

$\phi(1020)$

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

 $\phi(1020)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1019.460±0.019 OUR AVERAGE				
1019.52 ±0.05 ±0.05	17400	AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \rightarrow$
1019.483±0.011±0.025	272k	¹ AKHMETSHIN 04	CMD2	$\eta\gamma$ $e^+e^- \rightarrow K_L^0 K_S^0$
1019.42 ±0.05	1900k	² ACHASOV 01E	SND	$e^+e^- \rightarrow K^+ K^-,$ $K_S K_L, \pi^+ \pi^- \pi^0$
1019.40 ±0.04 ±0.05	23k	AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$
1019.36 ±0.12		³ ACHASOV 00B	SND	$e^+e^- \rightarrow \eta\gamma$
1019.38 ±0.07 ±0.08	2200	⁴ AKHMETSHIN 99F	CMD2	$e^+e^- \rightarrow \pi^+ \pi^- \geq$ 2γ
1019.51 ±0.07 ±0.10	11169	AKHMETSHIN 98	CMD2	$e^+e^- \rightarrow \pi^+ \pi^- \pi^0$
1019.5 ±0.4		BARBERIS 98	OMEG	450 $pp \rightarrow$ $pp2K^+2K^-$
1019.42 ±0.06	55600	AKHMETSHIN 95	CMD2	$e^+e^- \rightarrow$ hadrons
1019.7 ±0.3	2012	DAVENPORT 86	MPSF	400 $pA \rightarrow 4KX$
1019.7 ±0.1 ±0.1	5079	ALBRECHT 85D	ARG	10 $e^+e^- \rightarrow$ $K^+ K^- X$
1019.3 ±0.1	1500	ARENTON 82	AEMS	11.8 polar. $pp \rightarrow$ KK
1019.67 ±0.17	25080	⁵ PELLINEN 82	RVUE	
1019.52 ±0.13	3681	BUKIN 78C	OLYA	$e^+e^- \rightarrow$ hadrons
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1019.63 ±0.07	12540	⁶ AUBERT,B 05J	BABR	$D^0 \rightarrow \bar{K}^0 K^+ K^-$
1019.8 ±0.7		ARMSTRONG 86	OMEG	85 $\pi^+ / pp \rightarrow$ $\pi^+ / p4Kp$
1020.1 ±0.11	5526	⁶ ATKINSON 86	OMEG	20-70 γp
1019.7 ±1.0		BEBEK 86	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
1019.411±0.008	642k	⁷ DIJKSTRA 86	SPEC	100-200 $\pi^\pm, \bar{p}, p,$ K^\pm , on Be
1020.9 ±0.2		⁶ FRAME 86	OMEG	13 $K^+ p \rightarrow \phi K^+ p$
1021.0 ±0.2		⁶ ARMSTRONG 83B	OMEG	18.5 $K^- p \rightarrow$ $K^- K^+ \Lambda$
1020.0 ±0.5		⁶ ARMSTRONG 83B	OMEG	18.5 $K^- p \rightarrow$ $K^- K^+ \Lambda$
1019.7 ±0.3		⁶ BARATE 83	GOLI	190 $\pi^- Be \rightarrow 2\mu X$
1019.8 ±0.2 ±0.5	766	IVANOV 81	OLYA	1-1.4 $e^+e^- \rightarrow$ $K^+ K^-$
1019.4 ±0.5	337	COOPER 78B	HBC	0.7-0.8 $\bar{p}p \rightarrow$ $K_S^0 K_L^0 \pi^+ \pi^-$
1020 ±1	383	⁶ BALDI 77	CNTR	10 $\pi^- p \rightarrow \pi^- \phi p$
1018.9 ±0.6	800	COHEN 77	ASPK	6 $\pi^\pm N \rightarrow K^+ K^- N$
1019.7 ±0.5	454	KALBFLEISCH 76	HBC	2.18 $K^- p \rightarrow \Lambda K \bar{K}$
1019.4 ±0.8	984	BESCH 74	CNTR	2 $\gamma p \rightarrow p K^+ K^-$

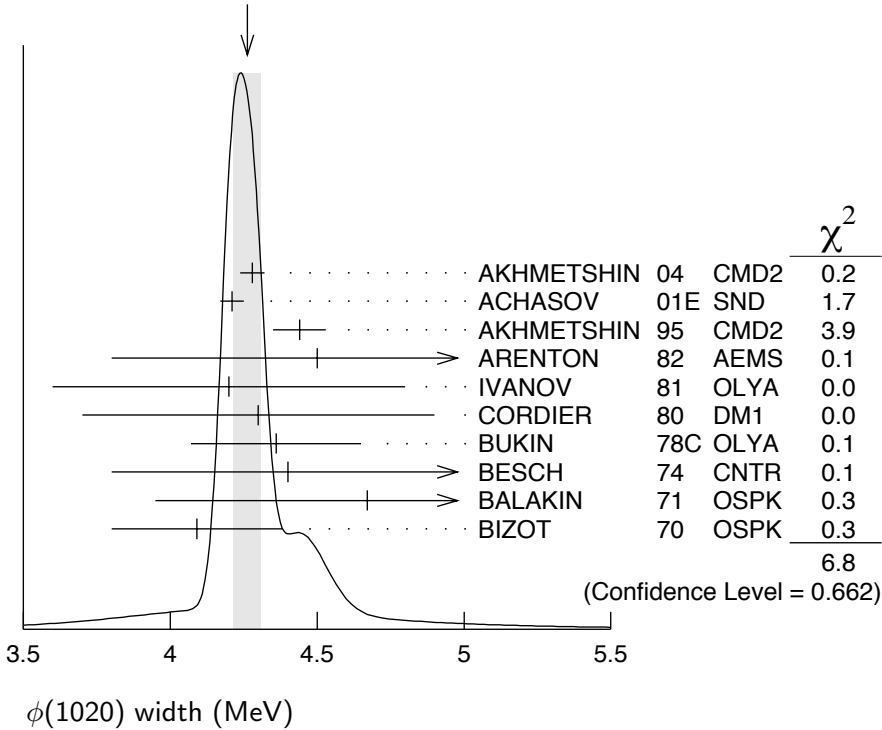
1020.3 ±0.4	100	BALLAM	73 HBC	2.8–9.3 γp
1019.4 ±0.7		BINNIE	73B CNTR	$\pi^- p \rightarrow \phi n$
1019.6 ±0.5	120	⁸ AGUILAR-...	72B HBC	3.9,4.6 $K^- p \rightarrow$ $\Lambda K^+ K^-$
1019.9 ±0.5	100	⁸ AGUILAR-...	72B HBC	3.9,4.6 $K^- p \rightarrow$ $K^- p K^+ K^-$
1020.4 ±0.5	131	COLLEY	72 HBC	10 $K^+ p \rightarrow K^+ p \phi$
1019.9 ±0.3	410	STOTTLE...	71 HBC	2.9 $K^- p \rightarrow$ $\Sigma / \Lambda K \bar{K}$

¹ Update of AKHMETSHIN 01D² From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of $K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$, and $\eta \gamma$ decays modes and using ACHASOV 00B for the $\eta \gamma$ decay mode.³ Using a total width of 4.43 ± 0.05 MeV. Systematic uncertainty included.⁴ Using a total width of 4.43 ± 0.05 MeV.⁵ PELLINEN 82 review includes AKERLOF 77, DAUM 81, BALDI 77, AYRES 74, DE-GROOT 74.⁶ Systematic errors not evaluated.⁷ Weighted and scaled average of 12 measurements of DIJKSTRA 86.⁸ Mass errors enlarged by us to Γ/\sqrt{N} ; see the note with the $K^*(892)$ mass.

$\phi(1020)$ WIDTH

VALUE (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
4.26 ±0.05 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.		
4.280 ±0.033 ±0.025	272k	⁹ AKHMETSHIN 04	CMD2	$e^+ e^- \rightarrow K_L^0 K_S^0$
4.21 ±0.04	1900k	¹⁰ ACHASOV	01E SND	$e^+ e^- \rightarrow K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$
4.44 ±0.09	55600	AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow$ hadrons
4.5 ±0.7	1500	ARENTON	82 AEMS	11.8 polar. $pp \rightarrow K K$
4.2 ±0.6	766	¹¹ IVANOV	81 OLYA	1–1.4 $e^+ e^- \rightarrow$ $K^+ K^-$
4.3 ±0.6		¹¹ CORDIER	80 DM1	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
4.36 ±0.29	3681	¹¹ BUKIN	78C OLYA	$e^+ e^- \rightarrow$ hadrons
4.4 ±0.6	984	¹¹ BESCH	74 CNTR	2 $\gamma p \rightarrow p K^+ K^-$
4.67 ±0.72	681	¹¹ BALAKIN	71 OSPK	$e^+ e^- \rightarrow$ hadrons
4.09 ±0.29		BIZOT	70 OSPK	$e^+ e^- \rightarrow$ hadrons
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
4.28 ±0.13	12540	¹² AUBERT,B	05J BABR	$D^0 \rightarrow \bar{K}^0 K^+ K^-$
4.45 ±0.06	271k	DIJKSTRA	86 SPEC	100 $\pi^- \text{Be}$
3.6 ±0.8	337	¹¹ COOPER	78B HBC	0.7–0.8 $\bar{p} p \rightarrow$ $K_S^0 K_L^0 \pi^+ \pi^-$
4.5 ±0.50	1300	^{11,12} AKERLOF	77 SPEC	400 $p A \rightarrow K^+ K^- X$
4.5 ±0.8	500	^{11,12} AYRES	74 ASPK	3–6 $\pi^- p \rightarrow$ $K^+ K^- n$, $K^- p \rightarrow$ $K^+ K^- \Lambda / \Sigma^0$
3.81 ±0.37		COSME	74B OSPK	$e^+ e^- \rightarrow K_L^0 K_S^0$
3.8 ±0.7	454	¹¹ BORENSTEIN	72 HBC	2.18 $K^- p \rightarrow K \bar{K} n$

WEIGHTED AVERAGE
4.26±0.05 (Error scaled by 1.7)



- ⁹ Update of AKHMETSHIN 01D
- ¹⁰ From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of $K^+ K^-$, $K_S^0 K_L^0$, $\pi^+ \pi^- \pi^0$, and $\eta \gamma$ decays modes and using ACHASOV 00B for the $\eta \gamma$ decay mode.
- ¹¹ Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.
- ¹² Systematic errors not evaluated.

