$\phi(1020)$

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

$\phi(1020)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1019.455±0.020 OUR AVERAGE		Error includes scale factor of 1.1.			
1019.30 ±0.02 ±0.10	105k	AKHMETSHIN	06	CMD2	0.98–1.06 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1019.52 ±0.05 ±0.05	17.4k	AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \rightarrow \eta\gamma$
1019.483±0.011±0.025	272k	[1] AKHMETSHIN	04	CMD2	$e^+e^- \rightarrow K^0_L K^0_S$
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	$e^+e^- \rightarrow \pi^+\pi^- \geq 2\gamma$
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 $\rightarrow 4K$X
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. • • •					
1019.441±0.008±0.080	542k	[6] AKHMETSHIN	08	CMD2	1.02 $e^+e^- \rightarrow K^+K^-$
1019.63 ±0.07	12540	[7] AUBERT,B	05J	BABR	$D^0 \rightarrow \overline{K}^0 K^+K^-$
1019.8 ±0.7		ARMSTRONG	86	OMEG	85 $\pi^+/pp \rightarrow \pi^+/p4Kp$
1020.1 ±0.11	5526	[7] ATKINSON	86	OMEG	20–70 γp
1019.7 ±1.0		BEBEK	86	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
1019.411±0.008	642k	[8] DIJKSTRA	86	SPEC	100–200 $\pi^\pm$, $\overline{p}$, p, $K^\pm$, on Be
1020.9 ±0.2		[7] FRAME	86	OMEG	13 $K^+p \rightarrow \phi K^+p$
1021.0 ±0.2		[7] ARMSTRONG	83B	OMEG	18.5 $K^-p \rightarrow K^-K^+\Lambda$
1020.0 ±0.5		[7] ARMSTRONG	83B	OMEG	18.5 $K^-p \rightarrow K^-K^+\Lambda$
1019.7 ±0.3		[7] BARATE	83	GOLI	190 π^-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 $\overline{p}p \rightarrow K^0_S K^0_L \pi^+\pi^-$
1020 ±1	383	[7] 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	$2.18\ K^{-} p \rightarrow \Lambda K \overline{K}$
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	[9] AGUILAR-...	72B	HBC	3.9,4.6 $K^{-} p \rightarrow \Lambda K^{+} K^{-}$
1019.9	±0.5	100	[9] 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 99D

[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] Strongly correlated with AKHMETSHIN 04.

[7] Systematic errors not evaluated.

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

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

ϕ(1020) WIDTH

VALUE (MeV)			*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
4.26	**±0.04**	**OUR AVERAGE**	Error includes scale factor of 1.4. See the ideogram below.				
4.30	±0.06	±0.17	105k	AKHMETSHIN	06	CMD2	0.98–1.06 $e^{+} e^{-} \rightarrow \pi^{+} \pi^{-} \pi^{0}$
4.280	±0.033	±0.025	272k	[10] AKHMETSHIN	04	CMD2	$e^{+} e^{-} \rightarrow K_L^0 K_S^0$
4.21	±0.04		1900k	[11] 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. $p p \rightarrow K K$
4.2	±0.6		766	[12] IVANOV	81	OLYA	1–1.4 $e^{+} e^{-} \rightarrow K^{+} K^{-}$
4.3	±0.6			[12] CORDIER	80	DM1	$e^{+} e^{-} \rightarrow \pi^{+} \pi^{-} \pi^{0}$
4.36	±0.29		3681	[12] BUKIN	78C	OLYA	$e^{+} e^{-} \rightarrow$ hadrons
4.4	±0.6		984	[12] BESCH	74	CNTR	$2\ \gamma p \rightarrow p K^{+} K^{-}$
4.67	±0.72		681	[12] 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. • • •							
4.24	±0.02	±0.03	542k	[13] AKHMETSHIN	08	CMD2	1.02 $e^{+} e^{-} \rightarrow K^{+} K^{-}$
4.28	±0.13		12540	[14] 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	[12] COOPER	78B	HBC	0.7–0.8 $\overline{p} p \rightarrow K_S^0 K_L^0 \pi^{+} \pi^{-}$

4.5	±0.50	1300	[12,14] AKERLOF	77	SPEC	400 $pA \to K^+ K^- X$
4.5	±0.8	500	[12,14] 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	[12] BORENSTEIN	72	HBC	2.18 $K^- p \to K \overline{K} n$

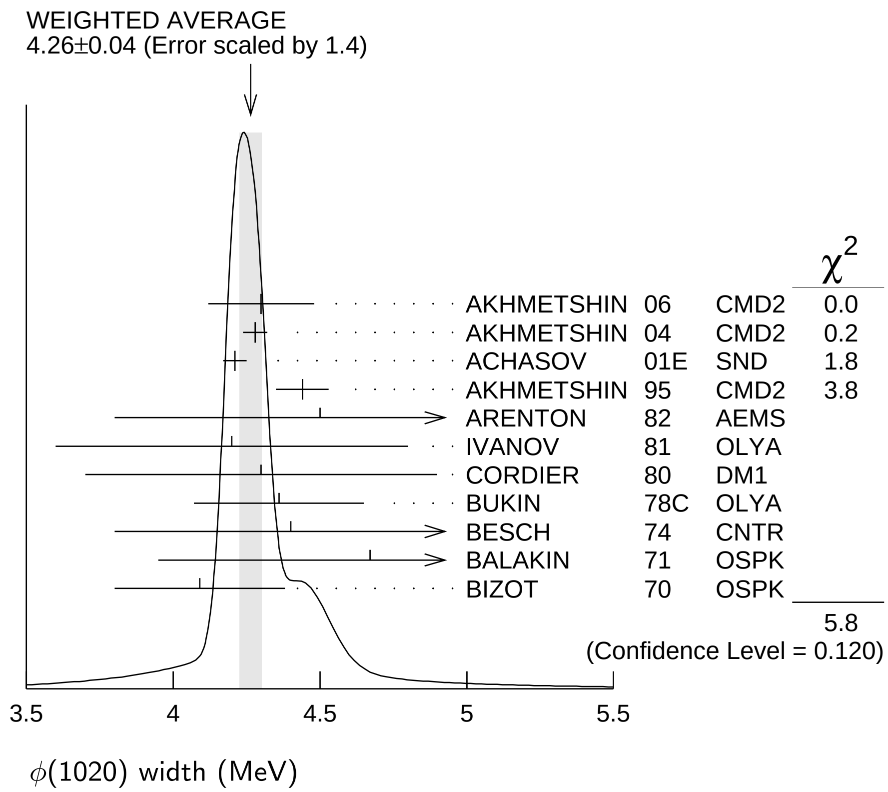
[10] Update of AKHMETSHIN 99D

[11] 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.

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

[13] Strongly correlated with AKHMETSHIN 04.

[14] Systematic errors not evaluated.



ϕ(1020) DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$K^+ K^-$	(48.9 ±0.5) %	S=1.1
Γ_2	$K^0_L K^0_S$	(34.2 ±0.4) %	S=1.1
Γ_3	$\rho\pi + \pi^+ \pi^- \pi^0$	(15.32 ±0.32) %	S=1.1
Γ_4	$\rho\pi$		
Γ_5	$\pi^+ \pi^- \pi^0$		
Γ_6	$\eta\gamma$	(1.309±0.024) %	S=1.2
Γ_7	$\pi^0\gamma$	(1.27 ±0.06) $\times 10^{-3}$	

