$\phi(1020)$

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

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

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 $K^- p \rightarrow \Sigma/\Lambda K \overline{K}$

[1] Update of AKHMETSHIN 01D

[2] 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, DEGROOT 74.

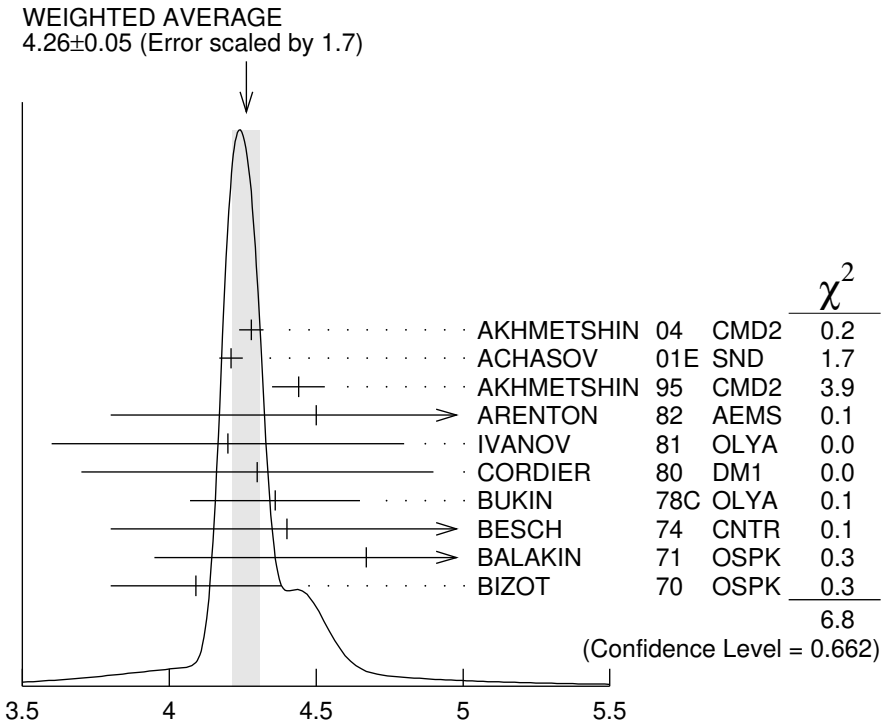
[6] Systematic errors not evaluated.

[7] Weighted and scaled average of 12 measurements of DIJKSTRA 86.

[8] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; 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. $pp \rightarrow KK$
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	$D^0 \rightarrow \overline{K}^0 K^+ K^-$
4.45 ±0.06	271k	DIJKSTRA	86	SPEC	100 π^- Be
3.6 ±0.8	337	[11] COOPER	78B	HBC	0.7–0.8 $\overline{p}p \rightarrow K_S^0 K_L^0 \pi^+\pi^-$
4.5 ±0.50	1300	[11,12] AKERLOF	77	SPEC	400 $pA \rightarrow K^+K^-X$
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 $K^- p \rightarrow K\overline{K}n$



$\phi(1020)$ width (MeV)

[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_SK_L, $\pi^+\pi^-\pi^0$, 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	$K^0_LK^0_S$	(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) $\times 10^{-3}$	
Γ_8	$\ell^+\ell^-$		
Γ_9	e^+e^-	(2.97 ±0.04) $\times 10^{-4}$	S=1.1
Γ_{10}	$\mu^+\mu^-$	(2.86 ±0.19) $\times 10^{-4}$	
Γ_{11}	ηe^+e^-	(1.15 ±0.10) $\times 10^{-4}$	
Γ_{12}	$\pi^+\pi^-$	(7.3 ±1.3) $\times 10^{-5}$	
Γ_{13}	$\omega\pi^0$	(5.2 $^{+1.3}_{-1.1}$) $\times 10^{-5}$	
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 $^{+2.8}_{-2.2}$	) $\times 10^{-6}$		
Γ_{20}	$\pi^+\pi^+\pi^-\pi^-\pi^0$	$<$	4.6	$\times 10^{-6}$	CL=90%	
Γ_{21}	$\pi^0 e^+ e^-$	(	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 $\left\langle \delta x_i \delta x_j \right\rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\rm total}$. 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. • • •				
$58.9\pm0.5\pm2.4$	ACHASOV	00	SND	$e^+e^-\to\eta\gamma$

