

$\omega(782)$ 

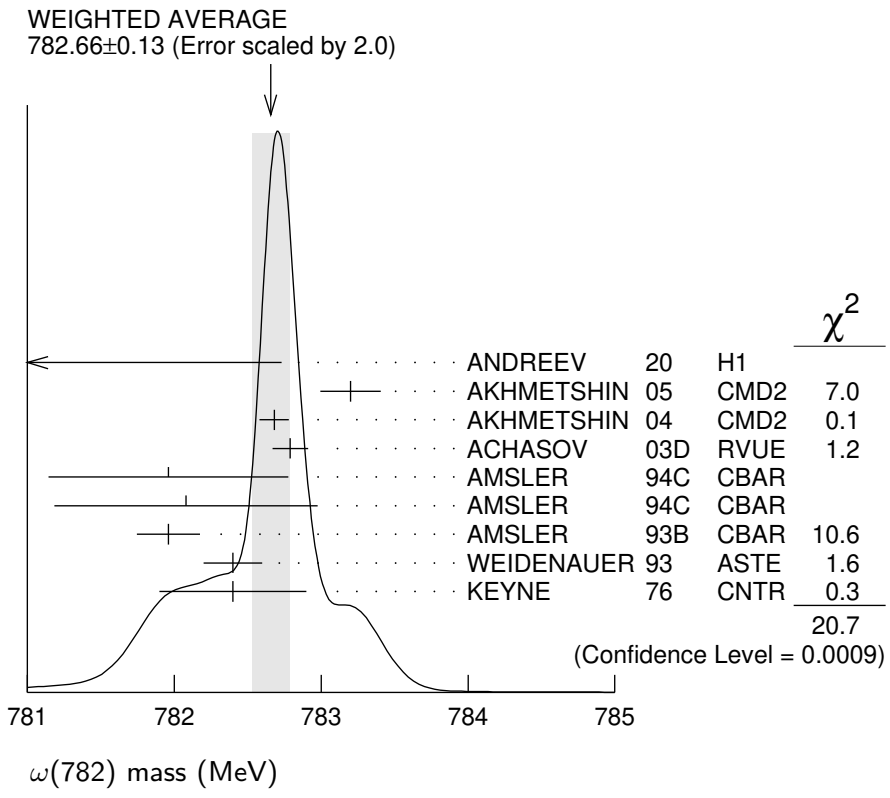
$$I^G(J^{PC}) = 0^-(1^{--})$$

 **$\omega(782)$  MASS**

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>782.66±0.13 OUR AVERAGE</b>		Error includes scale factor of 2.0. See the ideogram below.		
777.9 ±2.2 $\begin{smallmatrix} +4.3 \\ -2.2 \end{smallmatrix}$	900k	ANDREEV 20	H1	$e p \rightarrow e \pi^+ \pi^- p$
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	<sup>1</sup> AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
782.79±0.08±0.09	1.2M	<sup>2</sup> ACHASOV 03D	RVUE	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
781.96±0.17±0.80	11k	<sup>3</sup> AMSLER 94C	CBAR	$0.0 \bar{p} p \rightarrow \omega \eta \pi^0$
782.08±0.36±0.82	3463	<sup>4</sup> 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	$\bar{p} p \rightarrow 2\pi^+ 2\pi^- \pi^0$
782.4 ±0.5	7000	<sup>5</sup> KEYNE 76	CNTR	$\pi^- p \rightarrow \omega n$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
782.58±0.03±0.01		<sup>6</sup> HOID 20	RVUE	$e^+ e^- \rightarrow \pi^0 \gamma$
781.68±0.09±0.03		<sup>7</sup> COLANGELO 19	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^-$
782.63±0.03±0.01		<sup>8</sup> HOFERICHT... 19	RVUE	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
781.91±0.24		<sup>9</sup> LEES 12G	BABR	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma$
782.7 ±0.1 ±1.5	19500	<sup>10</sup> WURZINGER 95	SPEC	$1.33 p d \rightarrow {}^3\text{He} \omega$
781.78±0.10		<sup>10</sup> BARKOV 87	CMD	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
782.2 ±0.4	1488	<sup>11</sup> KURDADZE 83B	OLYA	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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	<sup>12</sup> COYNE 71	HBC	$3.7 \pi^+ p \rightarrow p \pi^+ \pi^+ \pi^- \pi^0$
784.1 ±1.2	750	ABRAMOVI... 70	HBC	$3.9 \pi^- p$
783.2 ±1.6		<sup>13</sup> BIGGS 70B	CNTR	$<4.1 \gamma C \rightarrow \pi^+ \pi^- C$
782.4 ±0.5	2400	BIZZARRI 69	HBC	$0.0 \bar{p} p$

<sup>1</sup> Update of AKHMETSHIN 00C.<sup>2</sup> 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.<sup>3</sup> From the  $\eta \rightarrow \gamma \gamma$  decay.<sup>4</sup> From the  $\eta \rightarrow 3\pi^0$  decay.<sup>5</sup> Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.

- <sup>6</sup> The values were extracted from a dispersively improved Breit-Wigner parameterization and do not include vacuum polarization. Inclusion of vacuum polarization gives  $782.736 \pm 0.024$  MeV.
- <sup>7</sup> The  $\omega$  mass was extracted from a dispersively improved Breit-Wigner parameterization, the  $\omega$  width fixed at  $8.49 \pm 0.08$  MeV. The value does not include vacuum polarization which would shift the mass to  $781.81 \pm 0.09 \pm 0.03$  MeV. The mixing parameter is assumed real valued.
- <sup>8</sup> The values were extracted from a dispersively improved Breit-Wigner parameterization and do not include vacuum polarization.
- <sup>9</sup> From the  $\rho - \omega$  interference in the  $\pi^+ \pi^-$  mass spectrum using the Breit-Wigner for the  $\omega$  and leaving its mass and width as free parameters of the fit.
- <sup>10</sup> Systematic uncertainties underestimated.
- <sup>11</sup> Systematic uncertainties not estimated.
- <sup>12</sup> From best-resolution sample of COYNE 71.
- <sup>13</sup> From  $\omega - \rho$  interference in the  $\pi^+ \pi^-$  mass spectrum assuming  $\omega$  width 12.6 MeV.



