



$$J = \frac{1}{2}$$

$\tau$  discovery paper was PERL 75.  $e^+e^- \rightarrow \tau^+\tau^-$  cross-section threshold behavior and magnitude are consistent with pointlike spin-1/2 Dirac particle. BRANDELIK 78 ruled out pointlike spin-0 or spin-1 particle. FELDMAN 78 ruled out  $J = 3/2$ . KIRKBY 79 also ruled out  $J=\text{integer}$ ,  $J = 3/2$ .

### $\tau$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1776.84 ± 0.17 OUR AVERAGE</b>				
1776.81 <sup>+0.25</sup> <sub>-0.23</sub> ± 0.15	81	ANASHIN	07	KEDR 6.7 pb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 3.54\text{--}3.78$ GeV
1776.61 ± 0.13 ± 0.35		<sup>1</sup> BELOUS	07	BELL 414 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
1775.1 ± 1.6 ± 1.0	13.3k	<sup>2</sup> ABBIENDI	00A	OPAL 1990–1995 LEP runs
1778.2 ± 0.8 ± 1.2		ANASTASSOV	97	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
1776.96 <sup>+0.18</sup> <sub>-0.21</sub> <sup>+0.25</sup> <sub>-0.17</sub>	65	<sup>3</sup> BAI	96	BES $E_{\text{cm}}^{ee} = 3.54\text{--}3.57$ GeV
1776.3 ± 2.4 ± 1.4	11k	<sup>4</sup> ALBRECHT	92M	ARG $E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV
1783 <sup>+3</sup> <sub>-4</sub>	692	<sup>5</sup> BACINO	78B	DLCO $E_{\text{cm}}^{ee} = 3.1\text{--}7.4$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
1777.8 ± 0.7 ± 1.7	35k	<sup>6</sup> BALEST	93	CLEO Repl. by ANASTASSOV 97
1776.9 <sup>+0.4</sup> <sub>-0.5</sub> ± 0.2	14	<sup>7</sup> BAI	92	BES Repl. by BAI 96

<sup>1</sup> BELOUS 07 fit  $\tau$  pseudomass spectrum in  $\tau \rightarrow \pi\pi^+\pi^-\nu_\tau$  decays. Result assumes  $m_{\nu_\tau} = 0$ .

<sup>2</sup> ABBIENDI 00A fit  $\tau$  pseudomass spectrum in  $\tau \rightarrow \pi^\pm \leq 2\pi^0\nu_\tau$  and  $\tau \rightarrow \pi^\pm\pi^+\pi^- \leq 1\pi^0\nu_\tau$  decays. Result assumes  $m_{\nu_\tau} = 0$ .

<sup>3</sup> BAI 96 fit  $\sigma(e^+e^- \rightarrow \tau^+\tau^-)$  at different energies near threshold.

<sup>4</sup> ALBRECHT 92M fit  $\tau$  pseudomass spectrum in  $\tau^- \rightarrow 2\pi^-\pi^+\nu_\tau$  decays. Result assumes  $m_{\nu_\tau} = 0$ .

<sup>5</sup> BACINO 78B value comes from  $e^\pm X^\mp$  threshold. Published mass 1782 MeV increased by 1 MeV using the high precision  $\psi(2S)$  mass measurement of ZHOLENTZ 80 to eliminate the absolute SPEAR energy calibration uncertainty.

<sup>6</sup> BALEST 93 fit spectra of minimum kinematically allowed  $\tau$  mass in events of the type  $e^+e^- \rightarrow \tau^+\tau^- \rightarrow (\pi^+n\pi^0\nu_\tau)(\pi^-m\pi^0\nu_\tau)$   $n \leq 2$ ,  $m \leq 2$ ,  $1 \leq n+m \leq 3$ . If  $m_{\nu_\tau} \neq 0$ , result increases by  $(m_{\nu_\tau}^2/1100)$  MeV.

<sup>7</sup> BAI 92 fit  $\sigma(e^+e^- \rightarrow \tau^+\tau^-)$  near threshold using  $e\mu$  events.

$$(m_{\tau^+} - m_{\tau^-})/m_{\text{average}}$$

A test of CPT invariance.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 2.8 × 10<sup>-4</sup></b>	90	BELOUS	07	BELL 414 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 3.0 × 10 <sup>-3</sup>	90	ABBIENDI	00A	OPAL 1990–1995 LEP runs

### $\tau$ MEAN LIFE

<u>VALUE (<math>10^{-15}</math> s)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>290.6 ± 1.0</b>	<b>OUR AVERAGE</b>			
290.9 ± 1.4 ± 1.0		ABDALLAH	04T DLPH	1991-1995 LEP runs
293.2 ± 2.0 ± 1.5		ACCIARRI	00B L3	1991-1995 LEP runs
290.1 ± 1.5 ± 1.1		BARATE	97R ALEP	1989-1994 LEP runs
289.2 ± 1.7 ± 1.2		ALEXANDER	96E OPAL	1990-1994 LEP runs
289.0 ± 2.8 ± 4.0	57.4k	BALEST	96 CLEO	$E_{cm}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
291.2 ± 2.0 ± 1.2		BARATE	97I ALEP	Repl. by BARATE 97R
291.4 ± 3.0		ABREU	96B DLPH	Repl. by ABDAL- LAH 04T
290.1 ± 4.0	34k	ACCIARRI	96K L3	Repl. by ACCIARRI 00B
297 ± 9 ± 5	1671	ABE	95Y SLD	1992-1993 SLC runs
304 ± 14 ± 7	4100	BATTLE	92 CLEO	$E_{cm}^{ee} = 10.6$ GeV
301 ± 29	3780	KLEINWORT	89 JADE	$E_{cm}^{ee} = 35-46$ GeV
288 ± 16 ± 17	807	AMIDEI	88 MRK2	$E_{cm}^{ee} = 29$ GeV
306 ± 20 ± 14	695	BRAUNSCH...	88C TASS	$E_{cm}^{ee} = 36$ GeV
299 ± 15 ± 10	1311	ABACHI	87C HRS	$E_{cm}^{ee} = 29$ GeV
295 ± 14 ± 11	5696	ALBRECHT	87P ARG	$E_{cm}^{ee} = 9.3-10.6$ GeV
309 ± 17 ± 7	3788	BAND	87B MAC	$E_{cm}^{ee} = 29$ GeV
325 ± 14 ± 18	8470	BEBEK	87C CLEO	$E_{cm}^{ee} = 10.5$ GeV
460 ± 190	102	FELDMAN	82 MRK2	$E_{cm}^{ee} = 29$ GeV

### $\tau$ MAGNETIC MOMENT ANOMALY

The  $q^2$  dependence is expected to be small providing no thresholds are nearby.

$$\mu_{\tau}/(e\hbar/2m_{\tau})-1 = (g_{\tau}-2)/2$$

For a theoretical calculation  $[(g_{\tau}-2)/2 = 117\,721(5) \times 10^{-8}]$ , see EIDELMAN 07.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&gt; -0.052 and &lt; 0.013 (CL = 95%) OUR LIMIT</b>				
> -0.052 and < 0.013	95	<sup>1</sup> ABDALLAH	04K DLPH	$e^+e^- \rightarrow e^+e^-\tau^+\tau^-$ at LEP2
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 0.107	95	<sup>2</sup> ACHARD	04G L3	$e^+e^- \rightarrow e^+e^-\tau^+\tau^-$ at LEP2
> -0.007 and < 0.005	95	<sup>3</sup> GONZALEZ-S..00	RVUE	$e^+e^- \rightarrow \tau^+\tau^-$ and $W \rightarrow \tau\nu_{\tau}$
> -0.052 and < 0.058	95	<sup>4</sup> ACCIARRI	98E L3	1991-1995 LEP runs
> -0.068 and < 0.065	95	<sup>5</sup> ACKERSTAFF	98N OPAL	1990-1995 LEP runs
> -0.004 and < 0.006	95	<sup>6</sup> ESCRIBANO	97 RVUE	$Z \rightarrow \tau^+\tau^-$ at LEP
< 0.01	95	<sup>7</sup> ESCRIBANO	93 RVUE	$Z \rightarrow \tau^+\tau^-$ at LEP
< 0.12	90	GRIFOLS	91 RVUE	$Z \rightarrow \tau\tau\gamma$ at LEP
< 0.023	95	<sup>8</sup> SILVERMAN	83 RVUE	$e^+e^- \rightarrow \tau^+\tau^-$ at PETRA

- <sup>1</sup> ABDALLAH 04K limit is derived from  $e^+e^- \rightarrow e^+e^-\tau^+\tau^-$  total cross-section measurements at  $\sqrt{s}$  between 183 and 208 GeV. In addition to the limits, the authors also quote a value of  $-0.018 \pm 0.017$ .
- <sup>2</sup> ACHARD 04G limit is derived from  $e^+e^- \rightarrow e^+e^-\tau^+\tau^-$  total cross-section measurements at  $\sqrt{s}$  between 189 and 206 GeV, and is on the absolute value of the magnetic moment anomaly.
- <sup>3</sup> GONZALEZ-SPRINBERG 00 use data on tau lepton production at LEP1, SLC, and LEP2, and data from colliders and LEP2 to determine limits. Assume imaginary component is zero.
- <sup>4</sup> ACCIARRI 98E use  $Z \rightarrow \tau^+\tau^-\gamma$  events. In addition to the limits, the authors also quote a value of  $0.004 \pm 0.027 \pm 0.023$ .
- <sup>5</sup> ACKERSTAFF 98N use  $Z \rightarrow \tau^+\tau^-\gamma$  events. The limit applies to an average of the form factor for off-shell  $\tau$ 's having  $p^2$  ranging from  $m_\tau^2$  to  $(M_Z - m_\tau)^2$ .
- <sup>6</sup> ESCRIBANO 97 use preliminary experimental results.
- <sup>7</sup> ESCRIBANO 93 limit derived from  $\Gamma(Z \rightarrow \tau^+\tau^-)$ , and is on the absolute value of the magnetic moment anomaly.
- <sup>8</sup> SILVERMAN 83 limit is derived from  $e^+e^- \rightarrow \tau^+\tau^-$  total cross-section measurements for  $q^2$  up to  $(37 \text{ GeV})^2$ .

## $\tau$ ELECTRIC DIPOLE MOMENT ( $d_\tau$ )

A nonzero value is forbidden by both  $T$  invariance and  $P$  invariance.

The  $q^2$  dependence is expected to be small providing no thresholds are nearby.

### Re( $d_\tau$ )

VALUE ( $10^{-16}$ e cm)	CL%	DOCUMENT ID	TECN	COMMENT
- 0.22 to 0.45	95	<sup>1</sup> INAMI	03 BELL	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
< 3.7	95	<sup>2</sup> ABDALLAH	04K DLPH	$e^+e^- \rightarrow e^+e^-\tau^+\tau^-$ at LEP2
< 11.4	95	<sup>3</sup> ACHARD	04G L3	$e^+e^- \rightarrow e^+e^-\tau^+\tau^-$ at LEP2
< 4.6	95	<sup>4</sup> ALBRECHT	00 ARG	$E_{\text{cm}}^{ee} = 10.4 \text{ GeV}$
> -3.1 and < 3.1	95	ACCIARRI	98E L3	1991-1995 LEP runs
> -3.8 and < 3.6	95	<sup>5</sup> ACKERSTAFF	98N OPAL	1990-1995 LEP runs
< 0.11	95	<sup>6,7</sup> ESCRIBANO	97 RVUE	$Z \rightarrow \tau^+\tau^-$ at LEP
< 0.5	95	<sup>8</sup> ESCRIBANO	93 RVUE	$Z \rightarrow \tau^+\tau^-$ at LEP
< 7	90	GRIFOLS	91 RVUE	$Z \rightarrow \tau\tau\gamma$ at LEP
< 1.6	90	DELAGUILA	90 RVUE	$e^+e^- \rightarrow \tau^+\tau^-$ $E_{\text{cm}}^{ee} = 35 \text{ GeV}$

- <sup>1</sup> INAMI 03 use  $e^+e^- \rightarrow \tau^+\tau^-$  events.
- <sup>2</sup> ABDALLAH 04K limit is derived from  $e^+e^- \rightarrow e^+e^-\tau^+\tau^-$  total cross-section measurements at  $\sqrt{s}$  between 183 and 208 GeV and is on the absolute value of  $d_\tau$ .
- <sup>3</sup> ACHARD 04G limit is derived from  $e^+e^- \rightarrow e^+e^-\tau^+\tau^-$  total cross-section measurements at  $\sqrt{s}$  between 189 and 206 GeV, and is on the absolute value of  $d_\tau$ .
- <sup>4</sup> ALBRECHT 00 use  $e^+e^- \rightarrow \tau^+\tau^-$  events. Limit is on the absolute value of  $\text{Re}(d_\tau)$ .
- <sup>5</sup> ACKERSTAFF 98N use  $Z \rightarrow \tau^+\tau^-\gamma$  events. The limit applies to an average of the form factor for off-shell  $\tau$ 's having  $p^2$  ranging from  $m_\tau^2$  to  $(M_Z - m_\tau)^2$ .

- <sup>6</sup> ESCRIBANO 97 derive the relationship  $|d_\tau| = \cot \theta_W |d_\tau^W|$  using effective Lagrangian methods, and use a conference result  $|d_\tau^W| < 5.8 \times 10^{-18} \text{ e cm}$  at 95% CL (L. Silvestris, ICHEP96) to obtain this result.
- <sup>7</sup> ESCRIBANO 97 use preliminary experimental results.
- <sup>8</sup> ESCRIBANO 93 limit derived from  $\Gamma(Z \rightarrow \tau^+ \tau^-)$ , and is on the absolute value of the electric dipole moment.

### $\text{Im}(d_\tau)$

VALUE ( $10^{-16} \text{ e cm}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>-0.25 to 0.008</b>	95	<sup>1</sup> INAMI 03	BELL	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

< 1.8	95	<sup>2</sup> ALBRECHT 00	ARG	$E_{\text{cm}}^{ee} = 10.4 \text{ GeV}$
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<sup>1</sup> INAMI 03 use  $e^+ e^- \rightarrow \tau^+ \tau^-$  events.

<sup>2</sup> ALBRECHT 00 use  $e^+ e^- \rightarrow \tau^+ \tau^-$  events. Limit is on the absolute value of  $\text{Im}(d_\tau)$ .

### $\tau$ WEAK DIPOLE MOMENT ( $d_\tau^W$ )

A nonzero value is forbidden by *CP* invariance.

The  $q^2$  dependence is expected to be small providing no thresholds are nearby.

### $\text{Re}(d_\tau^W)$

VALUE ( $10^{-17} \text{ e cm}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.50</b>	95	<sup>1</sup> HEISTER 03F	ALEP	1990–1995 LEP runs

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

<3.0	90	<sup>1</sup> ACCIARRI 98C	L3	1991–1995 LEP runs
<0.56	95	ACKERSTAFF 97L	OPAL	1991–1995 LEP runs
<0.78	95	<sup>2</sup> AKERS 95F	OPAL	Repl. by ACKERSTAFF 97L
<1.5	95	<sup>2</sup> BUSKULIC 95C	ALEP	Repl. by HEISTER 03F
<7.0	95	<sup>2</sup> ACTON 92F	OPAL	$Z \rightarrow \tau^+ \tau^-$ at LEP
<3.7	95	<sup>2</sup> BUSKULIC 92J	ALEP	Repl. by BUSKULIC 95C

<sup>1</sup> Limit is on the absolute value of the real part of the weak dipole moment.