$\phi(1020)$ DECAY MODES

Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$K^+ K^-$	(49.2 ±0.6) %	S=1.2
Γ_2	$K_L^0 K_S^0$	(34.0 ±0.5) %	S=1.1
Γ_3	$\rho \pi + \pi^+ \pi^- \pi^0$	(15.3 ±0.4) %	S=1.2
Γ_4	$\rho \pi$		
Γ_5	$\pi^+ \pi^- \pi^0$		
Γ_6	$\eta \gamma$	(1.301±0.024) %	S=1.1
Γ_7	$\pi^0 \gamma$	(1.25 ±0.07) × 10 ⁻³	
Γ_8	$\ell^+ \ell^-$		
Γ_9	$e^+ e^-$	(2.97 ±0.04) × 10 ⁻⁴	S=1.1
Γ_{10}	$\mu^+ \mu^-$	(2.86 ±0.19) × 10 ⁻⁴	
Γ_{11}	$\eta e^+ e^-$	(1.15 ±0.10) × 10 ⁻⁴	
Γ_{12}	$\pi^+ \pi^-$	(7.3 ±1.3) × 10 ⁻⁵	
Γ_{13}	$\omega \pi^0$	(5.2 ^{+1.3} _{-1.1}) × 10 ⁻⁵	
Γ_{14}	$\omega \gamma$	< 5 %	CL=84%

Γ_{15}	$\rho\gamma$	< 1.2	$\times 10^{-5}$	CL=90%
Γ_{16}	$\pi^+\pi^-\gamma$	(4.1 ± 1.3)	$\times 10^{-5}$	
Γ_{17}	$f_0(980)\gamma$	(4.40 ± 0.21)	$\times 10^{-4}$	
Γ_{18}	$\pi^0\pi^0\gamma$	(1.09 ± 0.06)	$\times 10^{-4}$	
Γ_{19}	$\pi^+\pi^-\pi^+\pi^-$	$(3.9 \pm_{-2.2}^{+2.8})$	$\times 10^{-6}$	
Γ_{20}	$\pi^+\pi^+\pi^-\pi^-\pi^0$	< 4.6	$\times 10^{-6}$	CL=90%
Γ_{21}	$\pi^0e^+e^-$	(1.12 ± 0.28)	$\times 10^{-5}$	
Γ_{22}	$\pi^0\eta\gamma$	(8.3 ± 0.5)	$\times 10^{-5}$	
Γ_{23}	$a_0(980)\gamma$	(7.6 ± 0.6)	$\times 10^{-5}$	
Γ_{24}	$\eta'(958)\gamma$	(6.2 ± 0.7)	$\times 10^{-5}$	S=1.1
Γ_{25}	$\eta\pi^0\pi^0\gamma$	< 2	$\times 10^{-5}$	CL=90%
Γ_{26}	$\mu^+\mu^-\gamma$	(1.4 ± 0.5)	$\times 10^{-5}$	
Γ_{27}	$\rho\gamma\gamma$	< 5	$\times 10^{-4}$	CL=90%
Γ_{28}	$\eta\pi^+\pi^-$	< 1.8	$\times 10^{-5}$	CL=90%
Γ_{29}	$\eta\mu^+\mu^-$	< 9.4	$\times 10^{-6}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 25 branching ratios uses 70 measurements and one constraint to determine 12 parameters. The overall fit has a $\chi^2 = 58.1$ for 59 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	-75										
x_3	-62	-5									
x_6	-30	25	9								
x_7	-13	12	4	12							
x_9	55	-51	-20	-51	-23						
x_{10}	-8	7	3	7	3	-15					
x_{12}	-4	4	1	4	2	-7	1				
x_{17}	0	0	0	0	0	0	0	0			
x_{19}	-1	1	0	1	0	-2	0	0	0		
x_{23}	0	0	0	0	0	0	0	0	0	0	
x_{24}	-5	4	2	17	2	-9	1	1	0	0	
	x_1	x_2	x_3	x_6	x_7	x_9	x_{10}	x_{12}	x_{17}	x_{19}	
x_{24}	0										
	x_{23}										

$\phi(1020)$ PARTIAL WIDTHS

$\Gamma(\eta\gamma)$ Γ_6

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$58.9 \pm 0.5 \pm 2.4$	ACHASOV	00	SND $e^+e^- \rightarrow \eta\gamma$

 $\Gamma(\pi^0\gamma)$ Γ_7

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$5.40 \pm 0.16^{+0.43}_{-0.40}$	ACHASOV	00	SND $e^+e^- \rightarrow \pi^0\gamma$

 $\Gamma(\ell^+\ell^-)$ Γ_8

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$1.320 \pm 0.017 \pm 0.015$	¹³ AMBROSINO	05	KLOE $1.02 e^+e^- \rightarrow \mu^+\mu^-$

 $\Gamma(e^+e^-)$ Γ_9

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.27 ± 0.04 OUR EVALUATION				
$1.32 \pm 0.05 \pm 0.03$		¹⁴ AMBROSINO	05	KLOE $1.02 e^+e^- \rightarrow e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.27 ± 0.03	272k	¹⁵ AKHMETSHIN	04	CMD2 $e^+e^- \rightarrow K_L^0 K_S^0$

 $(\Gamma(e^+e^-) \times \Gamma(\mu^+\mu^-))^{\frac{1}{2}}$ $(\Gamma_9\Gamma_{10})^{\frac{1}{2}}$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
$1.320 \pm 0.018 \pm 0.017$	AMBROSINO	05	KLOE $1.02 e^+e^- \rightarrow \mu^+\mu^-$
¹³ Weighted average of Γ_{ee} and $\sqrt{\Gamma_{ee}\Gamma_{\mu\mu}}$ from AMBROSINO 05 assuming lepton universality.			
¹⁴ From forward-backward asymmetry and using $\Gamma_{\text{total}} = 4.26 \pm 0.05$ MeV from the 2004 edition of this Review.			
¹⁵ Using $B(\phi \rightarrow K_L^0 K_S^0) = 0.337 \pm 0.005$ and $\Gamma_{\text{total}} = 4.26 \pm 0.05$ MeV. Update of AKHMETSHIN 99D.			

 $\phi(1020) \Gamma(i) \Gamma(e^+e^-) / \Gamma^2(\text{total})$ $\Gamma(e^+e^-) \times \Gamma(K^+K^-) / \Gamma_{\text{total}}^2$ $\Gamma_9\Gamma_1/\Gamma^2$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
14.60 ± 0.33 OUR FIT	Error includes scale factor of 1.2.			
$13.93 \pm 0.14 \pm 0.99$	1000k	¹⁶ ACHASOV	01E	SND $e^+e^- \rightarrow K^+K^-, K_S^0 K_L^0, \pi^+\pi^-\pi^0$

