NODE=M004

# $\phi(1020)$

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

## $\phi(1020)$ MASS

NODE=M004205

NODE=M004M

| 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 $pA \rightarrow 4KX$ | |
| 1019.7 ±0.1 ±0.1 | 5079 | ALBRECHT | 85D | ARG | 10 $e^+e^- \rightarrow K^+K^-X$ | |
| 1019.3 ±0.1 | 1500 | ARENTON | 82 | AEMS | 11.8 polar. $pp \rightarrow KK$ | |
| 1019.67 ±0.17 | 25080 | [5] PELLINEN | 82 | RVUE | | |
| 1019.52 ±0.13 | 3681 | BUKIN | 78C | OLYA | $e^+e^- \rightarrow$ hadrons | |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 1019.441±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 $\gamma p$ | |
| 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 $K^-p \rightarrow K^-K^+\Lambda$ | OCCUR=2 |
| 1019.7 ±0.3 | | [7] BARATE | 83 | GOLI | 190 $\pi^-$ Be $\rightarrow 2\mu X$ | |
| 1019.8 ±0.2 ±0.5 | 766 | IVANOV | 81 | OLYA | 1–1.4 $e^+e^- \rightarrow K^+K^-$ | |
| 1019.4 ±0.5 | 337 | COOPER | 78B | HBC | 0.7–0.8 $\overline{p}p \rightarrow K^0_S K^0_L \pi^+\pi^-$ | |
| 1020 ±1 | 383 | [7] BALDI | 77 | CNTR | 10 $\pi^-p \rightarrow \pi^-\phi p$ | OCCUR=2 |
| 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 $\gamma p \rightarrow pK^+K^-$ | |
| 1020.3 ±0.4 | 100 | BALLAM | 73 | HBC | 2.8–9.3 $\gamma p$ | |
| 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 $K^-p \rightarrow K^-pK^+K^-$ | OCCUR=2 |
| 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 NODE=M004M;LINKAGE=GS

[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. NODE=M004M;LINKAGE=AE

[3] Using a total width of 4.43 ± 0.05 MeV. Systematic uncertainty included. NODE=M004M;LINKAGE=G2

[4] Using a total width of 4.43 ± 0.05 MeV. NODE=M004M;LINKAGE=F2

[5] PELLINEN 82 review includes AKERLOF 77, DAUM 81, BALDI 77, AYRES 74, DEGROOT 74. NODE=M004M;LINKAGE=R
[6] Strongly correlated with AKHMETSHIN 04. NODE=M004M;LINKAGE=AH
[7] Systematic errors not evaluated. NODE=M004M;LINKAGE=A
[8] Weighted and scaled average of 12 measurements of DIJKSTRA 86. NODE=M004M;LINKAGE=B
[9] Mass errors enlarged by us to $\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass. NODE=M004M;LINKAGE=D

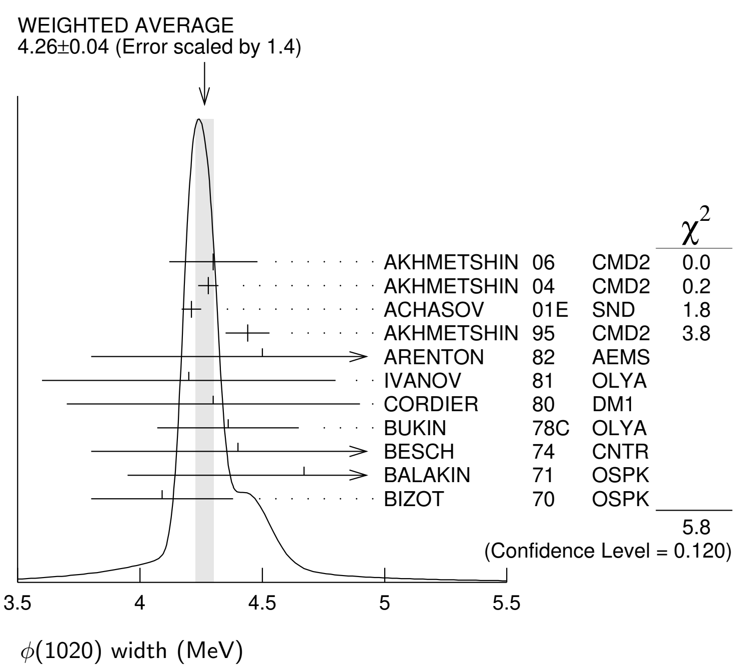
## $\phi$(1020) WIDTH

NODE=M004210

NODE=M004W

| *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 $e^+e^- \to \pi^+\pi^-\pi^0$ |
| 4.280±0.033±0.025 | 272k | [10] AKHMETSHIN | 04 | CMD2 | $e^+e^- \to K^0_L K^0_S$ |
| 4.21 ±0.04 | 1900k | [11] ACHASOV | 01E | SND | $e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |
| 4.44 ±0.09 | 55600 | AKHMETSHIN | 95 | CMD2 | $e^+e^- \to$ hadrons |
| 4.5 ±0.7 | 1500 | ARENTON | 82 | AEMS | 11.8 polar. $pp \to KK$ |
| 4.2 ±0.6 | 766 | [12] IVANOV | 81 | OLYA | 1–1.4 $e^+e^- \to K^+K^-$ |
| 4.3 ±0.6 | | [12] CORDIER | 80 | DM1 | $e^+e^- \to \pi^+\pi^-\pi^0$ |
| 4.36 ±0.29 | 3681 | [12] BUKIN | 78C | OLYA | $e^+e^- \to$ hadrons |
| 4.4 ±0.6 | 984 | [12] BESCH | 74 | CNTR | 2 $\gamma p \to pK^+K^-$ |
| 4.67 ±0.72 | 681 | [12] 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. • • • | | | | | |
| 4.24 ±0.02 ±0.03 | 542k | [13] AKHMETSHIN | 08 | CMD2 | 1.02 $e^+e^- \to K^+K^-$ |
| 4.28 ±0.13 | 12540 | [14] AUBERT,B | 05J | BABR | $D^0 \to \overline{K}^0 K^+K^-$ |
| 4.45 ±0.06 | 271k | DIJKSTRA | 86 | SPEC | 100 $\pi^-$ Be |
| 3.6 ±0.8 | 337 | [12] COOPER | 78B | HBC | 0.7–0.8 $\overline{p}p \to K^0_S K^0_L \pi^+\pi^-$ |
| 4.5 ±0.50 | 1300 | [12,14] AKERLOF | 77 | SPEC | 400 $p$A $\to K^+K^-$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 NODE=M004W;LINKAGE=GS
[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. NODE=M004W;LINKAGE=AE
[12] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass. NODE=M004W;LINKAGE=D
[13] Strongly correlated with AKHMETSHIN 04. NODE=M004W;LINKAGE=AH
[14] Systematic errors not evaluated. NODE=M004W;LINKAGE=A



