

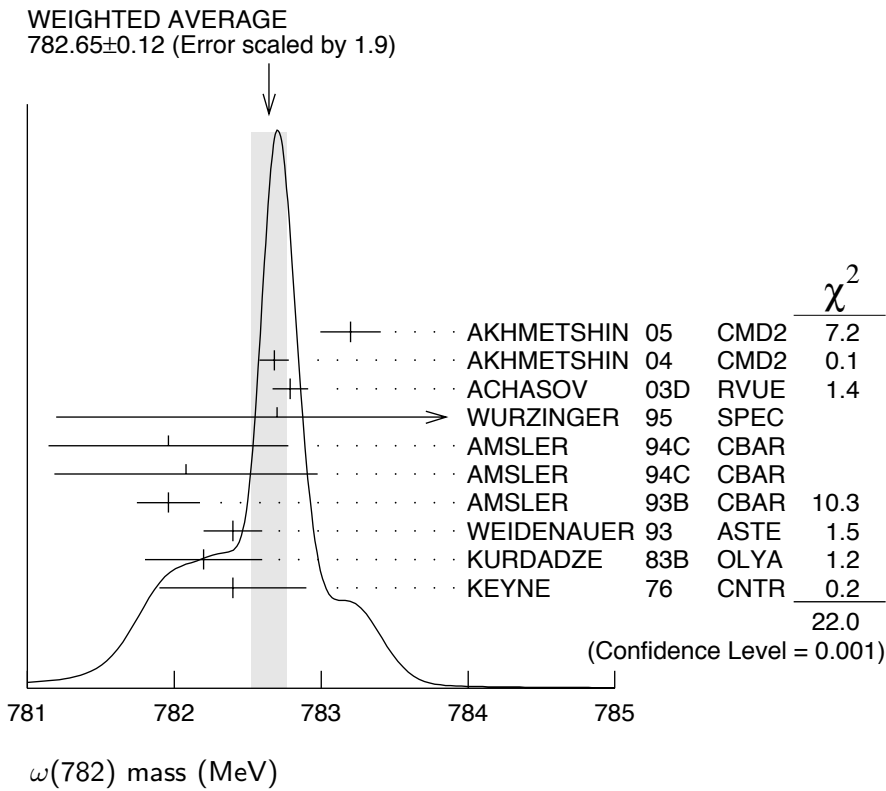
$\omega(782)$

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

 $\omega(782)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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. ● ● ●				
781.78±0.10		⁶ 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	⁷ 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		⁸ 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 Systematic uncertainties underestimated.⁷ From best-resolution sample of COYNE 71.⁸ From ω - ρ 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	⁹ AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.68±0.04±0.15	1.2M	¹⁰ 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		¹¹ 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. ● ● ●				
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	¹² 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 $\pi^+p \rightarrow p\pi^+\pi^+\pi^-\pi^0$

⁹ Update of AKHMETSHIN 00C.

¹⁰ 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.

¹¹ Relativistic Breit-Wigner includes radiative corrections.

¹² 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 $\pi^+\pi^-\pi^0$	(89.2 \pm 0.7) %	
Γ_2 $\pi^0\gamma$	(8.92 \pm 0.24) %	S=1.1
Γ_3 $\pi^+\pi^-$	(1.53 $^{+0.11}_{-0.13}$) %	S=1.2
Γ_4 neutrals (excluding $\pi^0\gamma$)	(1.5 $^{+7.4}_{-1.0}$) $\times 10^{-3}$	
Γ_5 $\eta\gamma$	(4.6 \pm 0.4) $\times 10^{-4}$	S=1.1
Γ_6 $\pi^0e^+e^-$	(7.7 \pm 0.9) $\times 10^{-4}$	S=1.1
Γ_7 $\pi^0\mu^+\mu^-$	(9.6 \pm 2.3) $\times 10^{-5}$	
Γ_8 ηe^+e^-		
Γ_9 e^+e^-	(7.16 \pm 0.12) $\times 10^{-5}$	S=1.1
Γ_{10} $\pi^+\pi^-\pi^0\pi^0$	< 2 %	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} $\mu^+\mu^-$	(9.0 \pm 3.1) $\times 10^{-5}$	
Γ_{16} 3γ	< 1.9 $\times 10^{-4}$	CL=95%
Charge conjugation (C) violating modes		
Γ_{17} $\eta\pi^0$	C < 1 $\times 10^{-3}$	CL=90%
Γ_{18} $3\pi^0$	C < 3 $\times 10^{-4}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 15 branching ratios uses 48 measurements and one constraint to determine 10 parameters. The overall fit has a $\chi^2 = 35.4$ for 39 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	27								
x_3	-18	-5							
x_4	-93	-56	1						
x_5	7	10	-1	-10					
x_6	-1	0	0	0	0				
x_7	0	0	0	0	0	0			
x_9	-42	-53	8	53	-19	1	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
$788 \pm 12 \pm 27$	36500	¹³ ACHASOV 03	SND	$0.60-0.97 e^+ e^- \rightarrow \pi^0 \gamma$
764 ± 51	10625	DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^0 \gamma$

