.06	970k	^{7,8} ABLIKIM 18C	BES3	$\eta'(958) \rightarrow \gamma\pi^+\pi^-$
1.75±0.11	4.5M	⁹ ACHASOV 05A	SND	$e^+e^- \rightarrow \pi^+\pi^-$
2.01±0.29		¹⁰ BENAYOUN 03	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1.9 ±0.3		¹¹ GARDNER 99	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
2.3 ±0.4		¹² BENAYOUN 98	RVUE	$e^+e^- \rightarrow \pi^+\pi^-, \mu^+\mu^-$
1.0 ±0.11		¹³ WICKLUND 78	ASPK	3,4,6 $\pi^\pm N$
1.22±0.30		ALVENSLEB... 71C	CNTR	Photoproduction
1.3 ^{+1.2} _{-0.9}		MOFFEIT 71	HBC	2.8,4.7 γp
0.80 ^{+0.28} _{-0.20}		¹⁴ BIGGS 70B	CNTR	4.2 $\gamma C \rightarrow \pi^+\pi^- C$

¹ Dispersive analysis. Value extracted from average of data from AUBERT 09AS, AKHMETSHIN 07, ACHASOV 06, AMBROSINO 11A, BABUSCI 13D, ABLIKIM 16B normalised by PDG evaluation for $\Gamma(\omega \rightarrow e^+e^-)$.

² A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.

³ Update of AKHMETSHIN 02.

⁴ From the $m_{\pi^+\pi^-}$ spectrum taking into account the interference of the $\rho\pi$ and $\omega\pi$ amplitudes.

⁵ From a fit to $\pi^+\pi^-$ mass using $\rho(770)$ (parametrized with the Gounaris-Sakurai approach), $\omega(782)$, and box anomaly components.

⁶ ABLIKIM 18C reports $[\Gamma(\omega(782) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\eta'(958) \rightarrow \omega\gamma)] = (3.25 \pm 0.21 \pm 0.52) \times 10^{-4}$ which we divide by our best value $B(\eta'(958) \rightarrow \omega\gamma) = (2.62 \pm 0.13) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁷ From a fit to $\pi^+\pi^-$ mass using $\rho(770)$ (parametrized with the Gounaris-Sakurai approach), $\omega(782)$, and $\rho(1450)$ components.

⁸ ABLIKIM 18C reports $[\Gamma(\omega(782) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\eta'(958) \rightarrow \omega\gamma)] = (3.22 \pm 0.21 \pm 0.52) \times 10^{-4}$ which we divide by our best value $B(\eta'(958) \rightarrow \omega\gamma) = (2.62 \pm 0.13) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

⁹ Using $\Gamma(\omega \rightarrow e^+e^-)$ from the 2004 Edition of this Review (PDG 04).

¹⁰ Using the data of AKHMETSHIN 02 in the hidden local symmetry model.

¹¹ Using the data of BARKOV 85.

¹² Using the data of BARKOV 85 in the hidden local symmetry model.

¹³ From a model-dependent analysis assuming complete coherence.

¹⁴ Re-evaluated under $\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$ by BEHREND 71 using more accurate $\omega \rightarrow \rho$ photoproduction cross-section ratio.

$\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_3/Γ_1

See also $\Gamma(\pi^+\pi^-)/\Gamma_{\text{total}}$.

VALUE	DOCUMENT ID	TECN	COMMENT
0.0171±0.0007 OUR FIT			
0.026 ±0.005 OUR AVERAGE			
0.021 ^{+0.028} / _{-0.009}	1,2 RATCLIFF	72	ASPK 15 $\pi^- p \rightarrow n2\pi$
0.028 ±0.006	1 BEHREND	71	ASPK Photoproduction
0.022 ^{+0.009} / _{-0.01}	3 ROOS	70	RVUE

¹The fitted width of these data is 160 MeV in agreement with present average, thus the ω contribution is overestimated. Assuming ρ width 145 MeV.

²Significant interference effect observed. NB of $\omega \rightarrow 3\pi$ comes from an extrapolation.

³ROOS 70 combines ABRAMOVICH 70 and BIZZARRI 70.

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.20±0.04	1.98M	1 ALOISIO	03	KLOE 1.02 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$

¹Using the data of ALOISIO 02D.