## $\phi$(1020) DECAY MODES

NODE=M004215;NODE=M004

| | Mode | Fraction ($\Gamma_i/\Gamma$) | Scale factor/ Confidence level | |
|---|---|---|---|---|
| $\Gamma_1$ | $K^+K^-$ | $(48.9 \pm 0.5)$ % | S=1.1 | DESIG=1 |
| $\Gamma_2$ | $K^0_L K^0_S$ | $(34.2 \pm 0.4)$ % | S=1.1 | DESIG=2 |
| $\Gamma_3$ | $\rho\pi + \pi^+\pi^-\pi^0$ | $(15.32 \pm 0.32)$ % | S=1.1 | DESIG=24 |
| $\Gamma_4$ | $\rho\pi$ | | | DESIG=16 |
| $\Gamma_5$ | $\pi^+\pi^-\pi^0$ | | | DESIG=3 |
| $\Gamma_6$ | $\eta\gamma$ | $(1.309 \pm 0.024)$ % | S=1.2 | DESIG=4 |
| $\Gamma_7$ | $\pi^0\gamma$ | $(1.27 \pm 0.06) \times 10^{-3}$ | | DESIG=7 |
| $\Gamma_8$ | $\ell^+\ell^-$ | | | DESIG=256 |
| $\Gamma_9$ | $e^+e^-$ | $(2.955 \pm 0.030) \times 10^{-4}$ | S=1.1 | DESIG=5 |
| $\Gamma_{10}$ | $\mu^+\mu^-$ | $(2.87 \pm 0.19) \times 10^{-4}$ | | DESIG=6 |
| $\Gamma_{11}$ | $\eta e^+e^-$ | $(1.15 \pm 0.10) \times 10^{-4}$ | | DESIG=17 |
| $\Gamma_{12}$ | $\pi^+\pi^-$ | $(7.4 \pm 1.3) \times 10^{-5}$ | | DESIG=8 |
| $\Gamma_{13}$ | $\omega\pi^0$ | $(5.2 {}^{+1.3}_{-1.1}) \times 10^{-5}$ | | DESIG=25 |
| $\Gamma_{14}$ | $\omega\gamma$ | $< 5$ % | CL=84% | DESIG=10 |
| $\Gamma_{15}$ | $\rho\gamma$ | $< 1.2 \times 10^{-5}$ | CL=90% | DESIG=12 |
| $\Gamma_{16}$ | $\pi^+\pi^-\gamma$ | $(4.1 \pm 1.3) \times 10^{-5}$ | | DESIG=9 |
| $\Gamma_{17}$ | $f_0(980)\gamma$ | $(3.22 \pm 0.19) \times 10^{-4}$ | S=1.1 | DESIG=20 |
| $\Gamma_{18}$ | $\pi^0\pi^0\gamma$ | $(1.07 \pm 0.06) \times 10^{-4}$ | | DESIG=19 |
| $\Gamma_{19}$ | $\pi^+\pi^-\pi^+\pi^-$ | $(4.0 {}^{+2.8}_{-2.2}) \times 10^{-6}$ | | DESIG=15 |
| $\Gamma_{20}$ | $\pi^+\pi^+\pi^-\pi^-\pi^0$ | $< 4.6 \times 10^{-6}$ | CL=90% | DESIG=14 |
| $\Gamma_{21}$ | $\pi^0 e^+e^-$ | $(1.12 \pm 0.28) \times 10^{-5}$ | | DESIG=21 |
| $\Gamma_{22}$ | $\pi^0\eta\gamma$ | $(8.3 \pm 0.5) \times 10^{-5}$ | | DESIG=22 |
| $\Gamma_{23}$ | $a_0(980)\gamma$ | $(7.6 \pm 0.6) \times 10^{-5}$ | | DESIG=23 |
| $\Gamma_{24}$ | $\eta'(958)\gamma$ | $(6.24 \pm 0.21) \times 10^{-5}$ | | DESIG=194 |
| $\Gamma_{25}$ | $\eta\pi^0\pi^0\gamma$ | $< 2 \times 10^{-5}$ | CL=90% | DESIG=195 |
| $\Gamma_{26}$ | $\mu^+\mu^-\gamma$ | $(1.4 \pm 0.5) \times 10^{-5}$ | | DESIG=196 |
| $\Gamma_{27}$ | $\rho\gamma\gamma$ | $< 1.2 \times 10^{-4}$ | CL=90% | DESIG=250 |
| $\Gamma_{28}$ | $\eta\pi^+\pi^-$ | $< 1.8 \times 10^{-5}$ | CL=90% | DESIG=255 |
| $\Gamma_{29}$ | $\eta\mu^+\mu^-$ | $< 9.4 \times 10^{-6}$ | CL=90% | DESIG=26 |

## CONSTRAINED FIT INFORMATION

An overall fit to 26 branching ratios uses 75 measurements and one constraint to determine 12 parameters. The overall fit has a $\chi^2 = 57.2$ for 64 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.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $x_2$ | −72 | | | | | | | | | |
| $x_3$ | −53 | −21 | | | | | | | | |
| $x_6$ | −12 | 6 | 2 | | | | | | | |
| $x_7$ | −5 | 3 | 1 | 5 | | | | | | |
| $x_9$ | 30 | −25 | −10 | −31 | −15 | | | | | |
| $x_{10}$ | −4 | 3 | 1 | 3 | 2 | −11 | | | | |
| $x_{12}$ | −2 | 1 | 0 | 2 | 1 | −5 | 1 | | | |
| $x_{17}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| $x_{19}$ | 0 | 0 | 0 | 0 | 0 | −1 | 0 | 0 | 0 | |
| $x_{23}$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| $x_{24}$ | −4 | 2 | 1 | 32 | 2 | −10 | 1 | 1 | 0 | 0 |
| | $x_1$ | $x_2$ | $x_3$ | $x_6$ | $x_7$ | $x_9$ | $x_{10}$ | $x_{12}$ | $x_{17}$ | $x_{19}$ |

| | |
|---|---|
| $x_{24}$ | 0 |
| | $x_{23}$ |

## $\phi(1020)$ PARTIAL WIDTHS

NODE=M004218

### $\Gamma(\eta\gamma)$ $\Gamma_6$

NODE=M004W6

| VALUE (keV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $58.9\pm0.5\pm2.4$ | ACHASOV | 00 | SND | $e^+e^- \to \eta\gamma$ |

### $\Gamma(\pi^0\gamma)$ $\Gamma_7$

NODE=M004W7

| 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 | $e^+e^- \to \pi^0\gamma$ |

### $\Gamma(\ell^+\ell^-)$ $\Gamma_8$

NODE=M004W5

| VALUE (keV) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $1.320\pm0.017\pm0.015$ | [15] AMBROSINO | 05 | KLOE | $1.02\ e^+e^- \to \mu^+\mu^-$ |

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

NODE=M004W8

→ NOT CHECKED ←

| VALUE (keV) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **1.27±0.04 OUR EVALUATION** | | | | | |
| **1.32±0.05±0.03** | | [16] AMBROSINO | 05 | KLOE | $1.02\ e^+e^- \to e^+e^-$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| $1.27\pm0.03$ | 272k | [17] AKHMETSHIN | 04 | CMD2 | $e^+e^- \to K^0_L K^0_S$ |

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

NODE=M004W9

| 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 $\Gamma_{ee}$ and $\sqrt{\Gamma_{ee}\Gamma_{\mu\mu}}$ from AMBROSINO 05 assuming lepton universality.

NODE=M004W5;LINKAGE=AM

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

NODE=M004W8;LINKAGE=AM

[17] Using B($\phi \to K^0_L K^0_S$) = 0.337 ± 0.005 and $\Gamma_{total}$ = 4.26 ± 0.05 MeV. Update of AKHMETSHIN 99D.