Γ_{8}	$\ell^+ \ell^-$		—		
Γ_{9}	$e^+ e^-$		$(2.954 \pm 0.030) \times 10^{-4}$		S=1.1
Γ_{10}	$\mu^+ \mu^-$		$(2.87 \pm 0.19) \times 10^{-4}$		
Γ_{11}	$\eta e^+ e^-$		$(1.15 \pm 0.10) \times 10^{-4}$		
Γ_{12}	$\pi^+ \pi^-$		$(7.4 \pm 1.3) \times 10^{-5}$		
Γ_{13}	$\omega \pi^0$		$(4.7 \pm 0.5) \times 10^{-5}$		
Γ_{14}	$\omega \gamma$		< 5 %		CL=84%
Γ_{15}	$\rho \gamma$		$< 1.2 \times 10^{-5}$		CL=90%
Γ_{16}	$\pi^+ \pi^- \gamma$		$(4.1 \pm 1.3) \times 10^{-5}$		
Γ_{17}	$f_0(980) \gamma$		$(3.22 \pm 0.19) \times 10^{-4}$		S=1.1
Γ_{18}	$\pi^0 \pi^0 \gamma$		$(1.13 \pm 0.06) \times 10^{-4}$		
Γ_{19}	$\pi^+ \pi^- \pi^+ \pi^-$		$(4.0 {}^{+2.8}_{-2.2}) \times 10^{-6}$		
Γ_{20}	$\pi^+ \pi^+ \pi^- \pi^- \pi^0$		$< 4.6 \times 10^{-6}$		CL=90%
Γ_{21}	$\pi^0 e^+ e^-$		$(1.12 \pm 0.28) \times 10^{-5}$		
Γ_{22}	$\pi^0 \eta \gamma$		$(7.27 \pm 0.30) \times 10^{-5}$		S=1.5
Γ_{23}	$a_0(980) \gamma$		$(7.6 \pm 0.6) \times 10^{-5}$		
Γ_{24}	$K^0 \overline{K}^0 \gamma$		$< 1.9 \times 10^{-8}$		CL=90%
Γ_{25}	$\eta'(958) \gamma$		$(6.25 \pm 0.21) \times 10^{-5}$		
Γ_{26}	$\eta \pi^0 \pi^0 \gamma$		$< 2 \times 10^{-5}$		CL=90%
Γ_{27}	$\mu^+ \mu^- \gamma$		$(1.4 \pm 0.5) \times 10^{-5}$		
Γ_{28}	$\rho \gamma \gamma$		$< 1.2 \times 10^{-4}$		CL=90%
Γ_{29}	$\eta \pi^+ \pi^-$		$< 1.8 \times 10^{-5}$		CL=90%
Γ_{30}	$\eta \mu^+ \mu^-$		$< 9.4 \times 10^{-6}$		CL=90%
	Lepton Faminly number (LF) violating modes				
Γ_{31}	$e^\pm \mu^\mp$	*LF*	$< 2 \times 10^{-6}$		CL=90%

CONSTRAINED FIT INFORMATION

An overall fit to 30 branching ratios uses 79 measurements and one constraint to determine 14 parameters. The overall fit has a $\chi^2 = 57.4$ for 66 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, $x_i \equiv \Gamma_i / \Gamma_{\text{total}}$. 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_9	x_{10}	x_{12}	x_{13}	x_{17}
x_2	−72									
x_3	−53	−21								
x_6	−13	7	2							
x_7	−5	3	1	5						
x_9	30	−25	−10	−32	−15					
x_{10}	−4	3	1	3	2	−11				
x_{12}	−2	1	0	2	1	−5	1			
x_{13}	−2	2	1	2	1	−7	1	0		
x_{17}	0	0	0	0	0	0	0	0	0	
x_{18}	−6	4	2	17	3	−17	2	1	1	0
x_{19}	0	0	0	0	0	−1	0	0	0	0
x_{23}	0	0	0	0	0	0	0	0	0	0
x_{25}	−4	2	1	32	2	−10	1	1	1	0

	x_{18}	x_{19}	x_{23}
x_{19}	0		
x_{23}	0	0	
x_{25}	5	0	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±0.5±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. • • •				
$5.40\pm0.16^{+0.43}_{-0.40}$	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±0.017±0.015	[15] AMBROSINO	05	KLOE	1.02 $e^+e^- \to \mu^+\mu^-$

$\Gamma(e^+e^-)$ Γ_9

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1.27 ±0.04 OUR EVALUATION				
1.251±0.021 OUR AVERAGE	Error includes scale factor of 1.1.			
1.235±0.006±0.022	[16] AKHMETSHIN	11	CMD2	1.02 $e^+e^- \to \phi$
1.32 ±0.05 ±0.03	[17] AMBROSINO	05	KLOE	1.02 $e^+e^- \to e^+e^-$
1.28 ±0.05	AKHMETSHIN	95	CMD2	1.02 $e^+e^- \to \phi$

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

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
1.320±0.018±0.017	AMBROSINO	05	KLOE	1.02 $e^+e^- \to \mu^+\mu^-$

[15] Weighted average of Γ_{ee} and $\sqrt{\Gamma_{ee}\Gamma_{\mu\mu}}$ from AMBROSINO 05 assuming lepton universality.

[16] Combined analysis of the CMD-2 data on $\phi \to K^+K^-$, $K^0_S K^0_L$, $\pi^+\pi^-\pi^0$, $\eta\gamma$ assuming that the sum of their branching fractions is 0.99741 ± 0.00007.

[17] From forward-backward asymmetry and using Γ_{total} = 4.26 ± 0.05 MeV from the 2004 edition of this Review.

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

$\Gamma(K^+K^-)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_1/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
14.46±0.23 OUR FIT	Error includes scale factor of 1.1.				
14.24±0.30 OUR AVERAGE					
14.27±0.05±0.31	542k	AKHMETSHIN	08	CMD2	1.02 $e^+e^- \to K^+K^-$
13.93±0.14±0.99	1000k	[18] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$

$\Gamma(K^0_L K^0_S)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_2/\Gamma \times \Gamma_9/\Gamma$

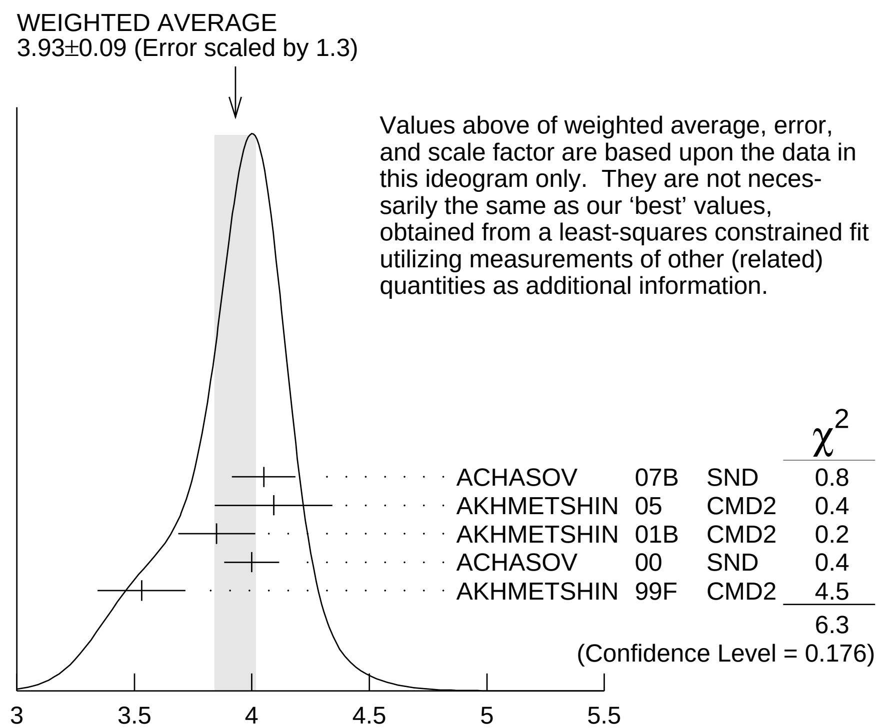
VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
10.10±0.13 OUR FIT					
10.06±0.16 OUR AVERAGE					
10.01±0.04±0.17	272k	[19] AKHMETSHIN	04	CMD2	$e^+e^- \to K^0_L K^0_S$
10.27±0.07±0.34	500k	[18] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$

$\left[\Gamma(\rho\pi) + \Gamma(\pi^+\pi^-\pi^0)\right]/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_3/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-5})	EVTS	DOCUMENT ID		TECN	COMMENT
4.53 ±0.10 OUR FIT	Error includes scale factor of 1.1.				
4.46 ±0.12 OUR AVERAGE					
4.51 ±0.16 ±0.11	105k	AKHMETSHIN	06	CMD2	0.98–1.06 $e^+e^- \to \pi^+\pi^-\pi^0$
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	[18] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$
4.35 ±0.27 ±0.08	11169	[20] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
4.38 ±0.12		BENAYOUN	10	RVUE	0.4–1.05 e^+e^-