$\Gamma(\text{neutrals})/\Gamma_{\text{total}}$ $(\Gamma_2+\Gamma_4)/\Gamma$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.091±0.006 OUR FIT				
0.081±0.011 OUR AVERAGE				
0.075±0.025		BIZZARRI	71	HBC 0.0 $p\bar{p}$
0.079±0.019		DEINET	69B	OSPK 1.5 $\pi^- p$
0.084±0.015		BOLLINI	68C	CNTR 2.1 $\pi^- p$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.073±0.018	42	BASILE	72B	CNTR 1.67 $\pi^- p$

$\Gamma(\text{neutrals})/\Gamma(\pi^+\pi^-\pi^0)$ $(\Gamma_2+\Gamma_4)/\Gamma_1$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.102±0.008 OUR FIT				
0.103^{+0.011}/_{-0.010} OUR AVERAGE				
0.15 ±0.04	46	AGUILAR-...	72B	HBC 3.9,4.6 $K^- p$
0.10 ±0.03	19	BARASH	67B	HBC 0.0 $\bar{p}p$
0.134±0.026	850	DIGIUGNO	66B	CNTR 1.4 $\pi^- p$
0.097±0.016	348	FLATTE	66	HBC 1.4 – 1.7 $K^- p \rightarrow \Lambda MM$
0.06 ^{+0.05} / _{-0.02}		JAMES	66	HBC 2.1 $\pi^+ p$
0.08 ±0.03	35	KRAEMER	64	DBC 1.2 $\pi^+ d$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.11 ±0.02	20	BUSCHBECK	63	HBC 1.5 $K^- p$

$\Gamma(\pi^0\gamma)/\Gamma(\text{neutrals})$ $\Gamma_2/(\Gamma_2+\Gamma_4)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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- • • We do not use the following data for averages, fits, limits, etc. • • •
- 0.78±0.07 ¹ DAKIN 72 OSPK 1.4 $\pi^- p \rightarrow nMM$
- >0.81 90 DEINET 69B OSPK

¹ Error statistical only. Authors obtain good fit also assuming $\pi^0\gamma$ as the only neutral decay.

$\Gamma(\text{neutrals})/\Gamma(\text{charged particles})$ $(\Gamma_2+\Gamma_4)/(\Gamma_1+\Gamma_3)$

VALUE	DOCUMENT ID	TECN	COMMENT
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- 0.100±0.008 OUR FIT**
- 0.124±0.021** FELDMAN 67C OSPK 1.2 $\pi^- p$

$\Gamma(\eta\gamma)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
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- 4.5 ±0.4 OUR FIT** Error includes scale factor of 1.1.
- 6.3 ±1.3 OUR AVERAGE** Error includes scale factor of 1.2.
- 6.6 ±1.7 ¹ ABELE 97E CBAR 0.0 $\bar{p}p \rightarrow 5\gamma$
- 8.3 ±2.1 ALDE 93 GAM2 38 $\pi^- p \rightarrow \omega n$
- 3.0 ^{+2.5}/_{-1.8} ² ANDREWS 77 CNTR 6.7–10 γCu

- • • We do not use the following data for averages, fits, limits, etc. • • •
- 4.2 ±0.4 ±0.1 33k ³ ACHASOV 07B SND 0.6–1.38 $e^+e^- \rightarrow \eta\gamma$
- 4.44 ^{+2.59}/_{-1.83} ±0.28 17.4k ^{4,5} AKHMETSHIN 05 CMD2 0.60-1.38 $e^+e^- \rightarrow \eta\gamma$
- 5.10±0.72±0.34 23k ⁶ AKHMETSHIN 01B CMD2 $e^+e^- \rightarrow \eta\gamma$
- 0.7 to 5.5 ⁷ CASE 00 CBAR 0.0 $p\bar{p} \rightarrow \eta\eta\gamma$
- 6.56 ^{+2.41}/_{-2.55} 3525 ^{2,8} BENAYOUN 96 RVUE $e^+e^- \rightarrow \eta\gamma$
- 7.3 ±2.9 ^{2,4} DOLINSKY 89 ND $e^+e^- \rightarrow \eta\gamma$