NODE=M004W8;LINKAGE=KG

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

NODE=M004224

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

NODE=M004G10

| 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** | | | | | |
| $14.27\pm0.05\pm0.31$ | 542k | AKHMETSHIN | 08 | CMD2 | $1.02\ e^+e^- \to K^+K^-$ |
| $13.93\pm0.14\pm0.99$ | 1000k | [18] ACHASOV | 01E | SND | $e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |

### $\Gamma(K^0_L K^0_S)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_2\Gamma_9/\Gamma^2$

NODE=M004G6

| VALUE (units $10^{-5}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **10.10±0.13 OUR FIT** | | | | | |
| **10.06±0.16 OUR AVERAGE** | | | | | |
| $10.01\pm0.04\pm0.17$ | 272k | [19] AKHMETSHIN | 04 | CMD2 | $e^+e^- \to K^0_L K^0_S$ |
| $10.27\pm0.07\pm0.34$ | 500k | [18] ACHASOV | 01E | SND | $e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |

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

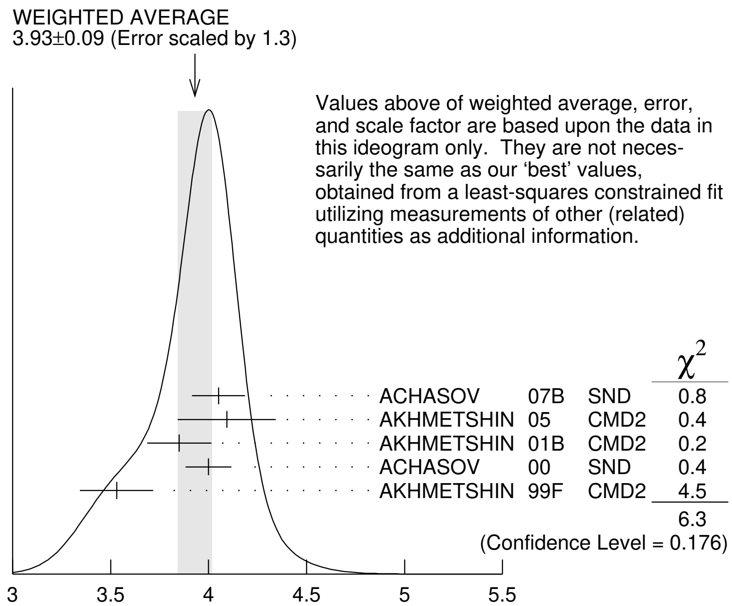
NODE=M004G7

| 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** | | | | | |
| $4.51\pm0.16\pm0.11$ | 105k | AKHMETSHIN | 06 | CMD2 | 0.98–1.06 $e^+e^- \to \pi^+\pi^-\pi^0$ |
| $4.30\pm0.08\pm0.21$ | | AUBERT,B | 04N | BABR | 10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$ |
| $4.665\pm0.042\pm0.261$ | 400k | [18] ACHASOV | 01E | SND | $e^+e^- \to K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |
| $4.35\pm0.27\pm0.08$ | 11169 | [20] AKHMETSHIN | 98 | CMD2 | $e^+e^- \to \pi^+\pi^-\pi^0$ |

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

NODE=M004G2
NODE=M004G2

| *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. | | | | |
| $4.050 \pm 0.067 \pm 0.118$ | 33k | [21] ACHASOV 07B | SND | 0.6–1.38 $e^+e^- \rightarrow \eta\gamma$ |
| $4.093^{+0.040}_{-0.043} \pm 0.247$ | 17.4k | [22] AKHMETSHIN 05 | CMD2 | 0.60-1.38 $e^+e^- \rightarrow \eta\gamma$ |
| $3.850 \pm 0.041 \pm 0.159$ | 23k | [23,24] AKHMETSHIN 01B | CMD2 | $e^+e^- \rightarrow \eta\gamma$ |
| $4.00 \pm 0.04 \pm 0.11$ | | [25] ACHASOV 00 | SND | $e^+e^- \rightarrow \eta\gamma$ |
| $3.53 \pm 0.08 \pm 0.17$ | 2200 | [26,27] AKHMETSHIN 99F | CMD2 | $e^+e^- \rightarrow \eta\gamma$ |




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

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

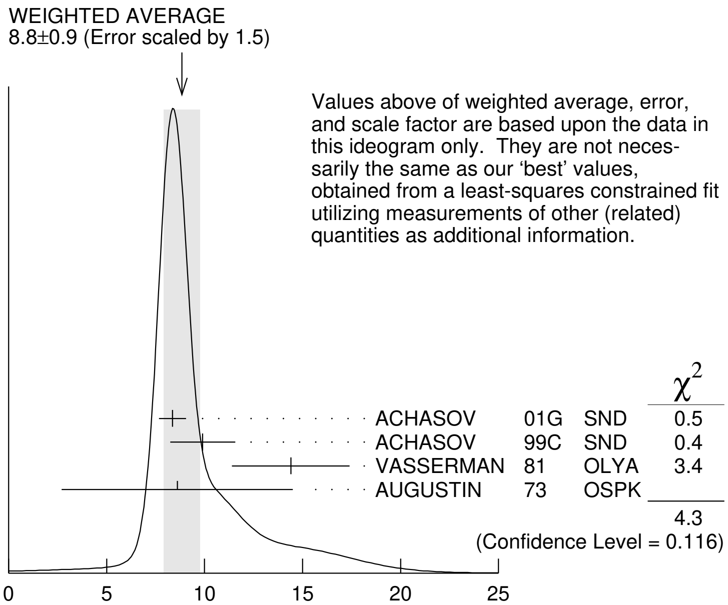
NODE=M004G3
NODE=M004G3

| *VALUE* (units $10^{-7}$) | *EVTS* | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|---|
| **3.74±0.18 OUR FIT** | | | | |
| **3.71±0.21 OUR AVERAGE** | | | | |
| $3.75 \pm 0.11 \pm 0.29$ | 18680 | AKHMETSHIN 05 | CMD2 | 0.60-1.38 $e^+e^- \rightarrow \pi^0\gamma$ |
| $3.67 \pm 0.10^{+0.27}_{-0.25}$ | | [28] ACHASOV 00 | SND | $e^+e^- \rightarrow \pi^0\gamma$ |

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

NODE=M004G5
NODE=M004G5

| *VALUE* (units $10^{-8}$) | *DOCUMENT ID* | *TECN* | *COMMENT* |
|---|---|---|---|
| **8.5 ±0.6 OUR FIT** | | | |
| **8.8 ±0.9 OUR AVERAGE** Error includes scale factor of 1.5. See the ideogram below. | | | |
| $8.36 \pm 0.59 \pm 0.37$ | ACHASOV 01G | SND | $e^+e^- \rightarrow \mu^+\mu^-$ |
| $9.9 \pm 1.4 \pm 0.9$ | [26] ACHASOV 99C | SND | $e^+e^- \rightarrow \mu^+\mu^-$ |
| $14.4 \pm 3.0$ | [20] VASSERMAN 81 | OLYA | $e^+e^- \rightarrow \mu^+\mu^-$ |
| $8.6 \pm 5.9$ | [20] AUGUSTIN 73 | OSPK | $e^+e^- \rightarrow \mu^+\mu^-$ |




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

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

NODE=M004G4
NODE=M004G4

| *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 | $e^+e^- \to \pi^+\pi^-$ |

## $\Gamma(\pi^0\pi^0\gamma)/\Gamma_{\rm total} \times \Gamma(e^+e^-)/\Gamma_{\rm total}$ $\Gamma_{18}\Gamma_9/\Gamma^2$

NODE=M004G9
NODE=M004G9

| *VALUE* (units $10^{-8}$) | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|
| $\mathbf{3.33^{+0.04}_{-0.09}{}^{+0.19}_{-0.20}}$ | [29] AMBROSINO | 07 | KLOE | $e^+e^- \to \pi^0\pi^0\gamma$ |

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

NODE=M004G8
NODE=M004G8

| *VALUE* (units $10^{-9}$) | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|
| $\mathbf{1.2\ ^{+0.8}_{-0.7}}$ **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. NODE=M004G;LINKAGE=AE

[19] Update of AKHMETSHIN 99D NODE=M004G;LINKAGE=GS

[20] Recalculated by us from the cross section in the peak. NODE=M004G;LINKAGE=B

[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. NODE=M004G2;LINKAGE=AH

[22] From the $\eta \to 2\gamma$ decay and using B($\eta \to \gamma\gamma$) = 39.43 ± 0.26%. NODE=M004G2;LINKAGE=AK