### $\omega(782)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>8.68±0.13 OUR AVERAGE</b>				
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	$0.44-2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

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

8.65±0.06±0.01		<sup>3</sup> HOID	20	RVUE	$e^+e^- \rightarrow \pi^0\gamma$
8.71±0.04±0.04		<sup>4</sup> HOFERICHT...	19	RVUE	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.13±0.45		<sup>5</sup> LEES	12G	BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
8.2 ±0.3	19500	<sup>6</sup> WURZINGER	95	SPEC	$1.33 \rho d \rightarrow {}^3\text{He}\omega$
8.4 ±0.1		<sup>7</sup> AULCHENKO	87	ND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.30±0.40		<sup>6</sup> BARKOV	87	CMD	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.8 ±0.9	1488	<sup>8</sup> KURDADZE	83B	OLYA	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.0 ±0.8	433	<sup>6</sup> CORDIER	80	DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
12 ±2	1430	COOPER	78B	HBC	$0.7\text{--}0.8 \bar{p}p \rightarrow 5\pi$
9.4 ±2.5	2100	GESSAROLI	77	HBC	$11 \pi^- p \rightarrow \omega n$
10.22±0.43	20000	<sup>9</sup> KEYNE	76	CNTR	$\pi^- p \rightarrow \omega n$
13.3 ±2	418	AGUILAR-...	72B	HBC	$3.9, 4.6 K^- p$
9.1 ±0.8	451	<sup>6</sup> BENAKSAS	72B	OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
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	$0.0 \rho\bar{p} \rightarrow K_1 K_1 \omega$
12.8 ±3.0	248	BIZZARRI	71	HBC	$0.0 \rho\bar{p} \rightarrow K^+ K^- \omega$
9.5 ±1.0	3583	COYNE	71	HBC	$3.7 \pi^+ p \rightarrow$ $\rho\pi^+\pi^+\pi^-\pi^0$

<sup>1</sup> Update of AKHMETSHIN 00C.

<sup>2</sup> 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.

<sup>3</sup> The values were extracted from a dispersively improved Breit-Wigner parameterization and do not include vacuum polarization. Inclusion of vacuum polarization gives  $8.63 \pm 0.05$  MeV.

<sup>4</sup> The values were extracted from a dispersively improved Breit-Wigner parameterization and do not include vacuum polarization.

<sup>5</sup> From the  $\rho-\omega$  interference in the  $\pi^+\pi^-$  mass spectrum using the Breit-Wigner for the  $\omega$  and leaving its mass and width as free parameters of the fit.

<sup>6</sup> Systematic uncertainties underestimated.

<sup>7</sup> Relativistic Breit-Wigner includes radiative corrections. Systematic uncertainties not estimated.

<sup>8</sup> Systematic uncertainties not estimated.

<sup>9</sup> Observed by threshold-crossing technique. Mass resolution = 4.8 MeV FWHM.

## $\omega(782)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level
$\Gamma_1$ $\pi^+\pi^-\pi^0$	(89.2 ±0.7) %	
$\Gamma_2$ $\pi^0\gamma$	( 8.35±0.27) %	S=2.2
$\Gamma_3$ $\pi^+\pi^-$	( 1.53±0.12) %	S=1.2
$\Gamma_4$ neutrals (excluding $\pi^0\gamma$ )	( 7 <sup>+8</sup> / <sub>-4</sub> ) × 10 <sup>-3</sup>	S=1.1
$\Gamma_5$ $\eta\gamma$	( 4.5 ±0.4 ) × 10 <sup>-4</sup>	S=1.1
$\Gamma_6$ $\pi^0 e^+ e^-$	( 7.7 ±0.6 ) × 10 <sup>-4</sup>	
$\Gamma_7$ $\pi^0 \mu^+ \mu^-$	( 1.34±0.18) × 10 <sup>-4</sup>	S=1.5
$\Gamma_8$ $\eta e^+ e^-$		

$\Gamma_9$	$e^+ e^-$	$(7.38 \pm 0.22) \times 10^{-5}$	$S=1.9$
$\Gamma_{10}$	$\pi^+ \pi^- \pi^0 \pi^0$	$< 2 \times 10^{-4}$	CL=90%
$\Gamma_{11}$	$\pi^+ \pi^- \gamma$	$< 3.6 \times 10^{-3}$	CL=95%
$\Gamma_{12}$	$\pi^+ \pi^- \pi^+ \pi^-$	$< 1 \times 10^{-3}$	CL=90%
$\Gamma_{13}$	$\pi^0 \pi^0 \gamma$	$(6.7 \pm 1.1) \times 10^{-5}$	
$\Gamma_{14}$	$\eta \pi^0 \gamma$	$< 3.3 \times 10^{-5}$	CL=90%
$\Gamma_{15}$	$\mu^+ \mu^-$	$(7.4 \pm 1.8) \times 10^{-5}$	
$\Gamma_{16}$	$3\gamma$	$< 1.9 \times 10^{-4}$	CL=95%

**Charge conjugation (C) violating modes**

$\Gamma_{17}$	$\eta \pi^0$	C	$< 2.1 \times 10^{-4}$	CL=90%
$\Gamma_{18}$	$2\pi^0$	C	$< 2.2 \times 10^{-4}$	CL=90%
$\Gamma_{19}$	$3\pi^0$	C	$< 2.3 \times 10^{-4}$	CL=90%
$\Gamma_{20}$	invisible		$< 7 \times 10^{-5}$	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  $\chi^2 = 48.0$  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.

$x_2$	23								
$x_3$	-18	-4							
$x_4$	-92	-55	1						
$x_5$	7	23	-1	-15					
$x_6$	-1	0	0	0	0				
$x_7$	0	0	0	0	0	0			
$x_9$	-24	-73	4	47	-31	0	0		
$x_{13}$	1	4	0	-2	1	0	0	-3	
$x_{15}$	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**

$\Gamma(\pi^0 \gamma)$						$\Gamma_2$
<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
••• We do not use the following data for averages, fits, limits, etc. •••						
880 ± 50	7815	<sup>1</sup> ACHASOV	13	SND	1.05–2.00 $e^+ e^- \rightarrow \pi^0 \pi^0 \gamma$	
788 ± 12 ± 27	36500	<sup>2</sup> ACHASOV	03	SND	0.60–0.97 $e^+ e^- \rightarrow \pi^0 \gamma$	
764 ± 51	10625	DOLINSKY	89	ND	$e^+ e^- \rightarrow \pi^0 \gamma$	

<sup>1</sup> Systematic uncertainty not estimated.

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

### $\Gamma(\eta\gamma)$ $\Gamma_5$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

6.1 ± 2.5	<sup>1</sup> DOLINSKY	89	ND	$e^+ e^- \rightarrow \eta \gamma$
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<sup>1</sup> Using  $\Gamma_\omega = 8.4 \pm 0.1$  MeV and  $B(\omega \rightarrow \eta \gamma)$  from DOLINSKY 89.

