$\phi(1020)$

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

$\phi(1020)$ MASS

We average mass and width values only when the systematic errors have been evaluated.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1019.456±0.020 OUR AVERAGE Error includes scale factor of 1.1.					
1019.42 ±0.05	1900k	[1] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$
1019.40 ±0.04 ±0.05	23k	AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
1019.483±0.011±0.025	314k	AKHMETSHIN	01D	CMD2	$e^+e^- \to K^0_LK^0_S$
1019.36 ±0.12		[2] ACHASOV	00B	SND	$e^+e^- \to \eta\gamma$
1019.38 ±0.07 ±0.08	2200	[3] 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 $pA \to 4KX$
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	[4] 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. • • •					
1019.8 ±0.7		ARMSTRONG	86	OMEG	85 $\pi^+/p\,p \to \pi^+/p\,4Kp$
1020.1 ±0.11	5526	[5] ATKINSON	86	OMEG	20–70 γp
1019.7 ±1.0		BEBEK	86	CLEO	$e^+e^- \to \Upsilon(4S)$
1019.411±0.008	642k	[6] DIJKSTRA	86	SPEC	100–200 $\pi^\pm$, $\overline{p}$, p, $K^\pm$, on Be
1020.9 ±0.2		[5] FRAME	86	OMEG	13 $K^+p \to \phi K^+p$
1021.0 ±0.2		[5] ARMSTRONG	83B	OMEG	18.5 $K^-p \to K^-K^+\Lambda$
1020.0 ±0.5		[5] ARMSTRONG	83B	OMEG	18.5 $K^-p \to K^-K^+\Lambda$
1019.7 ±0.3		[5] 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 $\overline{p}p \to K^0_S K^0_L \pi^+ \pi^-$
1020	±1	383	[5] 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 $\gamma p \to p K^+ K^-$
1020.3	±0.4	100	BALLAM	73	HBC	2.8–9.3 γp
1019.4	±0.7		BINNIE	73B	CNTR	$\pi^- p \to \phi n$
1019.6	±0.5	120	[7] AGUILAR-...	72B	HBC	3.9,4.6 $K^- p \to \Lambda K^+ K^-$
1019.9	±0.5	100	[7] AGUILAR-...	72B	HBC	3.9,4.6 $K^- p \to K^- p K^+ K^-$
1020.4	±0.5	131	COLLEY	72	HBC	10 $K^+ p \to K^+ p \phi$
1019.9	±0.3	410	STOTTLE...	71	HBC	2.9 $K^- p \to \Sigma / \Lambda K \overline{K}$

[1] 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.
[2] Using a total width of 4.43 ± 0.05 MeV. Systematic uncertainty included.
[3] Using a total width of 4.43 ± 0.05 MeV.
[4] PELLINEN 82 review includes AKERLOF 77, DAUM 81, BALDI 77, AYRES 74, DEGROOT 74.
[5] Systematic errors not evaluated.
[6] Weighted and scaled average of 12 measurements of DIJKSTRA 86.
[7] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

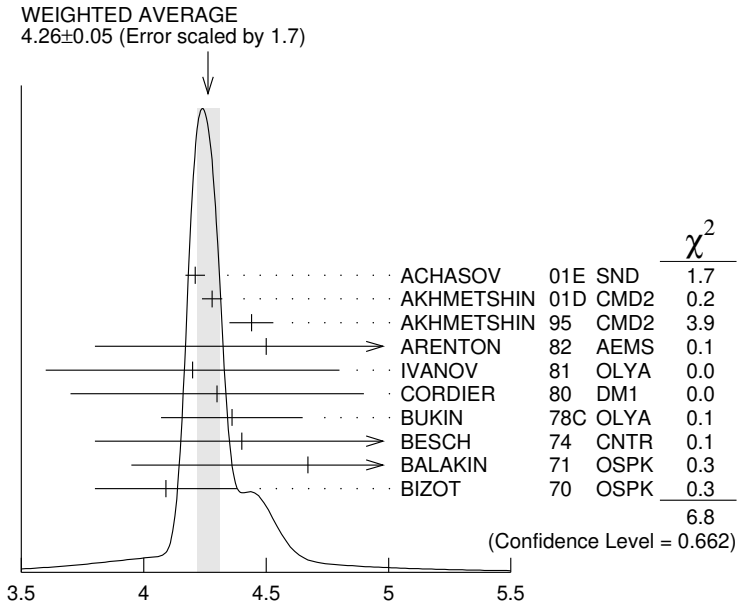
ϕ(1020) WIDTH

We average mass and width values only when the systematic errors have been evalutated.

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
4.26 ±0.05 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.			
4.21 ±0.04	1900k	[8] ACHASOV	01E	SND	$e^+ e^- \to K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$
4.280±0.033±0.025	314k	AKHMETSHIN	01D	CMD2	$e^+ e^- \to K^0_L K^0_S$
4.44 ±0.09	55600	AKHMETSHIN	95	CMD2	$e^+ e^- \to$ hadrons
4.5 ±0.7	1500	ARENTON	82	AEMS	11.8 polar. $p p \to K K$
4.2 ±0.6	766	[9] IVANOV	81	OLYA	1–1.4 $e^+ e^- \to K^+ K^-$
4.3 ±0.6		[9] CORDIER	80	DM1	$e^+ e^- \to \pi^+ \pi^- \pi^0$
4.36 ±0.29	3681	[9] BUKIN	78C	OLYA	$e^+ e^- \to$ hadrons
4.4 ±0.6	984	[9] BESCH	74	CNTR	2 $\gamma p \to p K^+ K^-$
4.67 ±0.72	681	[9] BALAKIN	71	OSPK	$e^+ e^- \to$ hadrons
4.09 ±0.29		BIZOT	70	OSPK	$e^+ e^- \to$ hadrons