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

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
10.11 ± 0.13 OUR FIT				
10.06 ± 0.16 OUR AVERAGE				
$10.01 \pm 0.04 \pm 0.17$	272k	¹⁷ AKHMETSHIN	04	CMD2 $e^+e^- \rightarrow K_L^0 K_S^0$
$10.27 \pm 0.07 \pm 0.34$	500k	¹⁶ ACHASOV	01E	SND $e^+e^- \rightarrow K^+K^-, K_S^0 K_L^0, \pi^+\pi^-\pi^0$

$$\Gamma(e^+e^-) \times [\Gamma(\rho\pi) + \Gamma(\pi^+\pi^-\pi^0)]/\Gamma_{\text{total}}^2 \quad \Gamma_9\Gamma_3/\Gamma^2$$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
4.53 ± 0.12 OUR FIT	Error includes scale factor of 1.1.			
4.43 ± 0.15 OUR AVERAGE				
4.30 ± 0.08 ± 0.21		AUBERT,B	04N BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
4.665 $\pm 0.042 \pm 0.261$	400k	16 ACHASOV	01E SND	$e^+e^- \rightarrow K^+K^-, K_S K_L, \pi^+\pi^-\pi^0$
4.35 ± 0.27 ± 0.08	11169	18 AKHMETSHIN 98	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$

$$\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2 \quad \Gamma_9\Gamma_6/\Gamma^2$$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
3.86 ± 0.06 OUR FIT	Error includes scale factor of 1.1.			
3.90 ± 0.07 OUR AVERAGE	Error includes scale factor of 1.2.			
4.093 $^{+0.040}_{-0.043} \pm 0.247$	17400	19 AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \rightarrow \eta\gamma$
3.850 $\pm 0.041 \pm 0.159$	23k	20,21 AKHMETSHIN 01B	CMD2	$e^+e^- \rightarrow \eta\gamma$
4.00 ± 0.04 ± 0.11		22 ACHASOV	00 SND	$e^+e^- \rightarrow \eta\gamma$
3.765 $\pm 0.092 \pm 0.143$		23 ACHASOV	00B SND	$e^+e^- \rightarrow \eta\gamma$
4.017 $\pm 0.035 \pm 0.124$	23k	24 ACHASOV	00D SND	$e^+e^- \rightarrow \eta\gamma$
3.53 ± 0.08 ± 0.17	2200	23,25 AKHMETSHIN 99F	CMD2	$e^+e^- \rightarrow \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.848 $\pm 0.036 \pm 0.070$		26 ACHASOV	00B SND	$e^+e^- \rightarrow \eta\gamma$

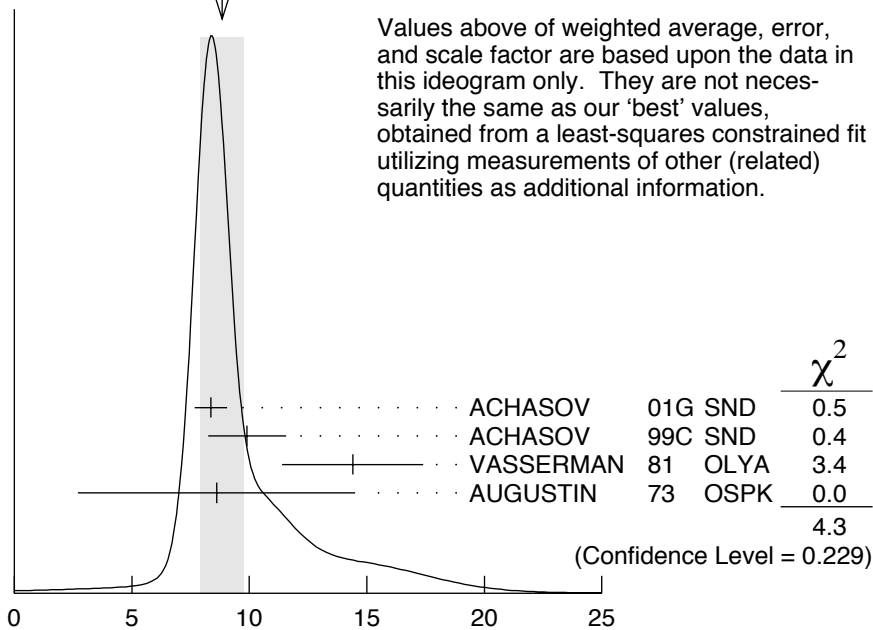
$$\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2 \quad \Gamma_9\Gamma_7/\Gamma^2$$

VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
3.71 ± 0.21 OUR FIT				
3.71 ± 0.21 OUR AVERAGE				
3.75 $\pm 0.11 \pm 0.29$	18680	AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \rightarrow \pi^0\gamma$
3.67 ± 0.10 $^{+0.27}_{-0.25}$		27 ACHASOV	00 SND	$e^+e^- \rightarrow \pi^0\gamma$

$$\Gamma(e^+e^-) \times \Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}^2 \quad \Gamma_9\Gamma_{10}/\Gamma^2$$

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
8.5 ± 0.6 OUR FIT			
8.8 ± 0.9 OUR AVERAGE	Error includes scale factor of 1.5. See the ideogram below.		
8.36 $\pm 0.59 \pm 0.37$	ACHASOV	01G SND	$e^+e^- \rightarrow \mu^+\mu^-$
9.9 ± 1.4 ± 0.9	25 ACHASOV	99C SND	$e^+e^- \rightarrow \mu^+\mu^-$
14.4 ± 3.0	18 VASSERMAN	81 OLYA	$e^+e^- \rightarrow \mu^+\mu^-$
8.6 ± 5.9	18 AUGUSTIN	73 OSPK	$e^+e^- \rightarrow \mu^+\mu^-$

WEIGHTED AVERAGE
 8.8 ± 0.9 (Error scaled by 1.5)



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

$$\Gamma_9\Gamma_{10}/\Gamma^2$$

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

$$\Gamma_9\Gamma_{12}/\Gamma^2$$

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
2.2 ± 0.4 OUR FIT			
2.2 ± 0.4 OUR AVERAGE			
$2.1 \pm 0.3 \pm 0.3$	25 ACHASOV	00C SND	$e^+e^- \rightarrow \pi^+\pi^-$
$1.95^{+1.15}_{-0.87}$	18 GOLUBEV	86 ND	$e^+e^- \rightarrow \pi^+\pi^-$
$6.01^{+3.19}_{-2.51}$	18 VASSERMAN	81 OLYA	$e^+e^- \rightarrow \pi^+\pi^-$

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

$$\Gamma_9\Gamma_{19}/\Gamma^2$$

VALUE (units 10^{-9})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.2^{+0.8}_{-0.7}$ OUR FIT				
$1.17 \pm 0.52 \pm 0.64$	3285	25 AKHMETSHIN 00E	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$

¹⁶ From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of K^+K^- , $K_S K_L$, $\pi^+\pi^-\pi^0$, and $\eta\gamma$ decays modes and using ACHASOV 00B for the $\eta\gamma$ decay mode.

¹⁷ Update of AKHMETSHIN 01D

¹⁸ Recalculated by us from the cross section in the peak.

¹⁹ From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.

²⁰ From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.

²¹ 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).

²² From the $\eta \rightarrow 2\gamma$ decay and using $B(\eta \rightarrow 2\gamma) = (39.21 \pm 0.34) \times 10^{-2}$.

²³ From the $\eta \rightarrow \pi^+\pi^-\pi^0$ decay and using $B(\eta \rightarrow \pi^+\pi^-\pi^0) = (23.1 \pm 0.5) \times 10^{-2}$.

²⁴ From the $\eta \rightarrow 3\pi^0$ decay and using $B(\eta \rightarrow 3\pi^0) = (32.2 \pm 0.4) \times 10^{-2}$.

²⁵ Recalculated by the authors from the cross section in the peak.

²⁶ Using various decay modes of the η from ACHASOV 98F, ACHASOV 00, and ACHASOV 00B.

²⁷ From the $\pi^0 \rightarrow 2\gamma$ decay and using $B(\pi^0 \rightarrow 2\gamma) = (98.798 \pm 0.032) \times 10^{-2}$.

$\phi(1020)$ BRANCHING RATIOS

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

Γ_1/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.492±0.006 OUR FIT	Error includes scale factor of 1.2.			
0.493±0.010 OUR AVERAGE				
0.492±0.012	2913	AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow K^+ K^-$
0.44 ±0.05	321	KALBFLEISCH 76	HBC	$2.18 K^- p \rightarrow \Lambda K^+ K^-$
0.49 ±0.06	270	DEGROOT 74	HBC	$4.2 K^- p \rightarrow \Lambda \phi$
0.540±0.034	565	BALAKIN 71	OSPK	$e^+ e^- \rightarrow K^+ K^-$
0.48 ±0.04	252	LINDSEY 66	HBC	$2.1-2.7 K^- p \rightarrow \Lambda K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.476±0.017	1000k	²⁸ ACHASOV	01E SND	$e^+ e^- \rightarrow K^+ K^-, K_S K_L, \pi^+ \pi^- \pi^0$

$\Gamma(K_L^0 K_S^0)/\Gamma_{\text{total}}$

Γ_2/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.340±0.005 OUR FIT	Error includes scale factor of 1.1.			
0.331±0.009 OUR AVERAGE				
0.335±0.010	40644	AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow K_L^0 K_S^0$
0.326±0.035		DOLINSKY 91	ND	$e^+ e^- \rightarrow K_L^0 K_S^0$
0.310±0.024		DRUZHININ 84	ND	$e^+ e^- \rightarrow K_L^0 K_S^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.351±0.013	500k	²⁸ ACHASOV	01E SND	$e^+ e^- \rightarrow K^+ K^-, K_S K_L, \pi^+ \pi^- \pi^0$
0.27 ±0.03	133	KALBFLEISCH 76	HBC	$2.18 K^- p \rightarrow \Lambda K_L^0 K_S^0$
0.257±0.030	95	BALAKIN 71	OSPK	$e^+ e^- \rightarrow K_L^0 K_S^0$
0.40 ±0.04	167	LINDSEY 66	HBC	$2.1-2.7 K^- p \rightarrow \Lambda K_L^0 K_S^0$