$\Gamma(\pi^0\gamma)$ Γ_7

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$5.40\pm0.16^{+0.43}_{-0.40}$	ACHASOV	00	SND	$e^+e^-\to\pi^0\gamma$

$\Gamma(\ell^+\ell^-)$ Γ_8

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.320\pm0.017\pm0.015$	[13] AMBROSINO	05	KLOE	$1.02\ e^+e^-\to\mu^+\mu^-$

$\Gamma(e^+e^-)$ Γ_9

VALUE (keV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.27 ± 0.04 OUR EVALUATION					
$1.32\pm0.05\pm0.03$		[14] AMBROSINO	05	KLOE	$1.02\ e^+e^-\to e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.27 ± 0.03	272k	[15] AKHMETSHIN	04	CMD2	$e^+e^-\to K^0_LK^0_S$

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

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$1.320\pm0.018\pm0.017$	AMBROSINO	05	KLOE	$1.02\ e^+e^-\to\mu^+\mu^-$

[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 $\Gamma_{\rm total}=4.26\pm0.05$ MeV from the 2004 edition of this Review.

[15] Using $B(\phi\to K^0_LK^0_S)=0.337\pm0.005$ and $\Gamma_{\rm total}=4.26\pm0.05$ MeV. Update of AKHMETSHIN 99D.

$\phi(1020)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\rm total)$

$\Gamma(e^+e^-)\times\Gamma(K^+K^-)/\Gamma^2_{\rm total}$ $\Gamma_9\Gamma_1/\Gamma^2$

VALUE (units 10^{-5})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
14.60 ± 0.33 OUR FIT	Error includes scale factor of 1.2.				
$13.93\pm0.14\pm0.99$	1000k	[16] ACHASOV	01E	SND	$e^+e^-\to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$

$\Gamma(e^+e^-)\times\Gamma(K^0_LK^0_S)/\Gamma^2_{\rm total}$ $\Gamma_9\Gamma_2/\Gamma^2$

VALUE (units 10^{-5})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
10.11 ± 0.13 OUR FIT					
10.06 ± 0.16 OUR AVERAGE					
$10.01\pm0.04\pm0.17$	272k	[17] AKHMETSHIN	04	CMD2	$e^+e^-\to K^0_LK^0_S$
$10.27\pm0.07\pm0.34$	500k	[16] ACHASOV	01E	SND	$e^+e^-\to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$

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

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 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
4.665±0.042±0.261	400k	[16] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$
4.35 ±0.27 ±0.08	11169	[18] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$

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

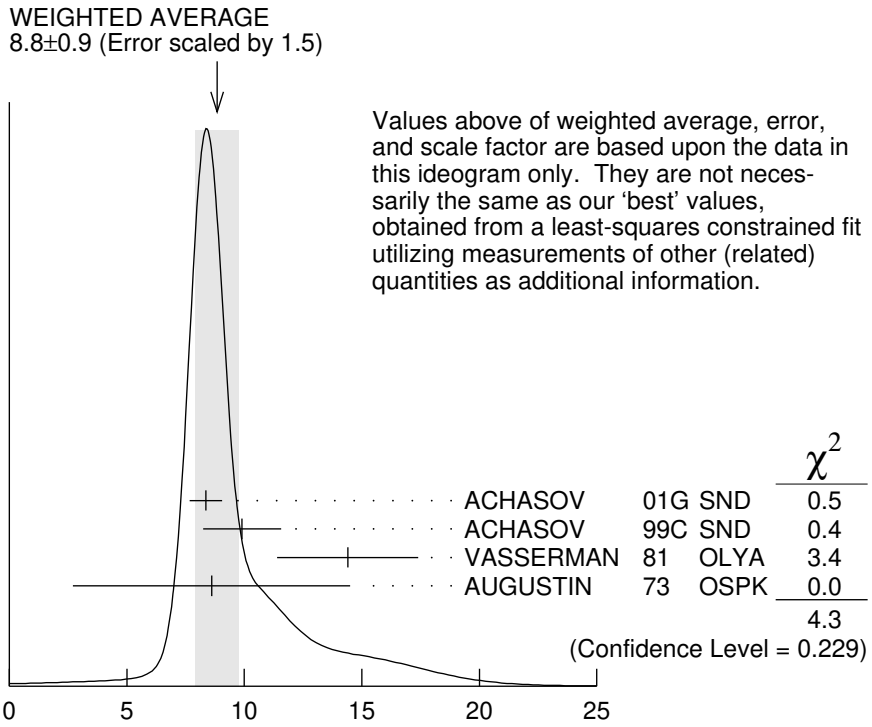
VALUE (units 10^{-6})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3.86 ±0.06 OUR FIT Error includes scale factor of 1.1.					
3.90 ±0.07 OUR AVERAGE Error includes scale factor of 1.2.					
$4.093^{+0.040}_{-0.043}\pm0.247$	17400	[19] AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \eta\gamma$
3.850±0.041±0.159	23k	[20,21] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
4.00 ±0.04 ±0.11		[22] ACHASOV	00	SND	$e^+e^- \to \eta\gamma$
3.765±0.092±0.143		[23] ACHASOV	00B	SND	$e^+e^- \to \eta\gamma$
4.017±0.035±0.124	23k	[24] ACHASOV	00D	SND	$e^+e^- \to \eta\gamma$
3.53 ±0.08 ±0.17	2200	[23,25] AKHMETSHIN	99F	CMD2	$e^+e^- \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.848±0.036±0.070		[26] ACHASOV	00B	SND	$e^+e^- \to \eta\gamma$

