Citation: K. Hagiwara *et al.* (Particle Data Group), Phys. Rev. D **66**, 010001 (2002) and 2003 partial update for edition 2004 (URL: http://pdg.lbl.gov)

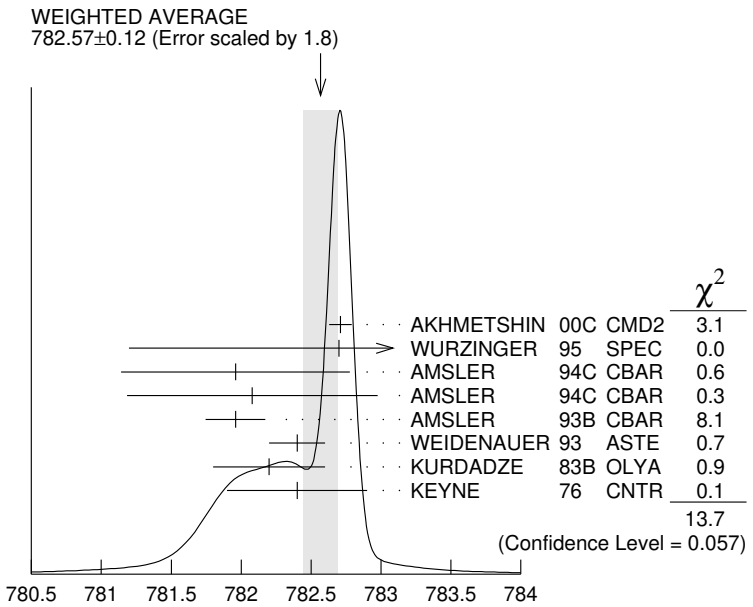
$\omega(782)$

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

$\omega(782)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
782.57±0.12 OUR AVERAGE		Error includes scale factor of 1.8. See the ideogram below.			
782.71±0.07±0.04	11200	AKHMETSHIN	00C	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
782.7 ±0.1 ±1.5	19500	WURZINGER	95	SPEC	1.33 $pd \to {}^3\mathrm{He}\omega$
781.96±0.17±0.80	11k	[1] AMSLER	94C	CBAR	0.0 $\overline{p}p \to \omega\eta\pi^0$
782.08±0.36±0.82	3463	[2] AMSLER	94C	CBAR	0.0 $\overline{p}p \to \omega\eta\pi^0$
781.96±0.13±0.17	15k	AMSLER	93B	CBAR	0.0 $\overline{p}p \to \omega\pi^0\pi^0$
782.4 ±0.2	270k	WEIDENAUER	93	ASTE	$\overline{p}p \to 2\pi^+2\pi^-\pi^0$
782.2 ±0.4	1488	KURDADZE	83B	OLYA	$e^+e^- \to \pi^+\pi^-\pi^0$
782.4 ±0.5	7000	[3] KEYNE	76	CNTR	$\pi^- p \to \omega n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
781.78±0.10		[4] BARKOV	87	CMD	$e^+e^- \to \pi^+\pi^-\pi^0$
783.3 ±0.4	433	CORDIER	80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
782.5 ±0.8	33260	ROOS	80	RVUE	0.0–3.6 $\overline{p}p$
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 $\overline{p}p \to 5\pi$
782.7 ±0.9	535	VANAPEL...	78	HBC	7.2 $\overline{p}p \to \overline{p}p\omega$
783.5 ±0.8	2100	GESSAROLI	77	HBC	11 $\pi^- p \to \omega n$
782.5 ±0.8	418	AGUILAR-...	72B	HBC	3.9,4.6 $K^- p$
783.4 ±1.0	248	BIZZARRI	71	HBC	0.0 $p\overline{p} \to K^+K^-\omega$
781.0 ±0.6	510	BIZZARRI	71	HBC	0.0 $p\overline{p} \to K_1K_1\omega$
783.7 ±1.0	3583	[5] COYNE	71	HBC	3.7 $\pi^+ p \to p\pi^+\pi^+\pi^-\pi^0$
784.1 ±1.2	750	ABRAMOVI...	70	HBC	3.9 $\pi^- p$
783.2 ±1.6		[6] BIGGS	70B	CNTR	$<4.1\ \gamma\mathrm{C} \to \pi^+\pi^-\mathrm{C}$
782.4 ±0.5	2400	BIZZARRI	69	HBC	0.0 $\overline{p}p$