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

Γ_3/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.153±0.004 OUR FIT	Error includes scale factor of 1.2.			
0.151±0.009 OUR AVERAGE	Error includes scale factor of 1.7.			
0.161±0.008	11761	AKHMETSHIN 95	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.143±0.007		DOLINSKY 91	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.159±0.008	400k	²⁸ ACHASOV	01E SND	$e^+ e^- \rightarrow K^+ K^-, K_S K_L, \pi^+ \pi^- \pi^0$
0.145±0.009±0.003	11169	²⁹ AKHMETSHIN 98	CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.139±0.007		³⁰ PARROUR 76B	OSPK	$e^+ e^-$

$\Gamma(K_L^0 K_S^0)/\Gamma(K\bar{K})$ $\Gamma_2/(\Gamma_1+\Gamma_2)$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.409 ± 0.006 OUR FIT	Error includes scale factor of 1.1.			
0.45 ± 0.04 OUR AVERAGE				
0.44 ± 0.07		LONDON	66 HBC	$2.24 K^- p \rightarrow \Lambda K\bar{K}$
0.48 ± 0.07	52	BADIER	65B HBC	$3 K^- p$
0.40 ± 0.10	34	SCHLEIN	63 HBC	$1.95 K^- p \rightarrow \Lambda K\bar{K}$

 $[\Gamma(\rho\pi) + \Gamma(\pi^+\pi^-\pi^0)]/\Gamma(K\bar{K})$ $\Gamma_3/(\Gamma_1+\Gamma_2)$

VALUE	DOCUMENT ID	TECN	COMMENT
0.184 ± 0.006 OUR FIT	Error includes scale factor of 1.2.		
0.24 ± 0.04 OUR AVERAGE			
0.237 ± 0.039	CERRADA	77B HBC	$4.2 K^- p \rightarrow \Lambda 3\pi$
0.30 ± 0.15	LONDON	66 HBC	$2.24 K^- p \rightarrow \Lambda \pi^+\pi^-\pi^0$

 $[\Gamma(\rho\pi) + \Gamma(\pi^+\pi^-\pi^0)]/\Gamma(K_L^0 K_S^0)$ Γ_3/Γ_2

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.449 ± 0.013 OUR FIT	Error includes scale factor of 1.1.			
0.51 ± 0.05 OUR AVERAGE				
0.56 ± 0.07	3681	BUKIN	78C OLYA	$e^+e^- \rightarrow K_L^0 K_S^0, \pi^+\pi^-\pi^0$
0.47 ± 0.06	516	COSME	74 OSPK	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$

 $\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$ Γ_6/Γ_7

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$10.9 \pm 0.3^{+0.7}_{-0.8}$	ACHASOV	00 SND	$e^+e^- \rightarrow \eta\gamma, \pi^0\gamma$

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

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
2.86 ± 0.19 OUR FIT			
2.5 ± 0.4 OUR AVERAGE			
2.69 ± 0.46	³¹ HAYES	71 CNTR	$8.3, 9.8 \gamma C \rightarrow \mu^+\mu^- X$
2.17 ± 0.60	³¹ EARLES	70 CNTR	$6.0 \gamma C \rightarrow \mu^+\mu^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$2.87 \pm 0.20 \pm 0.14$	³² ACHASOV	01G SND	$e^+e^- \rightarrow \mu^+\mu^-$
$3.30 \pm 0.45 \pm 0.32$	²⁹ ACHASOV	99C SND	$e^+e^- \rightarrow \mu^+\mu^-$
4.83 ± 1.02	³³ VASSERMAN	81 OLYA	$e^+e^- \rightarrow \mu^+\mu^-$
2.87 ± 1.98	³³ AUGUSTIN	73 OSPK	$e^+e^- \rightarrow \mu^+\mu^-$

$\Gamma(\eta\gamma)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
1.301 ± 0.024 OUR FIT	Error includes scale factor of 1.1.			
1.26 ± 0.04 OUR AVERAGE				
$1.246 \pm 0.025 \pm 0.057$	10k	³⁴ ACHASOV	98F SND	$e^+e^- \rightarrow 7\gamma$
1.18 ± 0.11	279	³⁵ AKHMETSHIN	95 CMD2	$e^+e^- \rightarrow \pi^+\pi^-3\gamma$
1.30 ± 0.06		³⁶ DRUZHININ	84 ND	$e^+e^- \rightarrow 3\gamma$
1.4 ± 0.2		³⁷ DRUZHININ	84 ND	$e^+e^- \rightarrow 6\gamma$
0.88 ± 0.20	290	KURDADZE	83C OLYA	$e^+e^- \rightarrow 3\gamma$
1.35 ± 0.29		ANDREWS	77 CNTR	6.7–10 γ Cu
1.5 ± 0.4	54	³⁶ COSME	76 OSPK	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.373 \pm 0.014 \pm 0.085$	17400	^{38,39} AKHMETSHIN	05 CMD2	0.60–1.38 $e^+e^- \rightarrow \eta\gamma$
$1.287 \pm 0.013 \pm 0.063$		^{40,41} AKHMETSHIN	01B CMD2	$e^+e^- \rightarrow \eta\gamma$
$1.338 \pm 0.012 \pm 0.052$		⁴² ACHASOV	00 SND	$e^+e^- \rightarrow \eta\gamma$
$1.287 \pm 0.012 \pm 0.042$		⁴³ ACHASOV	00B SND	$e^+e^- \rightarrow \eta\gamma$
$1.259 \pm 0.030 \pm 0.059$		⁴⁴ ACHASOV	00B SND	$e^+e^- \rightarrow \eta\gamma$
$1.343 \pm 0.012 \pm 0.055$	23k	³⁴ ACHASOV	00D SND	$e^+e^- \rightarrow \eta\gamma$
$1.18 \pm 0.03 \pm 0.06$	2200	⁴⁵ AKHMETSHIN	99F CMD2	$e^+e^- \rightarrow \eta\gamma$
1.21 ± 0.07		⁴⁶ BENAYOUN	96 RVUE	0.54–1.04 $e^+e^- \rightarrow \eta\gamma$

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$0.41 \pm 0.12 \pm 0.04$		30175	⁴⁷ AKHMETSHIN	99B CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.3	90		⁴⁸ AKHMETSHIN	97C CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
< 600	90		KALBFLEISCH	75 HBC	2.18 $K^-p \rightarrow \Lambda\pi^+\pi^-\gamma$
< 70	90		COSME	74 OSPK	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
< 400	90		LINDSEY	65 HBC	2.1–2.7 $K^-p \rightarrow \Lambda\pi^+\pi^-\text{neutrals}$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
< 0.05	84	LINDSEY	66 HBC	2.1–2.7 $K^-p \rightarrow \Lambda\pi^+\pi^-\text{neutrals}$

$\Gamma(\rho\gamma)/\Gamma_{\text{total}}$ Γ_{15}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
< 0.12	90	⁴⁹ AKHMETSHIN	99B CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 7	90	AKHMETSHIN	97C CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
< 200	84	LINDSEY	66 HBC	2.1–2.7 $K^-p \rightarrow \Lambda\pi^+\pi^-\text{neutrals}$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
2.97 ± 0.04 OUR FIT	Error includes scale factor of 1.1.			
2.98 ± 0.07 OUR AVERAGE	Error includes scale factor of 1.1.			
2.93 ± 0.14	1900k	⁵⁰ ACHASOV	01E SND	$e^+e^- \rightarrow K^+K^-, K_S^0 K_L^0, \pi^+\pi^-\pi^0$
2.88 ± 0.09	55600	AKHMETSHIN	95 CMD2	$e^+e^- \rightarrow \text{hadrons}$
3.00 ± 0.21	3681	BUKIN	78C OLYA	$e^+e^- \rightarrow \text{hadrons}$
3.10 ± 0.14		⁵¹ PARROUR	76 OSPK	e^+e^-
3.3 ± 0.3		COSME	74 OSPK	$e^+e^- \rightarrow \text{hadrons}$
2.81 ± 0.25	681	BALAKIN	71 OSPK	$e^+e^- \rightarrow \text{hadrons}$
3.50 ± 0.27		CHATELUS	71 OSPK	e^+e^-

$\Gamma(\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
1.31 ± 0.13 OUR AVERAGE				
1.30 ± 0.13		DRUZHININ	84 ND	$e^+e^- \rightarrow 3\gamma$
1.4 ± 0.5	32	COSME	76 OSPK	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.258 \pm 0.037 \pm 0.077$	18680	^{52,53} AKHMETSHIN	05 CMD2	$0.60-1.38 e^+e^- \rightarrow \pi^0\gamma$
$1.226 \pm 0.036^{+0.096}_{-0.089}$		⁵⁴ ACHASOV	00 SND	$e^+e^- \rightarrow \pi^0\gamma$
1.26 ± 0.17		⁴⁶ BENAYOUN	96 RVUE	$0.54-1.04 e^+e^- \rightarrow \pi^0\gamma$