¹³ 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
6.1 ± 2.5	¹⁴ DOLINSKY 89	ND	$e^+ e^- \rightarrow \eta \gamma$

¹⁴ 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	^{15,16} AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$0.653 \pm 0.003 \pm 0.021$	1.2M	¹⁷ ACHASOV 03D	RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.600 ± 0.031	10625	DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^0 \gamma$

¹⁵ Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = 0.891 \pm 0.007$ and $\Gamma_{\text{total}} = 8.44 \pm 0.09$ MeV.

¹⁶ Update of AKHMETSHIN 00C.

¹⁷ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+ \pi^-) = (1.70 \pm 0.28)\%$.

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

$\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^- \pi^0) / \Gamma_{\text{total}}^2$ $\Gamma_9 \Gamma_1 / \Gamma^2$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
6.39±0.10 OUR FIT				Error includes scale factor of 1.1.
6.38±0.10 OUR AVERAGE				Error includes scale factor of 1.1.
6.24±0.11±0.08	11.2k	¹⁸ 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	^{19,20} ACHASOV 03D	RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
6.37±0.35		¹⁹ DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
6.45±0.24		¹⁹ BARKOV 87	CMD	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
5.79±0.42	1488	¹⁹ KURDADZE 83B	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
5.89±0.54	433	¹⁹ CORDIER 80	DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
7.54±0.84	451	¹⁹ BENAKSAS 72B	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

¹⁸ Update of AKHMETSHIN 00c.

¹⁹ Recalculated by us from the cross section in the peak.

²⁰ 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.

$\Gamma(e^+ e^-) \times \Gamma(\pi^0 \gamma) / \Gamma_{\text{total}}^2$ $\Gamma_9 \Gamma_2 / \Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
6.39±0.15 OUR FIT				
6.45±0.17 OUR AVERAGE				
6.47±0.14±0.39	18680	AKHMETSHIN 05	CMD2	$0.60-1.38 e^+ e^- \rightarrow \pi^0 \gamma$
6.50±0.11±0.20	36500	²¹ ACHASOV 03	SND	$0.60-0.97 e^+ e^- \rightarrow \pi^0 \gamma$
6.34±0.21±0.21	10625	²² DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^0 \gamma$

²¹ 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 $(-10.2 \pm 7.0)^\circ$.

²² Recalculated by us from the cross section in the peak.

$\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^-) / \Gamma_{\text{total}}^2$ $\Gamma_9 \Gamma_3 / \Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
1.225±0.058±0.041	800k	²³ ACHASOV 06	SND	$e^+ e^- \rightarrow \pi^+ \pi^-$

²³ Supersedes ACHASOV 05A.

$\Gamma(e^+ e^-) \times \Gamma(\eta \gamma) / \Gamma_{\text{total}}^2$ $\Gamma_9 \Gamma_5 / \Gamma^2$

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT
3.31±0.28 OUR FIT				Error includes scale factor of 1.1.
3.18±0.28 OUR AVERAGE				
3.10±0.31±0.11	33k	²⁴ ACHASOV 07B	SND	$0.6-1.38 e^+ e^- \rightarrow \eta \gamma$
$3.17^{+1.85}_{-1.31} \pm 0.21$	17.4k	²⁵ AKHMETSHIN 05	CMD2	$0.60-1.38 e^+ e^- \rightarrow \eta \gamma$
3.41±0.52±0.21	23k	^{26,27} AKHMETSHIN 01B	CMD2	$e^+ e^- \rightarrow \eta \gamma$

- ²⁴ From 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.
- ²⁵ From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.
- ²⁶ From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.
- ²⁷ 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).

$\omega(782)$ BRANCHING RATIOS

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
-------	------	-------------	------	---------

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

0.8965 ± 0.0016 ± 0.0048	1.2M	^{28,29} ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.880 ± 0.020 ± 0.032	11200	^{29,30} AKHMETSHIN	00C	CMD2 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.8942 ± 0.0062		²⁹ DOLINSKY	89	ND $e^+e^- \rightarrow \pi^+\pi^-\pi^0$

²⁸ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$.