[23] From the $\eta \to 3\pi^0$ decay and using B($\eta \to 3\pi^0$)= (32.24 ± 0.29) × $10^{-2}$. NODE=M004G;LINKAGE=AK

[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). NODE=M004G;LINKAGE=BQ

[25] From the $\eta \to 2\gamma$ decay and using B($\eta \to 2\gamma$) =(39.21 ± 0.34) × $10^{-2}$. NODE=M004G2;LINKAGE=A

[26] Recalculated by the authors from the cross section in the peak. NODE=M004G;LINKAGE=A

[27] From the $\eta \to \pi^+\pi^-\pi^0$ decay and using B($\eta \to \pi^+\pi^-\pi^0$) =(23.1 ± 0.5) × $10^{-2}$. NODE=M004G2;LINKAGE=C

[28] From the $\pi^0 \to 2\gamma$ decay and using B($\pi^0 \to 2\gamma$) =(98.798 ± 0.032) × $10^{-2}$. NODE=M004G3;LINKAGE=A

[29] Calculated by the authors from the cross section at the peak. NODE=M004G9;LINKAGE=AM

## $\phi(1020)$ BRANCHING RATIOS

NODE=M004220

### $\Gamma(K^+K^-)/\Gamma_{total}$ $\Gamma_1/\Gamma$

NODE=M004R1
NODE=M004R1

| 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 | $e^+e^- \rightarrow K^+K^-$ |
| 0.44 ±0.05 | 321 | KALBFLEISCH | 76 | HBC | 2.18 $K^-p \rightarrow \Lambda K^+K^-$ |
| 0.49 ±0.06 | 270 | DEGROOT | 74 | HBC | 4.2 $K^-p \rightarrow \Lambda\phi$ |
| 0.540±0.034 | 565 | BALAKIN | 71 | OSPK | $e^+e^- \rightarrow K^+K^-$ |
| 0.48 ±0.04 | 252 | LINDSEY | 66 | HBC | 2.1–2.7 $K^-p \rightarrow \Lambda K^+K^-$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.476±0.017 | 1000k | [30] ACHASOV | 01E | SND | $e^+e^- \rightarrow K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |

### $\Gamma(K^0_L K^0_S)/\Gamma_{total}$ $\Gamma_2/\Gamma$

NODE=M004R2
NODE=M004R2

| 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 | $e^+e^- \rightarrow K^0_L K^0_S$ |
| 0.326±0.035 | | DOLINSKY | 91 | ND | $e^+e^- \rightarrow K^0_L K^0_S$ |
| 0.310±0.024 | | DRUZHININ | 84 | ND | $e^+e^- \rightarrow K^0_L K^0_S$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.351±0.013 | 500k | [30] ACHASOV | 01E | SND | $e^+e^- \rightarrow K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |
| 0.27 ±0.03 | 133 | KALBFLEISCH | 76 | HBC | 2.18 $K^-p \rightarrow \Lambda K^0_L K^0_S$ |
| 0.257±0.030 | 95 | BALAKIN | 71 | OSPK | $e^+e^- \rightarrow K^0_L K^0_S$ |
| 0.40 ±0.04 | 167 | LINDSEY | 66 | HBC | 2.1–2.7 $K^-p \rightarrow \Lambda K^0_L K^0_S$ |

### $\Gamma(K^0_L K^0_S)/\Gamma(K^+K^-)$ $\Gamma_2/\Gamma_1$

NODE=M004R19
NODE=M004R19

| 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 | $e^+e^- \rightarrow K^0_L K^0_S$ |
| 0.82 ±0.08 | | LOSTY | 78 | HBC | 4.2 $K^-p \rightarrow \phi$hyperon |
| 0.71 ±0.05 | | LAVEN | 77 | HBC | 10 $K^-p \rightarrow K^+K^-\Lambda$ |
| 0.71 ±0.08 | | LYONS | 77 | HBC | 3–4 $K^-p \rightarrow \Lambda\phi$ |
| 0.89 ±0.10 | 144 | AGUILAR-... | 72B | HBC | 3.9,4.6 $K^-p$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.68 ±0.03 | | [31] AKHMETSHIN | 95 | CMD2 | $e^+e^- \rightarrow K^0_L K^0_S$, $K^+K^-$ |

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

NODE=M004R5
NODE=M004R5

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

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

NODE=M004R3
NODE=M004R3

| 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 | $e^+e^- \rightarrow \pi^+\pi^-\pi^0$ |
| 0.143 ±0.007 | | DOLINSKY | 91 | ND | $e^+e^- \rightarrow \pi^+\pi^-\pi^0$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.159 ±0.008 | 400k | [30] ACHASOV | 01E | SND | $e^+e^- \rightarrow K^+K^-$, $K_S K_L$, $\pi^+\pi^-\pi^0$ |
| 0.145 ±0.009 ±0.003 | 11169 | [32] AKHMETSHIN | 98 | CMD2 | $e^+e^- \rightarrow \pi^+\pi^-\pi^0$ |
| 0.139 ±0.007 | | [33] PARROUR | 76B | OSPK | $e^+e^-$ |

### $\left[\Gamma(\rho\pi)+\Gamma(\pi^+\pi^-\pi^0)\right]/\Gamma(K^+K^-)$ $\Gamma_3/\Gamma_1$

NODE=M004R20
NODE=M004R20

| 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 $K^-p$ |

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

NODE=M004R6
NODE=M004R6

| 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 $K^- p \to \Lambda\pi^+\pi^-\pi^0$ |

### $[\Gamma(\rho\pi)+\Gamma(\pi^+\pi^-\pi^0)]/\Gamma(K^0_L K^0_S)$ — $\Gamma_3/\Gamma_2$

NODE=M004R7
NODE=M004R7

| 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 | $e^+e^- \to \pi^+\pi^-\pi^0$ |

### $\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — $\Gamma_5/\Gamma$

NODE=M004R46
NODE=M004R46

| VALUE | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $\simeq$ 0.0087 | | 1.98M | [34,35] ALOISIO | 03 | KLOE | 1.02 $e^+e^- \to \pi^+\pi^-\pi^0$ |
| <0.0006 | 90 | | [36] ACHASOV | 02 | SND | 1.02 $e^+e^- \to \pi^+\pi^-\pi^0$ |
| <0.23 | 90 | | [36] CORDIER | 80 | DM1 | $e^+e^- \to \pi^+\pi^-\pi^0$ |
| <0.20 | 90 | | [36] PARROUR | 76B | OSPK | $e^+e^- \to \pi^+\pi^-\pi^0$ |

### $\Gamma(\eta\gamma)/\Gamma_{total}$ — $\Gamma_6/\Gamma$

NODE=M004R11
NODE=M004R11

| 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 | [37] ACHASOV | 98F | SND | $e^+e^- \to 7\gamma$ |
| 1.18 ±0.11 | 279 | [38] AKHMETSHIN | 95 | CMD2 | $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| 1.30 ±0.06 | | [39] DRUZHININ | 84 | ND | $e^+e^- \to 3\gamma$ |
| 1.4 ±0.2 | | [40] 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 $\gamma$Cu |
| 1.5 ±0.4 | 54 | [39] COSME | 76 | OSPK | $e^+e^-$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 1.37 ±0.05 ±0.01 | 33k | [41] ACHASOV | 07B | SND | 0.6–1.38 $e^+e^- \to \eta\gamma$ |
| 1.373±0.014±0.085 | 17.4k | [42,43] AKHMETSHIN | 05 | CMD2 | 0.60-1.38 $e^+e^- \to \eta\gamma$ |
| 1.287±0.013±0.063 | | [44,45] AKHMETSHIN | 01B | CMD2 | $e^+e^- \to \eta\gamma$ |
| 1.338±0.012±0.052 | | [46] ACHASOV | 00 | SND | $e^+e^- \to \eta\gamma$ |
| 1.18 ±0.03 ±0.06 | 2200 | [47] AKHMETSHIN | 99F | CMD2 | $e^+e^- \to \eta\gamma$ |
| 1.21 ±0.07 | | [48] BENAYOUN | 96 | RVUE | 0.54-1.04 $e^+e^- \to \eta\gamma$ |