<sup>2</sup> Limit is on the absolute value of the real part of the weak dipole moment, and applies for  $q^2 = m_Z^2$ .

### $\text{Im}(d_\tau^W)$

VALUE ( $10^{-17} \text{ e cm}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;1.1</b>	95	<sup>1</sup> HEISTER 03F	ALEP	1990–1995 LEP runs

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

<1.5	95	ACKERSTAFF 97L	OPAL	1991–1995 LEP runs
<4.5	95	<sup>2</sup> AKERS 95F	OPAL	Repl. by ACKERSTAFF 97L

<sup>1</sup> HEISTER 03F limit is on the absolute value of the imaginary part of the weak dipole moment.

<sup>2</sup> Limit is on the absolute value of the imaginary part of the weak dipole moment, and applies for  $q^2 = m_Z^2$ .

## $\tau$ WEAK ANOMALOUS MAGNETIC DIPOLE MOMENT ( $\alpha_\tau^W$ )

Electroweak radiative corrections are expected to contribute at the  $10^{-6}$  level. See BERNABEU 95.

The  $q^2$  dependence is expected to be small providing no thresholds are nearby.

### Re( $\alpha_\tau^W$ )

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.1 \times 10^{-3}$	95	<sup>1</sup> HEISTER 03F ALEP		1990–1995 LEP runs
$> -0.0024$ and $< 0.0025$	95	<sup>2</sup> GONZALEZ-S..00	RVUE	$e^+ e^- \rightarrow \tau^+ \tau^-$ and $W \rightarrow \tau \nu_\tau$
$<4.5 \times 10^{-3}$	90	<sup>1</sup> ACCIARRI 98C L3		1991–1995 LEP runs

<sup>1</sup>Limit is on the absolute value of the real part of the weak anomalous magnetic dipole moment.

<sup>2</sup>GONZALEZ-SPRINBERG 00 use data on tau lepton production at LEP1, SLC, and LEP2, and data from colliders and LEP2 to determine limits. Assume imaginary component is zero.

### Im( $\alpha_\tau^W$ )

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.7 \times 10^{-3}$	95	<sup>1</sup> HEISTER 03F ALEP		1990–1995 LEP runs
$<9.9 \times 10^{-3}$	90	<sup>1</sup> ACCIARRI 98C L3		1991–1995 LEP runs

<sup>1</sup>Limit is on the absolute value of the imaginary part of the weak anomalous magnetic dipole moment.

## $\tau^-$ DECAY MODES

$\tau^+$  modes are charge conjugates of the modes below. “ $h^\pm$ ” stands for  $\pi^\pm$  or  $K^\pm$ . “ $\ell$ ” stands for  $e$  or  $\mu$ . “Neutrals” stands for  $\gamma$ 's and/or  $\pi^0$ 's.

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Scale factor/ Confidence level
<b>Modes with one charged particle</b>		
$\Gamma_1$ particle <sup>-</sup> $\geq 0$ neutrals $\geq 0 K^0 \nu_\tau$ (“1-prong”)	(85.36 $\pm$ 0.08) %	S=1.3
$\Gamma_2$ particle <sup>-</sup> $\geq 0$ neutrals $\geq 0 K_L^0 \nu_\tau$	(84.73 $\pm$ 0.08) %	S=1.4
$\Gamma_3$ $\mu^- \bar{\nu}_\mu \nu_\tau$	[a] (17.36 $\pm$ 0.05) %	
$\Gamma_4$ $\mu^- \bar{\nu}_\mu \nu_\tau \gamma$	[b] ( 3.6 $\pm$ 0.4 ) $\times 10^{-3}$	
$\Gamma_5$ $e^- \bar{\nu}_e \nu_\tau$	[a] (17.85 $\pm$ 0.05) %	
$\Gamma_6$ $e^- \bar{\nu}_e \nu_\tau \gamma$	[b] ( 1.75 $\pm$ 0.18) %	
$\Gamma_7$ $h^- \geq 0 K_L^0 \nu_\tau$	(12.13 $\pm$ 0.07) %	S=1.1
$\Gamma_8$ $h^- \nu_\tau$	(11.60 $\pm$ 0.06) %	S=1.1
$\Gamma_9$ $\pi^- \nu_\tau$	[a] (10.91 $\pm$ 0.07) %	S=1.1
$\Gamma_{10}$ $K^- \nu_\tau$	[a] ( 6.95 $\pm$ 0.23 ) $\times 10^{-3}$	S=1.1

Γ <sub>11</sub>	$h^- \geq 1 \text{ neutrals } \nu_\tau$	(37.08±0.11) %	S=1.2
Γ <sub>12</sub>	$h^- \geq 1\pi^0 \nu_\tau \text{ (ex. } K^0)$	(36.54±0.11) %	S=1.2
Γ <sub>13</sub>	$h^- \pi^0 \nu_\tau$	(25.95±0.10) %	S=1.1
Γ <sub>14</sub>	$\pi^- \pi^0 \nu_\tau$	[a] (25.52±0.10) %	S=1.1
Γ <sub>15</sub>	$\pi^- \pi^0 \text{ non-}\rho(770) \nu_\tau$	( 3.0 ±3.2 ) × 10 <sup>-3</sup>	
Γ <sub>16</sub>	$K^- \pi^0 \nu_\tau$	[a] ( 4.28±0.15 ) × 10 <sup>-3</sup>	
Γ <sub>17</sub>	$h^- \geq 2\pi^0 \nu_\tau$	(10.84±0.12) %	S=1.3
Γ <sub>18</sub>	$h^- 2\pi^0 \nu_\tau$	( 9.49±0.11 ) %	S=1.2
Γ <sub>19</sub>	$h^- 2\pi^0 \nu_\tau \text{ (ex. } K^0)$	( 9.33±0.12 ) %	S=1.2
Γ <sub>20</sub>	$\pi^- 2\pi^0 \nu_\tau \text{ (ex. } K^0)$	[a] ( 9.27±0.12 ) %	S=1.2
Γ <sub>21</sub>	$\pi^- 2\pi^0 \nu_\tau \text{ (ex. } K^0),$	< 9 × 10 <sup>-3</sup>	CL=95%
Γ <sub>22</sub>	scalar	< 7 × 10 <sup>-3</sup>	CL=95%
	$\pi^- 2\pi^0 \nu_\tau \text{ (ex. } K^0),$		
Γ <sub>23</sub>	vector	[a] ( 6.3 ±2.3 ) × 10 <sup>-4</sup>	
	$K^- 2\pi^0 \nu_\tau \text{ (ex. } K^0)$		
Γ <sub>24</sub>	$h^- \geq 3\pi^0 \nu_\tau$	( 1.35±0.07 ) %	S=1.1
Γ <sub>25</sub>	$h^- \geq 3\pi^0 \nu_\tau \text{ (ex. } K^0)$	( 1.26±0.07 ) %	S=1.1
Γ <sub>26</sub>	$h^- 3\pi^0 \nu_\tau$	( 1.18±0.08 ) %	
Γ <sub>27</sub>	$\pi^- 3\pi^0 \nu_\tau \text{ (ex. } K^0)$	[a] ( 1.04±0.07 ) %	
Γ <sub>28</sub>	$K^- 3\pi^0 \nu_\tau \text{ (ex. } K^0, \eta)$	[a] ( 4.7 ±2.1 ) × 10 <sup>-4</sup>	
Γ <sub>29</sub>	$h^- 4\pi^0 \nu_\tau \text{ (ex. } K^0)$	( 1.6 ±0.4 ) × 10 <sup>-3</sup>	
Γ <sub>30</sub>	$h^- 4\pi^0 \nu_\tau \text{ (ex. } K^0, \eta)$	[a] ( 1.0 ±0.4 ) × 10 <sup>-3</sup>	
Γ <sub>31</sub>	$K^- \geq 0\pi^0 \geq 0K^0 \geq 0\gamma \nu_\tau$	( 1.57±0.04 ) %	S=1.1
Γ <sub>32</sub>	$K^- \geq 1 (\pi^0 \text{ or } K^0 \text{ or } \gamma) \nu_\tau$	( 8.74±0.32 ) × 10 <sup>-3</sup>	

### Modes with $K^0$ 's

Γ <sub>33</sub>	$K_S^0 \text{ (particles)}^- \nu_\tau$	( 9.2 ±0.4 ) × 10 <sup>-3</sup>	S=1.4
Γ <sub>34</sub>	$h^- \bar{K}^0 \nu_\tau$	(10.0 ±0.5) × 10 <sup>-3</sup>	S=1.8
Γ <sub>35</sub>	$\pi^- \bar{K}^0 \nu_\tau$	[a] ( 8.4 ±0.4 ) × 10 <sup>-3</sup>	S=2.0
Γ <sub>36</sub>	$\pi^- \bar{K}^0 \text{ (non-} K^*(892)^- ) \nu_\tau$	( 5.4 ±2.1 ) × 10 <sup>-4</sup>	
Γ <sub>37</sub>	$K^- K^0 \nu_\tau$	[a] ( 1.58±0.16 ) × 10 <sup>-3</sup>	
Γ <sub>38</sub>	$K^- K^0 \geq 0\pi^0 \nu_\tau$	( 3.16±0.23 ) × 10 <sup>-3</sup>	
Γ <sub>39</sub>	$h^- \bar{K}^0 \pi^0 \nu_\tau$	( 5.5 ±0.4 ) × 10 <sup>-3</sup>	
Γ <sub>40</sub>	$\pi^- \bar{K}^0 \pi^0 \nu_\tau$	[a] ( 3.9 ±0.4 ) × 10 <sup>-3</sup>	
Γ <sub>41</sub>	$\bar{K}^0 \rho^- \nu_\tau$	( 2.2 ±0.5 ) × 10 <sup>-3</sup>	
Γ <sub>42</sub>	$K^- K^0 \pi^0 \nu_\tau$	[a] ( 1.58±0.20 ) × 10 <sup>-3</sup>	
Γ <sub>43</sub>	$\pi^- \bar{K}^0 \geq 1\pi^0 \nu_\tau$	( 3.2 ±1.0 ) × 10 <sup>-3</sup>	
Γ <sub>44</sub>	$\pi^- \bar{K}^0 \pi^0 \pi^0 \nu_\tau$	( 2.6 ±2.4 ) × 10 <sup>-4</sup>	
Γ <sub>45</sub>	$K^- K^0 \pi^0 \pi^0 \nu_\tau$	< 1.6 × 10 <sup>-4</sup>	CL=95%
Γ <sub>46</sub>	$\pi^- K^0 \bar{K}^0 \nu_\tau$	( 1.7 ±0.4 ) × 10 <sup>-3</sup>	S=1.6
Γ <sub>47</sub>	$\pi^- K_S^0 K_S^0 \nu_\tau$	[a] ( 2.4 ±0.5 ) × 10 <sup>-4</sup>	
Γ <sub>48</sub>	$\pi^- K_S^0 K_L^0 \nu_\tau$	[a] ( 1.2 ±0.4 ) × 10 <sup>-3</sup>	S=1.7
Γ <sub>49</sub>	$\pi^- K^0 \bar{K}^0 \pi^0 \nu_\tau$	( 3.1 ±2.3 ) × 10 <sup>-4</sup>	
Γ <sub>50</sub>	$\pi^- K_S^0 K_S^0 \pi^0 \nu_\tau$	< 2.0 × 10 <sup>-4</sup>	CL=95%

$\Gamma_{51}$	$\pi^- K_S^0 K_L^0 \pi^0 \nu_\tau$	$(3.1 \pm 1.2) \times 10^{-4}$	
$\Gamma_{52}$	$K^0 h^+ h^- h^- \geq 0$ neutrals $\nu_\tau$	$< 1.7 \times 10^{-3}$	CL=95%
$\Gamma_{53}$	$K^0 h^+ h^- h^- \nu_\tau$	$(2.3 \pm 2.0) \times 10^{-4}$	
<b>Modes with three charged particles</b>			
$\Gamma_{54}$	$h^- h^- h^+ \geq 0$ neutrals $\geq 0 K_L^0 \nu_\tau$	$(15.18 \pm 0.08) \%$	S=1.4
$\Gamma_{55}$	$h^- h^- h^+ \geq 0$ neutrals $\nu_\tau$ (ex. $K_S^0 \rightarrow \pi^+ \pi^-$ ) ("3-prong")	$(14.56 \pm 0.08) \%$	S=1.3
$\Gamma_{56}$	$h^- h^- h^+ \nu_\tau$	$(9.80 \pm 0.08) \%$	S=1.4
$\Gamma_{57}$	$h^- h^- h^+ \nu_\tau$ (ex. $K^0$ )	$(9.45 \pm 0.07) \%$	S=1.3
$\Gamma_{58}$	$h^- h^- h^+ \nu_\tau$ (ex. $K^0, \omega$ )	$(9.42 \pm 0.07) \%$	S=1.3
$\Gamma_{59}$	$\pi^- \pi^+ \pi^- \nu_\tau$	$(9.32 \pm 0.07) \%$	S=1.2
$\Gamma_{60}$	$\pi^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0$ )	$(9.03 \pm 0.06) \%$	S=1.2
$\Gamma_{61}$	$\pi^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0$ ), non-axial vector	$< 2.4 \%$	CL=95%
$\Gamma_{62}$	$\pi^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0, \omega$ )	[a] $(8.99 \pm 0.06) \%$	S=1.2
$\Gamma_{63}$	$h^- h^- h^+ \geq 1$ neutrals $\nu_\tau$	$(5.38 \pm 0.07) \%$	S=1.2
$\Gamma_{64}$	$h^- h^- h^+ \geq 1 \pi^0 \nu_\tau$ (ex. $K^0$ )	$(5.08 \pm 0.06) \%$	S=1.1
$\Gamma_{65}$	$h^- h^- h^+ \pi^0 \nu_\tau$	$(4.75 \pm 0.06) \%$	S=1.2
$\Gamma_{66}$	$h^- h^- h^+ \pi^0 \nu_\tau$ (ex. $K^0$ )	$(4.56 \pm 0.06) \%$	S=1.2
$\Gamma_{67}$	$h^- h^- h^+ \pi^0 \nu_\tau$ (ex. $K^0, \omega$ )	$(2.79 \pm 0.08) \%$	S=1.2
$\Gamma_{68}$	$\pi^- \pi^+ \pi^- \pi^0 \nu_\tau$	$(4.61 \pm 0.06) \%$	S=1.1
$\Gamma_{69}$	$\pi^- \pi^+ \pi^- \pi^0 \nu_\tau$ (ex. $K^0$ )	$(4.48 \pm 0.06) \%$	S=1.1
$\Gamma_{70}$	$\pi^- \pi^+ \pi^- \pi^0 \nu_\tau$ (ex. $K^0, \omega$ )	[a] $(2.70 \pm 0.08) \%$	S=1.2
$\Gamma_{71}$	$h^- \rho \pi^0 \nu_\tau$		
$\Gamma_{72}$	$h^- \rho^+ h^- \nu_\tau$		
$\Gamma_{73}$	$h^- \rho^- h^+ \nu_\tau$		
$\Gamma_{74}$	$h^- h^- h^+ \geq 2 \pi^0 \nu_\tau$ (ex. $K^0$ )	$(5.16 \pm 0.33) \times 10^{-3}$	
$\Gamma_{75}$	$h^- h^- h^+ 2 \pi^0 \nu_\tau$	$(5.04 \pm 0.32) \times 10^{-3}$	
$\Gamma_{76}$	$h^- h^- h^+ 2 \pi^0 \nu_\tau$ (ex. $K^0$ )	$(4.94 \pm 0.32) \times 10^{-3}$	
$\Gamma_{77}$	$h^- h^- h^+ 2 \pi^0 \nu_\tau$ (ex. $K^0, \omega, \eta$ )	[a] $(9 \pm 4) \times 10^{-4}$	
$\Gamma_{78}$	$h^- h^- h^+ 3 \pi^0 \nu_\tau$	[a] $(2.3 \pm 0.6) \times 10^{-4}$	S=1.2
$\Gamma_{79}$	$K^- h^+ h^- \geq 0$ neutrals $\nu_\tau$	$(6.24 \pm 0.24) \times 10^{-3}$	S=1.5
$\Gamma_{80}$	$K^- h^+ \pi^- \nu_\tau$ (ex. $K^0$ )	$(4.27 \pm 0.19) \times 10^{-3}$	S=2.4
$\Gamma_{81}$	$K^- h^+ \pi^- \pi^0 \nu_\tau$ (ex. $K^0$ )	$(8.7 \pm 1.2) \times 10^{-4}$	S=1.1
$\Gamma_{82}$	$K^- \pi^+ \pi^- \geq 0$ neutrals $\nu_\tau$	$(4.78 \pm 0.21) \times 10^{-3}$	S=1.3
$\Gamma_{83}$	$K^- \pi^+ \pi^- \geq 0 \pi^0 \nu_\tau$ (ex. $K^0$ )	$(3.68 \pm 0.19) \times 10^{-3}$	S=1.4
$\Gamma_{84}$	$K^- \pi^+ \pi^- \nu_\tau$	$(3.41 \pm 0.16) \times 10^{-3}$	S=1.8
$\Gamma_{85}$	$K^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0$ )	[a] $(2.87 \pm 0.16) \times 10^{-3}$	S=2.1
$\Gamma_{86}$	$K^- \rho^0 \nu_\tau \rightarrow$ $K^- \pi^+ \pi^- \nu_\tau$	$(1.4 \pm 0.5) \times 10^{-3}$	
$\Gamma_{87}$	$K^- \pi^+ \pi^- \pi^0 \nu_\tau$	$(1.35 \pm 0.14) \times 10^{-3}$	