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

VALUE (units 10^{-7})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
3.71±0.21 OUR FIT					
3.71±0.21 OUR AVERAGE					
3.75±0.11±0.29	18680	AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \pi^0\gamma$
$3.67\pm0.10^{+0.27}_{-0.25}$		[27] ACHASOV	00	SND	$e^+e^- \to \pi^0\gamma$

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

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±0.59±0.37	ACHASOV	01G	SND	$e^+e^- \to \mu^+\mu^-$
9.9 ±1.4 ±0.9	[25] ACHASOV	99C	SND	$e^+e^- \to \mu^+\mu^-$
14.4 ±3.0	[18] VASSERMAN	81	OLYA	$e^+e^- \to \mu^+\mu^-$
8.6 ±5.9	[18] AUGUSTIN	73	OSPK	$e^+e^- \to \mu^+\mu^-$



$\Gamma\left(e^+e^-\right) \times \Gamma\left(\mu^+\mu^-\right)/\Gamma^2_{\rm total}$ $\Gamma_9\Gamma_{10}/\Gamma^2$

$\Gamma\left(e^+e^-\right) \times \Gamma\left(\pi^+\pi^-\right)/\Gamma^2_{\rm total}$ $\Gamma_9\Gamma_{12}/\Gamma^2$

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

$\Gamma\left(e^+e^-\right) \times \Gamma\left(\pi^+\pi^-\pi^+\pi^-\right)/\Gamma^2_{\rm total}$ $\Gamma_9\Gamma_{19}/\Gamma^2$

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

[16] From the combined fit assuming that the total $\phi(1020)$ production cross section is saturated by those of K^+K^-, K_SK_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 $\eta \to 2\gamma$ decay and using B($\eta \to \gamma\gamma$) = 39.43 ± 0.26%.
[20] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$)= (32.24 ± 0.29) × 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 $\eta \to 2\gamma$ decay and using B($\eta \to 2\gamma$) =(39.21 ± 0.34) × 10^{-2}.
[23] From the $\eta \to \pi^+\pi^-\pi^0$ decay and using B($\eta \to \pi^+\pi^-\pi^0$) =(23.1 ± 0.5) × 10^{-2}.

[24] From the $\eta \to 3\pi^0$ decay and using $B(\eta \to 3\pi^0) = (32.2 \pm 0.4) \times 10^{-2}$.
[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 $\pi^0 \to 2\gamma$ decay and using $B(\pi^0 \to 2\gamma) = (98.798 \pm 0.032) \times 10^{-2}$.

$\phi(1020)$ BRANCHING RATIOS

$\Gamma(K^+K^-)/\Gamma_{total}$ 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	$e^+e^- \to K^+K^-$
0.44 ±0.05	321	KALBFLEISCH	76	HBC	2.18 $K^-p \to \Lambda K^+K^-$
0.49 ±0.06	270	DEGROOT	74	HBC	4.2 $K^-p \to \Lambda\phi$
0.540±0.034	565	BALAKIN	71	OSPK	$e^+e^- \to K^+K^-$
0.48 ±0.04	252	LINDSEY	66	HBC	2.1–2.7 $K^-p \to \Lambda K^+K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.476±0.017	1000k	[28] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$