[1] From the $\eta \to \gamma\gamma$ decay.
[2] From the $\eta \to 3\pi^0$ decay.
[3] Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.
[4] Systematic uncertainties underestimated.
[5] From best-resolution sample of COYNE 71.
[6] From ω-ρ interference in the $\pi^+\pi^-$ mass spectrum assuming ω width 12.6 MeV.



$\omega(782)$ mass (MeV)

$\omega(782)$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
8.44±0.09 OUR AVERAGE					
8.68±0.23±0.10	11200	AKHMETSHIN	00C	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
8.2 ±0.3	19500	WURZINGER	95	SPEC	1.33 $p\,d \to {}^3\mathrm{He}\,\omega$
8.4 ±0.1	[7]	AULCHENKO	87	ND	$e^+e^- \to \pi^+\pi^-\pi^0$
8.30±0.40		BARKOV	87	CMD	$e^+e^- \to \pi^+\pi^-\pi^0$
9.8 ±0.9	1488	KURDADZE	83B	OLYA	$e^+e^- \to \pi^+\pi^-\pi^0$
9.0 ±0.8	433	CORDIER	80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
9.1 ±0.8	451	BENAKSAS	72B	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
12 ±2	1430	COOPER	78B	HBC	0.7–0.8 $\overline{p}p \to 5\pi$
9.4 ±2.5	2100	GESSAROLI	77	HBC	11 $\pi^- p \to \omega n$
10.22±0.43	20000	[8] KEYNE	76	CNTR	$\pi^- p \to \omega n$
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 $\pi^- p \to n$MM
10.3 ±1.4	510	BIZZARRI	71	HBC	0.0 $p\overline{p} \to K_1 K_1 \omega$
12.8 ±3.0	248	BIZZARRI	71	HBC	0.0 $p\overline{p} \to K^+K^-\omega$
9.5 ±1.0	3583	COYNE	71	HBC	3.7 $\pi^+ p \to p\pi^+\pi^+\pi^-\pi^0$

[7] Relativistic Breit-Wigner includes radiative corrections.
[8] 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	$\pi^+\pi^-\pi^0$	(89.1 ± 0.7) %	S=1.1
Γ_2	$\pi^0\gamma$	$(9.09^{+0.29}_{-0.25})$ %	S=1.1
Γ_3	$\pi^+\pi^-$	(1.72 ± 0.26) %	S=1.4
Γ_4	neutrals (excluding $\pi^0\gamma$)	$(10^{+700}_{-7}) \times 10^{-5}$	
Γ_5	$\eta\gamma$	$(5.1 \pm 0.5) \times 10^{-4}$	
Γ_6	$\pi^0 e^+ e^-$	$(5.9 \pm 1.9) \times 10^{-4}$	
Γ_7	$\pi^0\mu^+\mu^-$	$(9.6 \pm 2.3) \times 10^{-5}$	
Γ_8	e^+e^-	$(6.95 \pm 0.12) \times 10^{-5}$	
Γ_9	$\pi^+\pi^-\pi^0\pi^0$	< 2 %	CL=90%
Γ_{10}	$\pi^+\pi^-\gamma$	$< 3.6 \times 10^{-3}$	CL=95%
Γ_{11}	$\pi^+\pi^-\pi^+\pi^-$	$< 1 \times 10^{-3}$	CL=90%
Γ_{12}	$\pi^0\pi^0\gamma$	$(6.6 \pm 1.5) \times 10^{-5}$	
Γ_{13}	$\mu^+\mu^-$	$(9.0 \pm 3.1) \times 10^{-5}$	
Γ_{14}	3γ	$< 1.9 \times 10^{-4}$	CL=95%