²⁹ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}^2$.

³⁰ 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. • • •

9.06 ± 0.20 ± 0.57	18680	^{31,32} AKHMETSHIN	05	CMD2 0.60–1.38 $e^+e^- \rightarrow \pi^0\gamma$
9.34 ± 0.15 ± 0.31	36500	³² ACHASOV	03	SND 0.60–0.97 $e^+e^- \rightarrow \pi^0\gamma$
8.65 ± 0.16 ± 0.42	1.2M	^{33,34} ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.39 ± 0.24	9975	³⁵ BENAYOUN	96	RVUE $e^+e^- \rightarrow \pi^0\gamma$
8.88 ± 0.62	10625	³² DOLINSKY	89	ND $e^+e^- \rightarrow \pi^0\gamma$

³¹ Using $B(\omega \rightarrow e^+e^-) = (7.14 \pm 0.13) \times 10^{-5}$.

³² Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$.

³³ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+\pi^-) = (1.70 \pm 0.28)\%$.

³⁴ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}^2$.

³⁵ 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
--------------------------	-------------	------	---------

9.99 ± 0.26 OUR FIT Error includes scale factor of 1.1.

9.7 ± 0.5 OUR AVERAGE

9.94 ± 0.36 ± 0.38	³⁶	AULCHENKO	00A	SND $e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0, \pi^0\pi^0\gamma$
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	^{37,38}	ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.9 ± 0.7	³⁷	DOLINSKY	89	ND $e^+e^- \rightarrow \pi^0\gamma$

36 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.

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

38 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^{+0.11}_{-0.13} OUR FIT Error includes scale factor of 1.2.

1.49 \pm 0.13 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.

1.46 \pm 0.12 \pm 0.02	900k	39	AKHMETSHIN 07		$e^+e^- \rightarrow \pi^+\pi^-$
1.30 \pm 0.24 \pm 0.05	11.2k	40	AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-$
2.38 ^{+1.77} _{-0.90} \pm 0.18	5.4k	41	ACHASOV	02E SND	1.1–1.38 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
2.3 \pm 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 \pm 1.9			BENAKSAS	72 OSPK	$e^+e^- \rightarrow \pi^+\pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
1.75 \pm 0.11	4.5M	42	ACHASOV	05A SND	$e^+e^- \rightarrow \pi^+\pi^-$
2.01 \pm 0.29		43	BENAYOUN	03 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1.9 \pm 0.3		44	GARDNER	99 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
2.3 \pm 0.4		45	BENAYOUN	98 RVUE	$e^+e^- \rightarrow \pi^+\pi^-, \mu^+\mu^-$
1.0 \pm 0.11		46	WICKLUND	78 ASPK	3,4,6 $\pi^\pm N$
1.22 \pm 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}		47	BIGGS	70B CNTR	4.2 $\gamma C \rightarrow \pi^+\pi^- C$

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

40 Update of AKHMETSHIN 02.

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

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

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

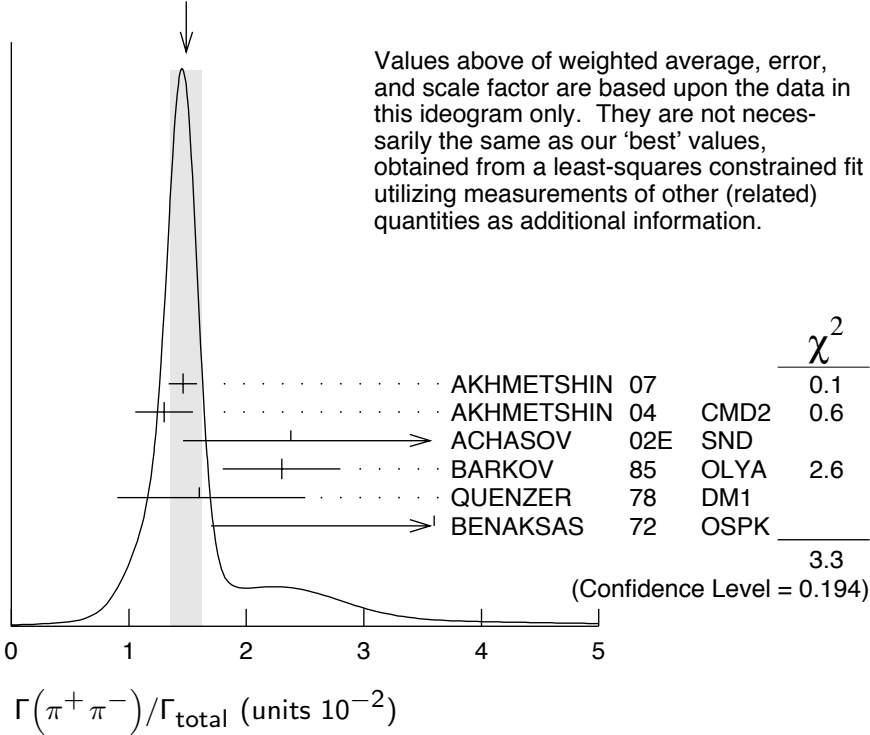
44 Using the data of BARKOV 85.