$\Gamma_{88}$	$K^- \pi^+ \pi^- \pi^0 \nu_\tau$ (ex. $K^0$ )		$( 8.1 \pm 1.2 ) \times 10^{-4}$	
$\Gamma_{89}$	$K^- \pi^+ \pi^- \pi^0 \nu_\tau$ (ex. $K^0, \eta$ )	[a]	$( 7.5 \pm 1.2 ) \times 10^{-4}$	
$\Gamma_{90}$	$K^- \pi^+ \pi^- \pi^0 \nu_\tau$ (ex. $K^0, \omega$ )		$( 3.7 \pm 0.9 ) \times 10^{-4}$	
$\Gamma_{91}$	$K^- \pi^+ K^- \geq 0$ neut. $\nu_\tau$		$< 9$	$\times 10^{-4}$ CL=95%
$\Gamma_{92}$	$K^- K^+ \pi^- \geq 0$ neut. $\nu_\tau$		$( 1.46 \pm 0.06 ) \times 10^{-3}$	S=1.6
$\Gamma_{93}$	$K^- K^+ \pi^- \nu_\tau$	[a]	$( 1.40 \pm 0.05 ) \times 10^{-3}$	S=1.7
$\Gamma_{94}$	$K^- K^+ \pi^- \pi^0 \nu_\tau$	[a]	$( 6.1 \pm 2.5 ) \times 10^{-5}$	S=1.4
$\Gamma_{95}$	$K^- K^+ K^- \geq 0$ neut. $\nu_\tau$		$< 2.1$	$\times 10^{-3}$ CL=95%
$\Gamma_{96}$	$K^- K^+ K^- \nu_\tau$		$( 1.58 \pm 0.18 ) \times 10^{-5}$	
$\Gamma_{97}$	$K^- K^+ K^- \nu_\tau$ (ex. $\phi$ )		$< 2.5$	$\times 10^{-6}$ CL=90%
$\Gamma_{98}$	$K^- K^+ K^- \pi^0 \nu_\tau$		$< 4.8$	$\times 10^{-6}$ CL=90%
$\Gamma_{99}$	$\pi^- K^+ \pi^- \geq 0$ neut. $\nu_\tau$		$< 2.5$	$\times 10^{-3}$ CL=95%
$\Gamma_{100}$	$e^- e^- e^+ \bar{\nu}_e \nu_\tau$		$( 2.8 \pm 1.5 ) \times 10^{-5}$	
$\Gamma_{101}$	$\mu^- e^- e^+ \bar{\nu}_\mu \nu_\tau$		$< 3.6$	$\times 10^{-5}$ CL=90%

### Modes with five charged particles

$\Gamma_{102}$	$3h^- 2h^+ \geq 0$ neutrals $\nu_\tau$ (ex. $K_S^0 \rightarrow \pi^- \pi^+$ ) ("5-prong")		$( 1.02 \pm 0.04 ) \times 10^{-3}$	S=1.1
$\Gamma_{103}$	$3h^- 2h^+ \nu_\tau$ (ex. $K^0$ )	[a]	$( 8.39 \pm 0.35 ) \times 10^{-4}$	S=1.1
$\Gamma_{104}$	$3h^- 2h^+ \pi^0 \nu_\tau$ (ex. $K^0$ )	[a]	$( 1.78 \pm 0.27 ) \times 10^{-4}$	
$\Gamma_{105}$	$3h^- 2h^+ 2\pi^0 \nu_\tau$		$< 3.4$	$\times 10^{-6}$ CL=90%

### Miscellaneous other allowed modes

$\Gamma_{106}$	$(5\pi)^- \nu_\tau$		$( 7.6 \pm 0.5 ) \times 10^{-3}$	
$\Gamma_{107}$	$4h^- 3h^+ \geq 0$ neutrals $\nu_\tau$ ("7-prong")		$< 3.0$	$\times 10^{-7}$ CL=90%
$\Gamma_{108}$	$4h^- 3h^+ \nu_\tau$		$< 4.3$	$\times 10^{-7}$ CL=90%
$\Gamma_{109}$	$4h^- 3h^+ \pi^0 \nu_\tau$		$< 2.5$	$\times 10^{-7}$ CL=90%
$\Gamma_{110}$	$X^-(S=-1) \nu_\tau$		$( 2.85 \pm 0.07 ) \%$	S=1.3
$\Gamma_{111}$	$K^*(892)^- \geq 0$ neutrals $\geq$ $0K_L^0 \nu_\tau$		$( 1.42 \pm 0.18 ) \%$	S=1.4
$\Gamma_{112}$	$K^*(892)^- \nu_\tau$		$( 1.20 \pm 0.07 ) \%$	S=1.8
$\Gamma_{113}$	$K^*(892)^- \nu_\tau \rightarrow \pi^- \bar{K}^0 \nu_\tau$		$( 7.8 \pm 0.5 ) \times 10^{-3}$	
$\Gamma_{114}$	$K^*(892)^0 K^- \geq 0$ neutrals $\nu_\tau$		$( 3.2 \pm 1.4 ) \times 10^{-3}$	
$\Gamma_{115}$	$K^*(892)^0 K^- \nu_\tau$		$( 2.1 \pm 0.4 ) \times 10^{-3}$	
$\Gamma_{116}$	$\bar{K}^*(892)^0 \pi^- \geq 0$ neutrals $\nu_\tau$		$( 3.8 \pm 1.7 ) \times 10^{-3}$	
$\Gamma_{117}$	$\bar{K}^*(892)^0 \pi^- \nu_\tau$		$( 2.2 \pm 0.5 ) \times 10^{-3}$	
$\Gamma_{118}$	$(\bar{K}^*(892)\pi)^- \nu_\tau \rightarrow$ $\pi^- \bar{K}^0 \pi^0 \nu_\tau$		$( 1.0 \pm 0.4 ) \times 10^{-3}$	
$\Gamma_{119}$	$K_1(1270)^- \nu_\tau$		$( 4.7 \pm 1.1 ) \times 10^{-3}$	
$\Gamma_{120}$	$K_1(1400)^- \nu_\tau$		$( 1.7 \pm 2.6 ) \times 10^{-3}$	S=1.7
$\Gamma_{121}$	$K^*(1410)^- \nu_\tau$		$( 1.5 \begin{smallmatrix} +1.4 \\ -1.0 \end{smallmatrix} ) \times 10^{-3}$	
$\Gamma_{122}$	$K_0^*(1430)^- \nu_\tau$		$< 5$	$\times 10^{-4}$ CL=95%



$\Gamma_{123}$	$K_2^*(1430)^- \nu_\tau$		$< 3 \times 10^{-3}$	CL=95%
$\Gamma_{124}$	$a_0(980)^- \geq 0$ neutrals $\nu_\tau$			
$\Gamma_{125}$	$\eta \pi^- \nu_\tau$		$< 1.4 \times 10^{-4}$	CL=95%
$\Gamma_{126}$	$\eta \pi^- \pi^0 \nu_\tau$	[a]	$(1.81 \pm 0.24) \times 10^{-3}$	
$\Gamma_{127}$	$\eta \pi^- \pi^0 \pi^0 \nu_\tau$		$(1.5 \pm 0.5) \times 10^{-4}$	
$\Gamma_{128}$	$\eta K^- \nu_\tau$	[a]	$(2.7 \pm 0.6) \times 10^{-4}$	
$\Gamma_{129}$	$\eta K^*(892)^- \nu_\tau$		$(2.9 \pm 0.9) \times 10^{-4}$	
$\Gamma_{130}$	$\eta K^- \pi^0 \nu_\tau$		$(1.8 \pm 0.9) \times 10^{-4}$	
$\Gamma_{131}$	$\eta \bar{K}^0 \pi^- \nu_\tau$		$(2.2 \pm 0.7) \times 10^{-4}$	
$\Gamma_{132}$	$\eta \pi^+ \pi^- \pi^- \geq 0$ neutrals $\nu_\tau$		$< 3 \times 10^{-3}$	CL=90%
$\Gamma_{133}$	$\eta \pi^- \pi^+ \pi^- \nu_\tau$		$(2.3 \pm 0.5) \times 10^{-4}$	
$\Gamma_{134}$	$\eta a_1(1260)^- \nu_\tau \rightarrow \eta \pi^- \rho^0 \nu_\tau$		$< 3.9 \times 10^{-4}$	CL=90%
$\Gamma_{135}$	$\eta \eta \pi^- \nu_\tau$		$< 1.1 \times 10^{-4}$	CL=95%
$\Gamma_{136}$	$\eta \eta \pi^- \pi^0 \nu_\tau$		$< 2.0 \times 10^{-4}$	CL=95%
$\Gamma_{137}$	$\eta'(958) \pi^- \nu_\tau$		$< 7.4 \times 10^{-5}$	CL=90%
$\Gamma_{138}$	$\eta'(958) \pi^- \pi^0 \nu_\tau$		$< 8.0 \times 10^{-5}$	CL=90%
$\Gamma_{139}$	$\phi \pi^- \nu_\tau$		$(3.4 \pm 0.6) \times 10^{-5}$	
$\Gamma_{140}$	$\phi K^- \nu_\tau$		$(3.70 \pm 0.33) \times 10^{-5}$	S=1.3
$\Gamma_{141}$	$f_1(1285) \pi^- \nu_\tau$		$(4.1 \pm 0.8) \times 10^{-4}$	
$\Gamma_{142}$	$f_1(1285) \pi^- \nu_\tau \rightarrow$ $\eta \pi^- \pi^+ \pi^- \nu_\tau$		$(1.3 \pm 0.4) \times 10^{-4}$	
$\Gamma_{143}$	$\pi(1300)^- \nu_\tau \rightarrow (\rho \pi)^- \nu_\tau \rightarrow$ $(3\pi)^- \nu_\tau$		$< 1.0 \times 10^{-4}$	CL=90%
$\Gamma_{144}$	$\pi(1300)^- \nu_\tau \rightarrow$ $((\pi \pi)_{S\text{-wave}} \pi)^- \nu_\tau \rightarrow$ $(3\pi)^- \nu_\tau$		$< 1.9 \times 10^{-4}$	CL=90%
$\Gamma_{145}$	$h^- \omega \geq 0$ neutrals $\nu_\tau$		$(2.40 \pm 0.09) \%$	S=1.2
$\Gamma_{146}$	$h^- \omega \nu_\tau$	[a]	$(1.99 \pm 0.08) \%$	S=1.3
$\Gamma_{147}$	$K^- \omega \nu_\tau$		$(4.1 \pm 0.9) \times 10^{-4}$	
$\Gamma_{148}$	$h^- \omega \pi^0 \nu_\tau$	[a]	$(4.1 \pm 0.4) \times 10^{-3}$	
$\Gamma_{149}$	$h^- \omega 2\pi^0 \nu_\tau$		$(1.4 \pm 0.5) \times 10^{-4}$	
$\Gamma_{150}$	$h^- 2\omega \nu_\tau$		$< 5.4 \times 10^{-7}$	CL=90%
$\Gamma_{151}$	$2h^- h^+ \omega \nu_\tau$		$(1.20 \pm 0.22) \times 10^{-4}$	

**Lepton Family number (LF), Lepton number (L),  
or Baryon number (B) violating modes**

*L* means lepton number violation (e.g.  $\tau^- \rightarrow e^+ \pi^- \pi^-$ ). Following common usage, *LF* means lepton family violation *and not* lepton number violation (e.g.  $\tau^- \rightarrow e^- \pi^+ \pi^-$ ). *B* means baryon number violation.