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

4.45 ±0.06	271k		DIJKSTRA	86	SPEC	100 π^- Be
3.6 ±0.8	337	[9]	COOPER	78B	HBC	0.7–0.8 $\overline{p}p \to K^0_S K^0_L \pi^+ \pi^-$
4.5 ±0.50	1300	[9,10]	AKERLOF	77	SPEC	400 $pA \to K^+ K^- X$
4.5 ±0.8	500	[9,10]	AYRES	74	ASPK	3–6 $\pi^- p \to K^+ K^- n$, $K^- p \to K^+ K^- \Lambda/\Sigma^0$
3.81 ±0.37			COSME	74B	OSPK	$e^+ e^- \to K^0_L K^0_S$
3.8 ±0.7	454	[9]	BORENSTEIN	72	HBC	2.18 $K^- p \to K \overline{K} n$



$\phi(1020)$ width (MeV)

[8] 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.

[9] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

[10] 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	$K^0_L K^0_S$	(33.7 ±0.5) %	S=1.2
Γ_3	$\rho\pi + \pi^+ \pi^- \pi^0$	(15.5 ±0.5) %	S=1.3
Γ_4	$\rho\pi$		

Γ_5	$\pi^+ \pi^- \pi^0$		
Γ_6	$\eta \gamma$	(1.301 ± 0.026) %	S=1.2
Γ_7	$\pi^0 \gamma$	$(1.24 \pm 0.10) \times 10^{-3}$	
Γ_8	$e^+ e^-$	$(2.96 \pm 0.04) \times 10^{-4}$	S=1.2
Γ_9	$\mu^+ \mu^-$	$(2.87 \pm 0.19) \times 10^{-4}$	
Γ_{10}	$\eta e^+ e^-$	$(1.15 \pm 0.10) \times 10^{-4}$	
Γ_{11}	$\pi^+ \pi^-$	$(7.3 \pm 1.3) \times 10^{-5}$	
Γ_{12}	$\omega \pi^0$	$(5.2 {}^{+1.3}_{-1.1}) \times 10^{-5}$	
Γ_{13}	$\omega \gamma$	< 5 %	CL=84%
Γ_{14}	$\rho \gamma$	$< 1.2 \times 10^{-5}$	CL=90%
Γ_{15}	$\pi^+ \pi^- \gamma$	$(4.1 \pm 1.3) \times 10^{-5}$	
Γ_{16}	$f_0(980) \gamma$	$(4.40 \pm 0.21) \times 10^{-4}$	
Γ_{17}	$\pi^0 \pi^0 \gamma$	$(1.09 \pm 0.06) \times 10^{-4}$	
Γ_{18}	$\pi^+ \pi^- \pi^+ \pi^-$	$(4.0 {}^{+2.8}_{-2.2}) \times 10^{-6}$	
Γ_{19}	$\pi^+ \pi^+ \pi^- \pi^- \pi^0$	$< 4.6 \times 10^{-6}$	CL=90%
Γ_{20}	$\pi^0 e^+ e^-$	$(1.12 \pm 0.28) \times 10^{-5}$	
Γ_{21}	$\pi^0 \eta \gamma$	$(8.3 \pm 0.5) \times 10^{-5}$	
Γ_{22}	$a_0(980) \gamma$	$(7.6 \pm 0.6) \times 10^{-5}$	
Γ_{23}	$\eta'(958) \gamma$	$(6.2 \pm 0.5) \times 10^{-5}$	S=1.1
Γ_{24}	$\eta \pi^0 \pi^0 \gamma$	$< 2 \times 10^{-5}$	CL=90%
Γ_{25}	$\mu^+ \mu^- \gamma$	$(1.4 \pm 0.5) \times 10^{-5}$	
Γ_{26}	$\rho \gamma \gamma$	$< 5 \times 10^{-4}$	CL=90%
Γ_{27}	$\eta \pi^+ \pi^-$	$< 1.8 \times 10^{-5}$	CL=90%
Γ_{28}	$\eta \mu^+ \mu^-$	$< 9.4 \times 10^{-6}$	CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 25 branching ratios uses 68 measurements and one constraint to determine 12 parameters. The overall fit has a $\chi^2 = 58.5$ for 57 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

	x_1	x_2	x_3	x_6	x_7	x_8	x_9	x_{11}	x_{16}	x_{18}
x_2	−68									
x_3	−59	−19								
x_6	−21	14	6							
x_7	−8	5	2	9						
x_8	38	−31	−14	−49	−19					
x_9	−6	5	2	8	3	−16				
x_{11}	−3	2	1	4	1	−8	1			
x_{16}	0	0	0	0	0	0	0	0		
x_{18}	−1	1	0	1	0	−2	0	0	0	
x_{22}	0	0	0	0	0	0	0	0	0	0
x_{23}	−3	2	1	12	1	−6	1	0	0	0

	x_{22}
x_{23}	0

$\phi(1020)$ 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	$e^+ e^- \to \eta\gamma$

$\Gamma(\pi^0\gamma)$ — Γ_7

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

$\Gamma(e^+ e^-)$ — Γ_8

VALUE (keV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.32 \pm 0.02 \pm 0.04$	314k	[11] AKHMETSHIN	99D	CMD2	$e^+ e^- \to K^0_L K^0_S$

[11] Using B($\phi \to K^0_L K^0_S$)= 0.331 ± 0.009.