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

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
3.87 ±0.07 OUR FIT Error includes scale factor of 1.2.				
3.93 ±0.09 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
$4.050\pm0.067\pm0.118$	33k	[21] ACHASOV 07B	SND	0.6–1.38 $e^+e^- \to \eta\gamma$
$4.093^{+0.040}_{-0.043}\pm0.247$	17.4k	[22] AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \to \eta\gamma$
$3.850\pm0.041\pm0.159$	23k	[23,24] AKHMETSHIN 01B	CMD2	$e^+e^- \to \eta\gamma$
$4.00\pm0.04\pm0.11$		[25] ACHASOV 00	SND	$e^+e^- \to \eta\gamma$
$3.53\pm0.08\pm0.17$	2200	[26,27] AKHMETSHIN 99F	CMD2	$e^+e^- \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.19 ± 0.06		[28] BENAYOUN 10	RVUE	0.4–1.05 e^+e^-



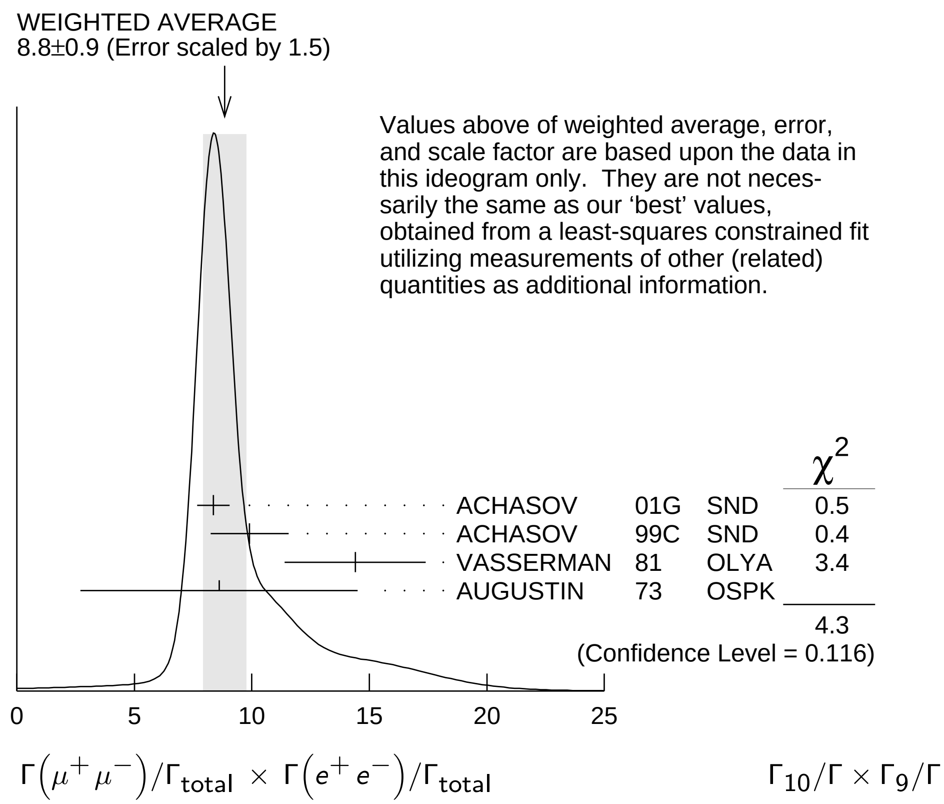
$\Gamma(\eta\gamma)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_6/\Gamma \times \Gamma_9/\Gamma$

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

VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
3.74±0.18 OUR FIT				
3.71±0.21 OUR AVERAGE				
$3.75\pm0.11\pm0.29$	18680	AKHMETSHIN 05	CMD2	0.60-1.38 $e^+e^- \to \pi^0\gamma$
$3.67\pm0.10^{+0.27}_{-0.25}$		[29] ACHASOV 00	SND	$e^+e^- \to \pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.29 ± 0.11		[28] BENAYOUN 10	RVUE	0.4–1.05 e^+e^-

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

VALUE (units 10^{-8})	*DOCUMENT ID*		*TECN*	*COMMENT*
8.5 $^{+0.5}_{-0.6}$ 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	[26] ACHASOV	99C	SND	$e^+e^- \to \mu^+\mu^-$
14.4 ±3.0	[20] VASSERMAN	81	OLYA	$e^+e^- \to \mu^+\mu^-$
8.6 ±5.9	[20] AUGUSTIN	73	OSPK	$e^+e^- \to \mu^+\mu^-$



$\Gamma(\pi^+\pi^-)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{12}/\Gamma \times \Gamma_9/\Gamma$

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	[26] ACHASOV	00C	SND	$e^+e^- \to \pi^+\pi^-$
$1.95^{+1.15}_{-0.87}$	[20] GOLUBEV	86	ND	$e^+e^- \to \pi^+\pi^-$
$6.01^{+3.19}_{-2.51}$	[20] VASSERMAN	81	OLYA	$e^+e^- \to \pi^+\pi^-$

$\Gamma(\omega\pi^0)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_{13}/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-8})	*DOCUMENT ID*		*TECN*	*COMMENT*
1.40±0.15 OUR FIT				
1.37±0.17±0.01	[30,31] AMBROSINO	08G	KLOE	$e^+e^- \to \pi^+\pi^- 2\pi^0$, $2\pi^0\gamma$

$\Gamma(\pi^0\pi^0\gamma)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{18}/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
3.34±0.17 OUR FIT			
$3.33^{+0.04}_{-0.09}{}^{+0.19}_{-0.20}$	[32] AMBROSINO 07	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{19}/\Gamma \times \Gamma_9/\Gamma$

VALUE (units 10^{-9})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.2^{+0.8}_{-0.7}$ OUR FIT				
1.17±0.52±0.64	3285	[26] AKHMETSHIN 00E	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$

[18] 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.
[19] Update of AKHMETSHIN 99D
[20] Recalculated by us from the cross section in the peak.
[21] From a combined fit of $\sigma(e^+e^- \to \eta\gamma)$ with $\eta \to 3\pi^0$ and $\eta \to \pi^+\pi^-\pi^0$, and fixing B($\eta \to 3\pi^0$) / B($\eta \to \pi^+\pi^-\pi^0$) = 1.44 ± 0.04. Recalculated by us from the cross section at the peak. Supersedes ACHASOV 00D and ACHASOV 06A.
[22] From the $\eta \to 2\gamma$ decay and using B($\eta \to \gamma\gamma$) = 39.43 ± 0.26%.
[23] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$)= (32.24 ± 0.29) × 10^{-2}.
[24] 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).
[25] From the $\eta \to 2\gamma$ decay and using B($\eta \to 2\gamma$) =(39.21 ± 0.34) × 10^{-2}.
[26] Recalculated by the authors from the cross section in the peak.
[27] From the $\eta \to \pi^+\pi^-\pi^0$ decay and using B($\eta \to \pi^+\pi^-\pi^0$) =(23.1 ± 0.5) × 10^{-2}.
[28] A simultaneous fit of $e^+e^- \to \pi^+\pi^-$, $\pi^+\pi^-\pi^0$, $\pi^0\gamma$, $\eta\gamma$ data.
[29] From the $\pi^0 \to 2\gamma$ decay and using B($\pi^0 \to 2\gamma$) =(98.798 ± 0.032) × 10^{-2}.
[30] Recalculated by the authors from the cross section at the peak.
[31] AMBROSINO 08G reports [$\Gamma(\phi(1020) \to \omega\pi^0)/\Gamma_{total} \times \Gamma(\phi(1020) \to e^+e^-)/\Gamma_{total}$] × [B($\omega(782) \to \pi^+\pi^-\pi^0$)] = (1.22 ± 0.13 ± 0.08) × 10^{-8} which we divide by our best value B($\omega(782) \to \pi^+\pi^-\pi^0$) = (89.2 ± 0.7) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.
[32] Calculated by the authors from the cross section at the peak.