OCCUR=2

### $\Gamma(\pi^0\gamma)/\Gamma_{total}$ — $\Gamma_7/\Gamma$

NODE=M004R17
NODE=M004R17

| 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 | [49,50] AKHMETSHIN | 05 | CMD2 | 0.60-1.38 $e^+e^- \to \pi^0\gamma$ |
| $1.226\pm0.036^{+0.096}_{-0.089}$ | | [51] ACHASOV | 00 | SND | $e^+e^- \to \pi^0\gamma$ |
| 1.26 ±0.17 | | [48] BENAYOUN | 96 | RVUE | 0.54-1.04 $e^+e^- \to \pi^0\gamma$ |

### $\Gamma(\eta\gamma)/\Gamma(\pi^0\gamma)$ — $\Gamma_6/\Gamma_7$

NODE=M004R42
NODE=M004R42

| 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 | $e^+e^- \to \eta\gamma,\ \pi^0\gamma$ |

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

NODE=M004R16
NODE=M004R16

| VALUE (units $10^{-4}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **2.955±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 | [52] 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 | | [53] 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 | $e^+e^-$ |

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

NODE=M004R10
NODE=M004R10

| VALUE (units $10^{-4}$) | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|
| **2.87±0.19 OUR FIT** | | | | |
| **2.5 ±0.4 OUR AVERAGE** | | | | |
| 2.69±0.46 | [54] HAYES | 71 | CNTR | 8.3,9.8 $\gamma C \to \mu^+\mu^- X$ |
| 2.17±0.60 | [54] 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 | [55] ACHASOV | 01G | SND | $e^+e^- \to \mu^+\mu^-$ |
| 3.30±0.45±0.32 | [32] ACHASOV | 99C | SND | $e^+e^- \to \mu^+\mu^-$ |
| 4.83±1.02 | [56] VASSERMAN | 81 | OLYA | $e^+e^- \to \mu^+\mu^-$ |
| 2.87±1.98 | [56] AUGUSTIN | 73 | OSPK | $e^+e^- \to \mu^+\mu^-$ |

## $\Gamma(\eta e^+e^-)/\Gamma_{total}$ — $\Gamma_{11}/\Gamma$

NODE=M004R24
NODE=M004R24

| VALUE (units $10^{-4}$) | EVTS | DOCUMENT ID | | TECN | COMMENT | |
|---|---|---|---|---|---|---|
| **1.15±0.10 OUR AVERAGE** | | | | | | |
| 1.19±0.19±0.12 | 213 | [57] ACHASOV | 01B | SND | $e^+e^- \to \gamma\gamma e^+e^-$ | |
| 1.14±0.10±0.06 | 355 | [58] 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 | [59] AKHMETSHIN | 01 | CMD2 | $e^+e^- \to \eta e^+e^-$ | OCCUR=2 |
| 1.21±0.14±0.09 | 130 | [60] AKHMETSHIN | 01 | CMD2 | $e^+e^- \to \eta e^+e^-$ | OCCUR=3 |
| 1.04±0.20±0.08 | 42 | [61] AKHMETSHIN | 01 | CMD2 | $e^+e^- \to \eta e^+e^-$ | OCCUR=4 |

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

NODE=M004R18
NODE=M004R18

| VALUE (units $10^{-4}$) | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.71±0.11±0.09 | | [32] ACHASOV | 00C | SND | $e^+e^- \to \pi^+\pi^-$ |
| 0.65$^{+0.38}_{-0.29}$ | | [32] GOLUBEV | 86 | ND | $e^+e^- \to \pi^+\pi^-$ |
| 2.01$^{+1.07}_{-0.84}$ | | [32] 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 $\gamma C \to C\pi^+\pi^-$ |

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

NODE=M004R28
NODE=M004R28

| VALUE (units $10^{-5}$) | DOCUMENT ID | | TECN | COMMENT | |
|---|---|---|---|---|---|
| **5.2$^{+1.3}_{-1.1}$** | [62,63] AULCHENKO | 00A | SND | $e^+e^- \to \pi^+\pi^-\pi^0\pi^0$ | OCCUR=2 |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| ∼ 5.4 | [64] ACHASOV | 00E | SND | $e^+e^- \to \pi^0\pi^0\gamma$ | |
| 5.5$^{+1.6}_{-1.4}$±0.3 | [63,65] AULCHENKO | 00A | SND | $e^+e^- \to \pi^+\pi^-\pi^0\pi^0$ | |
| 4.8$^{+1.9}_{-1.7}$±0.8 | [64] ACHASOV | 99 | SND | $e^+e^- \to \pi^+\pi^-\pi^0\pi^0$ | |

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

NODE=M004R14
NODE=M004R14

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

## $\Gamma(\rho\gamma)/\Gamma_{total}$ $\Gamma_{15}/\Gamma$

NODE=M004R15

| VALUE (units $10^{-4}$) | CL% | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **< 0.12** | 90 | [66] 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 |

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

NODE=M004R12

| VALUE (units $10^{-4}$) | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| **0.41±0.12±0.04** | | 30175 | [67] AKHMETSHIN | 99B | CMD2 | $e^+e^- \to \pi^+\pi^-\gamma$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| < 0.3 | 90 | | [68] 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 |

## $\Gamma(f_0(980)\gamma)/\Gamma_{total}$ $\Gamma_{17}/\Gamma$

NODE=M004R30

| 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** | | | | | | | |
| $3.21^{+0.03}_{-0.09}\pm0.18$ | | | [69] AMBROSINO | 07 | KLOE | $e^+e^- \to \pi^0\pi^0\gamma$ | |
| 2.90±0.21±1.54 | | | [70] AKHMETSHIN | 99C | CMD2 | $e^+e^- \to \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$ | OCCUR=3 |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | | |
| 4.47±0.21 | | 2438 | [71] ALOISIO | 02D | KLOE | $e^+e^- \to \pi^0\pi^0\gamma$ | |
| $3.5\pm0.3\,^{+1.3}_{-0.5}$ | | 419 | [72,73] ACHASOV | 00H | SND | $e^+e^- \to \pi^0\pi^0\gamma$ | |
| 1.93±0.46±0.50 | | 27188 | [74] AKHMETSHIN | 99B | CMD2 | $e^+e^- \to \pi^+\pi^-\gamma$ | |
| 3.05±0.25±0.72 | | 268 | [75] AKHMETSHIN | 99C | CMD2 | $e^+e^- \to \pi^0\pi^0\gamma$ | |
| 1.5 ±0.5 | | 268 | [76] AKHMETSHIN | 99C | CMD2 | $e^+e^- \to \pi^0\pi^0\gamma$ | OCCUR=2 |
| 3.42±0.30±0.36 | | 164 | [72] ACHASOV | 98I | SND | $e^+e^- \to 5\gamma$ | |
| < 1 | 90 | | [77] AKHMETSHIN | 97C | CMD2 | $e^+e^- \to \pi^+\pi^-\gamma$ | |
| < 7 | 90 | | [78] AKHMETSHIN | 97C | CMD2 | $e^+e^- \to \pi^+\pi^-\gamma$ | OCCUR=2 |
| < 20 | 90 | | DRUZHININ | 87 | ND | $e^+e^- \to \pi^0\pi^0\gamma$ | |