Charge conjugation (C) violating modes

Γ_{15}	$\eta\pi^0$	C	$< 1 \times 10^{-3}$	CL=90%
Γ_{16}	$3\pi^0$	C	$< 3 \times 10^{-4}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 11 branching ratios uses 37 measurements and one constraint to determine 7 parameters. The overall fit has a $\chi^2 = 28.9$ for 31 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, 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	−35	−9				
x_4	−88	−56	1			
x_5	6	7	−2	−8		
x_8	−43	−50	15	52	−14	
x_{13}	0	0	0	0	0	0
	x_1	x_2	x_3	x_4	x_5	x_8

$\omega(782)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ Γ_8

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. • • •					
0.595±0.014±0.009	11200	[9] AKHMETSHIN	00C	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
0.600±0.031	10625	DOLINSKY	89	ND	$e^+e^- \to \pi^0\gamma$

$\Gamma(\pi^0\gamma)$ Γ_2

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
788±12±27	36500	[10] ACHASOV	03	SND	0.60–0.97 $e^+e^- \to \pi^0\gamma$
764±51	10625	DOLINSKY	89	ND	$e^+e^- \to \pi^0\gamma$

$\Gamma(\eta\gamma)$ Γ_5

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.1±2.5	[11] DOLINSKY	89	ND	$e^+e^- \to \eta\gamma$

[9] Using B($\omega \to \pi^+\pi^-\pi^0$) = 0.888 ± 0.007.
[10] Using Γ_ω = 8.44 ± 0.09 MeV and B($\omega \to \pi^0\gamma$) from ACHASOV 03.
[11] Using Γ_ω = 8.4 ± 0.1 MeV and B($\omega \to \eta\gamma$) from DOLINSKY 89.

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

$\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma^2_{\text{total}}$ $\Gamma_8\Gamma_1/\Gamma^2$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
6.19±0.10 OUR NEW UNCHECKED FIT [(6.19 ± 0.12) × 10^{-5} OUR 2002 FIT Scale factor = 1.1]					
6.17±0.10 OUR NEW AVERAGE [(6.19 ± 0.12) × 10^{-5} OUR 2002 AVERAGE Scale factor = 1.1]					
6.08±0.10±0.08	11200	AKHMETSHIN	00C	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
6.37±0.35		[13] DOLINSKY	89	ND	$e^+e^- \to \pi^+\pi^-\pi^0$
6.45±0.24		[13] BARKOV	87	CMD	$e^+e^- \to \pi^+\pi^-\pi^0$
5.79±0.42	1488	[13] KURDADZE	83B	OLYA	$e^+e^- \to \pi^+\pi^-\pi^0$
5.89±0.54	433	[13] CORDIER	80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
7.54±0.84	451	[13] BENAKSAS	72B	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$

$\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma^2_{\text{total}}$ $\Gamma_8\Gamma_2/\Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
6.32±0.16 OUR FIT					
6.44±0.18 OUR NEW AVERAGE [(6.33 ± 0.29) × 10^{-6} OUR 2002 AVERAGE]					
6.50±0.11±0.20	36500	[12] ACHASOV	03	SND	0.60–0.97 $e^+e^- \to \pi^0\gamma$
6.34±0.21±0.21	10625	[13] DOLINSKY	89	ND	$e^+e^- \to \pi^0\gamma$

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

$\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{\text{total}}$ $\Gamma_8\Gamma_5/\Gamma^2$

VALUE (units 10^{-8})	EVTS	DOCUMENT ID		TECN	COMMENT
3.51±0.35 OUR FIT					
3.3 ±0.4 OUR AVERAGE					
3.41±0.52±0.21	23k	[14,15] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
3.25±0.51±0.10	312	[16] ACHASOV	00D	SND	$e^+e^- \to \eta\gamma$

[13] Recalculated by us from the cross section in the peak.
[14] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$)= (32.24 ± 0.29) × 10^{-2}.
[15] 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).
[16] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$) = (32.2 ± 0.4) × 10^{-2}.