$\phi(1020)$ BRANCHING RATIOS

$\Gamma(K^+K^-)/\Gamma_{total}$ Γ_1/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.489±0.005 OUR FIT Error includes scale factor of 1.1.				
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. • • •				
0.493±0.003±0.007		[33] AKHMETSHIN 11	CMD2	1.02 $e^+e^- \to K^+K^-$
0.476±0.017	1000k	[34] ACHASOV 01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.342±0.004 OUR FIT Error includes scale factor of 1.1.					
0.331±0.009 OUR AVERAGE					
0.335±0.010	40644	AKHMETSHIN	95	CMD2	$e^+e^- \to K^0_L K^0_S$
0.326±0.035		DOLINSKY	91	ND	$e^+e^- \to K^0_L K^0_S$
0.310±0.024		DRUZHININ	84	ND	$e^+e^- \to K^0_L K^0_S$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.336±0.002±0.006		[33] AKHMETSHIN	11	CMD2	1.02 $e^+e^- \to K^0_S K^0_L$
0.351±0.013	500k	[34] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$
0.27 ±0.03	133	KALBFLEISCH	76	HBC	2.18 $K^- p \to \Lambda K^0_L K^0_S$
0.257±0.030	95	BALAKIN	71	OSPK	$e^+e^- \to K^0_L K^0_S$
0.40 ±0.04	167	LINDSEY	66	HBC	2.1–2.7 $K^- p \to \Lambda K^0_L K^0_S$

$\Gamma(K^0_L K^0_S)/\Gamma(K^+K^-)$ — Γ_2/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.698±0.014 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		[35] AKHMETSHIN	95	CMD2	$e^+e^- \to K^0_L K^0_S$, K^+K^-

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.411±0.005 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 $K^- p \to \Lambda K\overline{K}$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.1532±0.0032 OUR FIT Error includes scale factor of 1.1.					
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. • • •					
0.155 ±0.002 ±0.005		[33] AKHMETSHIN	11	CMD2	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
0.159 ±0.008	400k	[34] ACHASOV	01E	SND	$e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$
0.145 ±0.009 ±0.003	11169	[36] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\pi^0$
0.139 ±0.007		[37] PARROUR	76B	OSPK	e^+e^-

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.313±0.009 OUR FIT	Error includes scale factor of 1.1.				
0.28 ±0.09	34	AGUILAR-...	72B	HBC	3.9,4.6 $K^- p$

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

VALUE	DOCUMENT ID		TECN	COMMENT
0.184±0.005 OUR FIT	Error includes scale factor of 1.1.			
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 $K^- p \to \Lambda\pi^+\pi^-\pi^0$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.448±0.012 OUR FIT	Error includes scale factor of 1.1.				
0.51 ±0.05 OUR AVERAGE					
0.56 ±0.07	3681	BUKIN	78C	OLYA	$e^+e^- \to K^0_L K^0_S$, $\pi^+\pi^-\pi^0$
0.47 ±0.06	516	COSME	74	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — 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	[38,39] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
<0.0006	90		[40] ACHASOV	02	SND	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
<0.23	90		[40] CORDIER	80	DM1	$e^+e^- \to \pi^+\pi^-\pi^0$
<0.20	90		[40] PARROUR	76B	OSPK	$e^+e^- \to \pi^+\pi^-\pi^0$

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
1.309±0.024 OUR FIT	Error includes scale factor of 1.2.				
1.26 ±0.04 OUR AVERAGE					
1.246±0.025±0.057	10k	[41] ACHASOV	98F	SND	$e^+e^- \to 7\gamma$
1.18 ±0.11	279	[42] AKHMETSHIN	95	CMD2	$e^+e^- \to \pi^+\pi^- 3\gamma$
1.30 ±0.06		[43] DRUZHININ	84	ND	$e^+e^- \to 3\gamma$
1.4 ±0.2		[44] 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	[43] COSME	76	OSPK	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.38 ±0.02 ±0.02		[33] AKHMETSHIN	11	CMD2	1.02 $e^+e^- \to \eta\gamma$
1.37 ±0.05 ±0.01	33k	[45] ACHASOV	07B	SND	0.6–1.38 $e^+e^- \to \eta\gamma$
1.373±0.014±0.085	17.4k	[46,47] AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \eta\gamma$
1.287±0.013±0.063		[48,49] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
1.338±0.012±0.052		[50] ACHASOV	00	SND	$e^+e^- \to \eta\gamma$
1.18 ±0.03 ±0.06	2200	[51] AKHMETSHIN	99F	CMD2	$e^+e^- \to \eta\gamma$
1.21 ±0.07		[52] BENAYOUN	96	RVUE	0.54-1.04 $e^+e^- \to \eta\gamma$

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

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.27 ±0.06 OUR FIT					
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	[53,54] AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \pi^0\gamma$
$1.226\pm0.036^{+0.096}_{-0.089}$		[55] ACHASOV	00	SND	$e^+e^- \to \pi^0\gamma$
1.26 ±0.17		[52] BENAYOUN	96	RVUE	0.54-1.04 $e^+e^- \to \pi^0\gamma$

$\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$ 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	$e^+e^- \to \eta\gamma, \pi^0\gamma$

$\Gamma(e^+e^-)/\Gamma_{total}$ Γ_9/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.954±0.030 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	[56] ACHASOV	01E	SND	$e^+e^- \to K^+K^-, K_S K_L, \pi^+\pi^-\pi^0$
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		[57] 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^-

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

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
2.87±0.19 OUR FIT				
2.5 ±0.4 OUR AVERAGE				
2.69±0.46	[58] HAYES	71	CNTR	8.3,9.8 $\gamma C \to \mu^+\mu^- X$
2.17±0.60	[58] 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±0.20±0.14	[59] ACHASOV	01G	SND	$e^+e^- \to \mu^+\mu^-$
3.30±0.45±0.32	[36] ACHASOV	99C	SND	$e^+e^- \to \mu^+\mu^-$
4.83±1.02	[60] VASSERMAN	81	OLYA	$e^+e^- \to \mu^+\mu^-$
2.87±1.98	[60] AUGUSTIN	73	OSPK	$e^+e^- \to \mu^+\mu^-$

$\Gamma(\eta e^+e^-)/\Gamma_{total}$ 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	[61] ACHASOV	01B	SND	$e^+e^- \to \gamma\gamma e^+e^-$
1.14±0.10±0.06	355	[62] 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. • • •

$1.13\pm0.14\pm0.07$	183	[63] AKHMETSHIN	01	CMD2	$e^+e^- \rightarrow \eta e^+e^-$
$1.21\pm0.14\pm0.09$	130	[64] AKHMETSHIN	01	CMD2	$e^+e^- \rightarrow \eta e^+e^-$
$1.04\pm0.20\pm0.08$	42	[65] AKHMETSHIN	01	CMD2	$e^+e^- \rightarrow \eta e^+e^-$

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.71\pm0.11\pm0.09$		[36] ACHASOV	00C	SND	$e^+e^- \rightarrow \pi^+\pi^-$
$0.65^{+0.38}_{-0.29}$		[36] GOLUBEV	86	ND	$e^+e^- \rightarrow \pi^+\pi^-$
$2.01^{+1.07}_{-0.84}$		[36] 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	$6.7\ \gamma C \rightarrow C\pi^+\pi^-$

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

VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
4.7 ± 0.5 OUR FIT				
$5.2^{+1.3}_{-1.1}$	[66,67] AULCHENKO	00A	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.4 ± 0.6	[68] AMBROSINO	08G	KLOE	$e^+e^- \rightarrow \pi^+\pi^-2\pi^0,\ 2\pi^0\gamma$
~ 5.4	[69] ACHASOV	00E	SND	$e^+e^- \rightarrow \pi^0\pi^0\gamma$
$5.5^{+1.6}_{-1.4}\pm0.3$	[67,70] AULCHENKO	00A	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$
$4.8^{+1.9}_{-1.7}\pm0.8$	[69] ACHASOV	99	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\pi^0$

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

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

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
$<\ 0.12$	90	[71] 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 $K^-p \rightarrow \Lambda\pi^+\pi^-$ neutrals

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$0.41\pm0.12\pm0.04$		30175	[72] AKHMETSHIN	99B	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<\ 0.3$	90		[73] 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 $K^-p \rightarrow \Lambda\pi^+\pi^-$ neutrals