$\Gamma_{152}$	$e^- \gamma$	<i>LF</i>	$< 1.1 \times 10^{-7}$	CL=90%
$\Gamma_{153}$	$\mu^- \gamma$	<i>LF</i>	$< 6.8 \times 10^{-8}$	CL=90%
$\Gamma_{154}$	$e^- \pi^0$	<i>LF</i>	$< 8.0 \times 10^{-8}$	CL=90%
$\Gamma_{155}$	$\mu^- \pi^0$	<i>LF</i>	$< 1.1 \times 10^{-7}$	CL=90%
$\Gamma_{156}$	$e^- K_S^0$	<i>LF</i>	$< 5.6 \times 10^{-8}$	CL=90%

Γ <sub>157</sub>	$\mu^- K_S^0$	LF	< 4.9	$\times 10^{-8}$	CL=90%
Γ <sub>158</sub>	$e^- \eta$	LF	< 9.2	$\times 10^{-8}$	CL=90%
Γ <sub>159</sub>	$\mu^- \eta$	LF	< 6.5	$\times 10^{-8}$	CL=90%
Γ <sub>160</sub>	$e^- \rho^0$	LF	< 6.3	$\times 10^{-8}$	CL=90%
Γ <sub>161</sub>	$\mu^- \rho^0$	LF	< 6.8	$\times 10^{-8}$	CL=90%
Γ <sub>162</sub>	$e^- \omega$	LF	< 1.1	$\times 10^{-7}$	CL=90%
Γ <sub>163</sub>	$\mu^- \omega$	LF	< 8.9	$\times 10^{-8}$	CL=90%
Γ <sub>164</sub>	$e^- K^*(892)^0$	LF	< 7.8	$\times 10^{-8}$	CL=90%
Γ <sub>165</sub>	$\mu^- K^*(892)^0$	LF	< 5.9	$\times 10^{-8}$	CL=90%
Γ <sub>166</sub>	$e^- \bar{K}^*(892)^0$	LF	< 7.7	$\times 10^{-8}$	CL=90%
Γ <sub>167</sub>	$\mu^- \bar{K}^*(892)^0$	LF	< 1.0	$\times 10^{-7}$	CL=90%
Γ <sub>168</sub>	$e^- \eta'(958)$	LF	< 1.6	$\times 10^{-7}$	CL=90%
Γ <sub>169</sub>	$\mu^- \eta'(958)$	LF	< 1.3	$\times 10^{-7}$	CL=90%
Γ <sub>170</sub>	$e^- \phi$	LF	< 7.3	$\times 10^{-8}$	CL=90%
Γ <sub>171</sub>	$\mu^- \phi$	LF	< 1.3	$\times 10^{-7}$	CL=90%
Γ <sub>172</sub>	$e^- e^+ e^-$	LF	< 3.6	$\times 10^{-8}$	CL=90%
Γ <sub>173</sub>	$e^- \mu^+ \mu^-$	LF	< 3.7	$\times 10^{-8}$	CL=90%
Γ <sub>174</sub>	$e^+ \mu^- \mu^-$	LF	< 2.3	$\times 10^{-8}$	CL=90%
Γ <sub>175</sub>	$\mu^- e^+ e^-$	LF	< 2.7	$\times 10^{-8}$	CL=90%
Γ <sub>176</sub>	$\mu^+ e^- e^-$	LF	< 2.0	$\times 10^{-8}$	CL=90%
Γ <sub>177</sub>	$\mu^- \mu^+ \mu^-$	LF	< 3.2	$\times 10^{-8}$	CL=90%
Γ <sub>178</sub>	$e^- \pi^+ \pi^-$	LF	< 1.2	$\times 10^{-7}$	CL=90%
Γ <sub>179</sub>	$e^+ \pi^- \pi^-$	L	< 2.0	$\times 10^{-7}$	CL=90%
Γ <sub>180</sub>	$\mu^- \pi^+ \pi^-$	LF	< 2.9	$\times 10^{-7}$	CL=90%
Γ <sub>181</sub>	$\mu^+ \pi^- \pi^-$	L	< 7	$\times 10^{-8}$	CL=90%
Γ <sub>182</sub>	$e^- \pi^+ K^-$	LF	< 3.2	$\times 10^{-7}$	CL=90%
Γ <sub>183</sub>	$e^- \pi^- K^+$	LF	< 1.6	$\times 10^{-7}$	CL=90%
Γ <sub>184</sub>	$e^+ \pi^- K^-$	L	< 1.8	$\times 10^{-7}$	CL=90%
Γ <sub>185</sub>	$e^- K_S^0 K_S^0$	LF	< 2.2	$\times 10^{-6}$	CL=90%
Γ <sub>186</sub>	$e^- K^+ K^-$	LF	< 1.4	$\times 10^{-7}$	CL=90%
Γ <sub>187</sub>	$e^+ K^- K^-$	L	< 1.5	$\times 10^{-7}$	CL=90%
Γ <sub>188</sub>	$\mu^- \pi^+ K^-$	LF	< 2.6	$\times 10^{-7}$	CL=90%
Γ <sub>189</sub>	$\mu^- \pi^- K^+$	LF	< 3.2	$\times 10^{-7}$	CL=90%
Γ <sub>190</sub>	$\mu^+ \pi^- K^-$	L	< 2.2	$\times 10^{-7}$	CL=90%
Γ <sub>191</sub>	$\mu^- K_S^0 K_S^0$	LF	< 3.4	$\times 10^{-6}$	CL=90%
Γ <sub>192</sub>	$\mu^- K^+ K^-$	LF	< 2.5	$\times 10^{-7}$	CL=90%
Γ <sub>193</sub>	$\mu^+ K^- K^-$	L	< 4.4	$\times 10^{-7}$	CL=90%
Γ <sub>194</sub>	$e^- \pi^0 \pi^0$	LF	< 6.5	$\times 10^{-6}$	CL=90%
Γ <sub>195</sub>	$\mu^- \pi^0 \pi^0$	LF	< 1.4	$\times 10^{-5}$	CL=90%
Γ <sub>196</sub>	$e^- \eta \eta$	LF	< 3.5	$\times 10^{-5}$	CL=90%
Γ <sub>197</sub>	$\mu^- \eta \eta$	LF	< 6.0	$\times 10^{-5}$	CL=90%
Γ <sub>198</sub>	$e^- \pi^0 \eta$	LF	< 2.4	$\times 10^{-5}$	CL=90%
Γ <sub>199</sub>	$\mu^- \pi^0 \eta$	LF	< 2.2	$\times 10^{-5}$	CL=90%
Γ <sub>200</sub>	$\bar{p} \gamma$	L,B	< 3.5	$\times 10^{-6}$	CL=90%

$\Gamma_{201}$	$\bar{p}\pi^0$	$L,B$	$< 1.5$	$\times 10^{-5}$	CL=90%
$\Gamma_{202}$	$\bar{p}2\pi^0$	$L,B$	$< 3.3$	$\times 10^{-5}$	CL=90%
$\Gamma_{203}$	$\bar{p}\eta$	$L,B$	$< 8.9$	$\times 10^{-6}$	CL=90%
$\Gamma_{204}$	$\bar{p}\pi^0\eta$	$L,B$	$< 2.7$	$\times 10^{-5}$	CL=90%
$\Gamma_{205}$	$\Lambda\pi^-$	$L,B$	$< 7.2$	$\times 10^{-8}$	CL=90%
$\Gamma_{206}$	$\bar{\Lambda}\pi^-$	$L,B$	$< 1.4$	$\times 10^{-7}$	CL=90%
$\Gamma_{207}$	$e^-$ light boson	$LF$	$< 2.7$	$\times 10^{-3}$	CL=95%
$\Gamma_{208}$	$\mu^-$ light boson	$LF$	$< 5$	$\times 10^{-3}$	CL=95%

[a] Basis mode for the  $\tau$ .

[b] See the Particle Listings below for the energy limits used in this measurement.

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### CONSTRAINED FIT INFORMATION

An overall fit to 64 branching ratios uses 130 measurements and one constraint to determine 31 parameters. The overall fit has a  $\chi^2 = 95.7$  for 100 degrees of freedom.

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

$x_5$	-13										
$x_9$	-3	-4									
$x_{10}$	0	1	-22								
$x_{14}$	-14	-15	-15	-1							
$x_{16}$	0	0	-1	-1	-5						
$x_{20}$	-3	-5	-10	-6	-51	-3					
$x_{23}$	-1	0	-1	-2	-1	-11	-8				
$x_{27}$	-3	-2	-10	-1	0	0	-24	-1			
$x_{28}$	-1	0	0	-2	1	-10	-5	-17	-11		
$x_{30}$	-2	-2	-12	1	-11	-1	12	-2	-39	1	
$x_{35}$	-7	-6	-7	-1	-1	0	-11	0	-5	0	
$x_{37}$	-2	-2	-1	-1	0	-6	-1	-10	0	-9	
$x_{40}$	-5	-4	-6	0	-1	1	-9	2	-6	2	
$x_{42}$	-1	-1	0	-2	1	-8	1	-13	1	-13	
$x_{47}$	0	0	0	0	0	0	-1	0	0	0	
$x_{48}$	-5	-4	-6	-1	-1	1	-9	1	-3	1	
$x_{62}$	-8	-7	2	0	2	1	-27	1	-16	1	
$x_{70}$	-3	-3	-5	3	-8	1	-1	1	-2	0	
$x_{77}$	1	1	-2	-1	-3	0	5	-1	4	-1	
$x_{78}$	0	0	0	0	1	0	-2	0	-1	0	
$x_{85}$	-4	-3	-1	-1	2	0	-17	0	-9	0	
$x_{89}$	0	1	0	0	2	0	-4	0	-2	0	
$x_{93}$	-3	-3	-1	0	2	0	-15	0	-8	0	
$x_{94}$	0	0	0	0	0	0	-1	0	0	0	
$x_{103}$	1	0	0	-1	-1	-1	3	-1	2	0	
$x_{104}$	-1	0	-1	0	-2	0	2	0	1	0	
$x_{126}$	-2	-2	-2	-1	0	0	-7	0	-1	0	
$x_{128}$	0	0	0	0	0	-2	-1	-3	-1	-3	
$x_{146}$	-3	-3	-4	1	-3	0	-4	0	-2	0	
$x_{148}$	0	-1	-4	-1	-4	-1	2	-1	4	-2	
	$x_3$	$x_5$	$x_9$	$x_{10}$	$x_{14}$	$x_{16}$	$x_{20}$	$x_{23}$	$x_{27}$	$x_{28}$	

x35	-1									
x37	0	-3								
x40	0	-10	0							
x42	0	-2	-17	-19						
x47	0	-2	-1	-2	0					
x48	-1	-22	-6	-17	-5	-4				
x62	-9	0	0	1	0	0	0			
x70	3	3	1	3	0	0	2	-14		
x77	4	-2	0	-1	0	0	-1	-4	-7	
x78	-1	0	0	0	0	0	0	0	-1	-1
x85	-5	-1	0	-1	0	0	-1	37	-8	-2
x89	-1	-1	0	-1	0	0	-1	-2	-7	-1
x93	-4	-1	0	-1	0	0	-1	35	-7	-2
x94	0	0	0	0	0	0	0	0	-1	0
x103	0	-2	0	-2	0	0	-2	-4	-1	1
x104	-1	0	0	0	0	0	0	-2	0	1
x126	-7	-2	0	-1	0	0	-1	0	1	-16
x128	0	0	-2	0	-2	0	0	0	0	0
x146	1	0	0	0	0	0	0	-8	-69	-4
x148	3	-3	0	-3	0	0	-2	-5	-9	-60
	x30	x35	x37	x40	x42	x47	x48	x62	x70	x77

x85	0									
x89	-1	-2								
x93	0	69	-2							
x94	0	0	-3	0						
x103	0	-3	-1	-3	0					
x104	0	-1	0	-1	0	-5				
x126	0	-1	0	0	0	-1	0			
x128	0	0	-12	0	0	0	0	0		
x146	-1	-4	3	-3	0	-1	0	0	0	
x148	-2	-3	-2	-3	0	1	1	-2	0	-5
	x78	x85	x89	x93	x94	x103	x104	x126	x128	x146

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### $\tau^-$ BRANCHING RATIOS

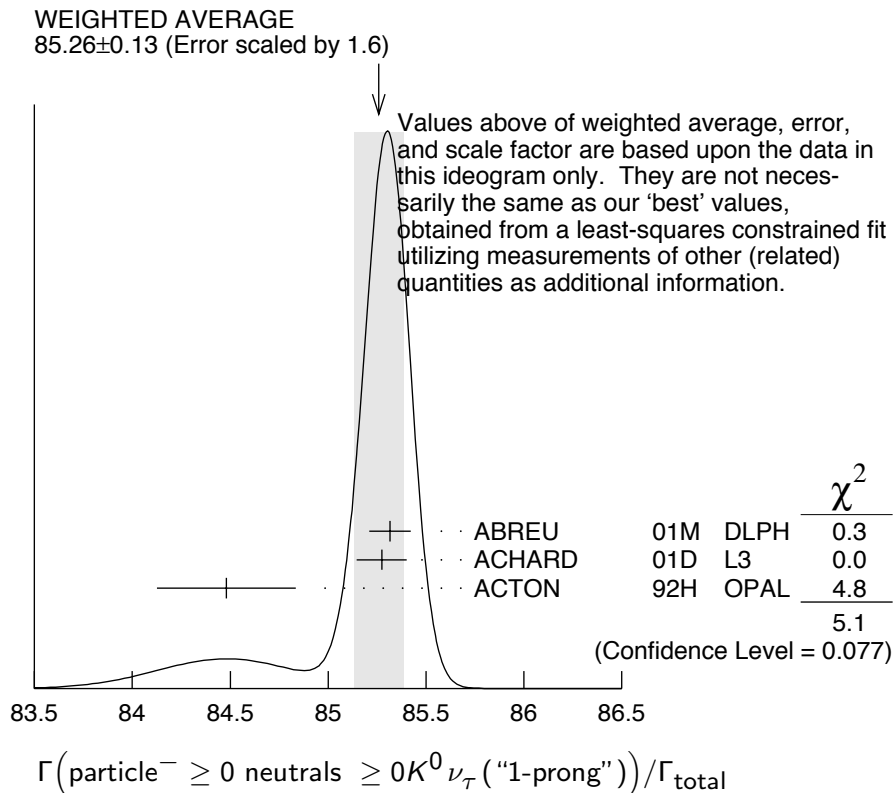
$$\Gamma(\text{particle}^- \geq 0 \text{ neutrals} \geq 0 K^0 \nu_\tau \text{ ("1-prong")}) / \Gamma_{\text{total}} \quad \Gamma_1 / \Gamma$$

$$\Gamma_1 / \Gamma = (\Gamma_3 + \Gamma_5 + \Gamma_9 + \Gamma_{10} + \Gamma_{14} + \Gamma_{16} + \Gamma_{20} + \Gamma_{23} + \Gamma_{27} + \Gamma_{28} + \Gamma_{30} + \Gamma_{35} + \Gamma_{37} + \Gamma_{40} + \Gamma_{42} + 2\Gamma_{47} + \Gamma_{48} + 0.708\Gamma_{126} + 0.715\Gamma_{128} + 0.09\Gamma_{146} + 0.09\Gamma_{148}) / \Gamma$$