$\omega(782)$ BRANCHING RATIOS

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

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 $\overline{p}p$
0.134±0.026	850	DIGIUGNO	66B	CNTR	1.4 π^-p
0.097±0.016	348	FLATTE	66	HBC	1.4 – 1.7 $K^-p \to \Lambda$MM
$0.06\ ^{+0.05}_{-0.02}$		JAMES	66	HBC	2.1 π^+p
0.08 ±0.03	35	KRAEMER	64	DBC	1.2 π^+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

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

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.0193±0.0030 OUR NEW UNCHECKED FIT Error includes scale factor of 1.4. [0.0191 ± 0.0033 OUR 2002 FIT Scale factor = 1.5]				
0.026 ±0.005 OUR AVERAGE				
$0.021\ ^{+0.028}_{-0.009}$	[18] RATCLIFF	72	ASPK	15 $\pi^-p \to n2\pi$
0.028 ±0.006	BEHREND	71	ASPK	Photoproduction
$0.022\ ^{+0.009}_{-0.01}$	[19] ROOS	70	RVUE	

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

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.1020^{+0.0032}_{-0.0026}}$ **OUR NEW UNCHECKED FIT** Error includes scale factor of 1.1. [0.097 ± 0.005 OUR 2002 FIT]				
0.097 ±0.005 OUR AVERAGE				
0.0994±0.0036±0.0038	[20] AULCHENKO	00A	SND	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$, $\pi^0\pi^0\gamma$
0.084 ±0.013	KEYNE	76	CNTR	$\pi^-p \to \omega n$

0.109 ±0.025		BENAKSAS	72C	OSPK	$e^+ e^- \to \pi^0 \gamma$
0.081 ±0.020		BALDIN	71	HLBC	2.9 $\pi^+ p$
0.13 ±0.04		JACQUET	69B	HLBC	2.05 $\pi^+ p \to \pi^+ p \omega$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.099 ±0.007	[21]	DOLINSKY	89	ND	$e^+ e^- \to \pi^0 \gamma$

$\Gamma(\pi^+\pi^-\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{10}/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.066	90	KALBFLEISCH	75	HBC	2.18 $K^- p \to \Lambda\pi^+\pi^-\gamma$
<0.05	90	FLATTE	66	HBC	1.2 – 1.7 $K^- p \to \Lambda\pi^+\pi^-\gamma$

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0036	95	WEIDENAUER	90	ASTE	$p\overline{p} \to \pi^+\pi^-\pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.004	95	BITYUKOV	88B	SPEC	32 $\pi^- p \to \pi^+\pi^-\gamma$ X

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

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1\times10^{-3}$	90	KURDADZE	88	OLYA	$e^+ e^- \to \pi^+\pi^-\pi^+\pi^-$

$\Gamma(\pi^+\pi^-\pi^0\pi^0)/\Gamma_{total}$ Γ_9/Γ

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
<2	90	KURDADZE	86	OLYA	$e^+ e^- \to \pi^+\pi^-\pi^0\pi^0$

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

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<0.2	90	WILSON	69	OSPK	12 π^- C → Fe
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.7	74	FLATTE	66	HBC	1.2 – 1.7 $K^- p \to \Lambda\mu^+\mu^-$
<1.2		BARBARO-...	65	HBC	2.7 $K^- p$