## $\Gamma(f_0(980)\gamma)/\Gamma(\eta\gamma)$ $\Gamma_{17}/\Gamma_6$

NODE=M004R44

| VALUE (units $10^{-2}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **2.46±0.15 OUR FIT** Error includes scale factor of 1.1. | | | | | |
| **$2.6\pm0.2\,^{+0.8}_{-0.3}$** | 419 | [72] ACHASOV | 00H | SND | $e^+e^- \to \pi^0\pi^0\gamma$ |

## $\Gamma(\pi^0\pi^0\gamma)/\Gamma_{total}$ $\Gamma_{18}/\Gamma$

NODE=M004R26

| VALUE (units $10^{-4}$) | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| **1.07 ±0.06 OUR AVERAGE** | | | | | | |
| $1.07\,^{+0.01}_{-0.03}\,^{+0.06}_{-0.06}$ | | | [79] AMBROSINO | 07 | KLOE | $e^+e^- \to \pi^0\pi^0\gamma$ |
| 1.08 ±0.17 ±0.09 | | 268 | AKHMETSHIN | 99C | CMD2 | $e^+e^- \to \pi^0\pi^0\gamma$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 1.09 ±0.03 ±0.05 | | 2438 | ALOISIO | 02D | KLOE | $e^+e^- \to \pi^0\pi^0\gamma$ |
| 1.158±0.093±0.052 | | 419 | [73,80] ACHASOV | 00H | SND | $e^+e^- \to \pi^0\pi^0\gamma$ |
| <10 | 90 | | DRUZHININ | 87 | ND | $e^+e^- \to 5\gamma$ |

## $\Gamma(\pi^0\pi^0\gamma)/\Gamma(\eta\gamma)$ $\Gamma_{18}/\Gamma_6$

NODE=M004R39

| VALUE (units $10^{-2}$) | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **0.865±0.070±0.017** | 419 | [80] ACHASOV | 00H | SND | $e^+e^- \to \pi^0\pi^0\gamma$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | |
| 0.90 ±0.08 ±0.07 | 164 | ACHASOV | 98I | SND | $e^+e^- \to 5\gamma$ |

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

NODE=M004R22

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

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

NODE=M004R27

| 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 | $e^+e^- \to \pi^+\pi^-\pi^+\pi^-\pi^0$ |

## $\Gamma(\pi^0 e^+e^-)/\Gamma_{total}$ — $\Gamma_{21}/\Gamma$

NODE=M004R31

| VALUE (units $10^{-5}$) | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| **1.12±0.28 OUR AVERAGE** | | | | | | |
| 1.01±0.28±0.29 | | 52 | [81] ACHASOV | 02D | SND | $e^+e^- \to \pi^0 e^+e^-$ |
| 1.22±0.34±0.21 | | 46 | [82] AKHMETSHIN | 01C | CMD2 | $e^+e^- \to \pi^0 e^+e^-$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| <12 | 90 | | DOLINSKY | 88 | ND | $e^+e^- \to \pi^0 e^+e^-$ |

## $\Gamma(\pi^0\eta\gamma)/\Gamma_{total}$ — $\Gamma_{22}/\Gamma$

NODE=M004R32

| VALUE (units $10^{-5}$) | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| **8.3 ±0.5 OUR AVERAGE** | | | | | | |
| 8.51±0.51±0.57 | | 607 | [83] ALOISIO | 02C | KLOE | $e^+e^- \to \eta\pi^0\gamma$ |
| 7.96±0.60±0.40 | | 197 | [84] ALOISIO | 02C | KLOE | $e^+e^- \to \eta\pi^0\gamma$ OCCUR=2 |
| 8.8 ±1.4 ±0.9 | | 36 | [85] ACHASOV | 00F | SND | $e^+e^- \to \eta\pi^0\gamma$ |
| 9.0 ±2.4 ±1.0 | | 80 | AKHMETSHIN | 99C | CMD2 | $e^+e^- \to \eta\pi^0\gamma$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| 8.3 ±2.3 ±1.2 | | 20 | ACHASOV | 98B | SND | $e^+e^- \to 5\gamma$ |
| <250 | 90 | | DOLINSKY | 91 | ND | $e^+e^- \to \pi^0\eta\gamma$ |

## $\Gamma(a_0(980)\gamma)/\Gamma_{total}$ — $\Gamma_{23}/\Gamma$

NODE=M004R33

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

## $\Gamma(f_0(980)\gamma)/\Gamma(a_0(980)\gamma)$ — $\Gamma_{17}/\Gamma_{23}$

NODE=M004R47

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

## $\Gamma(\eta'(958)\gamma)/\Gamma_{total}$ — $\Gamma_{24}/\Gamma$

NODE=M004R25

| VALUE (units $10^{-5}$) | CL% | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|---|
| **6.24±0.21 OUR FIT** | | | | | | |
| **6.25±0.30 OUR AVERAGE** | | | | | | |
| 6.24±0.28±0.12 | | 3407 | [90] AMBROSINO | 07A | KLOE | 1.02 $e^+e^- \to \pi^+\pi^- 7\gamma$ |
| $6.7\ ^{+2.8}_{-2.4}$ ±0.8 | | 12 | [91] AULCHENKO | 03B | SND | $e^+e^- \to \eta'\gamma$ OCCUR=2 |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | | | |
| $6.7\ ^{+5.0}_{-4.2}$ ±1.5 | | 7 | AULCHENKO | 03B | SND | $e^+e^- \to 7\gamma$ |
| 6.10±0.61±0.43 | | 120 | [92] ALOISIO | 02E | KLOE | 1.02 $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| $8.2\ ^{+2.1}_{-1.9}$ ±1.1 | | 21 | [93] AKHMETSHIN | 00B | CMD2 | $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| $4.9\ ^{+2.2}_{-1.8}$ ±0.6 | | 9 | [94] AKHMETSHIN | 00F | CMD2 | $e^+e^- \to \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$ |
| 6.4 ±1.6 | | 30 | [95] AKHMETSHIN | 00F | CMD2 | $e^+e^- \to \eta'(958)\gamma$ OCCUR=2 |
| $6.7\ ^{+3.4}_{-2.9}$ ±1.0 | | 5 | [96] AULCHENKO | 99 | SND | $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| <11 | 90 | | AULCHENKO | 98 | SND | $e^+e^- \to 7\gamma$ |
| $12\ ^{+7}_{-5}$ ±2 | | 6 | [93] AKHMETSHIN | 97B | CMD2 | $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| <41 | 90 | | DRUZHININ | 87 | ND | $e^+e^- \to \gamma\eta\pi^+\pi^-$ |

### $\Gamma(\eta'(958)\gamma)/\Gamma(K^0_L K^0_S)$ — $\Gamma_{24}/\Gamma_2$

NODE=M004R43
NODE=M004R43

| VALUE (units $10^{-4}$) | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| **1.82±0.06 OUR FIT** | | | | |
| **$1.46^{+0.64}_{-0.54}\pm0.18$** | 9 | [97] AKHMETSHIN 00F | CMD2 | $e^+e^- \to \pi^+\pi^-\pi^+\pi^- \geq 2\gamma$ |

### $\Gamma(\eta'(958)\gamma)/\Gamma(\eta\gamma)$ — $\Gamma_{24}/\Gamma_6$

NODE=M004R34
NODE=M004R34

| VALUE (units $10^{-3}$) | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| **4.76±0.15 OUR FIT** | | | | |
| **4.78±0.20 OUR AVERAGE** | | | | |
| 4.77±0.09±0.19 | 3407 | AMBROSINO 07A | KLOE | 1.02 $e^+e^- \to \pi^+\pi^- 7\gamma$ |
| 4.70±0.47±0.31 | 120 | [98] ALOISIO 02E | KLOE | 1.02 $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| $6.5\ ^{+1.7}_{-1.5}\ \pm0.8$ | 21 | AKHMETSHIN 00B | CMD2 | $e^+e^- \to \pi^+\pi^- 3\gamma$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • • | | | | |
| $9.5\ ^{+5.2}_{-4.0}\ \pm1.4$ | 6 | [99] AKHMETSHIN 97B | CMD2 | $e^+e^- \to \pi^+\pi^- 3\gamma$ |