The charged particle here can be  $e$ ,  $\mu$ , or hadron. In many analyses, the sum of the topological branching fractions (1, 3, and 5 prongs) is constrained to be unity. Since the 5-prong fraction is very small, the measured 1-prong and 3-prong fractions are highly correlated and cannot be treated as independent quantities in our overall fit. We arbitrarily choose to use the 3-prong fraction in our fit, and leave the 1-prong fraction out. We do, however, use these 1-prong measurements in our average below. The measurements used only for the average are marked "avg," whereas "f&a" marks a result used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>85.36 ± 0.08</b>	<b>OUR FIT</b>				Error includes scale factor of 1.3.
<b>85.26 ± 0.13</b>	<b>OUR AVERAGE</b>				Error includes scale factor of 1.6. See the ideogram below.
85.316 ± 0.093 ± 0.049	avg	78k	<sup>1</sup> ABREU	01M DLPH	1992–1995 LEP runs
85.274 ± 0.105 ± 0.073	avg		<sup>2</sup> ACHARD	01D L3	1992–1995 LEP runs
84.48 ± 0.27 ± 0.23	avg		ACTON	92H OPAL	1990–1991 LEP runs
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
85.45 <sup>+0.69</sup> <sub>-0.73</sub> ± 0.65			DECAMP	92C ALEP	Repl. by SCHAEEL 05C

- <sup>1</sup> The correlation coefficients between this measurement and the ABREU 01M measurements of  $B(\tau \rightarrow 3\text{-prong})$  and  $B(\tau \rightarrow 5\text{-prong})$  are  $-0.98$  and  $-0.08$  respectively.  
<sup>2</sup> The correlation coefficients between this measurement and the ACHARD 01D measurements of  $B(\tau \rightarrow "3\text{-prong}")$  and  $B(\tau \rightarrow "5\text{-prong}")$  are  $-0.978$  and  $-0.082$  respectively.



$$\Gamma(\text{particle}^- \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_2 / \Gamma$$

$$\Gamma_2 / \Gamma = (\Gamma_3 + \Gamma_5 + \Gamma_9 + \Gamma_{10} + \Gamma_{14} + \Gamma_{16} + \Gamma_{20} + \Gamma_{23} + \Gamma_{27} + \Gamma_{28} + \Gamma_{30} + 0.6569\Gamma_{35} + 0.6569\Gamma_{37} + 0.6569\Gamma_{40} + 0.6569\Gamma_{42} + 1.0985\Gamma_{47} + 0.3139\Gamma_{48} + 0.708\Gamma_{126} + 0.715\Gamma_{128} + 0.09\Gamma_{146} + 0.09\Gamma_{148}) / \Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>84.73 ± 0.08 OUR FIT</b>	Error includes scale factor of 1.4.			
<b>85.1 ± 0.4 OUR AVERAGE</b>				
85.6 ± 0.6 ± 0.3	avg 3300	<sup>1</sup> ADEVA	91F L3	$E_{\text{cm}}^{ee} = 88.3\text{--}94.3 \text{ GeV}$
84.9 ± 0.4 ± 0.3	avg	BEHREND	89B CELL	$E_{\text{cm}}^{ee} = 14\text{--}47 \text{ GeV}$
84.7 ± 0.8 ± 0.6	avg	<sup>2</sup> AIHARA	87B TPC	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
86.4 ± 0.3 ± 0.3		ABACHI	89B HRS	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
87.1 ± 1.0 ± 0.7		<sup>3</sup> BURCHAT	87 MRK2	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
87.2 ± 0.5 ± 0.8		SCHMIDKE	86 MRK2	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
84.7 ± 1.1 $\begin{smallmatrix} +1.6 \\ -1.3 \end{smallmatrix}$	169	<sup>4</sup> ALTHOFF	85 TASS	$E_{\text{cm}}^{ee} = 34.5 \text{ GeV}$
86.1 ± 0.5 ± 0.9		BARTEL	85F JADE	$E_{\text{cm}}^{ee} = 34.6 \text{ GeV}$
87.8 ± 1.3 ± 3.9		<sup>5</sup> BERGER	85 PLUT	$E_{\text{cm}}^{ee} = 34.6 \text{ GeV}$
86.7 ± 0.3 ± 0.6		FERNANDEZ	85 MAC	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$

<sup>1</sup> Not independent of ADEVA 91F  $\Gamma(h^- h^- h^+ \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma_{\text{total}}$  value.  
<sup>2</sup> Not independent of AIHARA 87B  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) / \Gamma_{\text{total}}$ ,  $\Gamma(e^- \bar{\nu}_e \nu_\tau) / \Gamma_{\text{total}}$ , and  $\Gamma(h^- \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma_{\text{total}}$  values.  
<sup>3</sup> Not independent of SCHMIDKE 86 value (also not independent of BURCHAT 87 value for  $\Gamma(h^- h^- h^+ \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma_{\text{total}}$ .  
<sup>4</sup> Not independent of ALTHOFF 85  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) / \Gamma_{\text{total}}$ ,  $\Gamma(e^- \bar{\nu}_e \nu_\tau) / \Gamma_{\text{total}}$ ,  $\Gamma(h^- \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma_{\text{total}}$ , and  $\Gamma(h^- h^- h^+ \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma_{\text{total}}$  values.  
<sup>5</sup> Not independent of (1-prong +  $0\pi^0$ ) and (1-prong +  $\geq 1\pi^0$ ) values.

$\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_3 / \Gamma$   
 Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

To minimize the effect of experiments with large systematic errors, we exclude experiments which together would contribute 5% of the weight in the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>17.36 ± 0.05 OUR FIT</b>				
<b>17.33 ± 0.05 OUR AVERAGE</b>				
17.319 ± 0.070 ± 0.032 f&a	54k	<sup>1</sup> SCHAEAL	05C ALEP	1991-1995 LEP runs
17.34 ± 0.09 ± 0.06 f&a	31.4k	ABBIENDI	03 OPAL	1990-1995 LEP runs
17.342 ± 0.110 ± 0.067 f&a	21.5k	<sup>2</sup> ACCIARRI	01F L3	1991-1995 LEP runs
17.325 ± 0.095 ± 0.077 f&a	27.7k	ABREU	99X DLPH	1991-1995 LEP runs
17.37 ± 0.08 ± 0.18 avg		<sup>3</sup> ANASTASSOV	97 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

17.31 ±0.11 ±0.05	20.7k	BUSKULIC	96C	ALEP	Repl. by SCHAEEL 05C
17.02 ±0.19 ±0.24	6586	ABREU	95T	DLPH	Repl. by ABREU 99X
17.36 ±0.27	7941	AKERS	95I	OPAL	Repl. by ABBI- ENDI 03
17.6 ±0.4 ±0.4	2148	ADRIANI	93M	L3	Repl. by ACCIA- RRI 01F
17.4 ±0.3 ±0.5		<sup>4</sup> ALBRECHT	93G	ARG	$E_{cm}^{ee} = 9.4\text{--}10.6$ GeV
17.35 ±0.41 ±0.37		DECAMP	92C	ALEP	1989-1990 LEP runs
17.7 ±0.8 ±0.4	568	BEHREND	90	CELL	$E_{cm}^{ee} = 35$ GeV
17.4 ±1.0	2197	ADEVA	88	MRKJ	$E_{cm}^{ee} = 14\text{--}16$ GeV
17.7 ±1.2 ±0.7		AIHARA	87B	TPC	$E_{cm}^{ee} = 29$ GeV
18.3 ±0.9 ±0.8		BURCHAT	87	MRK2	$E_{cm}^{ee} = 29$ GeV
18.6 ±0.8 ±0.7	558	<sup>5</sup> BARTEL	86D	JADE	$E_{cm}^{ee} = 34.6$ GeV
12.9 ±1.7 <sup>+0.7</sup> / <sub>-0.5</sub>		ALTHOFF	85	TASS	$E_{cm}^{ee} = 34.5$ GeV
18.0 ±0.9 ±0.5	473	<sup>5</sup> ASH	85B	MAC	$E_{cm}^{ee} = 29$ GeV
18.0 ±1.0 ±0.6		<sup>6</sup> BALTRUSAITIS	85	MRK3	$E_{cm}^{ee} = 3.77$ GeV
19.4 ±1.6 ±1.7	153	BERGER	85	PLUT	$E_{cm}^{ee} = 34.6$ GeV
17.6 ±2.6 ±2.1	47	BEHREND	83C	CELL	$E_{cm}^{ee} = 34$ GeV
17.8 ±2.0 ±1.8		BERGER	81B	PLUT	$E_{cm}^{ee} = 9\text{--}32$ GeV

<sup>1</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>2</sup> The correlation coefficient between this measurement and the ACCIARRI 01F measurement of  $B(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)$  is 0.08.

<sup>3</sup> The correlation coefficients between this measurement and the ANASTASSOV 97 measurements of  $B(e \bar{\nu}_e \nu_\tau)$ ,  $B(\mu \bar{\nu}_\mu \nu_\tau)/B(e \bar{\nu}_e \nu_\tau)$ ,  $B(h^- \nu_\tau)$ , and  $B(h^- \nu_\tau)/B(e \bar{\nu}_e \nu_\tau)$  are 0.50, 0.58, 0.50, and 0.08 respectively.

<sup>4</sup> Not independent of ALBRECHT 92D  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)/\Gamma(e^- \bar{\nu}_e \nu_\tau)$  and ALBRECHT 93G  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) \times \Gamma(e^- \bar{\nu}_e \nu_\tau)/\Gamma_{total}^2$  values.

<sup>5</sup> Modified using  $B(e^- \bar{\nu}_e \nu_\tau)/B(\text{"1 prong"})$  and  $B(\text{"1 prong"}) = 0.855$ .

<sup>6</sup> Error correlated with BALTRUSAITIS 85  $e \nu \bar{\nu}$  value.

$\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau \gamma)/\Gamma_{total}$					$\Gamma_4/\Gamma$
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT	
<b>0.361 ±0.016 ±0.035</b>		<sup>1</sup> BERGFELD 00	CLEO	$E_{cm}^{ee} = 10.6$ GeV	

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

0.30 ±0.04 ±0.05	116	<sup>2</sup> ALEXANDER	96S	OPAL	1991-1994 LEP runs
0.23 ±0.10	10	<sup>3</sup> WU	90	MRK2	$E_{cm}^{ee} = 29$ GeV

<sup>1</sup> BERGFELD 00 impose requirements on detected  $\gamma$ 's corresponding to a  $\tau$ -rest-frame energy cutoff  $E_\gamma^* > 10$  MeV. For  $E_\gamma^* > 20$  MeV, they quote  $(3.04 \pm 0.14 \pm 0.30) \times 10^{-3}$ .

<sup>2</sup> ALEXANDER 96S impose requirements on detected  $\gamma$ 's corresponding to a  $\tau$ -rest-frame energy cutoff  $E_\gamma > 20$  MeV.

<sup>3</sup> WU 90 reports  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau \gamma)/\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) = 0.013 \pm 0.006$ , which is converted to  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau \gamma)/\Gamma_{total}$  using  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau \gamma)/\Gamma_{total} = 17.35\%$ . Requirements on detected  $\gamma$ 's correspond to a  $\tau$  rest frame energy cutoff  $E_\gamma > 37$  MeV.



$\Gamma(e^- \bar{\nu}_e \nu_\tau) / \Gamma_{\text{total}}$

$\Gamma_5 / \Gamma$

To minimize the effect of experiments with large systematic errors, we exclude experiments which together would contribute 5% of the weight in the average.

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>17.85 ± 0.05</b>	<b>OUR FIT</b>			
<b>17.82 ± 0.05</b>	<b>OUR AVERAGE</b>			
17.837 ± 0.072 ± 0.036	56k	<sup>1</sup> SCHAEL	05C ALEP	1991-1995 LEP runs
17.806 ± 0.104 ± 0.076	24.7k	<sup>2</sup> ACCIARRI	01F L3	1991-1995 LEP runs
17.81 ± 0.09 ± 0.06	33.1k	ABBIENDI	99H OPAL	1991-1995 LEP runs
17.877 ± 0.109 ± 0.110	23.3k	ABREU	99X DLPH	1991-1995 LEP runs
17.76 ± 0.06 ± 0.17		<sup>3</sup> ANASTASSOV	97 CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
17.78 ± 0.10 ± 0.09	25.3k	ALEXANDER	96D OPAL	Repl. by ABBI- ENDI 99H
17.79 ± 0.12 ± 0.06	20.6k	BUSKULIC	96C ALEP	Repl. by SCHAEL 05C
17.51 ± 0.23 ± 0.31	5059	ABREU	95T DLPH	Repl. by ABREU 99X
17.9 ± 0.4 ± 0.4	2892	ADRIANI	93M L3	Repl. by ACCIARRI 01F
17.5 ± 0.3 ± 0.5		<sup>4</sup> ALBRECHT	93G ARG	$E_{\text{cm}}^{ee} = 9.4-10.6$ GeV
17.97 ± 0.14 ± 0.23	3970	AKERIB	92 CLEO	Repl. by ANAS- TASSOV 97
19.1 ± 0.4 ± 0.6	2960	<sup>5</sup> AMMAR	92 CLEO	$E_{\text{cm}}^{ee} = 10.5-10.9$ GeV
18.09 ± 0.45 ± 0.45		DECAMP	92C ALEP	Repl. by SCHAEL 05C
17.0 ± 0.5 ± 0.6	1.7k	ABACHI	90 HRS	$E_{\text{cm}}^{ee} = 29$ GeV
18.4 ± 0.8 ± 0.4	644	BEHREND	90 CELL	$E_{\text{cm}}^{ee} = 35$ GeV
16.3 ± 0.3 ± 3.2		JANSSEN	89 CBAL	$E_{\text{cm}}^{ee} = 9.4-10.6$ GeV
18.4 ± 1.2 ± 1.0		AIHARA	87B TPC	$E_{\text{cm}}^{ee} = 29$ GeV
19.1 ± 0.8 ± 1.1		BURCHAT	87 MRK2	$E_{\text{cm}}^{ee} = 29$ GeV
16.8 ± 0.7 ± 0.9	515	<sup>5</sup> BARTEL	86D JADE	$E_{\text{cm}}^{ee} = 34.6$ GeV
20.4 ± 3.0 +1.4 -0.9		ALTHOFF	85 TASS	$E_{\text{cm}}^{ee} = 34.5$ GeV
17.8 ± 0.9 ± 0.6	390	<sup>5</sup> ASH	85B MAC	$E_{\text{cm}}^{ee} = 29$ GeV
18.2 ± 0.7 ± 0.5		<sup>6</sup> BALTRUSAIT..	85 MRK3	$E_{\text{cm}}^{ee} = 3.77$ GeV
13.0 ± 1.9 ± 2.9		BERGER	85 PLUT	$E_{\text{cm}}^{ee} = 34.6$ GeV
18.3 ± 2.4 ± 1.9	60	BEHREND	83C CELL	$E_{\text{cm}}^{ee} = 34$ GeV
16.0 ± 1.3	459	<sup>7</sup> BACINO	78B DLCO	$E_{\text{cm}}^{ee} = 3.1-7.4$ GeV

<sup>1</sup> Correlation matrix for SCHAEL 05C branching fractions, in percent:

- (1)  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau) / \Gamma_{\text{total}}$
- (2)  $\Gamma(\tau^- \rightarrow \mu^- \bar{\nu}_\mu \nu_\tau) / \Gamma_{\text{total}}$
- (3)  $\Gamma(\tau^- \rightarrow \pi^- \nu_\tau) / \Gamma_{\text{total}}$
- (4)  $\Gamma(\tau^- \rightarrow \pi^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$
- (5)  $\Gamma(\tau^- \rightarrow \pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (6)  $\Gamma(\tau^- \rightarrow \pi^- 3\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (7)  $\Gamma(\tau^- \rightarrow h^- 4\pi^0 \nu_\tau (\text{ex. } K^0, \eta)) / \Gamma_{\text{total}}$
- (8)  $\Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0, \omega)) / \Gamma_{\text{total}}$
- (9)  $\Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (10)  $\Gamma(\tau^- \rightarrow h^- h^- h^+ 2\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (11)  $\Gamma(\tau^- \rightarrow h^- h^- h^+ 3\pi^0 \nu_\tau) / \Gamma_{\text{total}}$
- (12)  $\Gamma(\tau^- \rightarrow 3h^- 2h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$

$$(13) \Gamma(\tau^- \rightarrow 3h^- 2h^+ \pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(2)	-20											
(3)	-9	-6										
(4)	-16	-12	2									
(5)	-5	-5	-17	-37								
(6)	0	-4	-15	2	-27							
(7)	-2	-4	-24	-15	20	-47						
(8)	-14	-9	15	-5	-17	-14	-8					
(9)	-13	-12	-25	-30	4	-2	16	-15				
(10)	0	-2	-23	-14	4	10	13	-6	-17			
(11)	1	0	-5	1	4	6	0	-9	-2	-11		
(12)	0	1	9	4	-8	-4	-6	9	-5	-4	-2	
(13)	1	-4	-3	-5	3	2	-4	-3	-1	4	1	-24

<sup>2</sup> The correlation coefficient between this measurement and the ACCIARRI 01F measurement of  $B(\tau^- \rightarrow \mu^- \bar{\nu}_\mu \nu_\tau)$  is 0.08.