### $\Gamma(e^+ e^-)$ $\Gamma_9$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.60 ± 0.02 OUR EVALUATION**

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

0.591 ± 0.015	11200	<sup>1,2</sup> AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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0.653 ± 0.003 ± 0.021	1.2M	<sup>3</sup> ACHASOV	03D	RVUE 0.44–2.00 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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0.600 ± 0.031	10625	DOLINSKY	89	ND $e^+ e^- \rightarrow \pi^0 \gamma$
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<sup>1</sup> Using  $B(\omega \rightarrow \pi^+ \pi^- \pi^0) = 0.891 \pm 0.007$  and  $\Gamma_{\text{total}} = 8.44 \pm 0.09$  MeV.

<sup>2</sup> Update of AKHMETSHIN 00c.

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

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

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

VALUE (eV)	DOCUMENT ID	TECN	COMMENT
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<b>569.8 ± 3.1 ± 8.2</b>	<sup>1</sup> LEES	21B	BABR 10.5 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$
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<sup>1</sup> From the cross section for  $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$  with contributions from  $\rho(770)$ ,  $\omega(782)$ ,  $\phi(1020)$ ,  $\omega(1420)$ , and  $\omega(1650)$ .

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

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

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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**6.59 ± 0.19 OUR FIT** Error includes scale factor of 2.1.

**6.36 ± 0.14 OUR AVERAGE** Error includes scale factor of 1.3. See the ideogram below.

6.24 ± 0.11 ± 0.08	11.2k	<sup>1</sup> AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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6.74 ± 0.04 ± 0.24	1.2M	<sup>2,3</sup> ACHASOV	03D	RVUE 0.44–2.00 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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6.37 ± 0.35		<sup>2</sup> DOLINSKY	89	ND $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

6.20 ± 0.13		<sup>4</sup> BENAYOUN	10	RVUE 0.4–1.05 $e^+ e^-$
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6.70 ± 0.06 ± 0.27		<sup>5</sup> AUBERT,B	04N	BABR 10.6 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$
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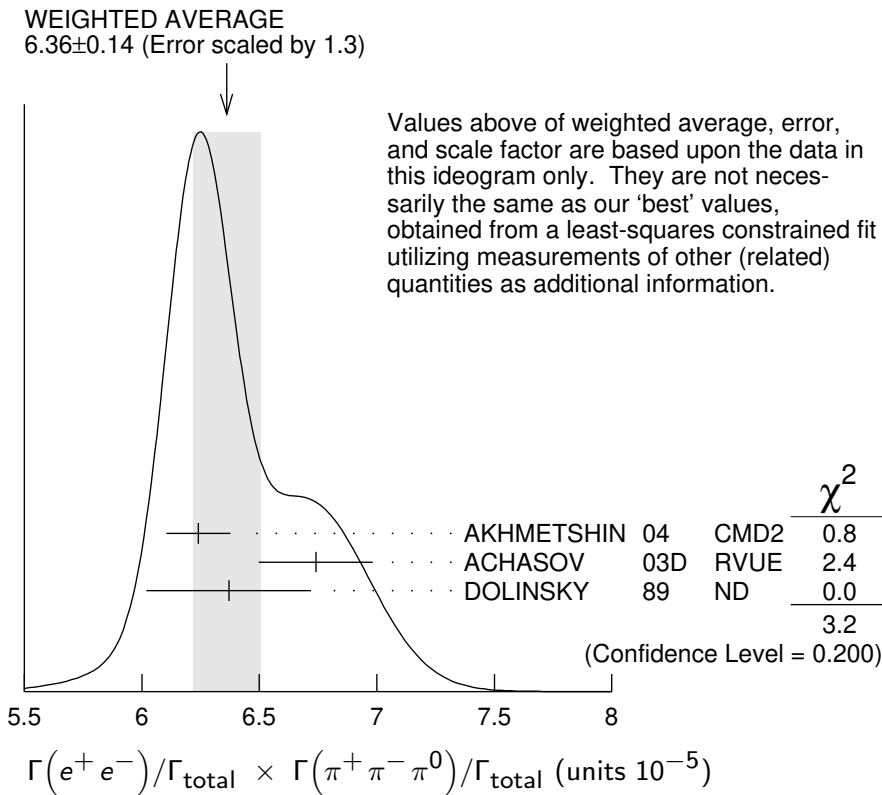
6.45 ± 0.24		<sup>6</sup> BARKOV	87	CMD $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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5.79 ± 0.42	1488	<sup>7</sup> KURDADZE	83B	OLYA $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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5.89 ± 0.54	433	<sup>6</sup> CORDIER	80	DM1 $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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7.54 ± 0.84	451	<sup>6</sup> BENAKSAS	72B	OSPK $e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
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- <sup>1</sup> Update of AKHMETSHIN 00C.
- <sup>2</sup> Recalculated by us from the cross section in the peak.
- <sup>3</sup> 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.
- <sup>4</sup> A simultaneous fit of  $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$  data.
- <sup>5</sup> Superseded by LEES 21B.
- <sup>6</sup> Recalculated by us from the cross section in the peak. Systematic uncertainties underestimated.
- <sup>7</sup> Recalculated by us from the cross section in the peak. Systematic uncertainties not estimated.



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

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>6.16 ±0.14 OUR FIT</b>				Error includes scale factor of 1.8.
<b>6.34 ±0.10 OUR AVERAGE</b>				
6.336±0.056±0.089		<sup>1</sup> 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 $e^+e^- \rightarrow \pi^0\gamma$
6.34 ±0.21 ±0.21	10k	<sup>2</sup> 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		<sup>3</sup> BENAYOUN 10	RVUE	0.4–1.05 $e^+e^-$
6.50 ±0.11 ±0.20	36k	<sup>4</sup> ACHASOV 03	SND	0.60–0.97 $e^+e^- \rightarrow \pi^0\gamma$

<sup>1</sup> 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.

<sup>2</sup> Recalculated by us from the cross section in the peak.

<sup>3</sup> A simultaneous fit of  $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$  data.

<sup>4</sup> 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  $\rho$ - $\omega$  interference equal to  $(-10.2 \pm 7.0)^\circ$ .

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

VALUE (units $10^{-6}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.28 ± 0.05</b>	<b>OUR AVERAGE</b>			
1.318 ± 0.051 ± 0.021		<sup>1</sup> ACHASOV 21	SND	$e^+e^- \rightarrow \pi^+\pi^-$
1.225 ± 0.058 ± 0.041	800k	<sup>2</sup> ACHASOV 06	SND	$e^+e^- \rightarrow \pi^+\pi^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1.166 ± 0.036		<sup>3</sup> BENAYOUN 13	RVUE	0.4–1.05 $e^+e^-$
1.05 ± 0.08		<sup>4</sup> DAVIER 13	RVUE	$e^+e^- \rightarrow \pi^+\pi^-(\gamma)$

<sup>1</sup> From a fit of the cross section in the energy range  $0.525 < \sqrt{s} < 0.883$  GeV parameterized by the sum of the Breit-Wigner amplitudes for the  $\rho(770)$ ,  $\omega$  and  $\rho(1450)$  resonances. The measured phase of the  $\rho(770)$ – $\omega$  interference is  $(110.7 \pm 1.5 \pm 1.0)^\circ$ .