$\Gamma(K_L^0K_S^0)/\Gamma_{total}$ 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	$e^+e^- \to K_L^0K_S^0$
0.326±0.035		DOLINSKY	91	ND	$e^+e^- \to K_L^0K_S^0$
0.310±0.024		DRUZHININ	84	ND	$e^+e^- \to K_L^0K_S^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.351±0.013	500k	[28] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$
0.27 ±0.03	133	KALBFLEISCH	76	HBC	2.18 $K^-p \to \Lambda K_L^0K_S^0$
0.257±0.030	95	BALAKIN	71	OSPK	$e^+e^- \to K_L^0K_S^0$
0.40 ±0.04	167	LINDSEY	66	HBC	2.1–2.7 $K^-p \to \Lambda K_L^0K_S^0$

$[\Gamma(\rho\pi) + \Gamma(\pi^+\pi^-\pi^0)]/\Gamma_{total}$ 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	$e^+e^- \to \pi^+\pi^-\pi^0$
0.143±0.007		DOLINSKY	91	ND	$e^+e^- \to \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.159±0.008	400k	[28] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$
0.145±0.009±0.003	11169	[29] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
0.139±0.007		[30] PARROUR	76B	OSPK	e^+e^-

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

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 $K^- p \to \Lambda K\overline{K}$
0.48 ±0.07	52	BADIER	65B	HBC	3 $K^- p$
0.40 ±0.10	34	SCHLEIN	63	HBC	1.95 $K^- p \to \Lambda K\overline{K}$

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

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 $K^- p \to \Lambda 3\pi$
0.30 ±0.15	LONDON	66	HBC	2.24 $K^- p \to \Lambda\pi^+\pi^-\pi^0$

$[\Gamma(\rho\pi)+\Gamma(\pi^+\pi^-\pi^0)]/\Gamma(K_L^0 K_S^0)$ 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	$e^+e^- \to K_L^0 K_S^0$, $\pi^+\pi^-\pi^0$
0.47 ±0.06	516	COSME	74	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$

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

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$10.9\pm0.3^{+0.7}_{-0.8}$	ACHASOV	00 SND	$e^+e^- \to \eta\gamma, \pi^0\gamma$

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$ 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 γ C $\to \mu^+\mu^-$ X
2.17±0.60	[31] EARLES	70	CNTR	6.0 γ C $\to \mu^+\mu^-$ X
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.87±0.20±0.14	[32] ACHASOV	01G	SND	$e^+e^- \to \mu^+\mu^-$
3.30±0.45±0.32	[29] ACHASOV	99C	SND	$e^+e^- \to \mu^+\mu^-$
4.83±1.02	[33] VASSERMAN	81	OLYA	$e^+e^- \to \mu^+\mu^-$
2.87±1.98	[33] AUGUSTIN	73	OSPK	$e^+e^- \to \mu^+\mu^-$

$\Gamma(\eta\gamma)/\Gamma_{\text{total}}$ 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±0.025±0.057	10k	[34] ACHASOV	98F	SND	$e^+e^- \to 7\gamma$
1.18 ±0.11	279	[35] AKHMETSHIN	95	CMD2	$e^+e^- \to \pi^+\pi^- 3\gamma$
1.30 ±0.06		[36] DRUZHININ	84	ND	$e^+e^- \to 3\gamma$
1.4 ±0.2		[37] DRUZHININ	84	ND	$e^+e^- \to 6\gamma$
0.88 ±0.20	290	KURDADZE	83C	OLYA	$e^+e^- \to 3\gamma$
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±0.014±0.085	17400	[38,39] AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \eta\gamma$
1.287±0.013±0.063		[40,41] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
1.338±0.012±0.052		[42] ACHASOV	00	SND	$e^+e^- \to \eta\gamma$
1.287±0.012±0.042		[43] ACHASOV	00B	SND	$e^+e^- \to \eta\gamma$
1.259±0.030±0.059		[44] ACHASOV	00B	SND	$e^+e^- \to \eta\gamma$
1.343±0.012±0.055	23k	[34] ACHASOV	00D	SND	$e^+e^- \to \eta\gamma$
1.18 ±0.03 ±0.06	2200	[45] AKHMETSHIN	99F	CMD2	$e^+e^- \to \eta\gamma$
1.21 ±0.07		[46] BENAYOUN	96	RVUE	0.54-1.04 $e^+e^- \to \eta\gamma$