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

46 From a model-dependent analysis assuming complete coherence.

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

WEIGHTED AVERAGE
 1.49 ± 0.13 (Error scaled by 1.3)



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

Γ_3 / Γ_1

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

VALUE	DOCUMENT ID	TECN	COMMENT
0.0172 ± 0.0014 OUR FIT	Error includes scale factor of 1.2.		
0.026 ± 0.005 OUR AVERAGE			
0.021 $+0.028$ -0.009	48,49 RATCLIFF	72 ASPK	15 $\pi^- p \rightarrow n 2\pi$
0.028 ± 0.006	48 BEHREND	71 ASPK	Photoproduction
0.022 $+0.009$ -0.01	50 ROOS	70 RVUE	

⁴⁸ The fitted width of these data is 160 MeV in agreement with present average, thus the ω contribution is overestimated. Assuming ρ width 145 MeV.

⁴⁹ Significant interference effect observed. NB of $\omega \rightarrow 3\pi$ comes from an extrapolation.

⁵⁰ ROOS 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	⁵¹ ALOISIO	03 KLOE	$1.02 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

⁵¹ Using the data of ALOISIO 02D.

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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 $\pi^- p$

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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 $K^- p$

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.78±0.07		⁵² DAKIN	72	OSPK 1.4 $\pi^- p \rightarrow nMM$
>0.81	90	DEINET	69B	OSPK
⁵² Error statistical only. Authors obtain good fit also assuming $\pi^0\gamma$ as the only neutral decay.				

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

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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

<u>VALUE (units 10⁻⁴)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
4.6 ±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		⁵³ 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}		⁵⁴ ANDREWS	77	CNTR 6.7–10 γCu

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

4.3 ± 0.5 ± 0.1	33k	⁵⁵ ACHASOV	07B	SND	0.6–1.38	$e^+e^- \rightarrow \eta\gamma$
4.44 ^{+2.59} _{-1.83} ± 0.28	17.4k	^{56,57} AKHMETSHIN	05	CMD2	0.60–1.38	$e^+e^- \rightarrow \eta\gamma$
5.10 ± 0.72 ± 0.34	23k	⁵⁸ AKHMETSHIN	01B	CMD2		$e^+e^- \rightarrow \eta\gamma$
0.7 to 5.5		⁵⁹ CASE	00	CBAR	0.0	$\rho\bar{p} \rightarrow \eta\eta\gamma$
6.56 ^{+2.41} _{-2.55}	3525	^{54,60} BENAYOUN	96	RVUE		$e^+e^- \rightarrow \eta\gamma$
7.3 ± 2.9		^{54,56} DOLINSKY	89	ND		$e^+e^- \rightarrow \eta\gamma$

⁵³ No flat $\eta\eta\gamma$ background assumed.

⁵⁴ Solution corresponding to constructive ω - ρ interference.

⁵⁵ ACHASOV 07B reports $[B(\omega(782) \rightarrow \eta\gamma)] \times [B(\omega(782) \rightarrow e^+e^-)] = (3.10 \pm 0.31 \pm 0.11) \times 10^{-8}$. We divide by our best value $B(\omega(782) \rightarrow e^+e^-) = (7.16 \pm 0.12) \times 10^{-5}$. 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.

⁵⁶ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.

⁵⁷ Using $B(\omega \rightarrow e^+e^-) = (7.14 \pm 0.13) \times 10^{-5}$ and $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.

⁵⁸ 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 $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.

⁵⁹ Depending on the degree of coherence with the flat $\eta\eta\gamma$ background and using $B(\omega \rightarrow \pi^0\gamma) = (8.5 \pm 0.5) \times 10^{-2}$.