<sup>3</sup> The correlation coefficients between this measurement and the ANASTASSOV 97 measurements of  $B(\mu \bar{\nu}_\mu \nu_\tau)$ ,  $B(\mu \bar{\nu}_\mu \nu_\tau)/B(e \bar{\nu}_e \nu_\tau)$ ,  $B(h^- \nu_\tau)$ , and  $B(h^- \nu_\tau)/B(e \bar{\nu}_e \nu_\tau)$  are 0.50, -0.42, 0.48, and -0.39 respectively.

<sup>4</sup> Not independent of ALBRECHT 92D  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)/\Gamma(e^- \bar{\nu}_e \nu_\tau)$  and ALBRECHT 93G  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) \times \Gamma(e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}^2$  values.

<sup>5</sup> Modified using  $B(e^- \bar{\nu}_e \nu_\tau)/B(\text{"1 prong"})$  and  $B(\text{"1 prong"}) = 0.855$ .

<sup>6</sup> Error correlated with BALTRUSAITIS 85  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)/\Gamma_{\text{total}}$ .

<sup>7</sup> BACINO 78B value comes from fit to events with  $e^\pm$  and one other nonelectron charged prong.

$$\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)/\Gamma(e^- \bar{\nu}_e \nu_\tau)$$

$\Gamma_3/\Gamma_5$

Standard Model prediction including mass effects is 0.9726.

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE		DOCUMENT ID	TECN	COMMENT
<b>0.973 ± 0.004</b>	<b>OUR FIT</b>			
<b>0.978 ± 0.011</b>	<b>OUR AVERAGE</b>			
0.9777 ± 0.0063 ± 0.0087	f&a	<sup>1</sup> ANASTASSOV 97	CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
0.997 ± 0.035 ± 0.040	f&a	ALBRECHT 92D	ARG	$E_{\text{cm}}^{\text{ee}} = 9.4\text{--}10.6 \text{ GeV}$

<sup>1</sup> The correlation coefficients between this measurement and the ANASTASSOV 97 measurements of  $B(\mu \bar{\nu}_\mu \nu_\tau)$ ,  $B(e \bar{\nu}_e \nu_\tau)$ ,  $B(h^- \nu_\tau)$ , and  $B(h^- \nu_\tau)/B(e \bar{\nu}_e \nu_\tau)$  are 0.58, -0.42, 0.07, and 0.45 respectively.

$$\Gamma(e^- \bar{\nu}_e \nu_\tau \gamma)/\Gamma_{\text{total}}$$

$\Gamma_6/\Gamma$

VALUE (%)		DOCUMENT ID	TECN	COMMENT
<b>1.75 ± 0.06 ± 0.17</b>		<sup>1</sup> BERGFELD 00	CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$

<sup>1</sup> BERGFELD 00 impose requirements on detected  $\gamma$ 's corresponding to a  $\tau$ -rest-frame energy cutoff  $E_\gamma^* > 10 \text{ MeV}$ .

$\Gamma(h^- \geq 0K_L^0 \nu_\tau)/\Gamma_{\text{total}}$

$\Gamma_7/\Gamma$

$\Gamma_7/\Gamma = (\Gamma_9 + \Gamma_{10} + \frac{1}{2}\Gamma_{35} + \frac{1}{2}\Gamma_{37} + \Gamma_{47})/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>12.13 ± 0.07 OUR FIT</b>					Error includes scale factor of 1.1.
<b>12.2 ± 0.4 OUR AVERAGE</b>					
12.47 ± 0.26 ± 0.43	f&a	2967	<sup>1</sup> ACCIARRI 95	L3	1992 LEP run
12.4 ± 0.7 ± 0.7	f&a	283	<sup>2</sup> ABREU 92N	DLPH	1990 LEP run
12.1 ± 0.7 ± 0.5	f&a	309	ALEXANDER 91D	OPAL	1990 LEP run
11.3 ± 0.5 ± 0.8	avg	798	<sup>3</sup> FORD 87	MAC	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
12.44 ± 0.11 ± 0.11		15k	<sup>4</sup> BUSKULIC 96	ALEP	Repl. by SCHAEEL 05C
11.7 ± 0.6 ± 0.8			<sup>5</sup> ALBRECHT 92D	ARG	$E_{\text{cm}}^{\text{ee}} = 9.4\text{--}10.6 \text{ GeV}$
12.98 ± 0.44 ± 0.33			<sup>6</sup> DECAMP 92C	ALEP	Repl. by SCHAEEL 05C
12.3 ± 0.9 ± 0.5		1338	BEHREND 90	CELL	$E_{\text{cm}}^{\text{ee}} = 35 \text{ GeV}$
11.1 ± 1.1 ± 1.4			<sup>7</sup> BURCHAT 87	MRK2	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$
12.3 ± 0.6 ± 1.1		328	<sup>8</sup> BARTEL 86D	JADE	$E_{\text{cm}}^{\text{ee}} = 34.6 \text{ GeV}$
13.0 ± 2.0 ± 4.0			BERGER 85	PLUT	$E_{\text{cm}}^{\text{ee}} = 34.6 \text{ GeV}$
11.2 ± 1.7 ± 1.2		34	<sup>9</sup> BEHREND 83C	CELL	$E_{\text{cm}}^{\text{ee}} = 34 \text{ GeV}$

- <sup>1</sup> ACCIARRI 95 with 0.65% added to remove their correction for  $\pi^- K_L^0$  backgrounds.
- <sup>2</sup> ABREU 92N with 0.5% added to remove their correction for  $K^*(892)^-$  backgrounds.
- <sup>3</sup> FORD 87 result for  $B(\pi^- \nu_\tau)$  with 0.67% added to remove their  $K^-$  correction and adjusted for 1992 B("1 prong").
- <sup>4</sup> BUSKULIC 96 quote  $11.78 \pm 0.11 \pm 0.13$  We add 0.66 to undo their correction for unseen  $K_L^0$  and modify the systematic error accordingly.
- <sup>5</sup> Not independent of ALBRECHT 92D  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)/\Gamma(e^- \bar{\nu}_e \nu_\tau)$ ,  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau) \times \Gamma(e^- \bar{\nu}_e \nu_\tau)$ , and  $\Gamma(h^- \geq 0K_L^0 \nu_\tau)/\Gamma(e^- \bar{\nu}_e \nu_\tau)$  values.
- <sup>6</sup> DECAMP 92C quote  $B(h^- \geq 0K_L^0 \geq 0(K_S^0 \rightarrow \pi^+ \pi^-) \nu_\tau) = 13.32 \pm 0.44 \pm 0.33$ . We subtract 0.35 to correct for their inclusion of the  $K_S^0$  decays.
- <sup>7</sup> BURCHAT 87 with 1.1% added to remove their correction for  $K^-$  and  $K^*(892)^-$  backgrounds.
- <sup>8</sup> BARTEL 86D result for  $B(\pi^- \nu_\tau)$  with 0.59% added to remove their  $K^-$  correction and adjusted for 1992 B("1 prong").
- <sup>9</sup> BEHREND 83C quote  $B(\pi^- \nu_\tau) = 9.9 \pm 1.7 \pm 1.3$  after subtracting  $1.3 \pm 0.5$  to correct for  $B(K^- \nu_\tau)$ .

$\Gamma(h^- \nu_\tau)/\Gamma_{\text{total}}$

$\Gamma_8/\Gamma = (\Gamma_9 + \Gamma_{10})/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>11.60 ± 0.06 OUR FIT</b>					Error includes scale factor of 1.1.
<b>11.63 ± 0.12 OUR AVERAGE</b>					Error includes scale factor of 1.4. See the ideogram below.
11.571 ± 0.120 ± 0.114	f&a	19k	<sup>1</sup> ABDALLAH 06A	DLPH	1992–1995 LEP runs
11.98 ± 0.13 ± 0.16	f&a		ACKERSTAFF 98M	OPAL	1991–1995 LEP runs
11.52 ± 0.05 ± 0.12	f&a		<sup>2</sup> ANASTASSOV 97	CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$

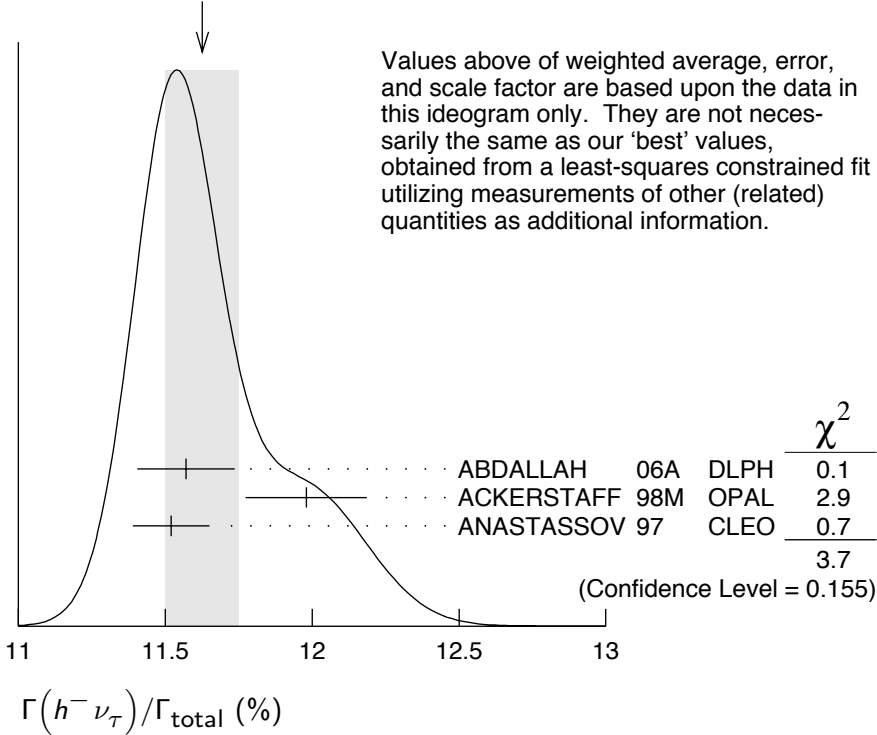
<sup>1</sup> Correlation matrix for ABDALLAH 06A branching fractions, in percent:

- (1)  $\Gamma(\tau^- \rightarrow h^- \nu_\tau) / \Gamma_{\text{total}}$
- (2)  $\Gamma(\tau^- \rightarrow h^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$
- (3)  $\Gamma(\tau^- \rightarrow h^- \geq 1\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (4)  $\Gamma(\tau^- \rightarrow h^- 2\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (5)  $\Gamma(\tau^- \rightarrow h^- \geq 3\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (6)  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (7)  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (8)  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \geq 1\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (9)  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \geq 2\pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (10)  $\Gamma(\tau^- \rightarrow 3h^- 2h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (11)  $\Gamma(\tau^- \rightarrow 3h^- 2h^+ \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(2)	-34									
(3)	-47	56								
(4)	6	-66	15							
(5)	-6	38	11	-86						
(6)	-7	-8	15	0	-2					
(7)	-2	-1	-5	-3	3	-53				
(8)	-4	-4	-13	-4	-2	-56	75			
(9)	-1	-1	-4	3	-6	26	-78	-16		
(10)	-1	-1	1	0	0	-2	-3	-1	3	
(11)	0	0	0	0	0	1	0	-5	5	-57

<sup>2</sup> The correlation coefficients between this measurement and the ANASTASSOV 97 measurements of  $B(\mu \bar{\nu}_\mu \nu_\tau)$ ,  $B(e \bar{\nu}_e \nu_\tau)$ ,  $B(\mu \bar{\nu}_\mu \nu_\tau) / B(e \bar{\nu}_e \nu_\tau)$ , and  $B(h^- \nu_\tau) / B(e \bar{\nu}_e \nu_\tau)$  are 0.50, 0.48, 0.07, and 0.63 respectively.

WEIGHTED AVERAGE  
 $11.63 \pm 0.12$  (Error scaled by 1.4)



Values above of weighted average, error, and scale factor are based upon the data in this ideogram only. They are not necessarily the same as our 'best' values, obtained from a least-squares constrained fit utilizing measurements of other (related) quantities as additional information.

$\Gamma(h^- \nu_\tau) / \Gamma(e^- \bar{\nu}_e \nu_\tau)$

$\Gamma_8 / \Gamma_5 = (\Gamma_9 + \Gamma_{10}) / \Gamma_5$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.650 ± 0.004 OUR FIT</b>			Error includes scale factor of 1.1.
<b>0.6484 ± 0.0041 ± 0.0060 avg</b>	<sup>1</sup> ANASTASSOV 97	CLEO	$E_{cm}^{ee} = 10.6$ GeV

<sup>1</sup> The correlation coefficients between this measurement and the ANASTASSOV 97 measurements of  $B(\mu \bar{\nu}_\mu \nu_\tau)$ ,  $B(e \bar{\nu}_e \nu_\tau)$ ,  $B(\mu \bar{\nu}_\mu \nu_\tau) / B(e \bar{\nu}_e \nu_\tau)$ , and  $B(h^- \nu_\tau)$  are 0.08, -0.39, 0.45, and 0.63 respectively.