<sup>2</sup> Supersedes ACHASOV 05A.

<sup>3</sup> A 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.

<sup>4</sup> From  $e^+e^- \rightarrow \pi^+\pi^-(\gamma)$  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
<b>3.32 ± 0.28</b>	<b>OUR FIT</b>			Error includes scale factor of 1.1.
<b>3.18 ± 0.28</b>	<b>OUR AVERAGE</b>			
3.10 ± 0.31 ± 0.11	33k	<sup>1</sup> ACHASOV 07B	SND	0.6–1.38 $e^+e^- \rightarrow \eta\gamma$
3.17 <sup>+</sup> <sub>-1.31</sub> ± 1.85 ± 0.21	17.4k	<sup>2</sup> AKHMETSHIN 05	CMD2	0.60–1.38 $e^+e^- \rightarrow \eta\gamma$
3.41 ± 0.52 ± 0.21	23k	<sup>3,4</sup> AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
4.50 ± 0.10		<sup>5</sup> BENAYOUN 10	RVUE	0.4–1.05 $e^+e^-$

<sup>1</sup> 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.

<sup>2</sup> From the  $\eta \rightarrow 2\gamma$  decay and using  $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$ .

<sup>3</sup> From the  $\eta \rightarrow 3\pi^0$  decay and using  $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$ .

<sup>4</sup> 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).

<sup>5</sup> A simultaneous fit of  $e^+e^- \rightarrow \pi^+\pi^-, \pi^+\pi^-\pi^0, \pi^0\gamma, \eta\gamma$  data.

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

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

<sup>1</sup> From 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

$\Gamma(\pi^+ \pi^- \pi^0)/\Gamma_{\text{total}}$   $\Gamma_1/\Gamma$   
 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
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.9024 ± 0.0019		<sup>1</sup> 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	<sup>2,3</sup> ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.880 ± 0.020 ± 0.032	11200	<sup>3,4</sup> AKHMETSHIN	00C	CMD2 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.8942 ± 0.0062		<sup>3</sup> DOLINSKY	89	ND $e^+e^- \rightarrow \pi^+\pi^-\pi^0$

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

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

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

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

$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$   $\Gamma_2/\Gamma$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

8.88 ± 0.18		<sup>1</sup> ACHASOV	16A	SND 0.60–1.38 $e^+e^- \rightarrow \pi^0\gamma$
8.09 ± 0.14		<sup>2</sup> AMBROSINO	08G	KLOE $e^+e^- \rightarrow \pi^+\pi^-2\pi^0, 2\pi^0\gamma$
9.06 ± 0.20 ± 0.57	18k	<sup>3,4</sup> AKHMETSHIN	05	CMD2 0.60–1.38 $e^+e^- \rightarrow \pi^0\gamma$
9.34 ± 0.15 ± 0.31	36k	<sup>4</sup> ACHASOV	03	SND 0.60–0.97 $e^+e^- \rightarrow \pi^0\gamma$
8.65 ± 0.16 ± 0.42	1.2M	<sup>5,6</sup> ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
8.39 ± 0.24	9k	<sup>7</sup> BENAYOUN	96	RVUE $e^+e^- \rightarrow \pi^0\gamma$
8.88 ± 0.62	10k	<sup>4</sup> DOLINSKY	89	ND $e^+e^- \rightarrow \pi^0\gamma$

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

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

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

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

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

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

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

$\Gamma(\pi^0\gamma)/\Gamma(\pi^+\pi^-\pi^0)$   $\Gamma_2/\Gamma_1$

VALUE (units $10^{-2}$ )	DOCUMENT ID	TECN	COMMENT
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**9.35 ± 0.30 OUR FIT** Error includes scale factor of 2.4.

**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		<sup>1</sup> 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 $\pi^+p$
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		<sup>2,3</sup> ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
9.9 ± 0.7		<sup>2</sup> DOLINSKY	89	ND $e^+e^- \rightarrow \pi^0\gamma$



<sup>1</sup> 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.

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

<sup>3</sup> Using ACHASOV 03. Based on 1.2M events.

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

$\Gamma_3/\Gamma$

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

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.53±0.12 OUR FIT</b>	Error includes scale factor of 1.2.			
<b>1.49±0.13 OUR AVERAGE</b>	Error includes scale factor of 1.3. See the ideogram below.			
1.46±0.12±0.02	900k	<sup>1</sup> AKHMETSHIN 07		$e^+e^- \rightarrow \pi^+\pi^-$
1.30±0.24±0.05	11.2k	<sup>2</sup> AKHMETSHIN 04	CMD2	$e^+e^- \rightarrow \pi^+\pi^-$
2.38 <sup>+1.77</sup> <sub>-0.90</sub> ±0.18	5.4k	<sup>3</sup> 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 <sup>+0.9</sup> <sub>-0.7</sub>		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. ● ● ●				
1.29±0.22±0.03	970k	<sup>4,5</sup> ABLIKIM	18C BES3	$\eta'(958) \rightarrow \gamma\pi^+\pi^-$
1.28±0.22±0.03	970k	<sup>6,7</sup> ABLIKIM	18C BES3	$\eta'(958) \rightarrow \gamma\pi^+\pi^-$
1.52±0.08		<sup>8</sup> HANHART	18 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1.75±0.11	4.5M	<sup>9</sup> ACHASOV	05A SND	$e^+e^- \rightarrow \pi^+\pi^-$
2.01±0.29		<sup>10</sup> BENAYOUN	03 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1.9 ±0.3		<sup>11</sup> GARDNER	99 RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
2.3 ±0.4		<sup>12</sup> BENAYOUN	98 RVUE	$e^+e^- \rightarrow \pi^+\pi^-, \mu^+\mu^-$
1.0 ±0.11		<sup>13</sup> WICKLUND	78 ASPK	3,4,6 $\pi^\pm N$
1.22±0.30		ALVENSLEB...	71C CNTR	Photoproduction
1.3 <sup>+1.2</sup> <sub>-0.9</sub>		MOFFEIT	71 HBC	2.8,4.7 $\gamma p$
0.80 <sup>+0.28</sup> <sub>-0.20</sub>		<sup>14</sup> BIGGS	70B CNTR	4.2 $\gamma C \rightarrow \pi^+\pi^- C$

<sup>1</sup> A combined fit of AKHMETSHIN 07, AULCHENKO 06, and AULCHENKO 05.