$\phi(1020)$ $\Gamma(i)\Gamma(e^+ e^-)/\Gamma^2(\text{total})$

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

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
14.56±0.33 OUR NEW UNCHECKED FIT Error includes scale factor of 1.2. [(14.56 ± 0.34) × 10^{-5} OUR 2002 FIT Scale factor = 1.2]					
13.93±0.14±0.99	1000	[12] ACHASOV	01E	SND	$e^+ e^- \to K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$

$\Gamma(e^+ e^-) \times \Gamma(K^0_L K^0_S)/\Gamma^2_{\text{total}}$ — $\Gamma_8\Gamma_2/\Gamma^2$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
9.97±0.18 OUR FIT Error includes scale factor of 1.4.					
9.86±0.21 OUR AVERAGE Error includes scale factor of 1.3.					
10.27±0.07 ±0.34	500	[12] ACHASOV	01E	SND	$e^+ e^- \to K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$
9.75±0.040±0.170	314k	AKHMETSHIN	01D	CMD2	$e^+ e^- \to K^0_L K^0_S$

$\Gamma(e^+ e^-) \times [\Gamma(\rho\pi) + \Gamma(\pi^+ \pi^- \pi^0)]/\Gamma^2_{\text{total}}$ — $\Gamma_8\Gamma_3/\Gamma^2$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
4.59 ±0.14 OUR FIT Error includes scale factor of 1.2.					
4.52 ±0.19 OUR AVERAGE					
4.665±0.042±0.261	400	[12] ACHASOV	01E	SND	$e^+ e^- \to K^+ K^-$, $K_S K_L$, $\pi^+ \pi^- \pi^0$
4.35 ±0.27 ±0.08	11169	[13] AKHMETSHIN	98	CMD2	$e^+ e^- \to \pi^+ \pi^- \pi^0$

$\Gamma(e^+ e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{\text{total}}$ — $\Gamma_8\Gamma_6/\Gamma^2$

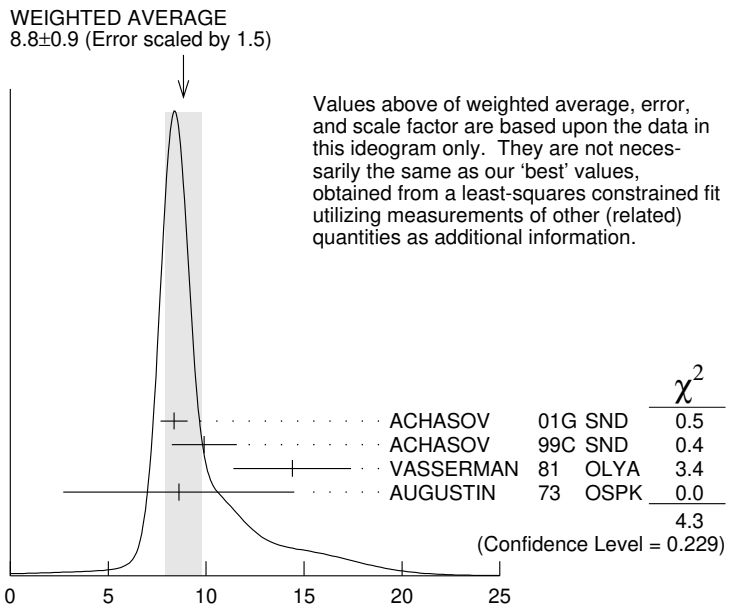
VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
3.85 ±0.07 OUR NEW UNCHECKED FIT Error includes scale factor of 1.2. [(3.84 ± 0.07) × 10^{-6} OUR 2002 FIT Scale factor = 1.2]					
3.89 ±0.08 OUR AVERAGE Error includes scale factor of 1.2.					
3.850±0.041±0.159	23k	[14,15] AKHMETSHIN	01B	CMD2	$e^+ e^- \to \eta\gamma$
4.00 ±0.04 ±0.11		[16] ACHASOV	00	SND	$e^+ e^- \to \eta\gamma$
3.765±0.092±0.143		[17] ACHASOV	00B	SND	$e^+ e^- \to \eta\gamma$
4.017±0.035±0.124	23k	[18] ACHASOV	00D	SND	$e^+ e^- \to \eta\gamma$
3.53 ±0.08 ±0.17	2200	[17,19] 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		[20] ACHASOV	00B	SND	$e^+ e^- \to \eta\gamma$

$\Gamma(e^+ e^-) \times \Gamma(\pi^0\gamma)/\Gamma^2_{\text{total}}$ — $\Gamma_8\Gamma_7/\Gamma^2$

VALUE (units 10^{-7})	DOCUMENT ID		TECN	COMMENT
3.67±0.28 OUR FIT				
$\mathbf{3.67 \pm 0.10^{+0.27}_{-0.25}}$	[21] ACHASOV	00	SND	$e^+ e^- \to \pi^0\gamma$

$\Gamma(e^+ e^-) \times \Gamma(\mu^+ \mu^-)/\Gamma^2_{total}$ — $\Gamma_8\Gamma_9/\Gamma^2$