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

NODE=M004R36
NODE=M004R36

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

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

NODE=M004R35
NODE=M004R35

| VALUE (units $10^{-5}$) | EVTS | DOCUMENT ID | TECN | COMMENT |
|---|---|---|---|---|
| **1.43±0.45±0.14** | 27188 | [74] 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 | [100] AKHMETSHIN 97C | CMD2 | $e^+e^- \to \mu^+\mu^-\gamma$ |

### $\Gamma(\rho\gamma\gamma)/\Gamma_{total}$ — $\Gamma_{27}/\Gamma$

NODE=M004R37
NODE=M004R37

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

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

NODE=M004R38
NODE=M004R38

| 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 | $e^+e^- \to \pi^+\pi^-\gamma\gamma$ |

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

NODE=M004R45
NODE=M004R45

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

[30] Using B($\phi \to e^+e^-$)= $(2.93 \pm 0.14) \times 10^{-4}$. NODE=M004R;LINKAGE=B2

[31] 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. NODE=M004R19;LINKAGE=KH

[32] Using B($\phi \to e^+e^-$)=$(2.99 \pm 0.08) \times 10^{-4}$. NODE=M004R;LINKAGE=8D

[33] Using $\Gamma(\phi)$= 4.1 Mev. If interference between the $\rho\pi$ and $3\pi$ modes is neglected, the fraction of the $\rho\pi$ is more than 80% at the 90% confidence level. NODE=M004R3;LINKAGE=E

[34] From a fit without limitations on charged and neutral $\rho$ masses and widths. NODE=M004R;LINKAGE=L1

[35] Adding the direct and $\omega\pi$ contributions and considering the interference between the $\rho\pi$ and $\pi^+\pi^-\pi^0$. NODE=M004R;LINKAGE=L2

[36] Neglecting the interference between the $\rho\pi$ and $\pi^+\pi^-\pi^0$. NODE=M004R;LINKAGE=46

[37] Using B($\phi \to e^+e^-$) = $(2.99 \pm 0.08) \times 10^{-4}$ and B($\eta \to 3\pi^0$)= $(32.2 \pm 0.4) \times 10^{-2}$. NODE=M004R11;LINKAGE=AC

[38] From $\pi^+\pi^-\pi^0$ decay mode of $\eta$. NODE=M004R11;LINKAGE=Z3

[39] From $2\gamma$ decay mode of $\eta$. NODE=M004R11;LINKAGE=A

[40] From $3\pi^0$ decay mode of $\eta$. NODE=M004R11;LINKAGE=C

[41] ACHASOV 07B reports [B($\phi(1020) \to \eta\gamma$)] × [B($\phi(1020) \to e^+e^-$)] = $(4.050 \pm 0.067 \pm 0.118) \times 10^{-6}$. We divide by our best value B($\phi(1020) \to e^+e^-$) = $(2.955 \pm 0.030) \times 10^{-4}$. 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. NODE=M004R11;LINKAGE=AO

[42] Using B($\phi \rightarrow e^+e^-$) = (2.98 ± 0.04) × $10^{-4}$ and B($\eta \rightarrow \gamma\gamma$) = 39.43 ± 0.26%. NODE=M004R11;LINKAGE=AH

[43] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\eta\gamma)/\Gamma^2_{total}$. NODE=M004R11;LINKAGE=AK

[44] Using B($\phi \rightarrow e^+e^-$) = (2.99 ± 0.08) × $10^{-4}$ and B($\eta \rightarrow 3\pi^0$)=(32.24 ± 0.29) × $10^{-2}$. NODE=M004R;LINKAGE=AK

[45] 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). NODE=M004R;LINKAGE=BQ

[46] From the $\eta \rightarrow 2\gamma$ decay and using B($\phi \rightarrow e^+e^-$) =(2.99 ± 0.08) × $10^{-4}$. NODE=M004R;LINKAGE=GA

[47] From $\pi^+\pi^-\pi^0$ decay mode of $\eta$ and using B($\phi \rightarrow e^+e^-$)= (2.99 ± 0.08) × $10^{-4}$. NODE=M004R;LINKAGE=FF

[48] Reanalysis of DRUZHININ 84, DOLINSKY 89, and DOLINSKY 91 taking into account a triangle anomaly contribution. NODE=M004R;LINKAGE=TS

[49] Using B($\phi \rightarrow e^+e^-$) = (2.98 ± 0.04) × $10^{-4}$. NODE=M004R17;LINKAGE=AH

[50] Not independent of the corresponding $\Gamma(e^+e^-) \times \Gamma(\pi^0\gamma)/\Gamma^2_{total}$. NODE=M004R17;LINKAGE=AK

[51] From the $\pi^0 \rightarrow 2\gamma$ decay and using B($\phi \rightarrow e^+e^-$) = (2.99 ± 0.08) × $10^{-4}$. NODE=M004R;LINKAGE=3G

[52] 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. NODE=M004R;LINKAGE=AE

[53] Using total width 4.2 MeV. They detect $3\pi$ mode and observe significant interference with $\omega$ tail. This is accounted for in the result quoted above. NODE=M004R16;LINKAGE=E

[54] Neglecting interference between resonance and continuum. NODE=M004R10;LINKAGE=A

[55] Using B($\phi \rightarrow e^+e^-$) = (2.91 ± 0.07) × $10^{-4}$. NODE=M004R;LINKAGE=GZ

[56] Recalculated by us using B($\phi \rightarrow e^+e^-$)= (2.99 ± 0.08) × $10^{-4}$. NODE=M004R;LINKAGE=VA

[57] Using B($\eta \rightarrow \gamma\gamma$) = (39.25 ± 0.32)%, B($\phi \rightarrow \eta\gamma$) = (1.26 ± 0.06)%, and B($\phi \rightarrow e^+e^-$) = (3.00 ± 0.06) × $10^{-4}$. NODE=M004R;LINKAGE=VM

[58] The average of the branching ratios separately obtained from the $\eta \rightarrow \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$ decays. NODE=M004R;LINKAGE=H1

[59] From $\eta \rightarrow \gamma\gamma$ decays and using B($\eta \rightarrow \gamma\gamma$) = (39.33 ± 0.25) × $10^{-2}$, B($\eta \rightarrow \pi^+\pi^-\gamma$) = (4.75 ± 11) × $10^{-2}$, and B($\phi \rightarrow \eta\gamma$) = (1.297 ± 0.033) × $10^{-2}$. NODE=M004R;LINKAGE=H2

[60] From $\eta \rightarrow 3\pi^0$ decays and using B($\pi^0 \rightarrow \gamma\gamma$) = (98.798 ± 0.033) × $10^{-2}$, B($\eta \rightarrow 3\pi^0$) = (32.24 ± 0.29) × $10^{-2}$, B($\eta \rightarrow \pi^+\pi^-\gamma$) = (4.75 ± 0.11) × $10^{-2}$, and B($\phi \rightarrow \eta\gamma$) = (1.297 ± 0.033) × $10^{-2}$. NODE=M004R;LINKAGE=H3