⁶⁰ 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
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

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

0.0098 ± 0.0024	⁶¹ ALDE	93	GAM2	38	$\pi^- p \rightarrow \omega n$
0.0082 ± 0.0033	⁶² DOLINSKY	89	ND		$e^+e^- \rightarrow \eta\gamma$
0.010 ± 0.045	APEL	72B	OSPK	4–8	$\pi^- p \rightarrow n3\gamma$

⁶¹ Model independent determination.

⁶² Solution corresponding to constructive ω - ρ interference.

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{\text{total}}$					Γ_6/Γ
<u>VALUE (units 10^{-4})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

7.7 ± 0.9 OUR FIT Error includes scale factor of 1.1.

7.7 ± 0.9 OUR AVERAGE Error includes scale factor of 1.1.

8.19 ± 0.71 ± 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
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	

0.96 ± 0.23 OUR FIT

0.96 ± 0.23 DZHELYADIN 81B CNTR 25–33 $\pi^- p \rightarrow \omega n$

$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$ 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
0.716 ± 0.012 OUR FIT				Error includes scale factor of 1.1.
0.700 ± 0.016	11200	^{63,64} AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$0.752 \pm 0.004 \pm 0.024$	1.2M	^{64,65} ACHASOV 03D	RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.714 ± 0.036		⁶⁴ DOLINSKY 89	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.72 ± 0.03		⁶⁴ BARKOV 87	CMD	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.64 ± 0.04	1488	⁶⁴ KURDADZE 83B	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.675 ± 0.069	433	⁶⁴ CORDIER 80	DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.83 ± 0.10	451	⁶⁴ BENAKSAS 72B	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.77 ± 0.06		⁶⁶ AUGUSTIN 69D	OSPK	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.65 ± 0.13	33	⁶⁷ ASTVACAT...	68 OSPK	Assume SU(3)+mixing

⁶³ Using $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = 0.891 \pm 0.007$. Update of AKHMETSHIN 00C.

⁶⁴ Not independent of the corresponding $\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}^2$.

⁶⁵ Using ACHASOV 03, ACHASOV 03D and $B(\omega \rightarrow \pi^+ \pi^-) = (1.70 \pm 0.28)\%$.

⁶⁶ Rescaled by us to correspond to ω width 8.4 MeV. Systematic errors underestimated.

⁶⁷ Not resolved from ρ decay. Error statistical only.

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

VALUE (units 10^{-2})	CL%	DOCUMENT ID	TECN	COMMENT
<2	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	$p\bar{p} \rightarrow \pi^+ \pi^- \pi^+ \pi^- \gamma$
<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} ±0.8	190	⁶⁸ AKHMETSHIN 04B	CMD2	0.6–0.97	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
6.6 ^{+1.4} _{-1.3} ±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} ±1.4	190	⁶⁹ AKHMETSHIN 04B	CMD2	0.6–0.97	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
7.8±2.7±2.0	63	^{68,70} ACHASOV 00G	SND		$e^+e^- \rightarrow \pi^0\pi^0\gamma$
12.7±2.3±2.5	63	^{69,70} ACHASOV 00G	SND		$e^+e^- \rightarrow \pi^0\pi^0\gamma$

⁶⁸ In the model assuming the $\rho \rightarrow \pi^0\pi^0\gamma$ decay via the $\omega\pi$ and $f_0(600)\gamma$ mechanisms.

⁶⁹ In the model assuming the $\rho \rightarrow \pi^0\pi^0\gamma$ decay via the $\omega\pi$ mechanism only.

⁷⁰ Superseded 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 $\pi^+p \rightarrow \pi^+p\omega$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma(\pi^0\gamma)$ Γ_{13}/Γ_2

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

7.6±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

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

0.22±0.07		⁷¹ DAKIN 72	OSPK	1.4	$\pi^-p \rightarrow nMM$
<0.19	90	DEINET 69B	OSPK		

⁷¹ See $\Gamma(\pi^0\gamma)/\Gamma(\text{neutrals})$.

$\Gamma(\eta\pi^0\gamma)/\Gamma_{\text{total}}$ 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
9.0 ± 3.1 OUR FIT				
$9.0 \pm 2.9 \pm 1.1$	18	HEISTER	02C ALEP	$Z \rightarrow \mu^+ \mu^- + X$

$\Gamma(\mu^+ \mu^-)/\Gamma(\pi^+ \pi^- \pi^0)$ 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	⁷² DZHELYADIN	79 CNTR	$25-33 \pi^- p$
⁷² 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	⁷³ 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	⁷³ PROKOSHKIN	95 GAM2	$38 \pi^- p \rightarrow 3\gamma n$
⁷³ From direct 3γ decay search.				