¹ No flat $\eta\eta\gamma$ background assumed.
² Solution corresponding to constructive ω - ρ interference.
³ ACHASOV 07B reports $[\Gamma(\omega(782) \rightarrow \eta\gamma)/\Gamma_{\text{total}}] \times [B(\omega(782) \rightarrow e^+e^-)] = (3.10 \pm 0.31 \pm 0.11) \times 10^{-8}$ which we divide by our best value $B(\omega(782) \rightarrow e^+e^-) = (7.36 \pm 0.15) \times 10^{-5}$. 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.
⁴ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.
⁵ Using $B(\omega \rightarrow e^+e^-) = (7.14 \pm 0.13) \times 10^{-5}$ and $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.
⁶ Using $B(\omega \rightarrow e^+e^-) = (7.07 \pm 0.19) \times 10^{-5}$ and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$. Solution corresponding to constructive ω - ρ interference. 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). Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.
⁷ Depending on the degree of coherence with the flat $\eta\eta\gamma$ background and using $B(\omega \rightarrow \pi^0\gamma) = (8.5 \pm 0.5) \times 10^{-2}$.
⁸ Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.

$\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$

Γ_5/Γ_2

VALUE DOCUMENT ID TECN COMMENT

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

0.0098 ± 0.0024	¹ ALDE	93	GAM2	$38\pi^- p \rightarrow \omega n$
0.0082 ± 0.0033	² DOLINSKY	89	ND	$e^+e^- \rightarrow \eta\gamma$
0.010 ± 0.045	APEL	72B	OSPK	$4-8 \pi^- p \rightarrow n3\gamma$

¹ Model independent determination.

² Solution corresponding to constructive ω - ρ interference.

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

Γ_6/Γ

VALUE (units 10^{-4}) EVTS DOCUMENT ID TECN COMMENT

7.7 \pm 0.6 OUR FIT

7.7 \pm 0.6 OUR AVERAGE

$7.61 \pm 0.53 \pm 0.64$		ACHASOV	08	SND	$0.36-0.97 e^+e^- \rightarrow \pi^0 e^+e^-$
$8.19 \pm 0.71 \pm 0.62$		AKHMETSHIN	05A	CMD2	$0.72-0.84 e^+e^-$
5.9 ± 1.9	43	DOLINSKY	88	ND	$e^+e^- \rightarrow \pi^0 e^+e^-$

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma_{\text{total}}$

Γ_7/Γ

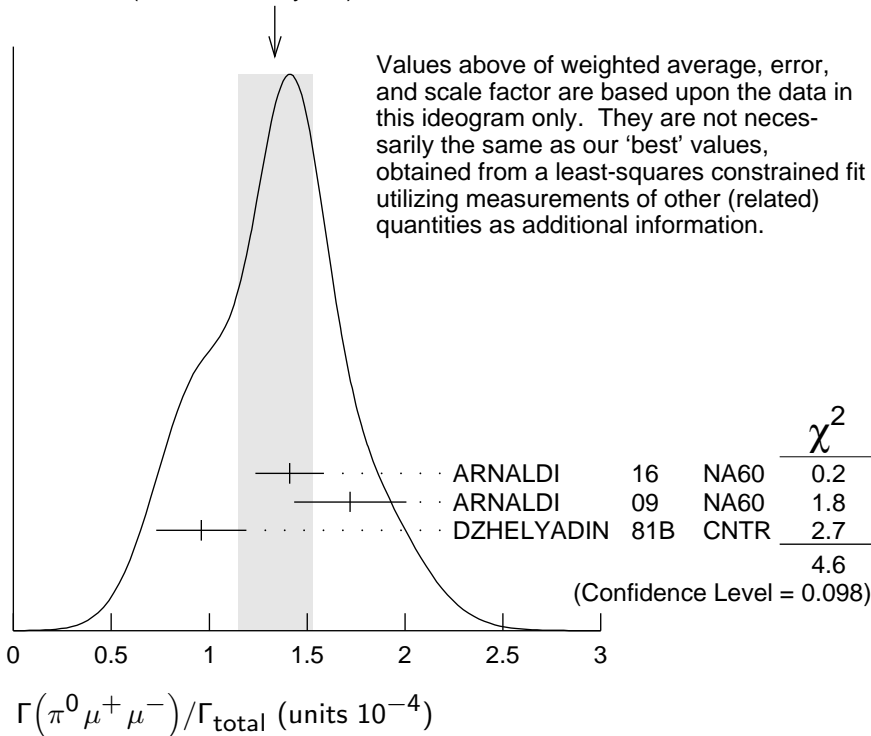
VALUE (units 10^{-4}) EVTS DOCUMENT ID TECN COMMENT

1.34 \pm 0.18 OUR FIT Error includes scale factor of 1.5.

1.34 \pm 0.19 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.