VALUE (units 10^{-8})	DOCUMENT ID		TECN	COMMENT
8.5 ±0.6 OUR NEW UNCHECKED FIT	$[(8.5^{+0.5}_{-0.6}) \times 10^{-8}$ OUR 2002 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	[19] ACHASOV	99C	SND	$e^+ e^- \to \mu^+ \mu^-$
14.4 ± 3.0	[13] VASSERMAN	81	OLYA	$e^+ e^- \to \mu^+ \mu^-$
8.6 ± 5.9	[13] AUGUSTIN	73	OSPK	$e^+ e^- \to \mu^+ \mu^-$



$\Gamma(e^+ e^-) \times \Gamma(\mu^+ \mu^-)/\Gamma^2_{total}$ — $\Gamma_8\Gamma_9/\Gamma^2$

$\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^-)/\Gamma^2_{total}$ — $\Gamma_8\Gamma_{11}/\Gamma^2$

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	[19] ACHASOV	00C	SND	$e^+ e^- \to \pi^+ \pi^-$
$1.95^{+1.15}_{-0.87}$	[13] GOLUBEV	86	ND	$e^+ e^- \to \pi^+ \pi^-$
$6.01^{+3.19}_{-2.51}$	[13] VASSERMAN	81	OLYA	$e^+ e^- \to \pi^+ \pi^-$

$\Gamma(e^+ e^-) \times \Gamma(\pi^+ \pi^- \pi^+ \pi^-)/\Gamma^2_{total}$ — $\Gamma_8\Gamma_{18}/\Gamma^2$

VALUE (units 10^{-9})	EVTS	DOCUMENT ID		TECN	COMMENT
$1.2^{+0.8}_{-0.7}$ OUR FIT					
1.17 ± 0.52 ± 0.64	3285	[19] AKHMETSHIN	00E	CMD2	$e^+ e^- \to \pi^+ \pi^- \pi^+ \pi^-$

[12] 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.
[13] Recalculated by us from the cross section in the peak.
[14] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$)= $(32.24 \pm 0.29) \times 10^{-2}$.
[15] The combined fit from 600 to 1380 MeV taking into account $\rho(770)$, $\omega(782)$, $\phi(1020)$, and $\rho(1450)$ (mass and width fixed at 1450 MeV and 310 MeV respectively).
[16] From the $\eta \to 2\gamma$ decay and using B($\eta \to 2\gamma$) =$(39.21 \pm 0.34) \times 10^{-2}$.
[17] From the $\eta \to \pi^+\pi^-\pi^0$ decay and using B($\eta \to \pi^+\pi^-\pi^0$) =$(23.1 \pm 0.5) \times 10^{-2}$.
[18] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$) = $(32.2 \pm 0.4) \times 10^{-2}$.
[19] Recalculated by the authors from the cross section in the peak.
[20] Using various decay modes of the η from ACHASOV 98F, ACHASOV 00, and ACHASOV 00B.
[21] 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 NEW UNCHECKED FIT Error includes scale factor of 1.2.					
$[0.492^{+0.006}_{-0.007}$ OUR 2002 FIT Scale factor = 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	[22] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, K_SK_L, $\pi^+\pi^-\pi^0$

$\Gamma(K^0_LK^0_S)/\Gamma_{total}$ — Γ_2/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.337±0.005 OUR FIT Error includes scale factor of 1.2.					
0.331±0.009 OUR AVERAGE					
0.335±0.010	40644	AKHMETSHIN	95	CMD2	$e^+e^- \to K^0_LK^0_S$
0.326±0.035		DOLINSKY	91	ND	$e^+e^- \to K^0_LK^0_S$
0.310±0.024		DRUZHININ	84	ND	$e^+e^- \to K^0_LK^0_S$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.351±0.013	500k	[22] 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 $K^-p \to \Lambda K^0_LK^0_S$
0.257±0.030	95	BALAKIN	71	OSPK	$e^+e^- \to K^0_LK^0_S$
0.40 ±0.04	167	LINDSEY	66	HBC	2.1–2.7 $K^-p \to \Lambda K^0_LK^0_S$

$[\Gamma(\rho\pi)+\Gamma(\pi^+\pi^-\pi^0)]/\Gamma_{total}$ — Γ_3/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.155±0.005 OUR FIT	Error includes scale factor of 1.3.				
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	[22] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$
0.145±0.009±0.003	11169	[23] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
0.139±0.007		[24] PARROUR	76B	OSPK	e^+e^-

$\Gamma(K^0_L K^0_S)/\Gamma(K\overline{K})$ — $\Gamma_2/(\Gamma_1+\Gamma_2)$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.406±0.006 OUR FIT	Error includes scale factor of 1.2.				
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
0.187±0.007 OUR FIT	Error includes scale factor of 1.3.			
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 $K^-p \to \Lambda\pi^+\pi^-\pi^0$

$[\Gamma(\rho\pi)+\Gamma(\pi^+\pi^-\pi^0)]/\Gamma(K^0_L K^0_S)$ — Γ_3/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.460±0.016 OUR FIT	Error includes scale factor of 1.3.				
0.51 ±0.05 OUR AVERAGE					
0.56 ±0.07	3681	BUKIN	78C	OLYA	$e^+e^- \to K^0_L K^0_S$, $\pi^+\pi^-\pi^0$
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	$e^+e^- \to \eta\gamma, \pi^0\gamma$