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.71 \pm 0.11 \pm 0.09$		²⁹ ACHASOV	00C SND	$e^+e^- \rightarrow \pi^+\pi^-$
$0.65^{+0.38}_{-0.29}$		²⁹ GOLUBEV	86 ND	$e^+e^- \rightarrow \pi^+\pi^-$
$2.01^{+1.07}_{-0.84}$		²⁹ VASSERMAN	81 OLYA	$e^+e^- \rightarrow \pi^+\pi^-$
< 6.6	95	BUKIN	78B OLYA	$e^+e^- \rightarrow \pi^+\pi^-$
< 2.7	95	ALVENSLEB...	72 CNTR	$6.7 \gamma C \rightarrow C\pi^+\pi^-$

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

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
$5.2^{+1.3}_{-1.1}$	^{55,56} AULCHENKO	00A SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~ 5.4	⁵⁷ ACHASOV	00E SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
$5.5^{+1.6}_{-1.4} \pm 0.3$	^{56,58} AULCHENKO	00A SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$
$4.8^{+1.9}_{-1.7} \pm 0.8$	⁵⁷ ACHASOV	99 SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$

$\Gamma(K_L^0 K_S^0)/\Gamma(K^+ K^-)$ Γ_2/Γ_1

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.692 ± 0.017 OUR FIT	Error includes scale factor of 1.1.			
0.740 ± 0.031 OUR AVERAGE				
0.70 ± 0.06	2732	BUKIN	78C OLYA	$e^+ e^- \rightarrow K_L^0 K_S^0$
0.82 ± 0.08		LOSTY	78 HBC	$4.2 K^- p \rightarrow \phi \text{ hyperon}$
0.71 ± 0.05		LAVEN	77 HBC	$10 K^- p \rightarrow K^+ K^- \Lambda$
0.71 ± 0.08		LYONS	77 HBC	$3-4 K^- p \rightarrow \Lambda \phi$
0.89 ± 0.10	144	AGUILAR-...	72B HBC	$3.9, 4.6 K^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.68 ± 0.03		⁵⁹ AKHMETSHIN	95 CMD2	$e^+ e^- \rightarrow K_L^0 K_S^0, K^+ K^-$

 $[\Gamma(\rho\pi) + \Gamma(\pi^+ \pi^- \pi^0)]/\Gamma(K^+ K^-)$ Γ_3/Γ_1

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.311 ± 0.011 OUR FIT	Error includes scale factor of 1.2.			
0.28 ± 0.09	34	AGUILAR-...	72B HBC	$3.9, 4.6 K^- p$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.15 ± 0.10 OUR AVERAGE				
$1.19 \pm 0.19 \pm 0.12$	213	⁶⁰ ACHASOV	01B SND	$e^+ e^- \rightarrow \gamma \gamma e^+ e^-$
$1.14 \pm 0.10 \pm 0.06$	355	⁶¹ AKHMETSHIN	01 CMD2	$e^+ e^- \rightarrow \eta e^+ e^-$
$1.3^{+0.8}_{-0.6}$	7	GOLUBEV	85 ND	$e^+ e^- \rightarrow \gamma \gamma e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.13 \pm 0.14 \pm 0.07$	183	⁶² AKHMETSHIN	01 CMD2	$e^+ e^- \rightarrow \eta e^+ e^-$
$1.21 \pm 0.14 \pm 0.09$	130	⁶³ AKHMETSHIN	01 CMD2	$e^+ e^- \rightarrow \eta e^+ e^-$
$1.04 \pm 0.20 \pm 0.08$	42	⁶⁴ AKHMETSHIN	01 CMD2	$e^+ e^- \rightarrow \eta e^+ e^-$

 $\Gamma(\eta'(958)\gamma)/\Gamma_{\text{total}}$ Γ_{24}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
6.2 ± 0.7 OUR FIT	Error includes scale factor of 1.1.				
$6.7^{+2.8}_{-2.4} \pm 0.8$	12	⁶⁵ AULCHENKO	03B SND		$e^+ e^- \rightarrow \eta' \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$6.7^{+5.0}_{-4.2} \pm 1.5$	7	AULCHENKO	03B SND		$e^+ e^- \rightarrow 7\gamma$
$6.10 \pm 0.61 \pm 0.43$	120	⁶⁶ ALOISIO	02E KLOE		$1.02 e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
$8.2^{+2.1}_{-1.9} \pm 1.1$	21	⁶⁷ AKHMETSHIN	00B CMD2		$e^+ e^- \rightarrow \pi^+ \pi^- 3\gamma$
$4.9^{+2.2}_{-1.8} \pm 0.6$	9	⁶⁸ AKHMETSHIN	00F CMD2		$e^+ e^- \rightarrow \pi^+ \pi^- \pi^+ \pi^- \geq 2\gamma$
6.4 ± 1.6	30	⁶⁹ AKHMETSHIN	00F CMD2		$e^+ e^- \rightarrow \eta'(958)\gamma$

6.7 $^{+3.4}_{-2.9}$ ± 1.0	5	70	AULCHENKO	99	SND	$e^+e^- \rightarrow \pi^+\pi^-3\gamma$
<11	90		AULCHENKO	98	SND	$e^+e^- \rightarrow 7\gamma$
12 $^{+7}_{-5}$ ± 2	6	67	AKHMETSHIN	97B	CMD2	$e^+e^- \rightarrow \pi^+\pi^-3\gamma$
<41	90		DRUZHININ	87	ND	$e^+e^- \rightarrow \gamma\eta\pi^+\pi^-$

$\Gamma(\eta\pi^0\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_{25}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<2	90	AULCHENKO	98	SND $e^+e^- \rightarrow 7\gamma$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma_{\text{total}}$ Γ_{18}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.09 ± 0.06 OUR AVERAGE					
1.09 ± 0.03 ± 0.05		2438	ALOISIO	02D	KLOE $e^+e^- \rightarrow \pi^0\pi^0\gamma$
1.08 ± 0.17 ± 0.09		268	AKHMETSHIN	99C	CMD2 $e^+e^- \rightarrow \pi^0\pi^0\gamma$

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

1.158 ± 0.093 ± 0.052	419	71,72	ACHASOV	00H	SND $e^+e^- \rightarrow \pi^0\pi^0\gamma$
<10	90		DRUZHININ	87	ND $e^+e^- \rightarrow 5\gamma$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma(\eta\gamma)$ Γ_{18}/Γ_6

<u>VALUE (units 10^{-2})</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.865±0.070±0.017	419	72 ACHASOV	00H SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$

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

0.90 ± 0.08 ± 0.07	164		ACHASOV	98I	SND $e^+e^- \rightarrow 5\gamma$
----------------------------	-----	--	---------	-----	----------------------------------

$\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{20}/Γ

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
< 4.6	90	AKHMETSHIN	00E	CMD2 $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-\pi^0$

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

<150	95	BARKOV	88	CMD $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-\pi^0$
------	----	--------	----	--

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{19}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
3.93 ± 1.74 ± 2.14		3285	AKHMETSHIN	00E	CMD2 $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$
<870	90		CORDIER	79	WIRE $e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-$

$\Gamma(f_0(980)\gamma)/\Gamma_{\text{total}}$
 Γ_{17}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
4.40±0.21 OUR FIT					
4.44±0.21 OUR AVERAGE					
4.47±0.21		2438	⁷³ ALOISIO	02D KLOE	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
2.90±0.21±1.54			⁷⁴ AKHMETSHIN 99C	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma, \pi^0\pi^0\gamma$

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

3.5 ±0.3 $^{+1.3}_{-0.5}$		419	^{71,75} ACHASOV	00H SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
1.93±0.46±0.50		27188	⁷⁶ AKHMETSHIN 99B	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
3.05±0.25±0.72		268	⁷⁷ AKHMETSHIN 99C	CMD2	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
1.5 ±0.5		268	⁷⁸ AKHMETSHIN 99C	CMD2	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
3.42±0.30±0.36		164	⁷⁵ ACHASOV	98I SND	$e^+e^- \rightarrow 5\gamma$
< 1	90		⁷⁹ AKHMETSHIN 97C	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
< 7	90		⁸⁰ AKHMETSHIN 97C	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
<20	90		DRUZHININ	87 ND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$

 $\Gamma(f_0(980)\gamma)/\Gamma(\eta\gamma)$
 Γ_{17}/Γ_6

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
3.38±0.17 OUR FIT					
2.6 ±0.2 $^{+0.8}_{-0.3}$		419	⁷⁵ ACHASOV	00H SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$

 $\Gamma(\pi^0 e^+ e^-)/\Gamma_{\text{total}}$
 Γ_{21}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.12±0.28 OUR AVERAGE					
1.01±0.28±0.29		52	⁸¹ ACHASOV	02D SND	$e^+e^- \rightarrow \pi^0 e^+ e^-$
1.22±0.34±0.21		46	⁸² AKHMETSHIN 01C	CMD2	$e^+e^- \rightarrow \pi^0 e^+ e^-$

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

<12	90		DOLINSKY	88 ND	$e^+e^- \rightarrow \pi^0 e^+ e^-$
-----	----	--	----------	-------	------------------------------------