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

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
6.6±1.5 OUR NEW AVERAGE		[(7.8 ± 3.4) × 10^{-5} OUR 2002 AVERAGE]			
$6.6^{+1.4}_{-1.3}\pm0.6$	295	ACHASOV	02F	SND	0.36–0.97 $e^+ e^- \to \pi^0\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
7.8±2.7±2.0	63	[22,23] ACHASOV	00G	SND	$e^+ e^- \to \pi^0\pi^0\gamma$
12.7±2.3±2.5	63	[22,24] ACHASOV	00G	SND	$e^+ e^- \to \pi^0\pi^0\gamma$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma(\pi^0\gamma)$ Γ_{12}/Γ_2

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.00085±0.00029		40 ± 14	ALDE	94B	GAM2	$38\pi^- p \to \pi^0\pi^0\gamma n$

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

< 0.005	90		DOLINSKY	89	ND	$e^+e^- \to \pi^0\pi^0\gamma$
< 0.18	95		KEYNE	76	CNTR	$\pi^- p \to \omega n$
< 0.15	90		BENAKSAS	72C	OSPK	e^+e^-
< 0.14			BALDIN	71	HLBC	2.9 $\pi^+ p$
< 0.1	90		BARMIN	64	HLBC	1.3–2.8 $\pi^- p$

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

Violates C conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.001	90	ALDE	94B	GAM2	$38\pi^- p \to \eta\pi^0 n$

$[\Gamma(\eta\gamma)+\Gamma(\eta\pi^0)]/\Gamma(\pi^+\pi^-\pi^0)$ $(\Gamma_5+\Gamma_{15})/\Gamma_1$

VALUE	CL%		DOCUMENT ID		TECN	COMMENT
<0.016	90	[25]	FLATTE	66	HBC	1.2 – 1.7 $K^- p \to \Lambda\pi^+\pi^-$ MM

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

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

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

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

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

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

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

<0.08	95	JACQUET	69B	HLBC	2.05 $\pi^+ p \to \pi^+ p\omega$

$\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$ 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	[26]	ALDE	93	GAM2	$38\pi^- p \to \omega n$
0.0082±0.0033	[27]	DOLINSKY	89	ND	$e^+e^- \to \eta\gamma$
0.010 ±0.045		APEL	72B	OSPK	4–8 $\pi^- p \to n3\gamma$

$\Gamma(\pi^0\mu^+\mu^-)/\Gamma_{total}$ Γ_7/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
0.96±0.23	DZHELYADIN	81B	CNTR	25–33 $\pi^- p \to \omega n$

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{total}$ Γ_6/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
5.9±1.9	43	DOLINSKY	88	ND	$e^+e^- \to \pi^0 e^+e^-$

$\Gamma(e^+e^-)/\Gamma_{total}$ Γ_8/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.695±0.012 OUR NEW UNCHECKED FIT [(0.695 ± 0.015) × 10^{-4} OUR 2002 FIT Scale factor = 1.1]					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.685±0.016	11200	[28,29] AKHMETSHIN	00C	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
0.714±0.036		[29] DOLINSKY	89	ND	$e^+e^- \to \pi^+\pi^-\pi^0$
0.72 ±0.03		[29] BARKOV	87	CMD	$e^+e^- \to \pi^+\pi^-\pi^0$
0.64 ±0.04	1488	[29] KURDADZE	83B	OLYA	$e^+e^- \to \pi^+\pi^-\pi^0$
0.675±0.069	433	[29] CORDIER	80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
0.83 ±0.10	451	[29] BENAKSAS	72B	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$
0.77 ±0.06		[30] AUGUSTIN	69D	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$
0.65 ±0.13	33	[31] ASTVACAT...	68	OSPK	Assume SU(3)+mixing

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

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
9.0±3.1 OUR FIT					
9.0±2.9±1.1	18	HEISTER	02C	ALEP	$Z \to \mu^+\mu^- + X$

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

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 $p\overline{p}$
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 $\pi^- p$