$\Gamma(\pi^- \nu_\tau) / \Gamma_{total}$

$\Gamma_9 / \Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>10.91 ± 0.07 OUR FIT</b>				Error includes scale factor of 1.1.
<b>10.828 ± 0.070 ± 0.078 f&amp;a</b>	38k	<sup>1</sup> SCHAEEL 05C	ALEP	1991-1995 LEP runs
• • • We do not use the following data for averages, fits, limits, etc. • • •				
11.06 ± 0.11 ± 0.14		<sup>2</sup> BUSKULIC 96	ALEP	Repl. by SCHAEEL 05C
11.7 ± 0.4 ± 1.8	1138	BLOCKER 82D	MRK2	$E_{cm}^{ee} = 3.5-6.7$ GeV

<sup>1</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau) / \Gamma_{total}$  measurement for correlations with other measurements.

<sup>2</sup> Not independent of BUSKULIC 96  $B(h^- \nu_\tau)$  and  $B(K^- \nu_\tau)$  values.

$\Gamma(K^- \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{10}/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.695 ± 0.023 OUR FIT** Error includes scale factor of 1.1.

**0.685 ± 0.023 OUR AVERAGE**

0.658 ± 0.027 ± 0.029		<sup>1</sup> ABBIENDI	01J	OPAL	1990–1995 LEP runs
0.696 ± 0.025 ± 0.014	2032	BARATE	99K	ALEP	1991–1995 LEP runs
0.85 ± 0.18	27	ABREU	94K	DLPH	LEP 1992 Z data
0.66 ± 0.07 ± 0.09	99	BATTLE	94	CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

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

0.72 ± 0.04 ± 0.04	728	BUSKULIC	96	ALEP	Repl. by BARATE 99K
0.59 ± 0.18	16	MILLS	84	DLCO	$E_{\text{cm}}^{ee} = 29$ GeV
1.3 ± 0.5	15	BLOCKER	82B	MRK2	$E_{\text{cm}}^{ee} = 3.9\text{--}6.7$ GeV

<sup>1</sup> The correlation coefficient between this measurement and the ABBIENDI 01J  $B(\tau^- \rightarrow K^- \geq 0\pi^0 \geq 0K^0 \geq 0\gamma \nu_\tau)$  is 0.60.

$\Gamma(h^- \geq 1 \text{ neutrals } \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{11}/\Gamma$

$$\Gamma_{11}/\Gamma = (\Gamma_{14} + \Gamma_{16} + \Gamma_{20} + \Gamma_{23} + \Gamma_{27} + \Gamma_{28} + \Gamma_{30} + 0.157\Gamma_{35} + 0.157\Gamma_{37} + 0.157\Gamma_{40} + 0.157\Gamma_{42} + 0.0985\Gamma_{47} + 0.708\Gamma_{126} + 0.715\Gamma_{128} + 0.09\Gamma_{146} + 0.09\Gamma_{148})/\Gamma$$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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**37.08 ± 0.11 OUR FIT** Error includes scale factor of 1.2.

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

36.14 ± 0.33 ± 0.58		<sup>1</sup> AKERS	94E	OPAL	1991–1992 LEP runs
38.4 ± 1.2 ± 1.0		<sup>2</sup> BURCHAT	87	MRK2	$E_{\text{cm}}^{ee} = 29$ GeV
42.7 ± 2.0 ± 2.9		BERGER	85	PLUT	$E_{\text{cm}}^{ee} = 34.6$ GeV

<sup>1</sup> Not independent of ACKERSTAFF 98M  $B(h^- \pi^0 \nu_\tau)$  and  $B(h^- \geq 2\pi^0 \nu_\tau)$  values.

<sup>2</sup> BURCHAT 87 quote for  $B(\pi^\pm \geq 1 \text{ neutral } \nu_\tau) = 0.378 \pm 0.012 \pm 0.010$ . We add 0.006 to account for contribution from  $(K^{*-} \nu_\tau)$  which they fixed at BR = 0.013.

$\Gamma(h^- \geq 1\pi^0 \nu_\tau \text{ (ex. } K^0))/\Gamma_{\text{total}}$   $\Gamma_{12}/\Gamma = (\Gamma_{14} + \Gamma_{16} + \Gamma_{20} + \Gamma_{23} + \Gamma_{27} + \Gamma_{28} + \Gamma_{30} + 0.325\Gamma_{126} + 0.325\Gamma_{128})/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**36.54 ± 0.11 OUR FIT** Error includes scale factor of 1.2.

**36.641 ± 0.155 ± 0.127 avg** 45k <sup>1</sup> ABDALLAH 06A DLPH 1992–1995 LEP runs

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$\Gamma(h^- \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{13}/\Gamma = (\Gamma_{14} + \Gamma_{16})/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**25.95 ± 0.10 OUR FIT** Error includes scale factor of 1.1.

**25.74 ± 0.17 OUR AVERAGE**

25.740 ± 0.201 ± 0.138	35k	<sup>1</sup> ABDALLAH	06A	DLPH	1992–1995 LEP runs
25.89 ± 0.17 ± 0.29		ACKERSTAFF	98M	OPAL	1991–1995 LEP runs
25.05 ± 0.35 ± 0.50	6613	ACCIARRI	95	L3	1992 LEP run
25.87 ± 0.12 ± 0.42	51k	<sup>2</sup> ARTUSO	94	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV

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

25.76 ±0.15 ±0.13	31k	BUSKULIC	96	ALEP	Repl. by SCHAEEL 05C
25.98 ±0.36 ±0.52		<sup>3</sup> AKERS	94E	OPAL	Repl. by ACKER-STAFF 98M
22.9 ±0.8 ±1.3	283	<sup>4</sup> ABREU	92N	DLPH	$E_{cm}^{ee} = 88.2-94.2$ GeV
23.1 ±0.4 ±0.9	1249	<sup>5</sup> ALBRECHT	92Q	ARG	$E_{cm}^{ee} = 10$ GeV
25.02 ±0.64 ±0.88	1849	DECAMP	92C	ALEP	1989-1990 LEP runs
22.0 ±0.8 ±1.9	779	ANTREASYAN	91	CBAL	$E_{cm}^{ee} = 9.4-10.6$ GeV
22.6 ±1.5 ±0.7	1101	BEHREND	90	CELL	$E_{cm}^{ee} = 35$ GeV
23.1 ±1.9 ±1.6		BEHREND	84	CELL	$E_{cm}^{ee} = 14,22$ GeV

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>2</sup> ARTUSO 94 reports the combined result from three independent methods, one of which (23% of the  $\tau^- \rightarrow h^- \pi^0 \nu_\tau$ ) is normalized to the inclusive one-prong branching fraction, taken as  $0.854 \pm 0.004$ . Renormalization to the present value causes negligible change.

<sup>3</sup> AKERS 94E quote  $(26.25 \pm 0.36 \pm 0.52) \times 10^{-2}$ ; we subtract 0.27% from their number to correct for  $\tau^- \rightarrow h^- K_L^0 \nu_\tau$ .

<sup>4</sup> ABREU 92N with 0.5% added to remove their correction for  $K^*(892)^-$  backgrounds.

<sup>5</sup> ALBRECHT 92Q with 0.5% added to remove their correction for  $\tau^- \rightarrow K^*(892)^- \nu_\tau$  background.

### $\Gamma(\pi^- \pi^0 \nu_\tau)/\Gamma_{total}$

### $\Gamma_{14}/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**25.52 ±0.10 OUR FIT** Error includes scale factor of 1.1.

**25.46 ±0.12 OUR AVERAGE**

25.471 ±0.097 ±0.085	f&a	81k	<sup>1</sup> SCHAEEL	05C	ALEP	1991-1995 LEP runs
25.36 ±0.44	avg		<sup>2</sup> ARTUSO	94	CLEO	$E_{cm}^{ee} = 10.6$ GeV

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

25.30 ±0.15 ±0.13		<sup>3</sup> BUSKULIC	96	ALEP	Repl. by SCHAEEL 05C
21.5 ±0.4 ±1.9	4400	<sup>4,5</sup> ALBRECHT	88L	ARG	$E_{cm}^{ee} = 10$ GeV
23.0 ±1.3 ±1.7	582	ADLER	87B	MRK3	$E_{cm}^{ee} = 3.77$ GeV
25.8 ±1.7 ±2.5		<sup>6</sup> BURCHAT	87	MRK2	$E_{cm}^{ee} = 29$ GeV
22.3 ±0.6 ±1.4	629	<sup>5</sup> YELTON	86	MRK2	$E_{cm}^{ee} = 29$ GeV

<sup>1</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>2</sup> Not independent of ARTUSO 94  $B(h^- \pi^0 \nu_\tau)$  and BATTLE 94  $B(K^- \pi^0 \nu_\tau)$  values.

<sup>3</sup> Not independent of BUSKULIC 96  $B(h^- \pi^0 \nu_\tau)$  and  $B(K^- \pi^0 \nu_\tau)$  values.

<sup>4</sup> The authors divide by  $(\Gamma_3 + \Gamma_5 + \Gamma_9 + \Gamma_{10})/\Gamma = 0.467$  to obtain this result.

<sup>5</sup> Experiment had no hadron identification. Kaon corrections were made, but insufficient information is given to permit their removal.

<sup>6</sup> BURCHAT 87 value is not independent of YELTON 86 value. Nonresonant decays included.

$\Gamma(\pi^- \pi^0 \text{non-}\rho(770) \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{15} / \Gamma$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b>0.3±0.1 ±0.3</b>	<sup>1</sup> BEHREND 84	CELL	$E_{\text{cm}}^{\text{ee}} = 14,22 \text{ GeV}$

<sup>1</sup> BEHREND 84 assume a flat nonresonant mass distribution down to the  $\rho(770)$  mass, using events with mass above 1300 to set the level.

$\Gamma(K^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{16} / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.428±0.015 OUR FIT**

**0.426±0.016 OUR AVERAGE**

0.416±0.003±0.018	78k	AUBERT	07AP BABR	230 fb <sup>-1</sup> $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
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0.471±0.059±0.023	360	ABBIENDI	04J OPAL	1991-1995 LEP runs
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0.444±0.026±0.024	923	BARATE	99K ALEP	1991-1995 LEP runs
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0.51 ±0.10 ±0.07	37	BATTLE	94 CLEO	$E_{\text{cm}}^{\text{ee}} \approx 10.6 \text{ GeV}$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.52 ±0.04 ±0.05	395	BUSKULIC	96 ALEP	Repl. by BARATE 99K
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$\Gamma(h^- \geq 2\pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{17} / \Gamma$

$$\Gamma_{17} / \Gamma = (\Gamma_{20} + \Gamma_{23} + \Gamma_{27} + \Gamma_{28} + \Gamma_{30} + 0.157\Gamma_{35} + 0.157\Gamma_{37} + 0.157\Gamma_{40} + 0.157\Gamma_{42} + 0.0985\Gamma_{47} + 0.319\Gamma_{126} + 0.322\Gamma_{128}) / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**10.84±0.12 OUR FIT** Error includes scale factor of 1.3.

**9.91±0.31±0.27 f&a** ACKERSTAFF 98M OPAL 1991–1995 LEP runs

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

9.89±0.34±0.55		<sup>1</sup> AKERS	94E OPAL	Repl. by ACKER-STAFF 98M
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14.0 ±1.2 ±0.6	938	<sup>2</sup> BEHREND	90 CELL	$E_{\text{cm}}^{\text{ee}} = 35 \text{ GeV}$
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12.0 ±1.4 ±2.5		<sup>3</sup> BURCHAT	87 MRK2	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$
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13.9 ±2.0 <sup>+1.9</sup> <sub>-2.2</sub>		<sup>4</sup> AIHARA	86E TPC	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$
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<sup>1</sup> AKERS 94E not independent of AKERS 94E  $B(h^- \geq 1\pi^0 \nu_\tau)$  and  $B(h^- \pi^0 \nu_\tau)$  measurements.

<sup>2</sup> No independent of BEHREND 90  $\Gamma(h^- 2\pi^0 \nu_\tau (\text{exp. } K^0))$  and  $\Gamma(h^- \geq 3\pi^0 \nu_\tau)$ .

<sup>3</sup> Error correlated with BURCHAT 87  $\Gamma(\rho^- \nu_e) / \Gamma(\text{total})$  value.

<sup>4</sup> AIHARA 86E (TPC) quote  $B(2\pi^0 \pi^- \nu_\tau) + 1.6B(3\pi^0 \pi^- \nu_\tau) + 1.1B(\pi^0 \eta \pi^- \nu_\tau)$ .

$\Gamma(h^- 2\pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{18} / \Gamma$

$$\Gamma_{18} / \Gamma = (\Gamma_{20} + \Gamma_{23} + 0.157\Gamma_{35} + 0.157\Gamma_{37}) / \Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**9.49±0.11 OUR FIT** Error includes scale factor of 1.2.

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

9.48±0.13±0.10	12k	<sup>1</sup> BUSKULIC	96 ALEP	Repl. by SCHAEEL 05C
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<sup>1</sup> BUSKULIC 96 quote  $9.29 \pm 0.13 \pm 0.10$ . We add 0.19 to undo their correction for  $\tau^- \rightarrow h^- K^0 \nu_\tau$ .



$$\frac{\Gamma(h^- 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}}{\Gamma_{19}/\Gamma = (\Gamma_{20} + \Gamma_{23})/\Gamma} \quad \Gamma_{19}/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. f&a marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>9.33 ± 0.12 OUR FIT</b>	Error includes scale factor of 1.2.			
<b>9.17 ± 0.27 OUR AVERAGE</b>				
9.498 ± 0.320 ± 0.275 f&a	9.5k	<sup>1</sup> ABDALLAH	06A DLPH	1992–1995 LEP runs
8.88 ± 0.37 ± 0.42 f&a	1060	ACCIARRI	95 L3	1992 LEP run
8.96 ± 0.16 ± 0.44 avg		<sup>2</sup> PROCARIO	93 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
10.38 ± 0.66 ± 0.82	809	<sup>3</sup> DECAMP	92C ALEP	Repl. by SCHAEEL 05C
5.7 ± 0.5 $\begin{smallmatrix} +1.7 \\ -1.0 \end{smallmatrix}$	133	<sup>4</sup> ANTREASYAN	91 CBAL	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV
10.0 ± 1.5 ± 1.1	333	<sup>5</sup> BEHREND	90 CELL	$E_{\text{cm}}^{ee} = 35$ GeV
8.7 ± 0.4 ± 1.1	815	<sup>6</sup> BAND	87 MAC	$E_{\text{cm}}^{ee} = 29$ GeV
6.2 ± 0.6 ± 1.2		<sup>7</sup> GAN	87 MRK2	$E_{\text{cm}}^{ee} = 29$ GeV
6.0 ± 3.0 ± 1.8		BEHREND	84 CELL	$E_{\text{cm}}^{ee} = 14,22$ GeV

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> PROCARIO 93 entry is obtained from  $B(h^- 2\pi^0 \nu_\tau)/B(h^- \pi^0 \nu_\tau)$  using ARTUSO 94 result for  $B(h^- \pi^0 \nu_\tau)$ .