 $\Gamma(\pi^0 \eta\gamma)/\Gamma_{\text{total}}$
 Γ_{22}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
8.3 ±0.5 OUR AVERAGE					
8.51±0.51±0.57		607	⁸³ ALOISIO	02C KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$
7.96±0.60±0.40		197	⁸⁴ ALOISIO	02C KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$
8.8 ±1.4 ±0.9		36	⁸⁵ ACHASOV	00F SND	$e^+e^- \rightarrow \eta\pi^0\gamma$
9.0 ±2.4 ±1.0		80	AKHMETSHIN 99C	CMD2	$e^+e^- \rightarrow \eta\pi^0\gamma$

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

8.3 ±2.3 ±1.2		20	ACHASOV	98B SND	$e^+e^- \rightarrow 5\gamma$
<250	90		DOLINSKY	91 ND	$e^+e^- \rightarrow \pi^0\eta\gamma$

$\Gamma(a_0(980)\gamma)/\Gamma_{\text{total}}$ Γ_{23}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
7.6 ± 0.6 OUR FIT					
7.6 ± 0.6 OUR AVERAGE					
7.4 ± 0.7			86 ALOISIO	02C KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$
8.8 ± 1.7		36	87 ACHASOV	00F SND	$e^+e^- \rightarrow \eta\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
11 ± 2			88 GOKALP	02 RVUE	$e^+e^- \rightarrow \eta\pi^0\gamma$
<500	90		DOLINSKY	91 ND	$e^+e^- \rightarrow \pi^0\eta\gamma$

 $\Gamma(f_0(980)\gamma)/\Gamma(a_0(980)\gamma)$ Γ_{17}/Γ_{23}

VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
6.1 ± 0.6	89 ALOISIO	02C KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$

 $\Gamma(\eta'(958)\gamma)/\Gamma(K_L^0 K_S^0)$ Γ_{24}/Γ_2

<u>VALUE (units 10⁻⁴)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.84±0.21 OUR FIT	Error includes scale factor of 1.1.			
1.46^{+0.64}_{-0.54}±0.18	9	90 AKHMETSHIN	00F CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$

 $\Gamma(\eta'(958)\gamma)/\Gamma(\eta\gamma)$ Γ_{24}/Γ_6

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
4.8 ± 0.5 OUR FIT	Error includes scale factor of 1.1.			
4.9 ± 0.5 OUR AVERAGE				
$4.70 \pm 0.47 \pm 0.31$	120	91 ALOISIO	02E KLOE	$1.02 e^+e^- \rightarrow \pi^+\pi^-3\gamma$
$6.5^{+1.7}_{-1.5} \pm 0.8$	21	AKHMETSHIN	00B CMD2	$e^+e^- \rightarrow \pi^+\pi^-3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$9.5^{+5.2}_{-4.0} \pm 1.4$	6	92 AKHMETSHIN	97B CMD2	$e^+e^- \rightarrow \pi^+\pi^-3\gamma$

 $\Gamma(\mu^+\mu^-\gamma)/\Gamma_{\text{total}}$ Γ_{26}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.43 \pm 0.45 \pm 0.14$	27188	76 AKHMETSHIN	99B CMD2	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.3 ± 1.0	824 ± 33	93 AKHMETSHIN	97C CMD2	$e^+e^- \rightarrow \mu^+\mu^-\gamma$

 $\Gamma(\rho\gamma\gamma)/\Gamma_{\text{total}}$ Γ_{27}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID	TECN	COMMENT
<5	90	AKHMETSHIN	98 CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma\gamma$

 $\Gamma(\eta\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{28}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
<1.8	90	AKHMETSHIN	00E CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<30	90	AKHMETSHIN	98 CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma\gamma$

$\Gamma(\eta\mu^+\mu^-)/\Gamma_{\text{total}}$					Γ_{29}/Γ
VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT	
<9.4	90	AKHMETSHIN 01	CMD2	$e^+e^- \rightarrow \eta e^+e^-$	

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT

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

- $\simeq 0.0087$ 1.98M ^{94,95} ALOISIO 03 KLOE $1.02 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
- <0.0006 90 ⁹⁶ ACHASOV 02 SND $1.02 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
- <0.23 90 ⁹⁶ CORDIER 80 DM1 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
- <0.20 90 ⁹⁶ PAROUR 76B OSPK $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
- ²⁸ Using $B(\phi \rightarrow e^+e^-) = (2.93 \pm 0.14) \times 10^{-4}$.
- ²⁹ Using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ³⁰ Using $\Gamma(\phi) = 4.1$ MeV. If interference between the $\rho\pi$ and 3π modes is neglected, the fraction of the $\rho\pi$ is more than 80% at the 90% confidence level.
- ³¹ Neglecting interference between resonance and continuum.
- ³² Using $B(\phi \rightarrow e^+e^-) = (2.91 \pm 0.07) \times 10^{-4}$.
- ³³ Recalculated by us using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ³⁴ Using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$ and $B(\eta \rightarrow 3\pi^0) = (32.2 \pm 0.4) \times 10^{-2}$.
- ³⁵ From $\pi^+\pi^-\pi^0$ decay mode of η .
- ³⁶ From 2γ decay mode of η .
- ³⁷ From $3\pi^0$ decay mode of η .
- ³⁸ Using $B(\phi \rightarrow e^+e^-) = (2.98 \pm 0.04) \times 10^{-4}$ and $B(\eta \rightarrow \gamma\gamma) = 39.43 \pm 0.26\%$.
- ³⁹ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma_{\text{total}}^2$.
- ⁴⁰ Using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$ and $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$.
- ⁴¹ 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).
- ⁴² From the $\eta \rightarrow 2\gamma$ decay and using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ⁴³ Using various decay modes of the η from ACHASOV 98F, ACHASOV 00, and ACHASOV 00B and $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ⁴⁴ From the $\eta \rightarrow \pi^+\pi^-\pi^0$ decay and $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ⁴⁵ From $\pi^+\pi^-\pi^0$ decay mode of η and using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ⁴⁶ Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution.
- ⁴⁷ For $E_\gamma > 20$ MeV and assuming that $B(\phi(1020) \rightarrow f_0(980)\gamma)$ is negligible. Supersedes AKHMETSHIN 97C.
- ⁴⁸ For $E_\gamma > 20$ MeV and assuming that $B(\phi(1020) \rightarrow f_0(980)\gamma)$ is negligible.
- ⁴⁹ Supersedes AKHMETSHIN 97C.
- ⁵⁰ From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of K^+K^- , $K_S K_L$, $\pi^+\pi^-\pi^0$, and $\eta\gamma$ decays modes and using ACHASOV 00B for the $\eta\gamma$ decay mode.
- ⁵¹ Using total width 4.2 MeV. They detect 3π mode and observe significant interference with ω tail. This is accounted for in the result quoted above.
- ⁵² Using $B(\phi \rightarrow e^+e^-) = (2.98 \pm 0.04) \times 10^{-4}$.
- ⁵³ Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma_{\text{total}}^2$.
- ⁵⁴ From the $\pi^0 \rightarrow 2\gamma$ decay and using $B(\phi \rightarrow e^+e^-) = (2.99 \pm 0.08) \times 10^{-4}$.
- ⁵⁵ Using the 1996 and 1998 data.
- ⁵⁶ $(2.3 \pm 0.3)\%$ correction for other decay modes of the $\omega(782)$ applied.