[61] From $\eta \rightarrow \pi^+\pi^-\pi^0$ decays and using B($\pi^0 \rightarrow \gamma\gamma$) = (98.798 ± 0.033) × $10^{-2}$, B($\pi^0 \rightarrow e^+e^-\gamma$) = (1.198 ± 0.032) × $10^{-2}$, B($\eta \rightarrow \pi^+\pi^-\pi^0$) = (23.0 ± 0.4) × $10^{-2}$, B($\phi \rightarrow \pi^+\pi^-\pi^0$) = (15.5 ± 0.6) × $10^{-2}$, and B($\phi \rightarrow \eta\gamma$) = (1.297 ± 0.033) × $10^{-2}$. NODE=M004R;LINKAGE=H4

[62] Using the 1996 and 1998 data. NODE=M004R28;LINKAGE=K2

[63] (2.3 ± 0.3)% correction for other decay modes of the $\omega$(782) applied. NODE=M004R28;LINKAGE=K3

[64] Using the 1996 data. NODE=M004R28;LINKAGE=VS

[65] Using the 1998 data. NODE=M004R28;LINKAGE=K1

[66] Supersedes AKHMETSHIN 97C. NODE=M004R;LINKAGE=1N

[67] For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \rightarrow f_0(980)\gamma$) is negligible. Supersedes AKHMETSHIN 97C. NODE=M004R;LINKAGE=2N

[68] For $E_\gamma > 20$ MeV and assuming that B($\phi(1020) \rightarrow f_0(980)\gamma$) is negligible. NODE=M004R12;LINKAGE=Z3

[69] Obtained by the authors taking into account the $\pi^+\pi^-$ decay mode. Includes a component due to $\pi\pi$ production via the $f_0$(600) meson. Supersedes ALOISIO 02D. NODE=M004R30;LINKAGE=MB

[70] From the combined fit of the photon spectra in the reactions $e^+e^- \rightarrow \pi^+\pi^-\gamma$, $\pi^0\pi^0\gamma$. NODE=M004R;LINKAGE=SL

[71] 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. Superseded by AMBROSINO 07. NODE=M004R;LINKAGE=KD

[72] 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($f_0 \rightarrow \pi^0\pi^0$). NODE=M004R;LINKAGE=AI

[73] Using the value B($\phi \rightarrow \eta\gamma$)=(1.338 ± 0.053) × $10^{-2}$. NODE=M004R;LINKAGE=U8

[74] For $E_\gamma > 20$ MeV. Supersedes AKHMETSHIN 97C. NODE=M004R;LINKAGE=3N

[75] Neglecting other intermediate mechanisms ($\rho\pi$, $\sigma\gamma$). NODE=M004R;LINKAGE=SM

[76] A narrow pole fit taking into account $f_0$(980) and $f_0$(1200) intermediate mechanisms. NODE=M004R;LINKAGE=ST

[77] For destructive interference with the Bremsstrahlung process NODE=M004R30;LINKAGE=A

[78] For constructive interference with the Bremsstrahlung process NODE=M004R30;LINKAGE=B

[79] Supersedes ALOISIO 02D. NODE=M004R26;LINKAGE=MB

[80] Supersedes ACHASOV 98I. Excluding $\omega\pi^0$. NODE=M004R;LINKAGE=V8

[81] Using various branching ratios from the 2000 Edition of this Review (PDG 00). NODE=M004R;LINKAGE=DS

[82] Using B($\pi^0 \rightarrow \gamma\gamma$) = 0.98798 ± 0.00032, B($\phi \rightarrow \eta\gamma$) = (1.297 ± 0.033) × $10^{-2}$, and B($\eta \rightarrow \pi^+\pi^-\gamma$) = (4.75 ± 0.11) × $10^{-2}$. NODE=M004R;LINKAGE=5H

[83] From the decay mode $\eta \rightarrow \gamma\gamma$. NODE=M004R;LINKAGE=C1

[84] From the decay mode $\eta \rightarrow \pi^+\pi^-\pi^0$. NODE=M004R;LINKAGE=C2

[85] Supersedes ACHASOV 98B. NODE=M004R32;LINKAGE=AF

[86] Using $M_{a_0(980)}$=984.8 MeV and assuming $a_0(980)\gamma$ dominance. NODE=M004R;LINKAGE=C3

[87] Assuming $a_0(980)\gamma$ dominance in the $\eta\pi^0\gamma$ final state. NODE=M004R33;LINKAGE=AF

[88] Using data of ACHASOV 00F. NODE=S004R;LINKAGE=GK

[89] Using results of ALOISIO 02D and assuming that $f_0(980)$ decays into $\pi\pi$ only and $a_0(980)$ into $\eta\pi$ only. NODE=M004R;LINKAGE=C4

[90] AMBROSINO 07A reports [B($\phi(1020) \to \eta'(958)\gamma$)] / [B($\phi(1020) \to \eta\gamma$)] = $(4.77 \pm 0.09 \pm 0.19) \times 10^{-3}$. We multiply by our best value B($\phi(1020) \to \eta\gamma$) = $(1.309 \pm 0.024) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=M004R25;LINKAGE=AM

[91] Averaging AULCHENKO 03B with AULCHENKO 99. NODE=M004R25;LINKAGE=BK

[92] Using B($\phi \to \eta\gamma$)= $(1.297 \pm 0.033)$%. NODE=M004R;LINKAGE=E2

[93] Using the value B($\phi \to \eta\gamma$) = $(1.26 \pm 0.06) \times 10^{-2}$. NODE=M004R25;LINKAGE=Q

[94] Using B($\phi \to K^0_L K^0_S$) = $(33.8 \pm 0.6)$%. NODE=M004R;LINKAGE=T2

[95] Averaging AKHMETSHIN 00B with AKHMETSHIN 00F. NODE=M004R;LINKAGE=T3

[96] Using the value B($\eta' \to \eta\pi^+\pi^-$)= $(43.7 \pm 1.5) \times 10^{-2}$ and B($\eta \to \gamma\gamma$)= $(39.25 \pm 0.31) \times 10^{-2}$. NODE=M004R25;LINKAGE=AU

[97] Using various branching ratios of $K^0_S$, $K^0_L$, $\eta$, $\eta'$ from the 2000 edition (The European Physical Journal **C15** 1 (2000)) of this Review. NODE=M004R;LINKAGE=T1

[98] From the decay mode $\eta' \to \eta\pi^+\pi^-$, $\eta \to \gamma\gamma$. NODE=M004R;LINKAGE=E1

[99] Superseded by AKHMETSHIN 00B. NODE=M004R;LINKAGE=KS

[100] For $E_\gamma > 20$ MeV. NODE=M004R35;LINKAGE=A

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

NODE=M004225

NODE=M004D1

| *VALUE* (units $10^{-2}$) | *CL%* | *EVTS* | *DOCUMENT ID* | | *TECN* | *COMMENT* |
|---|---|---|---|---|---|---|
| **9.1±1.2 OUR AVERAGE** | | | | | | |
| 10.1±4.4±1.7 | | 80k | [101] AKHMETSHIN | 06 | CMD2 | 1.017–1.021 $e^+e^- \to \pi^+\pi^-\pi^0$ |
| 9.0±1.1±0.6 | | 1.98M | [102,103] 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 | [103] ACHASOV | 02 | SND | $e^+e^- \to \pi^+\pi^-\pi^0$ |
| $-16 < a_1 < 11$ | 90 | 9.8k | [101,104] AKHMETSHIN | 98 | CMD2 | $e^+e^- \to \pi^+\pi^-\gamma\gamma$ |

[101] Dalitz plot analysis taking into account interference between the contact and $\rho\pi$ amplitudes. NODE=M004D1;LINKAGE=AK

[102] From a fit without limitations on charged and neutral $\rho$ masses and widths. NODE=M004D;LINKAGE=L1

[103] Recalculated by us to match the notations of AKHMETSHIN 98. NODE=M004D;LINKAGE=L3

[104] Assuming zero phase for the contact term. NODE=M004D1;LINKAGE=KL

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