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
3.22±0.19 OUR FIT Error includes scale factor of 1.1.					
3.21±0.19 OUR AVERAGE					
$3.21^{+0.03}_{-0.09}\pm0.18$			[74] AMBROSINO 07	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$
$2.90\pm0.21\pm1.54$			[75] 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. • • •					
4.47 ± 0.21		2438	[76] ALOISIO 02D	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$
$3.5\ \pm0.3\ ^{+1.3}_{-0.5}$		419	[77,78] ACHASOV 00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$
$1.93\pm0.46\pm0.50$		27188	[79] AKHMETSHIN 99B	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
$3.05\pm0.25\pm0.72$		268	[80] AKHMETSHIN 99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
$1.5\ \pm0.5$		268	[81] AKHMETSHIN 99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
$3.42\pm0.30\pm0.36$		164	[77] ACHASOV 98I	SND	$e^+e^- \to 5\gamma$
< 1	90		[82] AKHMETSHIN 97C	CMD2	$e^+e^- \to \pi^+\pi^-\gamma$
< 7	90		[83] 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
2.46±0.15 OUR FIT Error includes scale factor of 1.1.				
$\mathbf{2.6\ \pm0.2\ ^{+0.8}_{-0.3}}$	419	[77] ACHASOV 00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
1.07 ±0.06 OUR AVERAGE					
$1.07\ ^{+0.01}_{-0.03}\ ^{+0.06}_{-0.06}$			[84] AMBROSINO 07	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$
$1.08\ \pm0.17\ \pm0.09$		268	AKHMETSHIN 99C	CMD2	$e^+e^- \to \pi^0\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.09\ \pm0.03\ \pm0.05$		2438	ALOISIO 02D	KLOE	$e^+e^- \to \pi^0\pi^0\gamma$
$1.158\pm0.093\pm0.052$		419	[78,85] 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
0.86 ±0.04 OUR FIT				
0.865±0.070±0.017	419	[85] ACHASOV 00H	SND	$e^+e^- \to \pi^0\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.90\ \pm0.08\ \pm0.07$	164	ACHASOV 98I	SND	$e^+e^- \to 5\gamma$

$\Gamma(\pi^+\pi^-\pi^+\pi^-)/\Gamma_{total}$ — 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. • • •					
$3.93\pm1.74\pm2.14$		3285	AKHMETSHIN 00E	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$
< 870	90		CORDIER 79	WIRE	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-$

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

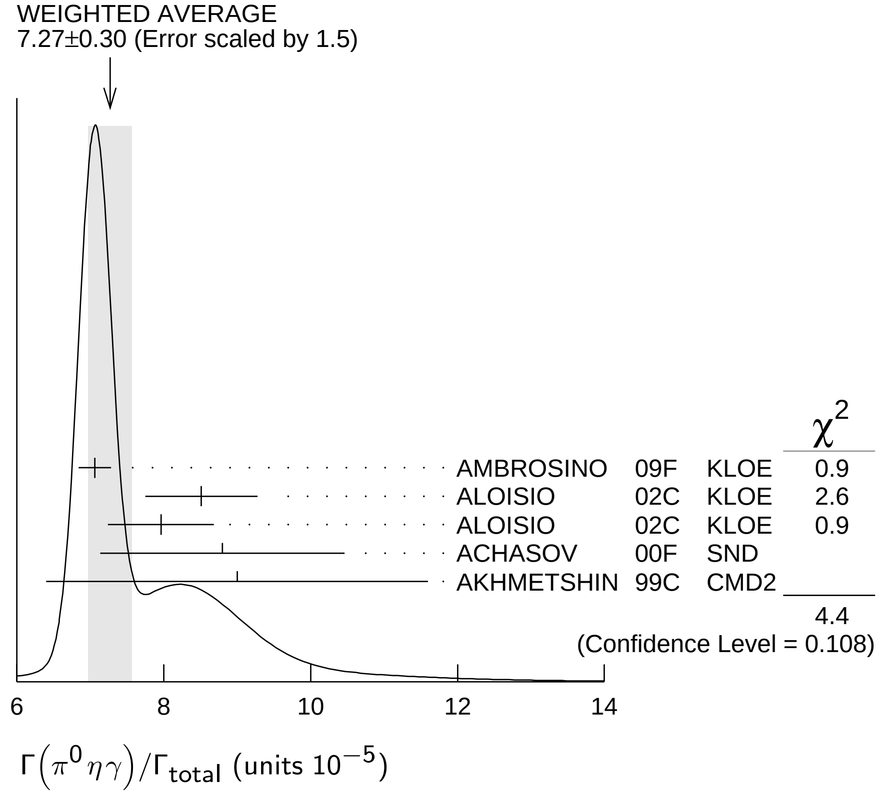
VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
< 4.6	90	AKHMETSHIN	00E	CMD2	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<150	95	BARKOV	88	CMD	$e^+e^- \to \pi^+\pi^-\pi^+\pi^-\pi^0$

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{total}$ — 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	[86] ACHASOV	02D	SND	$e^+e^- \to \pi^0 e^+e^-$
1.22±0.34±0.21		46	[87] 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_{22}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
7.27±0.30 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.						
7.06±0.22		16.9k	[88] AMBROSINO	09F	KLOE	1.02 $e^+e^- \to \eta\pi^0\gamma$
8.51±0.51±0.57		607	[89] ALOISIO	02C	KLOE	$e^+e^- \to \eta\pi^0\gamma$
7.96±0.60±0.40		197	[90] ALOISIO	02C	KLOE	$e^+e^- \to \eta\pi^0\gamma$
8.8 ±1.4 ±0.9		36	[91] 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. • • •						
7.01±0.10±0.20		13.3k	[89,92] AMBROSINO	09F	KLOE	1.02 $e^+e^- \to \eta\pi^0\gamma$
7.12±0.13±0.22		3.6k	[90,93] AMBROSINO	09F	KLOE	1.02 $e^+e^- \to \eta\pi^0\gamma$
8.3 ±2.3 ±1.2		20	ACHASOV	98B	SND	$e^+e^- \to 5\gamma$
<250	90		DOLINSKY	91	ND	$e^+e^- \to \pi^0\eta\gamma$



$\Gamma\left(a_0(980)\gamma\right)/\Gamma_{total}$ — 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			[94] ALOISIO	02C	KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$
8.8±1.7		36	[95] ACHASOV	00F	SND	$e^+e^- \rightarrow \eta\pi^0\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
11 ±2			[96] GOKALP	02	RVUE	$e^+e^- \rightarrow \eta\pi^0\gamma$
<500	90		DOLINSKY	91	ND	$e^+e^- \rightarrow \pi^0\eta\gamma$

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

VALUE	DOCUMENT ID		TECN	COMMENT
6.1±0.6	[97] ALOISIO	02C	KLOE	$e^+e^- \rightarrow \eta\pi^0\gamma$

$\Gamma\left(K^0\overline{K}^0\gamma\right)/\Gamma_{total}$ — Γ_{24}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.9 × 10^{-8}	90	AMBROSINO	09C	KLOE	$e^+e^- \rightarrow K^0_S K^0_S\gamma$

$\Gamma\left(\eta'(958)\gamma\right)/\Gamma_{total}$ — Γ_{25}/Γ

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
6.25±0.21 OUR FIT						
6.25±0.30 OUR AVERAGE						
6.25±0.28±0.11		3407	[98] AMBROSINO	07A	KLOE	1.02 $e^+e^- \rightarrow \pi^+\pi^- 7\gamma$
6.7 $^{+2.8}_{-2.4}$ ±0.8		12	[99] AULCHENKO	03B	SND	$e^+e^- \rightarrow \eta'\gamma$

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

$6.7\ ^{+5.0}_{-4.2}\ \pm1.5$	7		AULCHENKO	03B	SND	$e^+e^- \rightarrow 7\gamma$
$6.10\pm0.61\pm0.43$	120	[100]	ALOISIO	02E	KLOE	$1.02\ e^+e^- \rightarrow \pi^+\pi^- 3\gamma$
$8.2\ ^{+2.1}_{-1.9}\ \pm1.1$	21	[101]	AKHMETSHIN	00B	CMD2	$e^+e^- \rightarrow \pi^+\pi^- 3\gamma$
$4.9\ ^{+2.2}_{-1.8}\ \pm0.6$	9	[102]	AKHMETSHIN	00F	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$
$6.4\ \pm1.6$	30	[103]	AKHMETSHIN	00F	CMD2	$e^+e^- \rightarrow \eta'(958)\gamma$
$6.7\ ^{+3.4}_{-2.9}\ \pm1.0$	5	[104]	AULCHENKO	99	SND	$e^+e^- \rightarrow \pi^+\pi^- 3\gamma$
<11	90 (CL%)		AULCHENKO	98	SND	$e^+e^- \rightarrow 7\gamma$
$12\ ^{+7}_{-5}\ \pm2$	6	[101]	AKHMETSHIN	97B	CMD2	$e^+e^- \rightarrow \pi^+\pi^- 3\gamma$
<41	90 (CL%)		DRUZHININ	87	ND	$e^+e^- \rightarrow \gamma\eta\pi^+\pi^-$