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ Γ_3/Γ

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.72±0.26 OUR NEW UNCHECKED FIT Error includes scale factor of 1.4. [(1.70 ± 0.28) × 10^{-2} OUR 2002 FIT Scale factor = 1.5]					
1.59±0.23 OUR NEW AVERAGE Error includes scale factor of 1.1. [(1.55 ± 0.26) × 10^{-2} OUR 2002 AVERAGE Scale factor = 1.2]					
$2.38^{+1.77}_{-0.90}\pm0.18$	5.4k	[32] ACHASOV	02E	SND	1.1–1.38 $e^+e^- \to \pi^+\pi^-\pi^0$
1.33±0.24±0.05	114k	AKHMETSHIN	02	CMD2	$e^+e^- \to \pi^+\pi^-$
2.3 ±0.5		BARKOV	85	OLYA	$e^+e^- \to \pi^+\pi^-$
$1.6\ ^{+0.9}_{-0.7}$		QUENZER	78	DM1	$e^+e^- \to \pi^+\pi^-$
3.6 ±1.9		BENAKSAS	72	OSPK	$e^+e^- \to \pi^+\pi^-$

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

1.9 ±0.3	[33] GARDNER	99	RVUE	$e^+e^- \to \pi^+\pi^-$	
2.3 ±0.4	[34] BENAYOUN	98	RVUE	$e^+e^- \to \pi^+\pi^-$, $\mu^+\mu^-$	
1.0 ±0.11	[35] 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	
$0.80^{+0.28}_{-0.20}$	[36] BIGGS	70B	CNTR	4.2 γ C $\to \pi^+\pi^-$ C	

$\Gamma(\pi^0\pi^0\gamma)/\Gamma(\text{neutrals})$ $\Gamma_{12}/(\Gamma_2+\Gamma_4)$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.22±0.07		[17] DAKIN	72	OSPK 1.4 $\pi^- p \to n$MM
<0.19	90	DEINET	69B	OSPK

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

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.78±0.07		[37] DAKIN	72	OSPK 1.4 $\pi^- p \to n$MM
>0.81	90	DEINET	69B	OSPK

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
5.1 ±0.5 OUR NEW UNCHECKED FIT [$(6.5 \pm 1.1) \times 10^{-4}$ OUR 2002 FIT]				
6.3 ±1.3 OUR NEW AVERAGE Error includes scale factor of 1.2. [$(6.5 \pm 1.0) \times 10^{-4}$ OUR 2002 AVERAGE]				
6.6 ±1.7		[38] ABELE	97E	CBAR 0.0 $\bar{p}p \to 5\gamma$
8.3 ±2.1		ALDE	93	GAM2 38 $\pi^- p \to \omega n$
$3.0\ ^{+2.5}_{-1.8}$		[39] ANDREWS	77	CNTR 6.7–10 γ Cu
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.10±0.72±0.34	23k	[40] AKHMETSHIN	01B	CMD2 $e^+e^- \to \eta\gamma$
4.60±0.72±0.19	312	[41,42] ACHASOV	00D	SND $e^+e^- \to \eta\gamma$
0.7 to 5.5		[43] CASE	00	CBAR 0.0 $p\bar{p} \to \eta\eta\gamma$
$6.56^{+2.41}_{-2.55}$	3525	[39,44] BENAYOUN	96	RVUE $e^+e^- \to \eta\gamma$
7.3 ±2.9		[39,42] DOLINSKY	89	ND $e^+e^- \to \eta\gamma$

$\Gamma(\pi^0\mu^+\mu^-)/\Gamma(\mu^+\mu^-)$ Γ_7/Γ_{13}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.2±0.6	30	[45] DZHELYADIN	79	CNTR 25–33 $\pi^- p$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.880 ±0.020 ±0.032	11200	[29,46] AKHMETSHIN	00C	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
0.8942±0.0062		[29] DOLINSKY	89	ND	$e^+e^- \to \pi^+\pi^-\pi^0$

$\Gamma(3\pi^0)/\Gamma_{total}$ Γ_{16}/Γ

Violates C conservation.