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

VALUE (units 10^{-4})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.41±0.12±0.04		30175	[47] AKHMETSHIN	99B	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 0.3	90		[48] AKHMETSHIN	97C	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
<600	90		KALBFLEISCH	75	HBC	2.18 $K^-p \to \Lambda\pi^+\pi^-\gamma$
< 70	90		COSME	74	OSPK	$e^+e^- \to \pi^+\pi^-\gamma$
<400	90		LINDSEY	65	HBC	2.1–2.7 $K^-p \to \Lambda\pi^+\pi^-$ 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 $K^-p \to \Lambda\pi^+\pi^-$ 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	$e^+e^- \to \pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 7	90	AKHMETSHIN	97C	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
<200	84	LINDSEY	66	HBC	2.1–2.7 $K^-p \to \Lambda\pi^+\pi^-$ neutrals

$\Gamma(e^+e^-)/\Gamma_{total}$ 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	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$
2.88±0.09	55600	AKHMETSHIN	95	CMD2	$e^+e^- \to$ hadrons
3.00±0.21	3681	BUKIN	78C	OLYA	$e^+e^- \to$ hadrons
3.10±0.14		[51] PARROUR	76	OSPK	e^+e^-
3.3 ±0.3		COSME	74	OSPK	$e^+e^- \to$ hadrons
2.81±0.25	681	BALAKIN	71	OSPK	$e^+e^- \to$ hadrons
3.50±0.27		CHATELUS	71	OSPK	e^+e^-

$\Gamma(\pi^0\gamma)/\Gamma_{total}$ 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	$e^+e^- \to 3\gamma$
1.4 ±0.5	32	COSME	76	OSPK	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.258±0.037±0.077	18680	[52,53] AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \pi^0\gamma$
$1.226\pm0.036^{+0.096}_{-0.089}$		[54] ACHASOV	00	SND	$e^+e^- \to \pi^0\gamma$
1.26 ±0.17		[46] BENAYOUN	96	RVUE	0.54-1.04 $e^+e^- \to \pi^0\gamma$

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ 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±0.11±0.09		[29] ACHASOV	00C	SND	$e^+e^- \to \pi^+\pi^-$
$0.65^{+0.38}_{-0.29}$		[29] GOLUBEV	86	ND	$e^+e^- \to \pi^+\pi^-$
$2.01^{+1.07}_{-0.84}$		[29] VASSERMAN	81	OLYA	$e^+e^- \to \pi^+\pi^-$
<6.6	95	BUKIN	78B	OLYA	$e^+e^- \to \pi^+\pi^-$
<2.7	95	ALVENSLEB...	72	CNTR	6.7 γ C → C$\pi^+\pi^-$

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

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
$\mathbf{5.2^{+1.3}_{-1.1}}$	[55,56] AULCHENKO	00A	SND	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 5.4	[57] ACHASOV	00E	SND	$e^+e^- \to \pi^0\pi^0\gamma$
$5.5^{+1.6}_{-1.4}\pm0.3$	[56,58] AULCHENKO	00A	SND	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
$4.8^{+1.9}_{-1.7}\pm0.8$	[57] ACHASOV	99	SND	$e^+e^- \to \pi^+\pi^-\pi^0\pi^0$

$\Gamma(K^0_L K^0_S)/\Gamma(K^+K^-)$ 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	$e^+e^- \to K^0_L K^0_S$
0.82 ±0.08		LOSTY	78	HBC	4.2 $K^- p \to \phi$hyperon
0.71 ±0.05		LAVEN	77	HBC	10 $K^- p \to K^+K^-\Lambda$
0.71 ±0.08		LYONS	77	HBC	3–4 $K^- p \to \Lambda\phi$
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	$e^+e^- \to K^0_L K^0_S$, 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±0.19±0.12	213	[60] ACHASOV	01B	SND	$e^+e^- \to \gamma\gamma e^+e^-$
1.14±0.10±0.06	355	[61] AKHMETSHIN	01	CMD2	$e^+e^- \to \eta e^+e^-$
$1.3\ ^{+0.8}_{-0.6}$	7	GOLUBEV	85	ND	$e^+e^- \to \gamma\gamma e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.13±0.14±0.07	183	[62] AKHMETSHIN	01	CMD2	$e^+e^- \to \eta e^+e^-$
1.21±0.14±0.09	130	[63] AKHMETSHIN	01	CMD2	$e^+e^- \to \eta e^+e^-$
1.04±0.20±0.08	42	[64] AKHMETSHIN	01	CMD2	$e^+e^- \to \eta e^+e^-$