<sup>2</sup> Update of AKHMETSHIN 02.

<sup>3</sup> From the  $m_{\pi^+\pi^-}$  spectrum taking into account the interference of the  $\rho\pi$  and  $\omega\pi$  amplitudes.

<sup>4</sup> From a fit to  $\pi^+\pi^-$  mass using  $\rho(770)$  (parametrized with the Gounaris-Sakurai approach),  $\omega(782)$ , and box anomaly components.

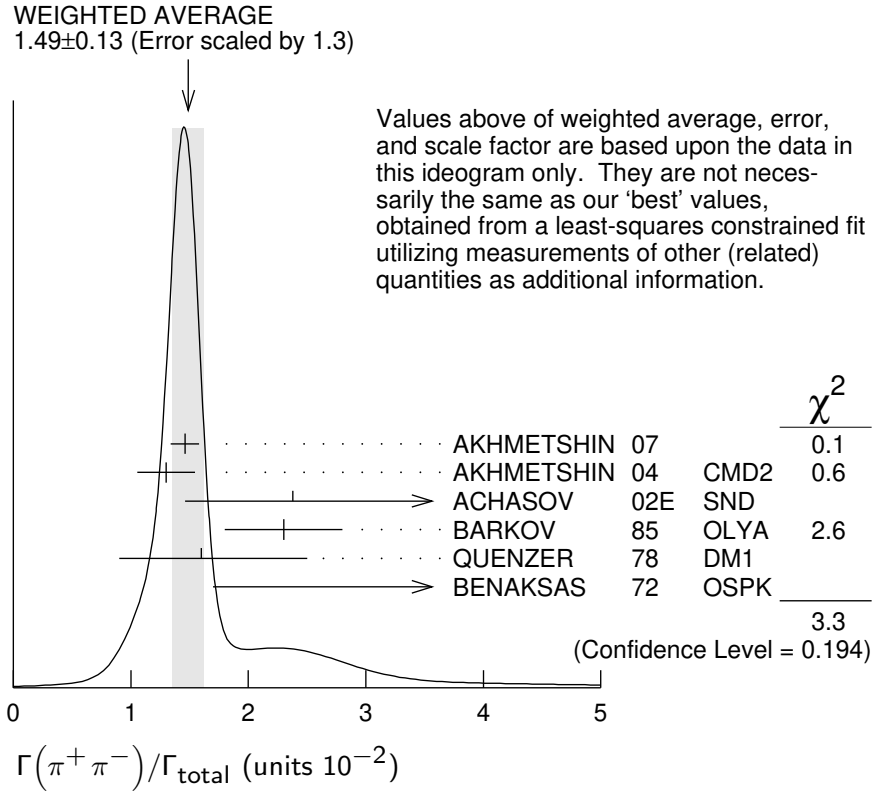
<sup>5</sup> ABLIKIM 18C reports  $[\Gamma(\omega(782) \rightarrow \pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\eta'(958) \rightarrow \omega\gamma)] = (3.25 \pm 0.21 \pm 0.52) \times 10^{-4}$  which we divide by our best value  $B(\eta'(958) \rightarrow \omega\gamma) = (2.52 \pm 0.07) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>6</sup> From a fit to  $\pi^+\pi^-$  mass using  $\rho(770)$  (parametrized with the Gounaris-Sakurai approach),  $\omega(782)$ , and  $\rho(1450)$  components.

<sup>7</sup> 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  $B(\eta'(958) \rightarrow \omega\gamma) = (2.52 \pm 0.07) \times 10^{-2}$ . Our first error is their experiment's error and our second error is the systematic error from using our best value.

<sup>8</sup> Dispersive analysis. Value extracted from average of data from AUBERT 09AS, AKHMETSHIN 07, ACHASOV 06, AMBROSINO 11A, BABUSCI 13D, ABLIKIM 16B normalised by PDG 16 evaluation for  $\Gamma(\omega \rightarrow e^+e^-)$ .

- 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.



**$\Gamma(\pi^+ \pi^-)/\Gamma(\pi^+ \pi^- \pi^0)$**   **$\Gamma_3/\Gamma_1$**   
 See also  $\Gamma(\pi^+ \pi^-)/\Gamma_{\text{total}}$ .

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.0172±0.0014 OUR FIT</b>	Error includes scale factor of 1.2.		
<b>0.026 ±0.005 OUR AVERAGE</b>			
0.021 <sup>+0.028</sup> / <sub>-0.009</sub>	1,2 RATCLIFF 72	ASPK	15 $\pi^- p \rightarrow n 2\pi$
0.028 ±0.006	1 BEHREND 71	ASPK	Photoproduction
0.022 <sup>+0.009</sup> / <sub>-0.01</sub>	3 ROOS 70	RVUE	

- <sup>1</sup> The fitted width of these data is 160 MeV in agreement with present average, thus the  $\omega$  contribution is overestimated. Assuming  $\rho$  width 145 MeV.
- <sup>2</sup> Significant interference effect observed. NB of  $\omega \rightarrow 3\pi$  comes from an extrapolation.
- <sup>3</sup> ROOS 70 combines ABRAMOVICH 70 and BIZZARRI 70.

**$\Gamma(\pi^+ \pi^-)/\Gamma(\pi^0 \gamma)$**   **$\Gamma_3/\Gamma_2$**

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

- <sup>1</sup> 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>
<b>0.091±0.006 OUR FIT</b>				
<b>0.081±0.011 OUR AVERAGE</b>				
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>
<b>0.102±0.008 OUR FIT</b>				
<b>0.103<sup>+0.011</sup><sub>-0.010</sub> OUR AVERAGE</b>				
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 <sup>+0.05</sup> <sub>-0.02</sub>		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		<sup>1</sup> DAKIN	72 OSPK	1.4 $\pi^- p \rightarrow nMM$
>0.81	90	DEINET	69B OSPK	

<sup>1</sup> 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>
<b>0.100±0.008 OUR FIT</b>			
<b>0.124±0.021</b>	FELDMAN	67C OSPK	1.2 $\pi^- p$

$\Gamma(\eta\gamma)/\Gamma_{\text{total}}$   $\Gamma_5/\Gamma$

<u>VALUE (units 10<sup>-4</sup>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>4.5 ±0.4 OUR FIT</b>	Error includes scale factor of 1.1.			
<b>6.3 ±1.3 OUR AVERAGE</b>	Error includes scale factor of 1.2.			
6.6 ±1.7		<sup>1</sup> 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 <sup>+2.5</sup> <sub>-1.8</sub>		<sup>2</sup> ANDREWS	77 CNTR	6.7–10 $\gamma Cu$