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

$\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{16}/Γ_1

Violates C conservation.

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

$\Gamma(3\gamma)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.9	95	[47] ABELE	97E	CBAR	$0.0\ \bar{p}p \to 5\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2	90	[47] PROKOSHKIN	95	GAM2	$38\ \pi^- p \to 3\gamma n$

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.34±0.15±0.31	36500	[21] ACHASOV	03	SND	0.60–$0.97\ e^+e^- \to \pi^0\gamma$
8.39±0.24	9975	[48] BENAYOUN	96	RVUE	$e^+e^- \to \pi^0\gamma$
8.88±0.62	10625	[21] DOLINSKY	89	ND	$e^+e^- \to \pi^0\gamma$

[18] Significant interference effect observed. NB of $\omega \to 3\pi$ comes from an extrapolation.
[19] ROOS 70 combines ABRAMOVICH 70 and BIZZARRI 70.
[20] From $\sigma_0^{\omega\pi^0 \to \pi^0\pi^0\gamma}(m_\phi)/\sigma_0^{\omega\pi^0 \to \pi^+\pi^-\pi^0\pi^0}(m_\phi)$ with a phase-space correction factor of 1/1.023.
[21] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma^2_{total}$.
[22] Superseded by ACHASOV 02F.
[23] In the model assuming the $\rho \to \pi^0\pi^0\gamma$ decay via the $\omega\pi$ and $S\gamma$ mechanisms where S is a broad scalar state.
[24] In the model assuming the $\rho \to \pi^0\pi^0\gamma$ decay via the $\omega\pi$ mechanism only.
[25] Restated by us using B($\eta \to$ charged modes) = 29.2%.
[26] Model independent determination.
[27] Solution corresponding to constructive ω-ρ interference.
[28] Using B($\omega \to \pi^+\pi^-\pi^0$)=0.888 ± 0.007.
[29] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^+\pi^-\pi^0)/\Gamma^2_{total}$.
[30] Rescaled by us to correspond to ω width 8.4 MeV. Systematic errors underestimated.
[31] Not resolved from ρ decay. Error statistical only.
[32] From the $m_{\pi^+\pi^-}$ spectrum taking into account the interference of the $\rho\pi$ and $\omega\pi$ amplitudes.
[33] Using the data of BARKOV 85.

[34] Using the data of BARKOV 85 in the hidden local symmetry model.
[35] From a model-dependent analysis assuming complete coherence.
[36] Re-evaluated under $\Gamma(\pi^+\pi^-)/\Gamma(\pi^+\pi^-\pi^0)$ by BEHREND 71 using more accurate $\omega \to \rho$ photoproduction cross-section ratio.
[37] Error statistical only. Authors obtain good fit also assuming $\pi^0\gamma$ as the only neutral decay.
[38] No flat $\eta\eta\gamma$ background assumed.
[39] Solution corresponding to constructive ω-ρ interference.
[40] Using $B(\omega \to e^+e^-) = (7.07 \pm 0.19) \times 10^{-5}$ and using $B(\eta \to 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$. 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 $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{\text{total}}$.
[41] Using $B(\omega \to e^+e^-) = (7.07 \pm 0.19) \times 10^{-5}$ and $B(\eta \to 3\pi^0) = (32.2 \pm 0.4) \times 10^{-2}$.
[42] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{\text{total}}$.
[43] Depending on the degree of coherence with the flat $\eta\eta\gamma$ background and using $B(\omega \to \pi^0\gamma) = (8.5 \pm 0.5) \times 10^{-2}$.
[44] Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.
[45] Superseded by DZHELYADIN 81B result above.
[46] Using $\Gamma(e^+e^-) = 0.60 \pm 0.02$ keV.
[47] From direct 3γ decay search.
[48] Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.

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