$1.41 \pm 0.09 \pm 0.15$		ARNALDI	16	NA60	400 GeV (p -A) collisions
$1.72 \pm 0.25 \pm 0.14$	3k	ARNALDI	09	NA60	158A In-In collisions
0.96 ± 0.23		DZHELYADIN	81B	CNTR	$25-33 \pi^- p \rightarrow \omega n$

WEIGHTED AVERAGE
1.34 \pm 0.19 (Error scaled by 1.5)



$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
<1.1	AKHMETSHIN 05A	CMD2	0.72-0.84 $e^+ e^-$

$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$ Γ_9/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
0.736 ± 0.015 OUR FIT				Error includes scale factor of 1.5.
0.700 ± 0.016	11200	^{1,2} AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$0.752 \pm 0.004 \pm 0.024$	1.2M	^{2,3} ACHASOV 03D	RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.714 ± 0.036		² DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.72 ± 0.03		² BARKOV 87	CMD	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.64 ± 0.04	1488	² KURDADZE 83B	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.675 ± 0.069	433	² CORDIER 80	DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.83 ± 0.10	451	² BENAKSAS 72B	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.77 ± 0.06		⁴ AUGUSTIN 69D	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.65 ± 0.13	33	⁵ ASTVACAT...	68 OSPK	Assume SU(3)+mixing

- ¹ Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = 0.891 \pm 0.007$. Update of AKHMETSHIN 00C.
² Not independent of the corresponding $\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}^2$.
³ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+ \pi^-) = (1.70 \pm 0.28)\%$.
⁴ Rescaled by us to correspond to ω width 8.4 MeV. Systematic errors underestimated.
⁵ Not resolved from ρ decay. Error statistical only.

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
< 2	90	ACHASOV 09A	SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$
<200	90	KURDADZE 86	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \pi^0$

$\Gamma(\pi^+ \pi^- \gamma)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0036	95	WEIDENAUER 90	ASTE	$\rho \bar{p} \rightarrow \pi^+ \pi^- \pi^+ \pi^- \gamma$
<0.004	95	BITYUKOV 88B	SPEC	$32 \pi^- p \rightarrow \pi^+ \pi^- \gamma X$

$\Gamma(\pi^+ \pi^- \gamma)/\Gamma(\pi^+ \pi^- \pi^0)$ Γ_{11}/Γ_1

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.066	90	KALBFLEISCH 75	HBC	$2.18 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$
<0.05	90	FLATTE 66	HBC	$1.2 - 1.7 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1 \times 10^{-3}$	90	KURDADZE 88	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^-$

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

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
6.7 ± 1.1				OUR FIT
6.5 ± 1.2				OUR AVERAGE

$6.4^{+2.4}_{-2.0} \pm 0.8$	190	¹ AKHMETSHIN 04B	CMD2	0.6–0.97 $e^+e^- \rightarrow \pi^0\pi^0\gamma$
$6.6^{+1.4}_{-1.3} \pm 0.6$	295	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. • • •

$11.8^{+2.1}_{-1.9} \pm 1.4$	190	² AKHMETSHIN 04B	CMD2	0.6–0.97 $e^+e^- \rightarrow \pi^0\pi^0\gamma$
$7.8 \pm 2.7 \pm 2.0$	63	^{1,3} ACHASOV 00G	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
$12.7 \pm 2.3 \pm 2.5$	63	^{2,3} ACHASOV 00G	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$

¹In the model assuming the $\rho \rightarrow \pi^0\pi^0\gamma$ decay via the $\omega\pi$ and $f_0(500)\gamma$ mechanisms.

²In the model assuming the $\rho \rightarrow \pi^0\pi^0\gamma$ decay via the $\omega\pi$ mechanism only.

³Superseded by ACHASOV 02F.

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.00045	90	DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$

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

<0.08	95	JACQUET 69B	HLBC	2.05 $\pi^+p \rightarrow \pi^+p\omega$
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 $\Gamma(\pi^0\pi^0\gamma)/\Gamma(\pi^0\gamma)$ Γ_{13}/Γ_2

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
7.9 ± 1.3					OUR FIT
8.5 ± 2.9		40 ± 14	ALDE 94B	GAM2	$38\pi^-p \rightarrow \pi^0\pi^0\gamma n$