$\Gamma(\mu^+\mu^-)/\Gamma_{total}$ — Γ_9/Γ

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
2.87±0.19 OUR NEW UNCHECKED FIT	$[(2.87^{+0.18}_{-0.22})\times10^{-4}$ OUR 2002 FIT]			
2.5 ±0.4 OUR AVERAGE				
2.69±0.46	[25] HAYES	71	CNTR	8.3,9.8 $\gamma C \to \mu^+\mu^- X$
2.17±0.60	[25] EARLES	70	CNTR	6.0 $\gamma C \to \mu^+\mu^- X$

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

$2.87 \pm 0.20 \pm 0.14$	[26] ACHASOV	01G	SND	$e^+ e^- \to \mu^+ \mu^-$
$3.30 \pm 0.45 \pm 0.32$	[23] ACHASOV	99C	SND	$e^+ e^- \to \mu^+ \mu^-$
4.83 ± 1.02	[27] VASSERMAN	81	OLYA	$e^+ e^- \to \mu^+ \mu^-$
2.87 ± 1.98	[27] AUGUSTIN	73	OSPK	$e^+ e^- \to \mu^+ \mu^-$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.01301 ± 0.00026 OUR NEW UNCHECKED FIT Error includes scale factor of 1.2. [0.01299 ± 0.00026 OUR 2002 FIT Scale factor = 1.2]					
0.0126 ± 0.0004 OUR AVERAGE					
$0.01246 \pm 0.00025 \pm 0.00057$	10k	[28] ACHASOV	98F	SND	$e^+ e^- \to 7\gamma$
0.0118 ± 0.0011	279	[29] AKHMETSHIN	95	CMD2	$e^+ e^- \to \pi^+ \pi^- 3\gamma$
0.0130 ± 0.0006		[30] DRUZHININ	84	ND	$e^+ e^- \to 3\gamma$
0.014 ± 0.002		[31] DRUZHININ	84	ND	$e^+ e^- \to 6\gamma$
0.0088 ± 0.0020	290	KURDADZE	83C	OLYA	$e^+ e^- \to 3\gamma$
0.0135 ± 0.0029		ANDREWS	77	CNTR	6.7–10 γ Cu
0.015 ± 0.004	54	[30] COSME	76	OSPK	$e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.01287 \pm 0.00013 \pm 0.00063$		[32,33] AKHMETSHIN	01B	CMD2	$e^+ e^- \to \eta\gamma$
$0.01338 \pm 0.00012 \pm 0.00052$		[34] ACHASOV	00	SND	$e^+ e^- \to \eta\gamma$
$0.01287 \pm 0.00012 \pm 0.00042$		[35] ACHASOV	00B	SND	$e^+ e^- \to \eta\gamma$
$0.01259 \pm 0.00030 \pm 0.00059$		[36] ACHASOV	00B	SND	$e^+ e^- \to \eta\gamma$
$0.01343 \pm 0.00012 \pm 0.00055$	23k	[28] ACHASOV	00D	SND	$e^+ e^- \to \eta\gamma$
$0.0118 \pm 0.0003 \pm 0.0006$	2200	[37] AKHMETSHIN	99F	CMD2	$e^+ e^- \to \eta\gamma$
0.0121 ± 0.0007		[38] BENAYOUN	96	RVUE	0.54-1.04 $e^+ e^- \to \eta\gamma$

$\Gamma(\pi^+\pi^-\gamma)/\Gamma_{total}$ — Γ_{15}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$0.41 \pm 0.12 \pm 0.04$		30175	[39] AKHMETSHIN	99B	CMD2	$e^+ e^- \to \pi^+ \pi^- \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 0.3	90		[40] 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

$\Gamma(\omega\gamma)/\Gamma_{total}$ — Γ_{13}/Γ

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

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
< 0.12	90	[41] 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_8/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.96±0.04 OUR FIT Error includes scale factor of 1.2.					
2.98±0.07 OUR AVERAGE Error includes scale factor of 1.1.					
2.93±0.14	1900k	[42] 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		[43] 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. • • •					
$1.226 \pm 0.036^{+0.096}_{-0.089}$		[44] ACHASOV	00	SND	$e^+e^- \to \pi^0\gamma$
1.26 ±0.17		[38] BENAYOUN	96	RVUE	0.54-1.04 $e^+e^- \to \pi^0\gamma$

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.71 \pm 0.11 \pm 0.09$		[23] ACHASOV	00C	SND	$e^+e^- \to \pi^+\pi^-$
$0.65^{+0.38}_{-0.29}$		[23] GOLUBEV	86	ND	$e^+e^- \to \pi^+\pi^-$
$2.01^{+1.07}_{-0.84}$		[23] 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 $\gamma C \to C\pi^+\pi^-$

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

VALUE (units 10^{-5})		DOCUMENT ID		TECN	COMMENT
$\mathbf{5.2^{+1.3}_{-1.1}}$	[45,46]	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	[47]	ACHASOV	00E	SND	$e^+ e^- \to \pi^0 \pi^0 \gamma$
$5.5^{+1.6}_{-1.4} \pm 0.3$	[46,48]	AULCHENKO	00A	SND	$e^+ e^- \to \pi^+ \pi^- \pi^0 \pi^0$
$4.8^{+1.9}_{-1.7} \pm 0.8$	[47]	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
0.685±0.018 OUR FIT	Error includes scale factor of 1.2.			
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		[49] 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
0.315±0.012 OUR FIT	Error includes scale factor of 1.3.			
0.28 ±0.09	34	AGUILAR-...	72B HBC	3.9,4.6 $K^- p$