$\Gamma(\eta'(958)\gamma)/\Gamma(K^0_L K^0_S)$ — Γ_{25}/Γ_2

VALUE (units 10^{-4})	EVTS		DOCUMENT ID		TECN	COMMENT
1.83±0.06 OUR FIT						
$\mathbf{1.46^{+0.64}_{-0.54}\pm0.18}$	9	[105]	AKHMETSHIN	00F	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$

$\Gamma(\eta'(958)\gamma)/\Gamma(\eta\gamma)$ — Γ_{25}/Γ_6

VALUE (units 10^{-3})	EVTS		DOCUMENT ID		TECN	COMMENT
4.77±0.15 OUR FIT						
4.78±0.20 OUR AVERAGE						
$4.77\pm0.09\pm0.19$	3407		AMBROSINO	07A	KLOE	$1.02\ e^+e^- \rightarrow \pi^+\pi^- 7\gamma$
$4.70\pm0.47\pm0.31$	120	[106]	ALOISIO	02E	KLOE	$1.02\ e^+e^- \rightarrow \pi^+\pi^- 3\gamma$
$6.5\ ^{+1.7}_{-1.5}\ \pm0.8$	21		AKHMETSHIN	00B	CMD2	$e^+e^- \rightarrow \pi^+\pi^- 3\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$9.5\ ^{+5.2}_{-4.0}\ \pm1.4$	6	[107]	AKHMETSHIN	97B	CMD2	$e^+e^- \rightarrow \pi^+\pi^- 3\gamma$

$\Gamma(\eta\pi^0\pi^0\gamma)/\Gamma_{total}$ — Γ_{26}/Γ

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

$\Gamma(\mu^+\mu^-\gamma)/\Gamma_{total}$ — Γ_{27}/Γ

VALUE (units 10^{-5})	EVTS		DOCUMENT ID		TECN	COMMENT
1.43±0.45±0.14	27188	[79]	AKHMETSHIN	99B	CMD2	$e^+e^- \rightarrow \mu^+\mu^-\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$2.3\ \pm1.0$	824±33	[108]	AKHMETSHIN	97C	CMD2	$e^+e^- \rightarrow \mu^+\mu^-\gamma$

$\Gamma(\rho\gamma\gamma)/\Gamma_{total}$ — Γ_{28}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<1.2	90	AULCHENKO	08	CMD2	$\phi \rightarrow \pi^+\pi^-\gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<5	90	AKHMETSHIN	98	CMD2	$e^+e^- \rightarrow \pi^+\pi^-\gamma\gamma$

$\Gamma(\eta\pi^+\pi^-)/\Gamma_{total}$ Γ_{29}/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. • • •				
< 6.1	90	AULCHENKO 08	CMD2	$\phi \to \eta\pi^+\pi^-$
<30	90	AKHMETSHIN 98	CMD2	$e^+e^- \to \pi^+\pi^-\gamma\gamma$

$\Gamma(\eta\mu^+\mu^-)/\Gamma_{total}$ Γ_{30}/Γ

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

[33] Combined analysis of the CMD-2 data on $\phi \to K^+K^-$, $K^0_S K^0_L$, $\pi^+\pi^-\pi^0$, $\eta\gamma$ assuming that the sum of their branching fractions is 0.99741 ± 0.00007.

[34] Using B($\phi \to e^+e^-$)= $(2.93 \pm 0.14) \times 10^{-4}$.

[35] Theoretical analysis of BRAMON 00 taking into account phase-space difference, electromagnetic radiative corrections, as well as isospin breaking, predicts 0.62. FLOREZ-BAEZ 08 predicts 0.63 considering also structure-dependent radiative corrections. FISCHBACH 02 calculates additional corrections caused by the close threshold and predicts 0.68. See also BENAYOUN 01 and DUBYNSKIY 07.

[36] Using B($\phi \to e^+e^-$)=$(2.99 \pm 0.08) \times 10^{-4}$.

[37] 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.

[38] From a fit without limitations on charged and neutral ρ masses and widths.

[39] Adding the direct and $\omega\pi$ contributions and considering the interference between the $\rho\pi$ and $\pi^+\pi^-\pi^0$.

[40] Neglecting the interference between the $\rho\pi$ and $\pi^+\pi^-\pi^0$.

[41] Using B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$ and B($\eta \to 3\pi^0$)= $(32.2 \pm 0.4) \times 10^{-2}$.

[42] From $\pi^+\pi^-\pi^0$ decay mode of η.

[43] From 2γ decay mode of η.

[44] From $3\pi^0$ decay mode of η.

[45] ACHASOV 07B reports [Γ(ϕ(1020) → $\eta\gamma$)/Γ_{total}] × [B(ϕ(1020) → e^+e^-)] = $(4.050 \pm 0.067 \pm 0.118) \times 10^{-6}$ which we divide by our best value B(ϕ(1020) → e^+e^-) = $(2.954 \pm 0.030) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. Supersedes ACHASOV 00D and ACHASOV 06A.

[46] Using B($\phi \to e^+e^-$) = $(2.98 \pm 0.04) \times 10^{-4}$ and B($\eta \to \gamma\gamma$) = 39.43 ± 0.26%.

[47] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{total}$.

[48] Using B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$ and B($\eta \to 3\pi^0$)=$(32.24 \pm 0.29) \times 10^{-2}$.

[49] The combined fit from 600 to 1380 MeV taking into account ρ(770), ω(782), ϕ(1020), and ρ(1450) (mass and width fixed at 1450 MeV and 310 MeV respectively).

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

[51] From $\pi^+\pi^-\pi^0$ decay mode of η and using B($\phi \to e^+e^-$)= $(2.99 \pm 0.08) \times 10^{-4}$.

[52] Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution.

[53] Using B($\phi \to e^+e^-$) = $(2.98 \pm 0.04) \times 10^{-4}$.

[54] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma^2_{total}$.

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

[56] From the combined fit assuming that the total ϕ(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.