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

4.2 ± 0.4 ± 0.1	33k	<sup>3</sup> ACHASOV	07B	SND	0.6–1.38	$e^+e^- \rightarrow \eta\gamma$
4.44 <sup>+2.59</sup> <sub>-1.83</sub> ± 0.28	17.4k	<sup>4,5</sup> AKHMETSHIN	05	CMD2	0.60–1.38	$e^+e^- \rightarrow \eta\gamma$
5.10 ± 0.72 ± 0.34	23k	<sup>6</sup> AKHMETSHIN	01B	CMD2		$e^+e^- \rightarrow \eta\gamma$
0.7 to 5.5		<sup>7</sup> CASE	00	CBAR	0.0	$p\bar{p} \rightarrow \eta\eta\gamma$
6.56 <sup>+2.41</sup> <sub>-2.55</sub>	3525	<sup>2,8</sup> BENAYOUN	96	RVUE		$e^+e^- \rightarrow \eta\gamma$
7.3 ± 2.9		<sup>2,4</sup> DOLINSKY	89	ND		$e^+e^- \rightarrow \eta\gamma$

<sup>1</sup> No flat  $\eta\eta\gamma$  background assumed.

<sup>2</sup> Solution corresponding to constructive  $\omega$ - $\rho$  interference.

<sup>3</sup> 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  $B(\omega(782) \rightarrow e^+e^-) = (7.38 \pm 0.22) \times 10^{-5}$ . 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.

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

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

<sup>6</sup> 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  $\omega$ - $\rho$  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  $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$ .

<sup>7</sup> Depending on the degree of coherence with the flat  $\eta\eta\gamma$  background and using  $B(\omega \rightarrow \pi^0\gamma) = (8.5 \pm 0.5) \times 10^{-2}$ .

<sup>8</sup> Reanalysis of DRUZHININ 84, DOLINSKY 89, DOLINSKY 91 taking into account the triangle anomaly contributions.

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

$\Gamma_5/\Gamma_2$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.0098 ± 0.0024	<sup>1</sup> ALDE	93	GAM2	38π <sup>-</sup> p → ωn
0.0082 ± 0.0033	<sup>2</sup> DOLINSKY	89	ND	$e^+e^- \rightarrow \eta\gamma$
0.010 ± 0.045	APEL	72B	OSPK	4–8 π <sup>-</sup> p → n3γ

<sup>1</sup> Model independent determination.

<sup>2</sup> Solution corresponding to constructive  $\omega$ - $\rho$  interference.

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

$\Gamma_6/\Gamma$

VALUE (units 10 <sup>-4</sup> )	EVTS	DOCUMENT ID	TECN	COMMENT
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**7.7 ± 0.6 OUR FIT**

**7.7 ± 0.6 OUR AVERAGE**

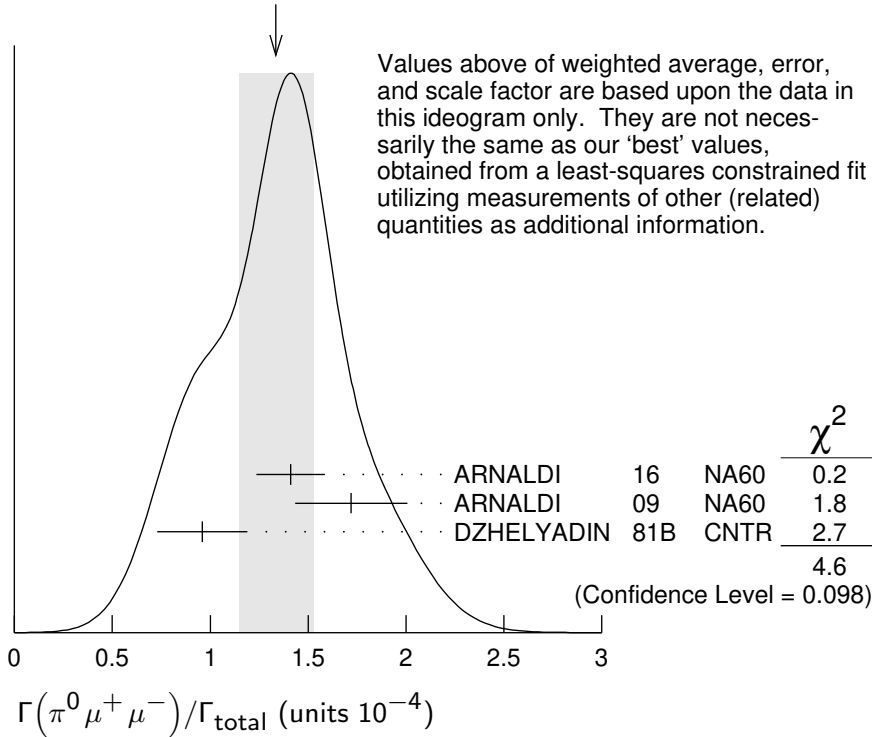
7.61 ± 0.53 ± 0.64		ACHASOV	08	SND	0.36–0.97	$e^+e^- \rightarrow \pi^0 e^+ e^-$
8.19 ± 0.71 ± 0.62		AKHMETSHIN	05A	CMD2	0.72–0.84	$e^+e^-$
5.9 ± 1.9	43	DOLINSKY	88	ND		$e^+e^- \rightarrow \pi^0 e^+ e^-$

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

$\Gamma_7 / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.34 ± 0.18 OUR FIT</b>				Error includes scale factor of 1.5.
<b>1.34 ± 0.19 OUR AVERAGE</b>				Error includes scale factor of 1.5. See the ideogram below.
1.41 ± 0.09 ± 0.15		ARNALDI 16	NA60	400 GeV ( <i>p</i> -A) collisions
1.72 ± 0.25 ± 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 ± 0.19 (Error scaled by 1.5)



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

$\Gamma_8 / \Gamma$

VALUE (units $10^{-5}$ )	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<1.1	AKHMETSHIN 05A	CMD2	0.72-0.84 $e^+ e^-$

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

$\Gamma_9 / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.738 ± 0.022 OUR FIT</b>				Error includes scale factor of 1.9.
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.700 ± 0.016	11200	1,2 AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.752 ± 0.004 ± 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	<sup>2</sup> CORDIER	80	DM1	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.83 ± 0.10	451	<sup>2</sup> BENAKSAS	72B	OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.77 ± 0.06		<sup>4</sup> AUGUSTIN	69D	OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.65 ± 0.13	33	<sup>5</sup> ASTVACAT...	68	OSPK	Assume SU(3)+mixing

<sup>1</sup> Using  $B(\omega \rightarrow \pi^+\pi^-\pi^0) = 0.891 \pm 0.007$ . Update of AKHMETSHIN 00C.

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

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

<sup>4</sup> Rescaled by us to correspond to  $\omega$  width 8.4 MeV. Systematic errors underestimated.