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<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	⁷⁴ 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	$2.05 \pi^+ p \rightarrow \pi^+ p \omega$
⁷⁴ Restated by us using $B(\eta \rightarrow \text{charged modes}) = 29.2\%$.				

$\Gamma(3\pi^0)/\Gamma_{\text{total}}$ Γ_{18}/Γ
Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.0003	90	PROKOSHKIN	95 GAM2	$38 \pi^- p \rightarrow 3\pi^0 n$

$\Gamma(3\pi^0)/\Gamma(\pi^+ \pi^- \pi^0)$ Γ_{18}/Γ_1
Violates C conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<0.009	90	BARBERIS	01	$450 p p \rightarrow p_f 3\pi^0 p_s$

$\omega(782)$ REFERENCES

- ACHASOV 07B PR D76 077101 M.N. Achasov *et al.* (SND Collab.)
 AKHMETSHIN 07 PL B648 28 R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 ACHASOV 06 JETP 103 380 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 Translated from ZETF 130 437.
 ACHASOV 06A PR D74 014016 M.N. Achasov *et al.* (SND Collab.)
 AULCHENKO 06 JETPL 84 413 V.M. Aulchenko *et al.* (Novosibirsk CMD-2 Collab.)
 Translated from ZETFP 84 491.
 ACHASOV 05A JETP 101 1053 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 Translated from ZETF 128 1201.
 AKHMETSHIN 05 PL B605 26 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 AKHMETSHIN 05A PL B613 29 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 AULCHENKO 05 JETPL 82 743 V.M. Aulchenko *et al.* (Novosibirsk CMD-2 Collab.)
 Translated from ZETFP 82 841.
 AKHMETSHIN 04 PL B578 285 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 AKHMETSHIN 04B PL B580 119 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 AUBERT,B 04N PR D70 072004 B. Aubert *et al.* (BABAR Collab.)
 PDG 04 PL B592 1 S. Eidelman *et al.*
 ACHASOV 03 PL B559 171 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 ACHASOV 03D PR D68 052006 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 ALOISIO 03 PL B561 55 A. Aloisio *et al.* (KLOE Collab.)
 BENAYOUN 03 EPJ C29 397 M. Benayoun *et al.*
 ACHASOV 02E PR D66 032001 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 ACHASOV 02F PL B537 201 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 AKHMETSHIN 02 PL B527 161 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 ALOISIO 02D PL B537 21 A. Aloisio *et al.* (KLOE Collab.)
 HEISTER 02C PL B528 19 A. Heister *et al.* (ALEPH Collab.)
 ACHASOV 01E PR D63 072002 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 AKHMETSHIN 01B PL B509 217 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 BARBERIS 01 PL B507 14 D. Barberis *et al.*
 ACHASOV 00 EPJ C12 25 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 ACHASOV 00D JETPL 72 282 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 Translated from ZETFP 72 411.
 ACHASOV 00G JETPL 71 355 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 Translated from ZETFP 71 519.
 AKHMETSHIN 00C PL B476 33 R.R. Akhmetshin *et al.* (Novosibirsk CMD-2 Collab.)
 AULCHENKO 00A JETP 90 927 V.M. Aulchenko *et al.* (Novosibirsk SND Collab.)
 Translated from ZETF 117 1067.
 CASE 00 PR D61 032002 T. Case *et al.* (Crystal Barrel Collab.)
 ACHASOV 99E PL B462 365 M.N. Achasov *et al.* (Novosibirsk SND Collab.)
 GARDNER 99 PR D59 076002 S. Gardner, H.B. O'Connell
 BENAYOUN 98 EPJ C2 269 M. Benayoun *et al.* (IPNP, NOVO, ADLD+)
 ABELE 97E PL B411 361 A. Abele *et al.* (Crystal Barrel Collab.)
 BENAYOUN 96 ZPHY C72 221 M. Benayoun *et al.* (IPNP, NOVO)
 PROKOSHKIN 95 SPD 40 273 Y.D. Prokoshkin, V.D. Samoilenko (SERP)
 Translated from DANS 342 610.
 WURZINGER 95 PR C51 443 R. Wurzinger *et al.* (BONN, ORSAY, SACL+)
 ALDE 94B PL B340 122 D.M. Alde *et al.* (SERP, BELG, LANL, LAPP+)
 AMSLER 94C PL B327 425 C. Amsler *et al.* (Crystal Barrel Collab.)
 ALDE 93 PAN 56 1229 D.M. Alde *et al.* (SERP, LAPP, LANL, BELG+)
 Translated from YAF 56 137.
 Also
 AMSLER 93B ZPHY C61 35 D.M. Alde *et al.* (SERP, LAPP, LANL, BELG+)
 PL B311 362 C. Amsler *et al.* (Crystal Barrel Collab.)
 WEIDENAUER 93 ZPHY C59 387 P. Weidenauer *et al.* (ASTERIX Collab.)
 ANTONELLI 92 ZPHY C56 15 A. Antonelli *et al.* (DM2 Collab.)
 DOLINSKY 91 PRPL 202 99 S.I. Dolinsky *et al.* (NOVO)
 WEIDENAUER 90 ZPHY C47 353 P. Weidenauer *et al.* (ASTERIX Collab.)
 DOLINSKY 89 ZPHY C42 511 S.I. Dolinsky *et al.* (NOVO)
 BITYUKOV 88B SJNP 47 800 S.I. Bityukov *et al.* (SERP)
 Translated from YAF 47 1258.
 DOLINSKY 88 SJNP 48 277 S.I. Dolinsky *et al.* (NOVO)
 Translated from YAF 48 442.
 KURDADZE 88 JETPL 47 512 L.M. Kurdadze *et al.* (NOVO)
 Translated from ZETFP 47 432.
 AULCHENKO 87 PL B186 432 V.M. Aulchenko *et al.* (NOVO)
 BARKOV 87 JETPL 46 164 L.M. Barkov *et al.* (NOVO)
 Translated from ZETFP 46 132.
 KURDADZE 86 JETPL 43 643 L.M. Kurdadze *et al.* (NOVO)
 Translated from ZETFP 43 497.
 BARKOV 85 NP B256 365 L.M. Barkov *et al.* (NOVO)
 DRUZHININ 84 PL 144B 136 V.P. Druzhinin *et al.* (NOVO)
 KURDADZE 83B JETPL 36 274 A.M. Kurdadze *et al.* (NOVO)
 Translated from ZETFP 36 221.