57 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.
58 Neglecting interference between resonance and continuum.
59 Using B($\phi \to e^+ e^-$) = (2.91 ± 0.07) × 10^{-4}.
60 Recalculated by us using B($\phi \to e^+ e^-$)= (2.99 ± 0.08) × 10^{-4}.
61 Using B($\eta \to \gamma\gamma$) = (39.25 ± 0.32)%, B($\phi \to \eta\gamma$) = (1.26 ± 0.06)%, and B($\phi \to e^+ e^-$) = (3.00 ± 0.06) × 10^{-4}.
62 The average of the branching ratios separately obtained from the $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$ decays.
63 From $\eta \to \gamma\gamma$ decays and using B($\eta \to \gamma\gamma$) = (39.33 ± 0.25) × 10^{-2}, B($\eta \to \pi^+\pi^-\gamma$) = (4.75 ± 11) × 10^{-2}, and B($\phi \to \eta\gamma$) = (1.297 ± 0.033) × 10^{-2}.
64 From $\eta \to 3\pi^0$ decays and using B($\pi^0 \to \gamma\gamma$) = (98.798 ± 0.033) × 10^{-2}, B($\eta \to 3\pi^0$) = (32.24 ± 0.29) × 10^{-2}, B($\eta \to \pi^+\pi^-\gamma$) = (4.75 ± 0.11) × 10^{-2}, and B($\phi \to \eta\gamma$) = (1.297 ± 0.033) × 10^{-2}.
65 From $\eta \to \pi^+\pi^-\pi^0$ decays and using B($\pi^0 \to \gamma\gamma$) = (98.798 ± 0.033) × 10^{-2}, B($\pi^0 \to e^+ e^- \gamma$) = (1.198 ± 0.032) × 10^{-2}, B($\eta \to \pi^+\pi^-\pi^0$) = (23.0 ± 0.4) × 10^{-2}, B($\phi \to \pi^+\pi^-\pi^0$) = (15.5 ± 0.6) × 10^{-2}, and B($\phi \to \eta\gamma$) = (1.297 ± 0.033) × 10^{-2}.
66 Using the 1996 and 1998 data.
67 (2.3 ± 0.3)% correction for other decay modes of the ω(782) applied.
68 Not independent of the corresponding $\Gamma(\omega\pi^0) \times \Gamma(e^+ e^-) / \Gamma^2$(total).
69 Using the 1996 data.
70 Using the 1998 data.
71 Supersedes AKHMETSHIN 97C.
72 For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \to f_0(980)\gamma$) is negligible. Supersedes AKHMETSHIN 97C.
73 For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \to f_0(980)\gamma$) is negligible.
74 Obtained by the authors taking into account the $\pi^+\pi^-$ decay mode. Includes a component due to $\pi\pi$ production via the $f_0(500)$ meson. Supersedes ALOISIO 02D.
75 From the combined fit of the photon spectra in the reactions $e^+ e^- \to \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$.
76 From the negative interference with the $f_0(500)$ meson of AITALA 01B using the ACHASOV 89 parameterization for the $f_0(980)$, a Breit-Wigner for the $f_0(500)$, and ACHASOV 01F for the $\rho\pi$ contribution. Superseded by AMBROSINO 07.
77 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($f_0 \to \pi^0\pi^0$).
78 Using the value B($\phi \to \eta\gamma$)=(1.338 ± 0.053) × 10^{-2}.
79 For $E_\gamma > 20$ MeV. Supersedes AKHMETSHIN 97C.
80 Neglecting other intermediate mechanisms ($\rho\pi$, $\sigma\gamma$).
81 A narrow pole fit taking into account $f_0(980)$ and $f_0(1200)$ intermediate mechanisms.
82 For destructive interference with the Bremsstrahlung process
83 For constructive interference with the Bremsstrahlung process
84 Supersedes ALOISIO 02D.
85 Supersedes ACHASOV 98I. Excluding $\omega\pi^0$.
86 Using various branching ratios from the 2000 Edition of this Review (PDG 00).
87 Using B($\pi^0 \to \gamma\gamma$) = 0.98798 ± 0.00032, B($\phi \to \eta\gamma$) = (1.297 ± 0.033) × 10^{-2}, and B($\eta \to \pi^+\pi^-\gamma$) = (4.75 ± 0.11) × 10^{-2}.
88 Combined results of $\eta \to \gamma\gamma$ and $\eta \to \pi^+\pi^-\pi^0$ decay modes measurements.
89 From the decay mode $\eta \to \gamma\gamma$.
90 From the decay mode $\eta \to \pi^+\pi^-\pi^0$.
91 Supersedes ACHASOV 98B.

[92] Using B($\phi \to \eta\gamma$) = (1.304 ± 0.025)%, B($\eta \to 3\pi^0$) = (32.56 ± 0.23)%, and B($\eta \to \gamma\gamma$) = (39.31 ± 0.20)%.
[93] Using B($\phi \to \eta\gamma$) = (1.304 ± 0.025)%, B($\eta \to 3\pi^0$) = (32.56 ± 0.23)%, and B($\eta \to \pi^+\pi^-\pi^0$) = (22.73 ± 0.28)%.
[94] Using $M_{a_0(980)}$=984.8 MeV and assuming $a_0(980)\gamma$ dominance.
[95] Assuming $a_0(980)\gamma$ dominance in the $\eta\pi^0\gamma$ final state.
[96] Using data of ACHASOV 00F.
[97] Using results of ALOISIO 02D and assuming that $f_0(980)$ decays into $\pi\pi$ only and $a_0(980)$ into $\eta\pi$ only.
[98] AMBROSINO 07A reports [Γ($\phi(1020) \to \eta'(958)\gamma$)/$\Gamma_{total}$] / [B($\phi(1020) \to \eta\gamma$)] = (4.77 ± 0.09 ± 0.19) × 10^{-3} which we multiply by our best value B($\phi(1020) \to \eta\gamma$) = (1.309 ± 0.024) × 10^{-2}. Our first error is their experiment's error and our second error is the systematic error from using our best value.
[99] Averaging AULCHENKO 03B with AULCHENKO 99.
[100] Using B($\phi \to \eta\gamma$)= (1.297 ± 0.033)%.
[101] Using the value B($\phi \to \eta\gamma$) = (1.26 ± 0.06) × 10^{-2}.
[102] Using B($\phi \to K^0_L K^0_S$) = (33.8 ± 0.6)%.
[103] Averaging AKHMETSHIN 00B with AKHMETSHIN 00F.
[104] Using the value B($\eta' \to \eta\pi^+\pi^-$)= (43.7 ± 1.5) × 10^{-2} and B($\eta \to \gamma\gamma$)= (39.25 ± 0.31) × 10^{-2}.
[105] 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.
[106] From the decay mode $\eta' \to \eta\pi^+\pi^-$, $\eta \to \gamma\gamma$.
[107] Superseded by AKHMETSHIN 00B.
[108] For $E_\gamma > 20$ MeV.

Lepton Faminly number (LF) violating modes

$\Gamma(e^\pm\mu^\mp)/\Gamma_{total}$ **Γ_{31}/Γ**

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2 × 10^{-6}	90	ACHASOV	10A	SND	$e^+e^- \to e^\pm\mu^\mp$

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

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
9.1±1.2 OUR AVERAGE						
10.1±4.4±1.7		80k	[109] AKHMETSHIN	06	CMD2	1.017–1.021 $e^+e^- \to \pi^+\pi^-\pi^0$
9.0±1.1±0.6		1.98M	[110,111] ALOISIO	03	KLOE	1.02 $e^+e^- \to \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$-6 < a_1 < 6$		500k	[111] ACHASOV	02	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
$-16 < a_1 < 11$	90	9.8k	[109,112] AKHMETSHIN	98	CMD2	$e^+e^- \to \pi^+\pi^-\gamma\gamma$

[109] Dalitz plot analysis taking into account interference between the contact and $\rho\pi$ amplitudes.
[110] From a fit without limitations on charged and neutral ρ masses and widths.
[111] Recalculated by us to match the notations of AKHMETSHIN 98.
[112] Assuming zero phase for the contact term.

ϕ(1020) REFERENCES

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BENAYOUN	10	EPJ C65 211	M. Benayoun *et al.*	
AMBROSINO	09C	PL B679 10	F. Ambrosino *et al.*	(KLOE Collab.)
AMBROSINO	09F	PL B681 5	F. Ambrosino *et al.*	(KLOE Collab.)
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AULCHENKO	08	JETPL 88 85	V. Aulchenko *et al.*	(CMD-2 Collab.)
		Translated from ZETFP 88 93.		
FLOREZ-BAEZ	08	PR D78 077301	F.V. Florez-Baez, G. Lopez Castro	
ACHASOV	07B	PR D76 077101	M.N. Achasov *et al.*	(SND Collab.)
AMBROSINO	07	EPJ C49 473	F. Ambrosino *et al.*	(KLOE Collab.)
AMBROSINO	07A	PL B648 267	F. Ambrosino *et al.*	(KLOE Collab.)
DUBYNSKIY	07	PR D75 113001	S. Dubynskiy *et al.*	
ACHASOV	06A	PR D74 014016	M.N. Achasov *et al.*	(SND Collab.)
AKHMETSHIN	06	PL B642 203	R.R. Akhmetshin *et al.*	(CMD-2 Collab.)
AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AMBROSINO	05	PL B608 199	F. Ambrosino *et al.*	(KLOE Collab.)
AUBERT,B	05J	PR D72 052008	B. Aubert *et al.*	(BABAR Collab.)
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.)
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FISCHBACH	02	PL B526 355	E. Fischbach, A.W. Overhauser, B. Woodahl	
GOKALP	02	JPG 28 2783	A. Gokalp *et al.*	
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ACHASOV	01F	PR D63 094007	N.N. Achasov, V.V. Gubin	(Novosibirsk SND Collab.)
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.)
AKHMETSHIN	01	PL B501 191	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	01C	PL B503 237	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
BENAYOUN	01	EPJ C22 503	M. Benayoun, H.B. O'Connell	
ACHASOV	00	EPJ C12 25	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	00B	JETP 90 17	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
		Translated from ZETF 117 22.		
ACHASOV	00C	PL B474 188	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	00D	JETPL 72 282	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
		Translated from ZETFP 72 411.		
ACHASOV	00E	NP B569 158	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	00F	PL B479 53	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	00H	PL B485 349	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
AKHMETSHIN	00B	PL B473 337	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	00E	PL B491 81	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	00F	PL B494 26	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AULCHENKO	00A	JETP 90 927	V.M. Aulchenko *et al.*	(Novosibirsk SND Collab.)
		Translated from ZETF 117 1067.		
BRAMON	00	PL B486 406	A. Bramon *et al.*	
PDG	00	EPJ C15 1	D.E. Groom *et al.*	
ACHASOV	99	PL B449 122	M.N. Achasov *et al.*	
ACHASOV	99C	PL B456 304	M.N. Achasov *et al.*	
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99D	PL B466 385	R.R. Akhmetshin *et al.*	
Also		PL B508 217 (erratum)	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	99F	PL B460 242	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AULCHENKO	99	JETPL 69 97	V.M. Aulchenko *et al.*	
		Translated from ZETFP 69 87.		