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

< 50	90	DOLINSKY 89	ND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
<1800	95	KEYNE 76	CNTR	$\pi^-p \rightarrow \omega n$
<1500	90	BENAKSAS 72C	OSPK	e^+e^-
<1400		BALDIN 71	HLBC	2.9 π^+p
<1000	90	BARMIN 64	HLBC	1.3–2.8 π^-p

 $\Gamma(\pi^0\pi^0\gamma)/\Gamma(\text{neutrals})$ $\Gamma_{13}/(\Gamma_2+\Gamma_4)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
0.22 ± 0.07		¹ DAKIN 72	OSPK	1.4 $\pi^-p \rightarrow nMM$
<0.19	90	DEINET 69B	OSPK	

¹See $\Gamma(\pi^0\gamma)/\Gamma(\text{neutrals})$.

 $\Gamma(\eta\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<3.3	90	AKHMETSHIN 04B	CMD2	0.6–0.97 $e^+e^- \rightarrow \eta\pi^0\gamma$

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

VALUE (units 10^{-5}) EVTS DOCUMENT ID TECN COMMENT

7.4±1.8 OUR FIT

7.4±1.8 OUR AVERAGE

6.6±1.4±1.7	4.5M	¹ ANASTASI	17	KLOE	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
9.0±2.9±1.1	18	HEISTER	02C	ALEP	$Z \rightarrow \mu^+\mu^- + X$

¹ Assuming lepton universality in the decay $\omega \rightarrow \ell^+\ell^-$ and correcting for different phase space between electron and muon final states.

$\Gamma(\mu^+\mu^-)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{15}/Γ_1

VALUE (units 10^{-3}) CL% DOCUMENT ID TECN COMMENT

<0.2 90 WILSON 69 OSPK $12 \pi^- C \rightarrow \text{Fe}$

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

<1.7 74 FLATTE 66 HBC $1.2 - 1.7 K^- p \rightarrow \Lambda \mu^+ \mu^-$

<1.2 BARBARO-... 65 HBC $2.7 K^- p$

$\Gamma(\pi^0\mu^+\mu^-)/\Gamma(\mu^+\mu^-)$ Γ_7/Γ_{15}

VALUE EVTS DOCUMENT ID TECN COMMENT

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

1.2±0.6 30 ¹ DZHELYADIN 79 CNTR $25-33 \pi^- p$

¹ Superseded by DZHELYADIN 81B result above.

$\Gamma(3\gamma)/\Gamma_{\text{total}}$ Γ_{16}/Γ

VALUE (units 10^{-4}) CL% DOCUMENT ID TECN COMMENT

<1.9 95 ¹ ABELE 97E CBAR $0.0 \bar{p} p \rightarrow 5\gamma$

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

<2 90 ¹ PROKOSHKIN 95 GAM2 $38 \pi^- p \rightarrow 3\gamma n$

¹ From direct 3γ decay search.

$\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$ Γ_{17}/Γ

Violates C conservation.

VALUE CL% DOCUMENT ID TECN COMMENT

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

<0.001 90 ALDE 94B GAM2 $38\pi^- p \rightarrow \eta\pi^0 n$

$[\Gamma(\eta\gamma) + \Gamma(\eta\pi^0)]/\Gamma(\pi^+\pi^-\pi^0)$ $(\Gamma_5+\Gamma_{17})/\Gamma_1$

VALUE CL% DOCUMENT ID TECN COMMENT

<0.016 90 ¹ FLATTE 66 HBC $1.2 - 1.7 K^- p \rightarrow \Lambda \pi^+ \pi^- \text{MM}$

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

<0.045 95 JACQUET 69B HLBC $2.05 \pi^+ p \rightarrow \pi^+ p \omega$

¹ Restated by us using $B(\eta \rightarrow \text{charged modes}) = 29.2\%$.

$\Gamma(\eta\pi^0)/\Gamma(\pi^0\gamma)$ Γ_{17}/Γ_2
 Violates C conservation.

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.6	90	¹ STAROSTIN 09	CRYM	$\gamma p \rightarrow \eta\pi^0 p$
¹ STAROSTIN 09 reports $[\Gamma(\omega(782) \rightarrow \eta\pi^0)/\Gamma(\omega(782) \rightarrow \pi^0\gamma)] \times [B(\eta \rightarrow 2\gamma)] < 1.01 \times 10^{-3}$ which we divide by our best value $B(\eta \rightarrow 2\gamma) = 39.41 \times 10^{-2}$.				