DZHELADIN	81B	PL 102B 296	R.I. Dzhelyadin <i>et al.</i>	(SERP)
CORDIER	80	NP B172 13	A. Cordier <i>et al.</i>	(LALO)
ROOS	80	LNC 27 321	M. Roos, A. Pellinen	(HELS)
BENKHEIRI	79	NP B150 268	P. Benkheiri <i>et al.</i>	(EPOL, CERN, CDEF+)
DZHELADIN	79	PL 84B 143	R.I. Dzhelyadin <i>et al.</i>	(SERP)
COOPER	78B	NP B146 1	A.M. Cooper <i>et al.</i>	(TATA, CERN, CDEF+)
QUENZER	78	PL 76B 512	A. Quenzer <i>et al.</i>	(LALO)
VANAPEL...	78	NP B133 245	G.W. van Apeldoorn <i>et al.</i>	(ZEEM)
WICKLUND	78	PR D17 1197	A.B. Wicklund <i>et al.</i>	(ANL)
ANDREWS	77	PRL 38 198	D.E. Andrews <i>et al.</i>	(ROCH)
GESSAROLI	77	NP B126 382	R. Gessaroli <i>et al.</i>	(BGNA, FIRZ, GENO+)
KEYNE	76	PR D14 28	J. Keyne <i>et al.</i>	(LOIC, SHMP)
	Also	PR D8 2789	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)
AGUILAR-...	72B	PR D6 29	M. Aguilar-Benitez <i>et al.</i>	(BNL)
APEL	72B	PL 41B 234	W.D. Apel <i>et al.</i>	(KARLK, KARLE, PISA)
BASILE	72B	Phil. Conf. 153	M. Basile <i>et al.</i>	(CERN)
BENAKSAS	72	PL 39B 289	D. Benaksas <i>et al.</i>	(ORSAY)
BENAKSAS	72B	PL 42B 507	D. Benaksas <i>et al.</i>	(ORSAY)
BENAKSAS	72C	PL 42B 511	D. Benaksas <i>et al.</i>	(ORSAY)
BORENSTEIN	72	PR D5 1559	S.R. Borenstein <i>et al.</i>	(BNL, MICH)
BROWN	72	PL 42B 117	R.M. Brown <i>et al.</i>	(ILL, ILLC)
DAKIN	72	PR D6 2321	J.T. Dakin <i>et al.</i>	(PRIN)
RATCLIFF	72	PL 38B 345	B.N. Ratcliff <i>et al.</i>	(SLAC)
ALVENSLEB...	71C	PRL 27 888	H. Alvensleben <i>et al.</i>	(DESY)
BALDIN	71	SJNP 13 758	A.B. Baldin <i>et al.</i>	(ITEP)
		Translated from YAF 13 1318.		
BEHREND	71	PRL 27 61	H.J. Behrend <i>et al.</i>	(ROCH, CORN, FNAL)
BIZZARRI	71	NP B27 140	R. Bizzarri <i>et al.</i>	(CERN, CDEF)
COYNE	71	NP B32 333	D.G. Coyne <i>et al.</i>	(LRL)
MOFFEIT	71	NP B29 349	K.C. Moffeit <i>et al.</i>	(LRL, UCB, SLAC+)
ABRAMOVI...	70	NP B20 209	M. Abramovich <i>et al.</i>	(CERN)
BIGGS	70B	PRL 24 1201	P.J. Biggs <i>et al.</i>	(DARE)
BIZZARRI	70	PRL 25 1385	R. Bizzarri <i>et al.</i>	(ROMA, SYRA)
ROOS	70	DNPL/R7 173	M. Roos	(CERN)
	Proc. Daresbury	Study Weekend No. 1.		
AUGUSTIN	69D	PL 28B 513	J.E. Augustin <i>et al.</i>	(ORSAY)
BIZZARRI	69	NP B14 169	R. Bizzarri <i>et al.</i>	(CERN, CDEF)
DEINET	69B	PL 30B 426	W. Deinet <i>et al.</i>	(KARL, CERN)
JACQUET	69B	NC 63A 743	F. Jacquet <i>et al.</i>	(EPOL, BERG)
WILSON	69	Private Comm.	R. Wilson	(HARV)
	Also	PR 178 2095	A.A. Wehmann <i>et al.</i>	(HARV, CASE, SLAC+)
ASTVACAT...	68	PL 27B 45	R.G. Astvatsaturov <i>et al.</i>	(JINR, MOSU)
BOLLINI	68C	NC 56A 531	D. Bollini <i>et al.</i>	(CERN, BGNA, STRB)
BARASH	67B	PR 156 1399	N. Barash <i>et al.</i>	(COLU)
FELDMAN	67C	PR 159 1219	M. Feldman <i>et al.</i>	(PENN)
DIGIUGNO	66B	NC 44A 1272	G. Di Giugno <i>et al.</i>	(NAPL, FRAS, TRST)
FLATTE	66	PR 145 1050	S.M. Flatte <i>et al.</i>	(LRL)
JAMES	66	PR 142 896	F.E. James, H.L. Kraybill	(YALE, BNL)
BARBARO-...	65	PRL 14 279	A. Barbaro-Galtieri, R.D. Tripp	(LRL)
BARMIN	64	JETP 18 1289	V.V. Barmin <i>et al.</i>	(ITEP)
		Translated from ZETF 45 1879.		
KRAEMER	64	PR 136 B496	R.W. Kraemer <i>et al.</i>	(JHU, NWES, WOOD)
BUSCHBECK	63	Siena Conf. 1 166	B. Buschbeck <i>et al.</i>	(VIEN, CERN, ANIK)