$\Gamma(\eta'(958)\gamma)/\Gamma_{\text{total}}$ 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 $^{+2.8}_{-2.4}$ ±0.8		12	[65] AULCHENKO	03B	SND	$e^+e^- \to \eta'\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
6.7 $^{+5.0}_{-4.2}$ ±1.5		7	AULCHENKO	03B	SND	$e^+e^- \to 7\gamma$
6.10±0.61±0.43		120	[66] ALOISIO	02E	KLOE	1.02 $e^+e^- \to \pi^+\pi^-3\gamma$
8.2 $^{+2.1}_{-1.9}$ ±1.1		21	[67] AKHMETSHIN	00B	CMD2	$e^+e^- \to \pi^+\pi^-3\gamma$
4.9 $^{+2.2}_{-1.8}$ ±0.6		9	[68] AKHMETSHIN	00F	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$
6.4 ±1.6		30	[69] AKHMETSHIN	00F	CMD2	$e^+e^- \to \eta'(958)\gamma$

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

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

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

$\Gamma(\pi^0\pi^0\gamma)/\Gamma_{total}$ 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	$e^+e^- \to \pi^0\pi^0\gamma$
1.08 ±0.17 ±0.09		268	AKHMETSHIN	99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1.158±0.093±0.052		419	[71,72] ACHASOV	00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$
<10	90		DRUZHININ	87	ND	$e^+e^- \to 5\gamma$

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

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.865±0.070±0.017	419	[72] ACHASOV	00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.90 ±0.08 ±0.07	164	ACHASOV	98I	SND	$e^+e^- \to 5\gamma$

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

VALUE (units 10^{-6})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
< 4.6	90	AKHMETSHIN	00E	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<150	95	BARKOV	88	CMD	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-\pi^0$

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

VALUE (units 10^{-6})	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •						
3.93±1.74±2.14		3285	AKHMETSHIN	00E	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$
<870	90		CORDIER	79	WIRE	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$

$\Gamma(f_0(980)\gamma)/\Gamma_{\text{total}}$ 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	$e^+e^-\to\pi^0\pi^0\gamma$
2.90±0.21±1.54			[74] AKHMETSHIN	99C	CMD2	$e^+e^-\to\pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$
• • • 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	$e^+e^-\to\pi^0\pi^0\gamma$
1.93±0.46±0.50		27188	[76] AKHMETSHIN	99B	CMD2	$e^+e^-\to\pi^+\pi^-\gamma$
3.05±0.25±0.72		268	[77] AKHMETSHIN	99C	CMD2	$e^+e^-\to\pi^0\pi^0\gamma$
1.5 ±0.5		268	[78] AKHMETSHIN	99C	CMD2	$e^+e^-\to\pi^0\pi^0\gamma$
3.42±0.30±0.36		164	[75] ACHASOV	98I	SND	$e^+e^-\to 5\gamma$
< 1	90		[79] AKHMETSHIN	97C	CMD2	$e^+e^-\to\pi^+\pi^-\gamma$
< 7	90		[80] AKHMETSHIN	97C	CMD2	$e^+e^-\to\pi^+\pi^-\gamma$
<20	90		DRUZHININ	87	ND	$e^+e^-\to\pi^0\pi^0\gamma$

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

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

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{\text{total}}$ 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	$e^+e^-\to\pi^0 e^+e^-$
1.22±0.34±0.21		46	[82] AKHMETSHIN	01C	CMD2	$e^+e^-\to\pi^0 e^+e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<12	90		DOLINSKY	88	ND	$e^+e^-\to\pi^0 e^+e^-$

$\Gamma(\pi^0\eta\gamma)/\Gamma_{\text{total}}$ 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	$e^+e^-\to\eta\pi^0\gamma$
7.96±0.60±0.40		197	[84] ALOISIO	02C	KLOE	$e^+e^-\to\eta\pi^0\gamma$
8.8 ±1.4 ±0.9		36	[85] ACHASOV	00F	SND	$e^+e^-\to\eta\pi^0\gamma$
9.0 ±2.4 ±1.0		80	AKHMETSHIN	99C	CMD2	$e^+e^-\to\eta\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
8.3 ±2.3 ±1.2		20	ACHASOV	98B	SND	$e^+e^-\to 5\gamma$
<250	90		DOLINSKY	91	ND	$e^+e^-\to\pi^0\eta\gamma$

$\Gamma(a_0(980)\gamma)/\Gamma_{total}$ 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	$e^+e^- \to \eta\pi^0\gamma$
8.8±1.7		36	[87] ACHASOV	00F	SND	$e^+e^- \to \eta\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
11 ±2			[88] GOKALP	02	RVUE	$e^+e^- \to \eta\pi^0\gamma$
<500	90		DOLINSKY	91	ND	$e^+e^- \to \pi^0\eta\gamma$