<sup>5</sup> Not resolved from  $\rho$  decay. Error statistical only.

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

<u>VALUE (units 10<sup>-4</sup>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
< 2	90	ACHASOV	09A	SND $e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
<200	90	KURDADZE	86	OLYA $e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$

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

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

### $\Gamma(\pi^+\pi^-\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ $\Gamma_{11}/\Gamma_1$

<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. ● ● ●				
<0.066	90	KALBFLEISCH	75	HBC 2.18 $K^-p \rightarrow \Lambda\pi^+\pi^-\gamma$
<0.05	90	FLATTE	66	HBC 1.2 – 1.7 $K^-p \rightarrow \Lambda\pi^+\pi^-\gamma$

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

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<1 × 10 <sup>-3</sup>	90	KURDADZE	88	OLYA $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$

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

<u>VALUE (units 10<sup>-5</sup>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>6.7 ± 1.1 OUR FIT</b>				
<b>6.5 ± 1.2 OUR AVERAGE</b>				
6.4 <sup>+2.4</sup> <sub>-2.0</sub> ± 0.8	190	<sup>1</sup> AKHMETSHIN	04B	CMD2 0.6–0.97 $e^+e^- \rightarrow \pi^0\pi^0\gamma$
6.6 <sup>+1.4</sup> <sub>-1.3</sub> ± 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 <sup>+2.1</sup> <sub>-1.9</sub> ± 1.4	190	<sup>2</sup> AKHMETSHIN	04B	CMD2 0.6–0.97 $e^+e^- \rightarrow \pi^0\pi^0\gamma$
7.8 ± 2.7 ± 2.0	63	<sup>1,3</sup> ACHASOV	00G	SND $e^+e^- \rightarrow \pi^0\pi^0\gamma$
12.7 ± 2.3 ± 2.5	63	<sup>2,3</sup> ACHASOV	00G	SND $e^+e^- \rightarrow \pi^0\pi^0\gamma$

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

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

<sup>3</sup> Superseded by ACHASOV 02F.

$\Gamma(\pi^0\pi^0\gamma)/\Gamma(\pi^+\pi^-\pi^0)$   $\Gamma_{13}/\Gamma_1$

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	$2.05 \pi^+ p \rightarrow \pi^+ p \gamma$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma(\pi^0\gamma)$   $\Gamma_{13}/\Gamma_2$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>8.0±1.3 OUR FIT</b>					
<b>8.5±2.9</b>		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 $2.9 \pi^+ p$
<1000	90		BARMIN	64	HLBC $1.3-2.8 \pi^- p$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.22±0.07		<sup>1</sup> DAKIN 72	OSPK	$1.4 \pi^- p \rightarrow nMM$
<0.19	90	DEINET 69B	OSPK	
<sup>1</sup> See $\Gamma(\pi^0\gamma)/\Gamma(\text{neutrals})$ .				

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

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

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

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>7.4±1.8 OUR FIT</b>				
<b>7.4±1.8 OUR AVERAGE</b>				
6.6±1.4±1.7	4.5M	<sup>1</sup> ANASTASI 17	KLOE	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
9.0±2.9±1.1	18	HEISTER 02C	ALEP	$Z \rightarrow \mu^+\mu^- + X$

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

$\Gamma(\mu^+\mu^-)/\Gamma(\pi^+\pi^-\pi^0)$   $\Gamma_{15}/\Gamma_1$

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<0.2	90	WILSON 69	OSPK	$12 \pi^- C \rightarrow Fe$
● ● ● 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	$2.7 K^- p$

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma(\mu^+ \mu^-)$   $\Gamma_7/\Gamma_{15}$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$1.2 \pm 0.6$	30	<sup>1</sup> DZHELYADIN 79	CNTR	25–33 $\pi^- p$
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<sup>1</sup>Superseded by DZHELYADIN 81B result above.

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

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt;1.9</b>	95	<sup>1</sup> ABELE 97E	CBAR	0.0 $\bar{p} p \rightarrow 5\gamma$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<2	90	<sup>1</sup> PROKOSHKIN 95	GAM2	38 $\pi^- p \rightarrow 3\gamma n$
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<sup>1</sup>From direct  $3\gamma$  decay search.

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

Violates C conservation.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.001	90	ALDE 94B	GAM2	38 $\pi^- p \rightarrow \eta\pi^0 n$
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$[\Gamma(\eta\gamma) + \Gamma(\eta\pi^0)]/\Gamma(\pi^+ \pi^- \pi^0)$   $(\Gamma_5 + \Gamma_{17})/\Gamma_1$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt;0.016</b>	90	<sup>1</sup> FLATTE 66	HBC	1.2 – 1.7 $K^- p \rightarrow \Lambda\pi^+ \pi^- \text{MM}$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.045	95	JACQUET 69B	HLBC	2.05 $\pi^+ p \rightarrow \pi^+ p\omega$
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<sup>1</sup>Restated by us using  $B(\eta \rightarrow \text{charged modes}) = 29.2\%$ .

$\Gamma(\eta\pi^0)/\Gamma(\pi^0\gamma)$   $\Gamma_{17}/\Gamma_2$

Violates C conservation.

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt;2.6</b>	90	<sup>1</sup> STAROSTIN 09	CRYM	$\gamma p \rightarrow \eta\pi^0 p$
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<sup>1</sup>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  $B(\eta \rightarrow 2\gamma) = 39.36 \times 10^{-2}$ .

$\Gamma(2\pi^0)/\Gamma(\pi^0\gamma)$   $\Gamma_{18}/\Gamma_2$

Violates C conservation and Bose-Einstein statistics.

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt;2.59</b>	90	STAROSTIN 09	CRYM	$\gamma p \rightarrow 2\pi^0 p$
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$\Gamma(3\pi^0)/\Gamma_{\text{total}}$   $\Gamma_{19}/\Gamma$

Violates C conservation.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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• • • We do not use the following data for averages, fits, limits, etc. • • •

< $3 \times 10^{-4}$	90	PROKOSHKIN 95	GAM2	38 $\pi^- p \rightarrow 3\pi^0 n$
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$\Gamma(3\pi^0)/\Gamma(\pi^0\gamma)$   $\Gamma_{19}/\Gamma_2$

Violates C conservation.