OTHER RELATED PAPERS

AZIMOV	03	EPJ A16 209	Ya.I. Aximov	
BENAYOUN	01	EPJ C22 503	M. Benayoun, H.B. O'Connell	
GOKALP	01B	EPJ C22 327	A. Gokalp, Y. Sarac, O. Yilmaz	
DELBOURGO	99B	PR D59 113006	R. Delbourgo <i>et al.</i>	
GARDNER	98	PR D57 2716	S. Gardner, H.B. O'Connell	
	Also	PR D62 019903 (erratum)	S. Gardner, H.B. O'Connell	
ABELE	97F	PL B411 354	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
DOLINSKY	86	PL B174 453	S.I. Dolinsky <i>et al.</i>	(NOVO)
KURDADZE	83	JETPL 37 733	L.M. Kurdadze <i>et al.</i>	(NOVO)
		Translated from ZETFP 37 613.		

ALFF-...	62B	PRL 9 325	C. Alff-Steinberger <i>et al.</i>	(COLU, RUTG)
STEVENSON	62	PR 125 687	M.L. Stevenson <i>et al.</i>	(LRL)
MAGLICH	61	PRL 7 178	B.C. Maglich <i>et al.</i>	(LRL)
PEVSNER	61	PRL 7 421	A. Pevsner <i>et al.</i>	(JHU)
XUONG	61	PRL 7 327	H. Nguyen Ngoc, G.R. Lynch	(LRL)