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

VALUE	DOCUMENT ID		TECN	COMMENT
6.1±0.6	[89] ALOISIO	02C	KLOE	$e^+e^- \to \eta\pi^0\gamma$

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.84±0.21 OUR FIT Error includes scale factor of 1.1.					
$\mathbf{1.46^{+0.64}_{-0.54}\pm0.18}$	9	[90] AKHMETSHIN	00F	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$

$\Gamma(\eta'(958)\gamma)/\Gamma(\eta\gamma)$ 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±0.47±0.31	120	[91] ALOISIO	02E	KLOE	1.02 $e^+e^- \to \pi^+\pi^- 3\gamma$
$6.5\ ^{+1.7}_{-1.5}\ \pm0.8$	21	AKHMETSHIN	00B	CMD2	$e^+e^- \to \pi^+\pi^- 3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$9.5\ ^{+5.2}_{-4.0}\ \pm1.4$	6	[92] AKHMETSHIN	97B	CMD2	$e^+e^- \to \pi^+\pi^- 3\gamma$

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

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

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

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

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

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

$\Gamma(\eta\mu^+\mu^-)/\Gamma_{total}$ Γ_{29}/Γ

VALUE (units 10^{-6})	*CL%*	*DOCUMENT ID*	*TECN*	*COMMENT*
<9.4	90	AKHMETSHIN 01	CMD2	$e^+e^- \to \eta e^+e^-$

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ 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 $e^+e^- \to \pi^+\pi^-\pi^0$
<0.0006	90	[96]	ACHASOV	02	SND	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
<0.23	90	[96]	CORDIER	80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
<0.20	90	[96]	PARROUR	76B	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$