$\Gamma(\eta e^+ e^-)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID	TECN	COMMENT
1.15±0.10 OUR AVERAGE				
1.19±0.19±0.12	213	[50] ACHASOV	01B SND	$e^+ e^- \to \gamma\gamma e^+ e^-$
1.14±0.10±0.06	355	[51] 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	[52] AKHMETSHIN	01 CMD2	$e^+ e^- \to \eta e^+ e^-$
1.21±0.14±0.09	130	[53] AKHMETSHIN	01 CMD2	$e^+ e^- \to \eta e^+ e^-$
1.04±0.20±0.08	42	[54] AKHMETSHIN	01 CMD2	$e^+ e^- \to \eta e^+ e^-$

$\Gamma(\eta'(958)\gamma)/\Gamma_{total}$ — Γ_{23}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
6.2 ±0.5 OUR NEW UNCHECKED FIT Error includes scale factor of 1.1. $[(6.7^{+1.5}_{-1.4}) \times 10^{-5}$ OUR 2002 FIT]					
6.1 ±0.7 OUR NEW AVERAGE $[(6.7^{+3.5}_{-3.1}) \times 10^{-5}$ OUR 2002 AVERAGE]					
6.10±0.61±0.43		120	[55] ALOISIO	02E KLOE	1.02 $e^+ e^- \to \pi^+ \pi^- 3\gamma$
$6.7\ ^{+3.4}_{-2.9}$ ±1.0		5	[56] AULCHENKO	99 SND	$e^+ e^- \to \pi^+ \pi^- 3\gamma$

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

$8.2\ ^{+2.1}_{-1.9}\ \pm 1.1$	21	[57] AKHMETSHIN 00B	CMD2	$e^+e^- \to \pi^+\pi^- 3\gamma$
$4.9\ ^{+2.2}_{-1.8}\ \pm 0.6$	9	[58] AKHMETSHIN 00F	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$
$6.4\ \pm 1.6$	30	[59] AKHMETSHIN 00F	CMD2	$e^+e^- \to \eta'(958)\gamma$
<11	90	AULCHENKO 98	SND	$e^+e^- \to 7\gamma$
$12\ ^{+7}_{-5}\ \pm 2$	6	[57] 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_{24}/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_{17}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.09 ±0.06 OUR NEW AVERAGE			[(1.08 ± 0.19) × 10^{-4} OUR 2002 AVERAGE]		
$1.09\ \pm 0.03\ \pm 0.05$		2438	ALOISIO 02D	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$
$1.08\ \pm 0.17\ \pm 0.09$		268	AKHMETSHIN 99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$

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

$1.158 \pm 0.093 \pm 0.052$	419	[60,61] 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_{17}/Γ_6

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$0.865 \pm 0.070 \pm 0.017$	419	[61] ACHASOV 00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$

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

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

$\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{total}$ — Γ_{19}/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_{18}/Γ

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT

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

$3.93 \pm 1.74 \pm 2.14$		3285	AKHMETSHIN 00E	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$
<870	90		CORDIER 79	WIRE	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$

$\Gamma(f_0(980)\gamma)/\Gamma_{total}$ — Γ_{16}/Γ

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
4.40±0.21 OUR NEW UNCHECKED FIT			$[(3.3^{+0.8}_{-0.5}) \times 10^{-4}$ OUR 2002 FIT]			
4.44±0.21 OUR NEW AVERAGE			$[(2.9 \pm 1.6) \times 10^{-4}$ OUR 2002 AVERAGE]			
4.47±0.21		2438	[62] ALOISIO	02D	KLOE	$e^+ e^- \to \pi^0 \pi^0 \gamma$
2.90±0.21±1.54			[63] 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	[60,64] ACHASOV	00H	SND	$e^+ e^- \to \pi^0 \pi^0 \gamma$
1.93±0.46±0.50		27188	[65] AKHMETSHIN	99B	CMD2	$e^+ e^- \to \pi^+ \pi^- \gamma$
3.05±0.25±0.72		268	[66] AKHMETSHIN	99C	CMD2	$e^+ e^- \to \pi^0 \pi^0 \gamma$
1.5 ±0.5		268	[67] AKHMETSHIN	99C	CMD2	$e^+ e^- \to \pi^0 \pi^0 \gamma$
3.42±0.30±0.36		164	[64] ACHASOV	98I	SND	$e^+ e^- \to 5\gamma$
< 1	90		[68] AKHMETSHIN	97C	CMD2	$e^+ e^- \to \pi^+ \pi^- \gamma$
< 7	90		[69] 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_{16}/Γ_6

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.38±0.18 OUR NEW UNCHECKED FIT		Error includes scale factor of 1.1. $[(2.6^{+0.6}_{-0.4}) \times 10^{-2}$ OUR 2002 FIT]			
2.6 ±0.2 $^{+0.8}_{-0.3}$	419	[64] ACHASOV	00H	SND	$e^+ e^- \to \pi^0 \pi^0 \gamma$

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

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.12±0.28 OUR NEW AVERAGE			$[(1.2 \pm 0.4) \times 10^{-5}$ OUR 2002 AVERAGE]			
1.01±0.28±0.29		52	[70] ACHASOV	02D	SND	$e^+ e^- \to \pi^0 e^+ e^-$
1.22±0.34±0.21		46	[71] 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	$e^+ e^- \to \pi^0 e^+ e^-$