ACHASOV	98B	PL B438 441	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	98F	JETPL 68 573	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	98I	PL B440 442	M.N. Achasov *et al.*	
AKHMETSHIN	98	PL B434 426	R.R. Akhmetshin *et al.*	(CMD-2 Collab.)
AULCHENKO	98	PL B436 199	V.M. Aulchenko *et al.*	(Novosibirsk SND Collab.)
BARBERIS	98	PL B432 436	D. Barberis *et al.*	(Omega Expt.)
AKHMETSHIN	97B	PL B415 445	R.R. Akhmetshin *et al.*	(NOVO, BOST, PITT+)
AKHMETSHIN	97C	PL B415 452	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
BENAYOUN	96	ZPHY C72 221	M. Benayoun *et al.*	(IPNP, NOVO)
AKHMETSHIN	95	PL B364 199	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky *et al.*	(NOVO)
ACHASOV	89	NP B315 465	N.N. Achasov, V.N. Ivanchenko	
DOLINSKY	89	ZPHY C42 511	S.I. Dolinsky *et al.*	(NOVO)
BARKOV	88	SJNP 47 248	L.M. Barkov *et al.*	(NOVO)
		Translated from YAF 47 393.		
DOLINSKY	88	SJNP 48 277	S.I. Dolinsky *et al.*	(NOVO)
		Translated from YAF 48 442.		
DRUZHININ	87	ZPHY C37 1	V.P. Druzhinin *et al.*	(NOVO)
ARMSTRONG	86	PL 166B 245	T.A. Armstrong *et al.*	(ATHU, BARI, BIRM+)
ATKINSON	86	ZPHY C30 521	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
BEBEK	86	PRL 56 1893	C. Bebek *et al.*	(CLEO Collab.)
DAVENPORT	86	PR D33 2519	T.F. Davenport	(TUFTS, ARIZ, FNAL, FSU, NDAM+)
DIJKSTRA	86	ZPHY C31 375	H. Dijkstra *et al.*	(ANIK, BRIS, CERN+)
FRAME	86	NP B276 667	D. Frame *et al.*	(GLAS)
GOLUBEV	86	SJNP 44 409	V.B. Golubev *et al.*	(NOVO)
		Translated from YAF 44 633.		
ALBRECHT	85D	PL 153B 343	H. Albrecht *et al.*	(ARGUS Collab.)
GOLUBEV	85	SJNP 41 756	V.B. Golubev *et al.*	(NOVO)
		Translated from YAF 41 1183.		
DRUZHININ	84	PL 144B 136	V.P. Druzhinin *et al.*	(NOVO)
ARMSTRONG	83B	NP B224 193	T.A. Armstrong *et al.*	(BARI, BIRM, CERN+)
BARATE	83	PL 121B 449	R. Barate *et al.*	(SACL, LOIC, SHMP, IND)
KURDADZE	83C	JETPL 38 366	L.M. Kurdadze *et al.*	(NOVO)
		Translated from ZETFP 38 306.		
ARENTON	82	PR D25 2241	M.W. Arenton *et al.*	(ANL, ILL)
PELLINEN	82	PS 25 599	A. Pellinen, M. Roos	(HELS)
DAUM	81	PL 100B 439	C. Daum *et al.*	(AMST, BRIS, CERN, CRAC+)
IVANOV	81	PL 107B 297	P.M. Ivanov *et al.*	(NOVO)
Also		Private Comm.	S.I. Eidelman	(NOVO)
VASSERMAN	81	PL 99B 62	I.B. Vasserman *et al.*	(NOVO)
Also		SJNP 35 240	L.M. Kurdadze *et al.*	
		Translated from YAF 35 352.		
CORDIER	80	NP B172 13	A. Cordier *et al.*	(LALO)
CORDIER	79	PL 81B 389	A. Cordier *et al.*	(LALO)
BUKIN	78B	SJNP 27 521	A.D. Bukin *et al.*	(NOVO)
		Translated from YAF 27 985.		
BUKIN	78C	SJNP 27 516	A.D. Bukin *et al.*	(NOVO)
		Translated from YAF 27 976.		
COOPER	78B	NP B146 1	A.M. Cooper *et al.*	(TATA, CERN, CDEF+)
LOSTY	78	NP B133 38	M.J. Losty *et al.*	(CERN, AMST, NIJM+)
AKERLOF	77	PRL 39 861	C.W. Akerlof *et al.*	(FNAL, MICH, PURD)
ANDREWS	77	PRL 38 198	D.E. Andrews *et al.*	(ROCH)
BALDI	77	PL 68B 381	R. Baldi *et al.*	(GEVA)
CERRADA	77B	NP B126 241	M. Cerrada *et al.*	(AMST, CERN, NIJM+)
COHEN	77	PRL 38 269	D. Cohen *et al.*	(ANL)
LAVEN	77	NP B127 43	H. Laven *et al.*	(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 *et al.*	(ORSAY)
KALBFLEISCH	76	PR D13 22	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)
PARROUR	76	PL 63B 357	G. Parrour *et al.*	(ORSAY)
PARROUR	76B	PL 63B 362	G. Parrour *et al.*	(ORSAY)
KALBFLEISCH	75	PR D11 987	G.R. Kalbfleisch, R.C. Strand, J.W. Chapman	(BNL+)
AYRES	74	PRL 32 1463	D.S. Ayres *et al.*	(ANL)
BESCH	74	NP B70 257	H.J. Besch *et al.*	(BONN)
COSME	74	PL 48B 155	G. Cosme *et al.*	(ORSAY)
COSME	74B	PL 48B 159	G. Cosme *et al.*	(ORSAY)
DEGROOT	74	NP B74 77	A.J. de Groot *et al.*	(AMST, NIJM)
AUGUSTIN	73	PRL 30 462	J.E. Augustin *et al.*	(ORSAY)
BALLAM	73	PR D7 3150	J. Ballam *et al.*	(SLAC, LBL)
BINNIE	73B	PR D8 2789	D.M. Binnie *et al.*	(LOIC, SHMP)
AGUILAR-...	72B	PR D6 29	M. Aguilar-Benitez *et al.*	(BNL)
ALVENSLEB...	72	PRL 28 66	H. Alvensleben *et al.*	(MIT, DESY)
BORENSTEIN	72	PR D5 1559	S.R. Borenstein *et al.*	(BNL, MICH)

COLLEY	72	NP B50 1	D.C. Colley *et al.*	(BIRM, GLAS)
BALAKIN	71	PL 34B 328	V.E. Balakin *et al.*	(NOVO)
CHATELUS	71	Thesis LAL 1247	Y. Chatelus	(STRB)
Also		PL 32B 416	J.C. Bizot *et al.*	(ORSAY)
HAYES	71	PR D4 899	S. Hayes *et al.*	(CORN)
STOTTLE...	71	Thesis ORO 2504 170	A.R. Stottlemyer	(UMD)
BIZOT	70	PL 32B 416	J.C. Bizot *et al.*	(ORSAY)
Also		Liverpool Sym. 69	J.P. Perez-y-Jorba	
EARLES	70	PRL 25 1312	D.R. Earles *et al.*	(NEAS)
LINDSEY	66	PR 147 913	J.S. Lindsey, G. Smith	(LRL)
LONDON	66	PR 143 1034	G.W. London *et al.*	(BNL, SYRA) IGJPC
BADIER	65B	PL 17 337	J. Badier *et al.*	(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 *et al.*	(UCLA) IGJP