[28] Using B($\phi \to e^+e^-$)= $(2.93 \pm 0.14) \times 10^{-4}$.
[29] Using B($\phi \to e^+e^-$)=$(2.99 \pm 0.08) \times 10^{-4}$.
[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($\phi \to e^+e^-$) = $(2.91 \pm 0.07) \times 10^{-4}$.
[33] Recalculated by us using B($\phi \to e^+e^-$)= $(2.99 \pm 0.08) \times 10^{-4}$.
[34] Using B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$ and B($\eta \to 3\pi^0$)= $(32.2 \pm 0.4) \times 10^{-2}$.
[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($\phi \to e^+e^-$) = $(2.98 \pm 0.04) \times 10^{-4}$ and B($\eta \to \gamma\gamma$) = 39.43 ± 0.26%.
[39] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{total}$.
[40] Using B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$ and B($\eta \to 3\pi^0$)=$(32.24 \pm 0.29) \times 10^{-2}$.
[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 $\eta \to 2\gamma$ decay and using B($\phi \to e^+e^-$) =$(2.99 \pm 0.08) \times 10^{-4}$.
[43] Using various decay modes of the η from ACHASOV 98F, ACHASOV 00, and ACHASOV 00B and B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$.
[44] From the $\eta \to \pi^+\pi^-\pi^0$ decay and B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$.
[45] From $\pi^+\pi^-\pi^0$ decay mode of η and using B($\phi \to e^+e^-$)= $(2.99 \pm 0.08) \times 10^{-4}$.
[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($\phi(1020) \to f_0(980)\gamma$) is negligible. Supersedes AKHMETSHIN 97C.
[48] For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \to f_0(980)\gamma$) 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_SK_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($\phi \to e^+e^-$) = $(2.98 \pm 0.04) \times 10^{-4}$.
[53] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma^2_{total}$.
[54] From the $\pi^0 \to 2\gamma$ decay and using B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$.
[55] Using the 1996 and 1998 data.
[56] (2.3 ± 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 $B(\eta \to \gamma\gamma) = (39.25 \pm 0.32)\%$, $B(\phi \to \eta\gamma) = (1.26 \pm 0.06)\%$, and $B(\phi \to e^+e^-) = (3.00 \pm 0.06) \times 10^{-4}$.
[61] The average of the branching ratios separately obtained from the $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$ decays.
[62] From $\eta \to \gamma\gamma$ decays and using $B(\eta \to \gamma\gamma) = (39.33 \pm 0.25) \times 10^{-2}$, $B(\eta \to \pi^+\pi^-\gamma) = (4.75 \pm 11) \times 10^{-2}$, and $B(\phi \to \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
[63] From $\eta \to 3\pi^0$ decays and using $B(\pi^0 \to \gamma\gamma) = (98.798 \pm 0.033) \times 10^{-2}$, $B(\eta \to 3\pi^0) = (32.24 \pm 0.29) \times 10^{-2}$, $B(\eta \to \pi^+\pi^-\gamma) = (4.75 \pm 0.11) \times 10^{-2}$, and $B(\phi \to \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
[64] From $\eta \to \pi^+\pi^-\pi^0$ decays and using $B(\pi^0 \to \gamma\gamma) = (98.798 \pm 0.033) \times 10^{-2}$, $B(\pi^0 \to e^+e^-\gamma) = (1.198 \pm 0.032) \times 10^{-2}$, $B(\eta \to \pi^+\pi^-\pi^0) = (23.0 \pm 0.4) \times 10^{-2}$, $B(\phi \to \pi^+\pi^-\pi^0) = (15.5 \pm 0.6) \times 10^{-2}$, and $B(\phi \to \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.
[65] Averaging AULCHENKO 03B with AULCHENKO 99.
[66] Using $B(\phi \to \eta\gamma) = (1.297 \pm 0.033)\%$.
[67] Using the value $B(\phi \to \eta\gamma) = (1.26 \pm 0.06) \times 10^{-2}$.
[68] Using $B(\phi \to K^0_L K^0_S) = (33.8 \pm 0.6)\%$.
[69] Averaging AKHMETSHIN 00B with AKHMETSHIN 00F.
[70] Using the value $B(\eta' \to \eta\pi^+\pi^-) = (43.7 \pm 1.5) \times 10^{-2}$ and $B(\eta \to \gamma\gamma) = (39.25 \pm 0.31) \times 10^{-2}$.
[71] Using the value $B(\phi \to \eta\gamma) = (1.338 \pm 0.053) \times 10^{-2}$.
[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 $e^+e^- \to \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
[75] Assuming that the $\pi^0\pi^0\gamma$ final state is completely determined by the $f_0\gamma$ mechanism, neglecting the decay $B(\phi \to K\overline{K}\gamma)$ and using $B(f_0 \to \pi^+\pi^-) = 2B(f_0 \to \pi^0\pi^0)$.
[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 $B(\pi^0 \to \gamma\gamma) = 0.98798 \pm 0.00032$, $B(\phi \to \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$, and $B(\eta \to \pi^+\pi^-\gamma) = (4.75 \pm 0.11) \times 10^{-2}$.
[83] From the decay mode $\eta \to \gamma\gamma$.
[84] From the decay mode $\eta \to \pi^+\pi^-\pi^0$.
[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^0_S, K^0_L, η, η' from the 2000 edition (The European Physical Journal **C15** 1 (2000)) of this Review.
[91] From the decay mode $\eta' \to \eta\pi^+\pi^-$, $\eta \to \gamma\gamma$.
[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 $\phi \to \pi^+\pi^-\pi^0$

VALUE	*CL%*	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.090±0.011±0.006		1.98M	[98,99] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$-0.06 < a_1 < 0.06$		500k	[100] ACHASOV	02	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
$-0.16 < a_1 < 0.11$	90		[97] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\gamma\gamma$

[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.

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AKHMETSHIN	04	PL B578 285	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
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ALOISIO	03	PL B561 55	A. Aloisio *et al.*	(KLOE Collab.)
AULCHENKO	03B	JETP 97 24	V.M. Aulchenko *et al.*	(Novosibirsk SND Collab.)
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ACHASOV	02	PR D65 032002	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	02D	JETPL 75 449	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
		Translated from ZETFP 75 539.		
ALOISIO	02C	PL B536 209	A. Aloisio *et al.*	(KLOE Collab.)
ALOISIO	02D	PL B537 21	A. Aloisio *et al.*	(KLOE Collab.)
ALOISIO	02E	PL B541 45	A. Aloisio *et al.*	(KLOE Collab.)
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ACHASOV	01G	PRL 86 1698	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
AITALA	01B	PRL 86 770	E.M. Aitala *et al.*	(FNAL E791 Collab.)
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AULCHENKO	00A	JETP 90 927	V.M. Aulchenko *et al.*	(Novosibirsk SND Collab.)
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PDG	00	EPJ C15 1	D.E. Groom *et al.*	
ACHASOV	99	PL B449 122	M.N. Achasov *et al.*	
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