- 57 Using the 1996 data.
- 58 Using the 1998 data.
- 59 Theoretical analysis of BRAMON 00 taking into account phase-space difference, electromagnetic radiative corrections, as well as isospin breaking, predicts 0.62. FISCHBACH 02 calculates additional corrections caused by the close threshold and predicts 0.68.
- 60 Using $B(\eta \rightarrow \gamma\gamma) = (39.25 \pm 0.32)\%$, $B(\phi \rightarrow \eta\gamma) = (1.26 \pm 0.06)\%$, and $B(\phi \rightarrow e^+e^-) = (3.00 \pm 0.06) \times 10^{-4}$.
- 61 The average of the branching ratios separately obtained from the $\eta \rightarrow \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$ decays.
- 62 From $\eta \rightarrow \gamma\gamma$ decays and using $B(\eta \rightarrow \gamma\gamma) = (39.33 \pm 0.25) \times 10^{-2}$, $B(\eta \rightarrow \pi^+\pi^-\gamma) = (4.75 \pm 11) \times 10^{-2}$, and $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
- 63 From $\eta \rightarrow 3\pi^0$ decays and using $B(\pi^0 \rightarrow \gamma\gamma) = (98.798 \pm 0.033) \times 10^{-2}$, $B(\eta \rightarrow 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$, $B(\eta \rightarrow \pi^+\pi^-\gamma) = (4.75 \pm 0.11) \times 10^{-2}$, and $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
- 64 From $\eta \rightarrow \pi^+\pi^-\pi^0$ decays and using $B(\pi^0 \rightarrow \gamma\gamma) = (98.798 \pm 0.033) \times 10^{-2}$, $B(\pi^0 \rightarrow e^+e^-\gamma) = (1.198 \pm 0.032) \times 10^{-2}$, $B(\eta \rightarrow \pi^+\pi^-\pi^0) = (23.0 \pm 0.4) \times 10^{-2}$, $B(\phi \rightarrow \pi^+\pi^-\pi^0) = (15.5 \pm 0.6) \times 10^{-2}$, and $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
- 65 Averaging AULCHENKO 03B with AULCHENKO 99.
- 66 Using $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033)\%$.
- 67 Using the value $B(\phi \rightarrow \eta\gamma) = (1.26 \pm 0.06) \times 10^{-2}$.
- 68 Using $B(\phi \rightarrow K_L^0 K_S^0) = (33.8 \pm 0.6)\%$.
- 69 Averaging AKHMETSHIN 00B with AKHMETSHIN 00F.
- 70 Using the value $B(\eta' \rightarrow \eta\pi^+\pi^-) = (43.7 \pm 1.5) \times 10^{-2}$ and $B(\eta \rightarrow \gamma\gamma) = (39.25 \pm 0.31) \times 10^{-2}$.
- 71 Using the value $B(\phi \rightarrow \eta\gamma) = (1.338 \pm 0.053) \times 10^{-2}$.
- 72 Supersedes ACHASOV 98I. Excluding $\omega\pi^0$.
- 73 From the negative interference with the $f_0(600)$ meson of AITALA 01B using the ACHASOV 89 parameterization for the $f_0(980)$, a Breit-Wigner for the $f_0(600)$, and ACHASOV 01F for the $\rho\pi$ contribution.
- 74 From the combined fit of the photon spectra in the reactions $e^+e^- \rightarrow \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
- 75 Assuming that the $\pi^0\pi^0\gamma$ final state is completely determined by the $f_0\gamma$ mechanism, neglecting the decay $B(\phi \rightarrow K\bar{K}\gamma)$ and using $B(f_0 \rightarrow \pi^+\pi^-) = 2B(f_0 \rightarrow \pi^0\pi^0)$.
- 76 For $E_\gamma > 20$ MeV. Supersedes AKHMETSHIN 97C.
- 77 Neglecting other intermediate mechanisms ($\rho\pi$, $\sigma\gamma$).
- 78 A narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
- 79 For destructive interference with the Bremsstrahlung process
- 80 For constructive interference with the Bremsstrahlung process
- 81 Using various branching ratios from the 2000 Edition of this Review (PDG 00).
- 82 Using $B(\pi^0 \rightarrow \gamma\gamma) = 0.98798 \pm 0.00032$, $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$, and $B(\eta \rightarrow \pi^+\pi^-\gamma) = (4.75 \pm 0.11) \times 10^{-2}$.
- 83 From the decay mode $\eta \rightarrow \gamma\gamma$.
- 84 From the decay mode $\eta \rightarrow \pi^+\pi^-\pi^0$.
- 85 Supersedes ACHASOV 98B.
- 86 Using $M_{a_0(980)} = 984.8$ MeV and assuming $a_0(980)\gamma$ dominance.
- 87 Assuming $a_0(980)\gamma$ dominance in the $\eta\pi^0\gamma$ final state.
- 88 Using data of ACHASOV 00F.
- 89 Using results of ALOISIO 02D and assuming that $f_0(980)$ decays into $\pi\pi$ only and $a_0(980)$ into $\eta\pi$ only.

- ⁹⁰ Using various branching ratios of K_S^0 , K_L^0 , η , η' from the 2000 edition (The European Physical Journal **C15** 1 (2000)) of this Review.
- ⁹¹ From the decay mode $\eta' \rightarrow \eta \pi^+ \pi^-$, $\eta \rightarrow \gamma \gamma$.
- ⁹² Superseded by AKHMETSHIN 00B.
- ⁹³ For $E_\gamma > 20$ MeV.
- ⁹⁴ From a fit without limitations on charged and neutral ρ masses and widths.
- ⁹⁵ Adding the direct and $\omega \pi$ contributions and considering the interference between the $\rho \pi$ and $\pi^+ \pi^- \pi^0$.
- ⁹⁶ Neglecting the interference between the $\rho \pi$ and $\pi^+ \pi^- \pi^0$.

$\pi^+ \pi^- \pi^0$ / $\rho \pi$ AMPLITUDE RATIO a_1 IN DECAY OF $\phi \rightarrow \pi^+ \pi^- \pi^0$

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
$0.090 \pm 0.011 \pm 0.006$		1.98M	^{98,99} ALOISIO	03 KLOE	$1.02 \frac{e^+ e^- \rightarrow \pi^+ \pi^- \pi^0}{\pi^+ \pi^- \pi^0}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$-0.06 < a_1 < 0.06$		500k	¹⁰⁰ ACHASOV	02 SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$-0.16 < a_1 < 0.11$	90		⁹⁷ AKHMETSHIN	98 CMD2	$e^+ e^- \rightarrow \pi^+ \pi^- \gamma \gamma$
⁹⁷ Dalitz plot analysis of 9735 events taking into account interference between the contact and $\rho \pi$ terms and assuming zero phase for the contact term.					
⁹⁸ From a fit without limitations on charged and neutral ρ masses and widths.					
⁹⁹ Recalculated by us to match the notations of AKHMETSHIN 98.					
¹⁰⁰ Recalculated by the authors to match the notations of AKHMETSHIN 98.					

$\phi(1020)$ REFERENCES

AKHMETSHIN 05	PL B605 26	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AMBROSINO 05	PL B608 199	F. Ambrosino <i>et al.</i>	(KLOE Collab.)
AUBERT,B 05J	PR D72 052008	B. Aubert <i>et al.</i>	(BABAR Collab.)
AKHMETSHIN 04	PL B578 285	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AUBERT,B 04N	PR D70 072004	B. Aubert <i>et al.</i>	(BABAR Collab.)
ALOISIO 03	PL B561 55	A. Aloisio <i>et al.</i>	(KLOE Collab.)
AULCHENKO 03B	JETP 97 24	V.M. Aulchenko <i>et al.</i>	(Novosibirsk SND Collab.)
	Translated from ZETF 124 28.		
ACHASOV 02	PR D65 032002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 02D	JETPL 75 449	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
	Translated from ZETFP 75 539.		
ALOISIO 02C	PL B536 209	A. Aloisio <i>et al.</i>	(KLOE Collab.)
ALOISIO 02D	PL B537 21	A. Aloisio <i>et al.</i>	(KLOE Collab.)
ALOISIO 02E	PL B541 45	A. Aloisio <i>et al.</i>	(KLOE Collab.)
FISCHBACH 02	PL B526 355	E. Fischbach, A.W. Overhauser, B. Woodahl	
GOKALP 02	JPG 28 2783	A. Gokalp <i>et al.</i>	
ACHASOV 01B	PL B504 275	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 01E	PR D63 072002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 01F	PR D63 094007	N.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 01G	PRL 86 1698	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
AITALA 01B	PRL 86 770	E.M. Aitala <i>et al.</i>	(FNAL E791 Collab.)
AKHMETSHIN 01	PL B501 191	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN 01B	PL B509 217	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN 01C	PL B503 237	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN 01D	PL B508 217 (erratum)	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
Also	PL B466 385	R.R. Akhmetshin <i>et al.</i>	
ACHASOV 00	EPJ C12 25	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV 00B	JETP 90 17	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
	Translated from ZETF 117 22.		
ACHASOV 00C	PL B474 188	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	00E	NP B569 158	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV	00F	PL B479 53	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV	00H	PL B485 349	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
AKHMETSHIN	00B	PL B473 337	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	00E	PL B491 81	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	00F	PL B494 26	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.		
BRAMON	00	PL B486 406	A. Bramon <i>et al.</i>	
PDG	00	EPJ C15 1	D.E. Groom <i>et al.</i>	
ACHASOV	99	PL B449 122	M.N. Achasov <i>et al.</i>	
ACHASOV	99C	PL B456 304	M.N. Achasov <i>et al.</i>	
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99D	PL B466 385	R.R. Akhmetshin <i>et al.</i>	
AKHMETSHIN	99F	PL B460 242	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AULCHENKO	99	JETPL 69 97	V.M. Aulchenko <i>et al.</i>	
		Translated from ZETFP 69 87.		
ACHASOV	98B	PL B438 441	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV	98F	JETPL 68 573	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV	98I	PL B440 442	M.N. Achasov <i>et al.</i>	
AKHMETSHIN	98	PL B434 426	R.R. Akhmetshin <i>et al.</i>	
AULCHENKO	98	PL B436 199	V.M. Aulchenko <i>et al.</i>	(Novosibirsk SND Collab.)
BARBERIS	98	PL B432 436	D. Barberis <i>et al.</i>	(Omega Expt.)
AKHMETSHIN	97B	PL B415 445	R.R. Akhmetshin <i>et al.</i>	(NOVO, BOST, PITT+)
AKHMETSHIN	97C	PL B415 452	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
BENAYOUN	96	ZPHY C72 221	M. Benayoun <i>et al.</i>	(IPNP, NOVO)
AKHMETSHIN	95	PL B364 199	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)
ACHASOV	89	NP B315 465	N.N. Achasov, V.N. Ivanchenko	
DOLINSKY	89	ZPHY C42 511	S.I. Dolinsky <i>et al.</i>	(NOVO)
BARKOV	88	SJNP 47 248	L.M. Barkov <i>et al.</i>	(NOVO)
		Translated from YAF 47 393.		
DOLINSKY	88	SJNP 48 277	S.I. Dolinsky <i>et al.</i>	(NOVO)
		Translated from YAF 48 442.		
DRUZHININ	87	ZPHY C37 1	V.P. Druzhinin <i>et al.</i>	(NOVO)
ARMSTRONG	86	PL 166B 245	T.A. Armstrong <i>et al.</i>	(ATHU, BARI, BIRM+)
ATKINSON	86	ZPHY C30 521	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
BEBEK	86	PRL 56 1893	C. Bebek <i>et al.</i>	(CLEO Collab.)
DAVENPORT	86	PR 33 2519	T.F. Davenport	(TUFTS, ARIZ, FNAL, FSU, NDAM+)
DIJKSTRA	86	ZPHY C31 375	H. Dijkstra <i>et al.</i>	(ANIK, BRIS, CERN+)
FRAME	86	NP B276 667	D. Frame <i>et al.</i>	(GLAS)
GOLUBEV	86	SJNP 44 409	V.B. Golubev <i>et al.</i>	(NOVO)
		Translated from YAF 44 633.		
ALBRECHT	85D	PL 153B 343	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
GOLUBEV	85	SJNP 41 756	V.B. Golubev <i>et al.</i>	(NOVO)
		Translated from YAF 41 1183.		
DRUZHININ	84	PL 144B 136	V.P. Druzhinin <i>et al.</i>	(NOVO)
ARMSTRONG	83B	NP B224 193	T.A. Armstrong <i>et al.</i>	(BARI, BIRM, CERN+)
BARATE	83	PL 121B 449	R. Barate <i>et al.</i>	(SACL, LOIC, SHMP, IND)
KURDADZE	83C	JETPL 38 366	L.M. Kurdadze <i>et al.</i>	(NOVO)
		Translated from ZETFP 38 306.		
ARENTON	82	PR D25 2241	M.W. Arenton <i>et al.</i>	(ANL, ILL)
PELLINEN	82	PS 25 599	A. Pellinen, M. Roos	(HELS)
DAUM	81	PL 100B 439	C. Daum <i>et al.</i>	(AMST, BRIS, CERN, CRAC+)
IVANOV	81	PL 107B 297	P.M. Ivanov <i>et al.</i>	(NOVO)
Also		Private Comm.	S.I. Eidelman	(NOVO)
VASSERMAN	81	PL 99B 62	I.B. Vasserman <i>et al.</i>	(NOVO)
Also		SJNP 35 240	L.M. Kurdadze <i>et al.</i>	
		Translated from YAF 35 352.		
CORDIER	80	NP B172 13	A. Cordier <i>et al.</i>	(LALO)
CORDIER	79	PL 81B 389	A. Cordier <i>et al.</i>	(LALO)
BUKIN	78B	SJNP 27 521	A.D. Bukin <i>et al.</i>	(NOVO)
		Translated from YAF 27 985.		
BUKIN	78C	SJNP 27 516	A.D. Bukin <i>et al.</i>	(NOVO)
		Translated from YAF 27 976.		
COOPER	78B	NP B146 1	A.M. Cooper <i>et al.</i>	(TATA, CERN, CDEF+)
LOSTY	78	NP B133 38	M.J. Losty <i>et al.</i>	(CERN, AMST, NIJM+)
AKERLOF	77	PRL 39 861	C.W. Akerlof <i>et al.</i>	(FNAL, MICH, PURD)
ANDREWS	77	PRL 38 198	D.E. Andrews <i>et al.</i>	(ROCH)
BALDI	77	PL 68B 381	R. Baldi <i>et al.</i>	(GEVA)
CERRADA	77B	NP B126 241	M. Cerrada <i>et al.</i>	(AMST, CERN, NIJM+)