$\Gamma(2\pi^0)/\Gamma(\pi^0\gamma)$ Γ_{18}/Γ_2
 Violates C conservation and Bose-Einstein statistics.

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.59	90	STAROSTIN 09	CRYM	$\gamma p \rightarrow 2\pi^0 p$

$\Gamma(3\pi^0)/\Gamma_{\text{total}}$ Γ_{19}/Γ
 Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<3 × 10⁻⁴	90	PROKOSHKIN 95	GAM2	$38 \pi^- p \rightarrow 3\pi^0 n$

$\Gamma(3\pi^0)/\Gamma(\pi^0\gamma)$ Γ_{19}/Γ_2
 Violates C conservation.

VALUE (units 10^{-3})	CL%	DOCUMENT ID	TECN	COMMENT
<2.72	90	STAROSTIN 09	CRYM	$\gamma p \rightarrow 3\pi^0 p$

$\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{19}/Γ_1
 Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.009	90	BARBERIS 01	450	$p p \rightarrow p_f 3\pi^0 p_s$

$\Gamma(\text{invisible})/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{20}/Γ_1

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<8.1 × 10⁻⁵	90	ABLIKIM 18S	BES3	$J/\psi \rightarrow \omega\eta \rightarrow \omega\pi^+\pi^-\pi^0$

PARAMETER Λ IN $\omega \rightarrow \pi^0\ell^+\ell^-$ DECAY

In the pole approximation the electromagnetic transition form factor for a resonance of mass M is given by the expression:

$$|F|^2 = (1 - M^2/\Lambda^2)^{-2},$$

where for the parameter Λ vector dominance predicts $\Lambda = M_p \approx 0.770$ GeV. The ARNALDI 09 measurement is in obvious conflict with this expectation. Note that for $\eta \rightarrow \gamma\mu^+\mu^-$ decay ARNALDI 09 and DZHELYADIN 80 obtain the value of Λ consistent with vector dominance.

PARAMETER Λ IN $\omega \rightarrow \pi^0\mu^+\mu^-$ DECAY

VALUE (GeV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.670 ± 0.006 OUR AVERAGE				
0.6707 ± 0.0039 ± 0.0056		¹ ARNALDI 16	NA60	400 GeV (p -A) collisions
0.668 ± 0.009 ± 0.003	3k	² ARNALDI 09	NA60	158A In-In collisions
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.65 ± 0.03		DZHELYADIN 81B	CNTR	25-33 $\pi^- p \rightarrow \omega n$

¹ ARNALDI 16 reports $\Lambda^{-2}(\omega) = 2.223 \pm 0.026 \pm 0.037 \text{ GeV}^{-2}$ which we converted to the quoted Λ value.

² ARNALDI 09 reports $\Lambda^{-2}(\omega) = 2.24 \pm 0.06 \pm 0.02 \text{ GeV}^{-2}$ which we converted to the quoted Λ value.

PARAMETER Λ IN $\omega \rightarrow \pi^0 e^+ e^-$ DECAY

VALUE (GeV)	EVTS	DOCUMENT ID	TECN	COMMENT
0.709 ± 0.037	1.1k	¹ ADLARSON	17B A2MM	$\gamma p \rightarrow \omega p$

¹ ADLARSON 17B reports $\Lambda^{-2}(\omega\pi^0) = 1.99 \pm 0.21 \text{ GeV}^{-2}$ that we converted to the quoted Λ value.

ENERGY DEPENDENCE OF $\omega \rightarrow \pi^+ \pi^- \pi^0$ DALITZ PLOT

The following experiments fit to one or more of the coefficients α, β, γ for |matrix element|² $\propto P (1 + 2\alpha Z + 2\beta Z^{3/2} \sin(3\phi) + 2\gamma Z^2 + O(Z^{5/2}))$ where P is the P -wave phase-space factor and Z, ϕ are kinematical variables as defined in ADLARSON 17.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.133 ± 0.008 OUR AVERAGE				
0.1321 ± 0.0067 ± 0.0046	260k	¹ ABLIKIM	18AD BES3	$J/\psi \rightarrow \omega\eta$
0.147 ± 0.036	44k	ADLARSON	17 WASA	α in $pd \rightarrow {}^3\text{He } \omega$, $pp \rightarrow pp\omega$

¹ Keeping a term linear in Z only. A fit with the terms proportional to Z and $Z^{3/2}$ gives $\alpha = 0.133 \pm 0.041$ and $\beta = 0.037 \pm 0.054$.

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