<u>VALUE (units <math>10^{-3}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>&lt;2.72</b>	90	STAROSTIN 09	CRYM	$\gamma p \rightarrow 3\pi^0 p$
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$\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$	$\Gamma_{19}/\Gamma_1$
Violates <i>C</i> conservation.	
<u>VALUE</u>	<u>CL%</u>
<u>DOCUMENT ID</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •	
<0.009	90
BARBERIS	01
450 $p p \rightarrow p_f 3\pi^0 p_s$	

$\Gamma(\text{invisible})/\Gamma(\pi^+\pi^-\pi^0)$	$\Gamma_{20}/\Gamma_1$
<u>VALUE</u>	<u>CL%</u>
<u>DOCUMENT ID</u>	<u>TECN</u>
<u>COMMENT</u>	
<b>&lt;8.1 × 10<sup>-5</sup></b>	90
ABLIKIM	18S
BES3 $J/\psi \rightarrow \omega\eta \rightarrow \omega\pi^+\pi^-\pi^0$	

### PARAMETER $\Lambda$ 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  $\Lambda$  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  $\Lambda$  consistent with vector dominance.

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

<u>VALUE (GeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.670 ± 0.006 OUR AVERAGE</b>				
0.6707 ± 0.0039 ± 0.0056		<sup>1</sup> ARNALDI	16	NA60
				400 GeV ( <i>p</i> -A) collisions
0.668 ± 0.009 ± 0.003	3k	<sup>2</sup> 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 $\pi^- p \rightarrow \omega n$
<sup>1</sup> ARNALDI 16 reports $\Lambda^{-2}(\omega) = 2.223 \pm 0.026 \pm 0.037$ GeV <sup>-2</sup> which we converted to the quoted $\Lambda$ value.				
<sup>2</sup> ARNALDI 09 reports $\Lambda^{-2}(\omega) = 2.24 \pm 0.06 \pm 0.02$ GeV <sup>-2</sup> which we converted to the quoted $\Lambda$ value.				

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

<u>VALUE (GeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.709 ± 0.037</b>				
1.1k		<sup>1</sup> ADLARSON	17B	A2MM
				$\gamma p \rightarrow \omega p$
<sup>1</sup> ADLARSON 17B reports $\Lambda^{-2}(\omega\pi^0) = 1.99 \pm 0.21$ GeV <sup>-2</sup> that we converted to the quoted $\Lambda$ value.				

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

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

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.133 ± 0.008 OUR AVERAGE</b>				
0.1321 ± 0.0067 ± 0.0046	260k	<sup>1</sup> ABLIKIM	18AD	BES3
				$J/\psi \rightarrow \omega\eta$
0.147 ± 0.036	44k	ADLARSON	17	WASA
				$\alpha$ in $p d \rightarrow {}^3\text{He } \omega,$ $p p \rightarrow p p \omega$

<sup>1</sup> 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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AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
BARBERIS	01	PL B507 14	D. Barberis <i>et al.</i>	
ACHASOV	00	EPJ C12 25	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV	00D	JETPL 72 282	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
		Translated from ZETFP 72 411.		

ACHASOV	00G	JETPL 71 355	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
		Translated from ZETFP 71 519.		
AKHMETSIN	00C	PL B476 33	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AULCHENKO	00A	JETP 90 927	V.M. Aulchenko <i>et al.</i>	(Novosibirsk SND Collab.)
		Translated from ZETF 117 1067.		
CASE	00	PR D61 032002	T. Case <i>et al.</i>	(Crystal Barrel Collab.)
ACHASOV	99E	PL B462 365	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
GARDNER	99	PR D59 076002	S. Gardner, H.B. O'Connell	
BENAYOUN	98	EPJ C2 269	M. Benayoun <i>et al.</i>	(IPNP, NOVO, ADLD+)
ABELE	97E	PL B411 361	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
BENAYOUN	96	ZPHY C72 221	M. Benayoun <i>et al.</i>	(IPNP, NOVO)
PROKOSHKIN	95	PD 40 273	Y.D. Prokoshkin, V.D. Samoilenko	(SERP)
		Translated from DANS 342 610.		
WURZINGER	95	PR C51 443	R. Wurzinger <i>et al.</i>	(BONN, ORSAY, SACL+)
ALDE	94B	PL B340 122	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP+)
AMSLER	94C	PL B327 425	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
ALDE	93	PAN 56 1229	D.M. Alde <i>et al.</i>	(SERP, LAPP, LANL, BELG+)
		Translated from YAF 56 137.		
Also		ZPHY C61 35	D.M. Alde <i>et al.</i>	(SERP, LAPP, LANL, BELG+)
AMSLER	93B	PL B311 362	C. Amsler <i>et al.</i>	(Crystal Barrel Collab.)
WEIDENAUER	93	ZPHY C59 387	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)
ANTONELLI	92	ZPHY C56 15	A. Antonelli <i>et al.</i>	(DM2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)
WEIDENAUER	90	ZPHY C47 353	P. Weidenauer <i>et al.</i>	(ASTERIX Collab.)
DOLINSKY	89	ZPHY C42 511	S.I. Dolinsky <i>et al.</i>	(NOVO)
BITYUKOV	88B	SJNP 47 800	S.I. Bityukov <i>et al.</i>	(SERP)
		Translated from YAF 47 1258.		
DOLINSKY	88	SJNP 48 277	S.I. Dolinsky <i>et al.</i>	(NOVO)
		Translated from YAF 48 442.		
KURDADZE	88	JETPL 47 512	L.M. Kurdadze <i>et al.</i>	(NOVO)
		Translated from ZETFP 47 432.		
AULCHENKO	87	PL B186 432	V.M. Aulchenko <i>et al.</i>	(NOVO)
BARKOV	87	JETPL 46 164	L.M. Barkov <i>et al.</i>	(NOVO)
		Translated from ZETFP 46 132.		
KURDADZE	86	JETPL 43 643	L.M. Kurdadze <i>et al.</i>	(NOVO)
		Translated from ZETFP 43 497.		
BARKOV	85	NP B256 365	L.M. Barkov <i>et al.</i>	(NOVO)
DRUZHININ	84	PL 144B 136	V.P. Druzhinin <i>et al.</i>	(NOVO)
KURDADZE	83B	JETPL 36 274	A.M. Kurdadze <i>et al.</i>	(NOVO)
		Translated from ZETFP 36 221.		
DZHELYADIN	81B	PL 102B 296	R.I. Dzheilyadin <i>et al.</i>	(SERP)
CORDIER	80	NP B172 13	A. Cordier <i>et al.</i>	(LALO)
DZHELYADIN	80	PL 94B 548	R.I. Dzheilyadin <i>et al.</i>	(SERP)
ROOS	80	LNC 27 321	M. Roos, A. Pellinen	(HELS)
BENKHEIRI	79	NP B150 268	P. Benkheiri <i>et al.</i>	(EPOL, CERN, CDEF+)
DZHELYADIN	79	PL 84B 143	R.I. Dzheilyadin <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)
GOUNARIS	68	PRL 21 244	G.J. Gounaris, J.J. Sakurai	
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)