COHEN	77	PRL 38 269	D. Cohen <i>et al.</i>	(ANL)
LAVEN	77	NP B127 43	H. Laven <i>et al.</i>	(AACH3, BERL, CERN, LOIC+)
LYONS	77	NP B125 207	L. Lyons, A.M. Cooper, A.G. Clark	(OXF)
COSME	76	PL 63B 352	G. Cosme <i>et al.</i>	(ORSAY)
KALBFLEISCH	76	PR D13 22	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)
PARROUR	76	PL 63B 357	G. Parrou <i>et al.</i>	(ORSAY)
PARROUR	76B	PL 63B 362	G. Parrou <i>et al.</i>	(ORSAY)
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)
AYRES	74	PRL 32 1463	D.S. Ayres <i>et al.</i>	(ANL)
BESCH	74	NP B70 257	H.J. Besch <i>et al.</i>	(BONN)
COSME	74	PL 48B 155	G. Cosme <i>et al.</i>	(ORSAY)
COSME	74B	PL 48B 159	G. Cosme <i>et al.</i>	(ORSAY)
DEGROOT	74	NP B74 77	A.J. de Groot <i>et al.</i>	(AMST, NIJM)
AUGUSTIN	73	PRL 30 462	J.E. Augustin <i>et al.</i>	(ORSAY)
BALLAM	73	PR D7 3150	J. Ballam <i>et al.</i>	(SLAC, LBL)
BINNIE	73B	PR D8 2789	D.M. Binnie <i>et al.</i>	(LOIC, SHMP)
AGUILAR-....	72B	PR D6 29	M. Aguilar-Benitez <i>et al.</i>	(BNL)
ALVENSLEB...	72	PRL 28 66	H. Alvensleben <i>et al.</i>	(MIT, DESY)
BORENSTEIN	72	PR D5 1559	S.R. Borenstein <i>et al.</i>	(BNL, MICH)
COLLEY	72	NP B50 1	D.C. Colley <i>et al.</i>	(BIRM, GLAS)
BALAKIN	71	PL 34B 328	V.E. Balakin <i>et al.</i>	(NOVO)
CHATELUS	71	Thesis LAL 1247	Y. Chatelus	(STRB)
Also		PL 32 416	J.C. Bizot <i>et al.</i>	(ORSAY)
HAYES	71	PR D4 899	S. Hayes <i>et al.</i>	(CORN)
STOTTLE...	71	Thesis ORO 2504 170	A.R. Stottlemeyer	(UMD)
BIZOT	70	PL 32 416	J.C. Bizot <i>et al.</i>	(ORSAY)
Also		Liverpool Sym. 69	J.P. Perez-y-Jorba	
EARLES	70	PRL 25 1312	D.R. Earles <i>et al.</i>	(NEAS)
LINDSEY	66	PR 147 913	J.S. Lindsey, G. Smith	(LRL)
LONDON	66	PR 143 1034	G.W. London <i>et al.</i>	(BNL, SYRA) IGJPC
BADIER	65B	PL 17 337	J. Badier <i>et al.</i>	(EPOL, SACL, AMST)
LINDSEY	65	PRL 15 221	J.S. Lindsey, G.A. Smith	(LRL)
LINDSEY	65 data included in LINDSEY 66.			
SCHLEIN	63	PRL 10 368	P.E. Schlein <i>et al.</i>	(UCLA) IGJP

OTHER RELATED PAPERS

AMBROSINO	06B	PL B634 148	F. Ambrosino <i>et al.</i>	(KLOE Collab.)
ANISOVICH	05B	PAN 68 1554	A.V. Anisovich, V.V. Anisovich, V.N. Markov	
		Translated from YAF 68 1614.		
KALASHNIK...	05	EPJ A24 437	Yu.S. Kalashnikova, A.E. Kudryavtsev, A.V. Nefediev	
VOLOSHIN	05A	PAN 68 771	M.B. Voloshin	
		Translated from YAF 68 804.		
ACHASOV	03B	PR D68 014006	N.N. Achasov, A.V. Kiselev	
BOGLIONE	03	EPJ C30 503	M. Boglione, M.R. Pennington	
ACHASOV	02L	PAN 65 1887	N.N. Achasov <i>et al.</i>	
		Translated from YAF 65 1939.		
ANISOVICH	02C	PAN 65 497	A.V. Anisovich <i>et al.</i>	
		Translated from YAF 65 523.		
BRAMON	02	EPJ C26 253	A. Bramon <i>et al.</i>	
ACHASOV	01F	PR D63 094007	N.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
BENAYOUN	01	EPJ C22 503	M. Benayoun, H.B. O'Connell	
CLOSE	01	PL B515 13	F.E. Close, A. Kirk	
GOKALP	01	PR D64 053017	A. Gokalp, O. Yilmaz	
MARKUSHIN	00	EPJ A8 389	V.E. Markushin	
ACHASOV	99B	PAN 62 442	M.N. Achasov <i>et al.</i>	
		Translated from YAF 62 484.		
MARCO	99	PL B470 20	E. Marco <i>et al.</i>	
OLLER	98B	PL B426 7	J.A. Oller	
ACHASOV	95	PL B363 106	N.N. Achasov, V.V. Gubin	(NOVM)
KAMAL	92	PL B284 421	A.N. Kamal, Q.P. Xu	(ALBE)
GEORGIO...	85	PL 152B 428	C. Georgiopoulos <i>et al.</i>	(TUFTS, ARIZ, FNAL+)
GELFAND	63B	PRL 11 438	N. Gelfand <i>et al.</i>	(COLU, RUTG)
BERTANZA	62	PRL 9 180	L. Bertanza <i>et al.</i>	(BNL, SYRA)