$\Gamma(\pi^0 \eta\gamma)/\Gamma_{total}$ — Γ_{21}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
8.3 ±0.5 OUR NEW AVERAGE			$[(0.89 \pm 0.14) \times 10^{-4}$ OUR 2002 AVERAGE]			
8.51±0.51±0.57		607	[72] ALOISIO	02C	KLOE	$e^+ e^- \to \eta \pi^0 \gamma$

$7.96 \pm 0.60 \pm 0.40$	197	[73] ALOISIO	02C	KLOE	$e^+ e^- \to \eta \pi^0 \gamma$
$8.8 \pm 1.4 \pm 0.9$	36	[74] ACHASOV	00F	SND	$e^+ e^- \to \eta \pi^0 \gamma$
$9.0 \pm 2.4 \pm 1.0$	80	AKHMETSHIN	99C	CMD2	$e^+ e^- \to \eta \pi^0 \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$8.3 \pm 2.3 \pm 1.2$	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_{22}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
7.6 ± 0.6 OUR NEW UNCHECKED FIT [$(0.88 \pm 0.17) \times 10^{-3}$ OUR 2002 FIT]						
7.6 ± 0.6 OUR NEW AVERAGE [$(0.88 \pm 0.17) \times 10^{-3}$ OUR 2002 AVERAGE]						
7.4 ± 0.7			[75] ALOISIO	02C	KLOE	$e^+ e^- \to \eta \pi^0 \gamma$
8.8 ± 1.7		36	[76] ACHASOV	00F	SND	$e^+ e^- \to \eta \pi^0 \gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
11 ± 2			[77] 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_{16}/Γ_{22}

VALUE (units 10^{-5})		DOCUMENT ID		TECN	COMMENT
6.1 ± 0.6		[78] ALOISIO	02C	KLOE	$e^+ e^- \to \eta \pi^0 \gamma$

$\Gamma(\eta'(958)\gamma)/\Gamma(K^0_L K^0_S)$ — Γ_{23}/Γ_2

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.83 ± 0.16 OUR NEW UNCHECKED FIT Error includes scale factor of 1.1. [$(2.0^{+0.5}_{-0.4}) \times 10^{-4}$ OUR 2002 FIT]					
$1.46^{+0.64}_{-0.54} \pm 0.18$	9	[79] AKHMETSHIN	00F	CMD2	$e^+ e^- \to \pi^+ \pi^- \pi^+ \pi^- \geq 2\gamma$

$\Gamma(\eta'(958)\gamma)/\Gamma(\eta\gamma)$ — Γ_{23}/Γ_6

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
4.7 ± 0.4 OUR NEW UNCHECKED FIT Error includes scale factor of 1.1. [$(5.1^{+1.2}_{-1.1}) \times 10^{-3}$ OUR 2002 FIT]					
4.9 ± 0.5 OUR NEW AVERAGE [$(6.5 \pm 1.8) \times 10^{-3}$ OUR 2002 AVERAGE]					
$4.70 \pm 0.47 \pm 0.31$	120	[80] ALOISIO	02E	KLOE	$1.02\ e^+ e^- \to \pi^+ \pi^- 3\gamma$
$6.5\ ^{+1.7}_{-1.5} \pm 0.8$	21	AKHMETSHIN	00B	CMD2	$e^+ e^- \to \pi^+ \pi^- 3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$9.5\ ^{+5.2}_{-4.0} \pm 1.4$	6	[81] AKHMETSHIN	97B	CMD2	$e^+ e^- \to \pi^+ \pi^- 3\gamma$

$\Gamma(\mu^+ \mu^- \gamma)/\Gamma_{total}$ — Γ_{25}/Γ

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
$1.43 \pm 0.45 \pm 0.14$	27188	[65] 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	[82] AKHMETSHIN	97C	CMD2	$e^+ e^- \to \mu^+ \mu^- \gamma$

$\Gamma(\rho\gamma\gamma)/\Gamma_{total}$ — Γ_{26}/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_{27}/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_{28}/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%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.0006	90	[83] ACHASOV 02	SND	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
<0.23	90	[83] CORDIER 80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
<0.20	90	[83] PARROUR 76B	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$

[22] Using B($\phi \to e^+e^-$)= (2.93 ± 0.14) × 10^{-4}.
[23] Using B($\phi \to e^+e^-$)=(2.99 ± 0.08) × 10^{-4}.
[24] Using Γ(ϕ)= 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.
[25] Neglecting interference between resonance and continuum.
[26] Using B($\phi \to e^+e^-$) = (2.91 ± 0.07) × 10^{-4}.
[27] Recalculated by us using B($\phi \to e^+e^-$)= (2.99 ± 0.08) × 10^{-4}.
[28] Using B($\phi \to e^+e^-$) = (2.99 ± 0.08) × 10^{-4} and B($\eta \to 3\pi^0$)= (32.2 ± 0.4) × 10^{-2}.
[29] From $\pi^+\pi^-\pi^0$ decay mode of η.
[30] From 2γ decay mode of η.
[31] From $3\pi^0$ decay mode of η.
[32] Using B($\phi \to e^+e^-$) = (2.99 ± 0.08) × 10^{-4} and B($\eta \to 3\pi^0$)=(32.24 ± 0.29) × 10^{-2}.
[33] 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).
[34] From the $\eta \to 2\gamma$ decay and using B($\phi \to e^+e^-$) =(2.99 ± 0.08) × 10^{-4}.
[35] Using various decay modes of the η from ACHASOV 98F, ACHASOV 00, and ACHASOV 00B and B($\phi \to e^+e^-$) = (2.99 ± 0.08) × 10^{-4}.
[36] From the $\eta \to \pi^+\pi^-\pi^0$ decay and B($\phi \to e^+e^-$) = (2.99 ± 0.08) × 10^{-4}.
[37] From $\pi^+\pi^-\pi^0$ decay mode of η and using B($\phi \to e^+e^-$)= (2.99 ± 0.08) × 10^{-4}.
[38] Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution.
[39] For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \to f_0(980)\gamma$) is neglibible. Supersedes AKHMETSHIN 97C.
[40] For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \to f_0(980)\gamma$) is negligible.
[41] Supersedes AKHMETSHIN 97C.

[42] 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.

[43] 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.

[44] From the $\pi^0 \rightarrow 2\gamma$ decay and using $B(\phi \rightarrow e^+ e^-) = (2.99 \pm 0.08) \times 10^{-4}$.

[45] Using the 1996 and 1998 data.

[46] $(2.3 \pm 0.3)\%$ correction for other decay modes of the $\omega(782)$ applied.

[47] Using the 1996 data.

[48] Using the 1998 data.

[49] Theoretical analysis of BRAMON 00 taking into account phase-space difference, electromagnetic radiatve corrections, as well as isospin breaking, predicts 0.62. FISCHBACH 02 calculates additional corrections caused by the close threshold and predicts 0.68.

[50] Using $B(\eta \rightarrow \gamma\gamma) = (39.25 \pm 0.32)\%$, $B(\phi \rightarrow \eta\gamma) = (1.26 \pm 0.06)\%$, and $B(\phi \rightarrow e^+ e^-) = (3.00 \pm 0.06) \times 10^{-4}$.

[51] The average of the branching ratios separately obtained from the $\eta \rightarrow \gamma\gamma$, $3\pi^0$, $\pi^+ \pi^- \pi^0$ decays.

[52] 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 $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.

[53] 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 $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.

[54] 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 $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033) \times 10^{-2}$.

[55] Using $B(\phi \rightarrow \eta\gamma) = (1.297 \pm 0.033)\%$.

[56] Using the value $B(\eta' \rightarrow \eta\pi^+ \pi^-) = (43.7 \pm 1.5) \times 10^{-2}$ and $B(\eta \rightarrow \gamma\gamma) = (39.25 \pm 0.31) \times 10^{-2}$.

[57] Using the value $B(\phi \rightarrow \eta\gamma) = (1.26 \pm 0.06) \times 10^{-2}$.

[58] Using $B(\phi \rightarrow K^0_L K^0_S) = (33.8 \pm 0.6)\%$.

[59] Averaging AKHMETSHIN 00B with AKHMETSHIN 00F.

[60] Using the value $B(\phi \rightarrow \eta\gamma) = (1.338 \pm 0.053) \times 10^{-2}$.

[61] Supersedes ACHASOV 98I. Excluding $\omega\pi^0$.

[62] 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.

[63] From the combined fit of the photon spectra in the reactions $e^+ e^- \rightarrow \pi^+ \pi^- \gamma$, $\pi^0 \pi^0 \gamma$.

[64] Assuming that the $\pi^0 \pi^0 \gamma$ final state is completely determined by the $f_0 \gamma$ mechanism, neglecting the decay $B(\phi \rightarrow K\overline{K}\gamma)$ and using $B(f_0 \rightarrow \pi^+ \pi^-) = 2B(f_0 \rightarrow \pi^0 \pi^0)$.

[65] For $E_\gamma > 20$ MeV. Supersedes AKHMETSHIN 97C.

[66] Neglecting other intermediate mechanisms ($\rho\pi$, $\sigma\gamma$).

[67] A narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.

[68] For destructive interference with the Bremsstrahlung process

[69] For constructive interference with the Bremsstrahlung process

[70] Using various branching ratios from the 2000 Edition of this Review (PDG 00).

[71] 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 $B(\eta \rightarrow \pi^+ \pi^- \gamma) = (4.75 \pm 0.11) \times 10^{-2}$.

[72] From the decay mode $\eta \rightarrow \gamma\gamma$.

[73] From the decay mode $\eta \rightarrow \pi^+ \pi^- \pi^0$.

[74] Supersedes ACHASOV 98B.

[75] Using $M_{a_0(980)}$=984.8 MeV and assuming $a_0(980)\gamma$ dominance.

[76] Assuming $a_0(980)\gamma$ dominance in the $\eta\pi^0\gamma$ final state.

[77] Using data of ACHASOV 00F.

[78] Using results of ALOISIO 02D and assuming that $f_0(980)$ decays into $\pi\pi$ only and $a_0(980)$ into $\eta\pi$ only.

[79] 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.

[80] From the decay mode $\eta' \rightarrow \eta\pi^+\pi^-$, $\eta \rightarrow \gamma\gamma$.

[81] Superseded by AKHMETSHIN 00B.

[82] For $E_\gamma > 20$ MeV.

[83] 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
$-0.06 < a_1 < 0.06$		500k	[85] ACHASOV	02	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
$-0.16 < a_1 < 0.11$	90		[84] AKHMETSHIN	98	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma\gamma$

[84] 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.

[85] Recalculated by the authors to match the notations of AKHMETSHIN 98.

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