<sup>3</sup> We subtract 0.0015 to account for  $\tau^- \rightarrow K^*(892)^- \nu_\tau$  contribution.

<sup>4</sup> ANTREASYAN 91 subtract 0.001 to account for the  $\tau^- \rightarrow K^*(892)^- \nu_\tau$  contribution.

<sup>5</sup> BEHREND 90 subtract 0.002 to account for the  $\tau^- \rightarrow K^*(892)^- \nu_\tau$  contribution.

<sup>6</sup> BAND 87 assume  $B(\pi^- 3\pi^0 \nu_\tau) = 0.01$  and  $B(\pi^- \pi^0 \eta \nu_\tau) = 0.005$ .

<sup>7</sup> GAN 87 analysis use photon multiplicity distribution.

$$\frac{\Gamma(h^- 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma(h^- \pi^0 \nu_\tau)}{\Gamma_{19}/\Gamma_{13} = (\Gamma_{20} + \Gamma_{23})/(\Gamma_{14} + \Gamma_{16})} \quad \Gamma_{19}/\Gamma_{13}$$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.360 ± 0.005 OUR FIT</b>	Error includes scale factor of 1.2.		
<b>0.342 ± 0.006 ± 0.016</b>	<sup>1</sup> PROCARIO	93 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

<sup>1</sup> PROCARIO 93 quote  $0.345 \pm 0.006 \pm 0.016$  after correction for 2 kaon backgrounds assuming  $B(K^{*-} \nu_\tau) = 1.42 \pm 0.18\%$  and  $B(h^- K^0 \pi^0 \nu_\tau) = 0.48 \pm 0.48\%$ . We multiply by  $0.990 \pm 0.010$  to remove these corrections to  $B(h^- \pi^0 \nu_\tau)$ .

$$\frac{\Gamma(\pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}}{\Gamma_{20}/\Gamma} \quad \Gamma_{20}/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>9.27 ± 0.12 OUR FIT</b>	Error includes scale factor of 1.2.			
<b>9.239 ± 0.086 ± 0.090 f&amp;a</b>	31k	<sup>1</sup> SCHAEEL	05C ALEP	1991-1995 LEP runs
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
9.21 ± 0.13 ± 0.11		<sup>2</sup> BUSKULIC	96 ALEP	Repl. by SCHAEEL 05C

<sup>1</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> Not independent of BUSKULIC 96  $B(h^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$  and  $B(K^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$  values.

$\Gamma(\pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0), \text{ scalar})/\Gamma(\pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$   $\Gamma_{21}/\Gamma_{20}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;0.094</b>	95	<sup>1</sup> BROWDER 00	CLEO	$4.7 \text{ fb}^{-1} E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

<sup>1</sup> Model-independent limit from structure function analysis on contribution to  $B(\tau^- \rightarrow \pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$  from scalars.

$\Gamma(\pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0), \text{ vector})/\Gamma(\pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$   $\Gamma_{22}/\Gamma_{20}$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;0.073</b>	95	<sup>1</sup> BROWDER 00	CLEO	$4.7 \text{ fb}^{-1} E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

<sup>1</sup> Model-independent limit from structure function analysis on contribution to  $B(\tau^- \rightarrow \pi^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$  from vectors.

$\Gamma(K^- 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$   $\Gamma_{23}/\Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**6.3 ± 2.3 OUR FIT**

**5.8 ± 2.4 OUR AVERAGE**

5.6 ± 2.0 ± 1.5      131      BARATE      99K      ALEP      1991–1995 LEP runs

9 ± 10 ± 3      3      <sup>1</sup> BATTLE      94      CLEO       $E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$

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

8 ± 2 ± 2      59      BUSKULIC      96      ALEP      Repl. by BARATE 99K

<sup>1</sup> BATTLE 94 quote  $(14 \pm 10 \pm 3) \times 10^{-4}$  or  $< 30 \times 10^{-4}$  at 90% CL. We subtract  $(5 \pm 2) \times 10^{-4}$  to account for  $\tau^- \rightarrow K^- (K^0 \rightarrow \pi^0 \pi^0) \nu_\tau$  background.

$\Gamma(h^- \geq 3\pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{24}/\Gamma$

$$\Gamma_{24}/\Gamma = (\Gamma_{27} + \Gamma_{28} + \Gamma_{30} + 0.157\Gamma_{40} + 0.157\Gamma_{42} + 0.0985\Gamma_{47} + 0.319\Gamma_{126} + 0.322\Gamma_{128})/\Gamma$$

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1.35 ± 0.07 OUR FIT** Error includes scale factor of 1.1.

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

1.53 ± 0.40 ± 0.46      186      DECAMP      92C      ALEP      Repl. by SCHAEEL 05C

3.2 ± 1.0 ± 1.0      BEHREND      90      CELL       $E_{\text{cm}}^{ee} = 35 \text{ GeV}$

$\Gamma(h^- \geq 3\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$   $\Gamma_{25}/\Gamma$

$$\Gamma_{25}/\Gamma = (\Gamma_{27} + \Gamma_{28} + \Gamma_{30} + 0.325\Gamma_{126} + 0.325\Gamma_{128})/\Gamma$$

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1.26 ± 0.07 OUR FIT** Error includes scale factor of 1.1.

**1.403 ± 0.214 ± 0.224**      1.1k      <sup>1</sup> ABDALLAH      06A      DLPH      1992–1995 LEP runs

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$$\frac{\Gamma(h^- 3\pi^0 \nu_\tau)/\Gamma_{\text{total}}}{\Gamma_{26}/\Gamma} = (\Gamma_{27} + \Gamma_{28} + 0.157\Gamma_{40} + 0.157\Gamma_{42} + 0.322\Gamma_{128})/\Gamma \quad \Gamma_{26}/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.18 ± 0.08 OUR FIT</b>					
<b>1.21 ± 0.17 OUR AVERAGE</b> Error includes scale factor of 1.2.					
1.70 ± 0.24 ± 0.38	f&a	293	ACCIARRI	95 L3	1992 LEP run
1.15 ± 0.08 ± 0.13	avg		<sup>1</sup> PROCARIO	93 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.24 ± 0.09 ± 0.11		2.3k	<sup>2</sup> BUSKULIC	96 ALEP	Repl. by SCHAEEL 05c
0.0 <sup>+1.4</sup> <sub>-0.1</sub> <sup>+1.1</sup> <sub>-0.1</sub>			<sup>3</sup> GAN	87 MRK2	$E_{\text{cm}}^{ee} = 29$ GeV

<sup>1</sup> PROCARIO 93 entry is obtained from  $B(h^- 3\pi^0 \nu_\tau)/B(h^- \pi^0 \nu_\tau)$  using ARTUSO 94 result for  $B(h^- \pi^0 \nu_\tau)$ .

<sup>2</sup> BUSKULIC 96 quote  $B(h^- 3\pi^0 \nu_\tau (\text{ex. } K^0)) = 1.17 \pm 0.09 \pm 0.11$ . We add 0.07 to remove their correction for  $K^0$  backgrounds.

<sup>3</sup> Highly correlated with GAN 87  $\Gamma(\eta \pi^- \pi^0 \nu_\tau)/\Gamma_{\text{total}}$  value. Authors quote  $B(\pi^\pm 3\pi^0 \nu_\tau) + 0.67B(\pi^\pm \eta \pi^0 \nu_\tau) = 0.047 \pm 0.010 \pm 0.011$ .

$$\frac{\Gamma(h^- 3\pi^0 \nu_\tau)/\Gamma(h^- \pi^0 \nu_\tau)}{\Gamma_{26}/\Gamma_{13}} = (\Gamma_{27} + \Gamma_{28} + 0.157\Gamma_{40} + 0.157\Gamma_{42} + 0.322\Gamma_{128})/(\Gamma_{14} + \Gamma_{16}) \quad \Gamma_{26}/\Gamma_{13}$$

VALUE		DOCUMENT ID	TECN	COMMENT
<b>0.0456 ± 0.0029 OUR FIT</b>				
<b>0.044 ± 0.003 ± 0.005</b>		<sup>1</sup> PROCARIO	93 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

<sup>1</sup> PROCARIO 93 quote  $0.041 \pm 0.003 \pm 0.005$  after correction for 2 kaon backgrounds assuming  $B(K^{*-} \nu_\tau) = 1.42 \pm 0.18\%$  and  $B(h^- K^0 \pi^0 \nu_\tau) = 0.48 \pm 0.48\%$ . We add  $0.003 \pm 0.003$  and multiply the sum by  $0.990 \pm 0.010$  to remove these corrections.

$$\frac{\Gamma(\pi^- 3\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}}{\Gamma_{27}/\Gamma} \quad \Gamma_{27}/\Gamma$$

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.04 ± 0.07 OUR FIT</b>					
<b>0.977 ± 0.069 ± 0.058</b>		6.1k	<sup>1</sup> SCHAEEL	05C ALEP	1991-1995 LEP runs

<sup>1</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$$\frac{\Gamma(K^- 3\pi^0 \nu_\tau (\text{ex. } K^0, \eta))/\Gamma_{\text{total}}}{\Gamma_{28}/\Gamma} \quad \Gamma_{28}/\Gamma$$

VALUE (units $10^{-4}$ )		EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.7 ± 2.1 OUR FIT</b>					
<b>3.7 ± 2.1 ± 1.1</b>		22	BARATE	99K ALEP	1991-1995 LEP runs

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

5 ± 13 <sup>1</sup> BUSKULIC 94E ALEP Repl. by BARATE 99K

<sup>1</sup> BUSKULIC 94E quote  $B(K^- \geq 0\pi^0 \geq 0K^0 \nu_\tau) - [B(K^- \nu_\tau) + B(K^- \pi^0 \nu_\tau) + B(K^- K^0 \nu_\tau) + B(K^- \pi^0 \pi^0 \nu_\tau) + B(K^- \pi^0 K^0 \nu_\tau)] = (5 \pm 13) \times 10^{-4}$  accounting for common systematic errors in BUSKULIC 94E and BUSKULIC 94F measurements of these modes. We assume  $B(K^- \geq 2K^0 \nu_\tau)$  and  $B(K^- \geq 4\pi^0 \nu_\tau)$  are negligible.

$$\frac{\Gamma(h^- 4\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}}{\Gamma_{29}/\Gamma = (\Gamma_{30} + 0.319\Gamma_{126})/\Gamma} \quad \Gamma_{29}/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.16 ± 0.04 OUR FIT**

**0.16 ± 0.05 ± 0.05** <sup>1</sup> PROCARIO 93 CLEO  $E_{\text{cm}}^{ee} \approx 10.6$  GeV

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

0.16 ± 0.04 ± 0.09 232 <sup>2</sup> BUSKULIC 96 ALEP Repl. by SCHAEEL 05C

<sup>1</sup> PROCARIO 93 quotes  $B(h^- 4\pi^0 \nu_\tau)/B(h^- \pi^0 \nu_\tau) = 0.006 \pm 0.002 \pm 0.002$ . We multiply by the ARTUSO 94 result for  $B(h^- \pi^0 \nu_\tau)$  to obtain  $B(h^- 4\pi^0 \nu_\tau)$ . PROCARIO 93 assume  $B(h^- \geq 5 \pi^0 \nu_\tau)$  is small and do not correct for it.

<sup>2</sup> BUSKULIC 96 quote result for  $\tau^- \rightarrow h^- \geq 4\pi^0 \nu_\tau$ . We assume  $B(h^- \geq 5\pi^0 \nu_\tau)$  is negligible.

$$\frac{\Gamma(h^- 4\pi^0 \nu_\tau (\text{ex. } K^0, \eta))/\Gamma_{\text{total}}}{\Gamma_{30}/\Gamma} \quad \Gamma_{30}/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.10 ± 0.04 OUR FIT**

**0.112 ± 0.037 ± 0.035** 957 <sup>1</sup> SCHAEEL 05C ALEP 1991-1995 LEP runs

<sup>1</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$$\frac{\Gamma(K^- \geq 0\pi^0 \geq 0K^0 \geq 0\gamma \nu_\tau)/\Gamma_{\text{total}}}{\Gamma_{31}/\Gamma = (\Gamma_{10} + \Gamma_{16} + \Gamma_{23} + \Gamma_{28} + \Gamma_{37} + \Gamma_{42} + 0.715\Gamma_{128})/\Gamma} \quad \Gamma_{31}/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**1.57 ± 0.04 OUR FIT** Error includes scale factor of 1.1.

**1.53 ± 0.04 OUR AVERAGE**

1.528 ± 0.039 ± 0.040 f&a <sup>1</sup> ABBIENDI 01J OPAL 1990–1995 LEP runs

1.520 ± 0.040 ± 0.041 avg 4006 <sup>2</sup> BARATE 99K ALEP 1991–1995 LEP runs

1.54 ± 0.24 f&a ABREU 94K DLPH LEP 1992 Z data

1.70 ± 0.12 ± 0.19 f&a 202 <sup>3</sup> BATTLE 94 CLEO  $E_{\text{cm}}^{ee} \approx 10.6$  GeV

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

1.70 ± 0.05 ± 0.06 1610 <sup>4</sup> BUSKULIC 96 ALEP Repl. by BARATE 99K

1.6 ± 0.4 ± 0.2 35 AIHARA 87B TPC  $E_{\text{cm}}^{ee} = 29$  GeV

1.71 ± 0.29 53 MILLS 84 DLCO  $E_{\text{cm}}^{ee} = 29$  GeV

<sup>1</sup> The correlation coefficient between this measurement and the ABBIENDI 01J  $B(\tau^- \rightarrow K^- \nu_\tau)$  is 0.60.

<sup>2</sup> Not independent of BARATE 99K  $B(K^- \nu_\tau)$ ,  $B(K^- \pi^0 \nu_\tau)$ ,  $B(K^- 2\pi^0 \nu_\tau (\text{ex. } K^0))$ ,  $B(K^- 3\pi^0 \nu_\tau (\text{ex. } K^0))$ ,  $B(K^- K^0 \nu_\tau)$ , and  $B(K^- K^0 \pi^0 \nu_\tau)$  values.

<sup>3</sup> BATTLE 94 quote  $1.60 \pm 0.12 \pm 0.19$ . We add  $0.10 \pm 0.02$  to correct for their rejection of  $K_S^0 \rightarrow \pi^+ \pi^-$  decays.

<sup>4</sup> Not independent of BUSKULIC 96  $B(K^- \nu_\tau)$ ,  $B(K^- \pi^0 \nu_\tau)$ ,  $B(K^- 2\pi^0 \nu_\tau)$ ,  $B(K^- K^0 \nu_\tau)$ , and  $B(K^- K^0 \pi^0 \nu_\tau)$  values.

$$\Gamma(K^- \geq 1(\pi^0 \text{ or } K^0 \text{ or } \gamma) \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{32} / \Gamma$$

$$\Gamma_{32} / \Gamma = (\Gamma_{16} + \Gamma_{23} + \Gamma_{28} + \Gamma_{37} + \Gamma_{42} + 0.715\Gamma_{128}) / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.874 ± 0.032 OUR FIT**

**0.86 ± 0.05 OUR AVERAGE**

0.869 ± 0.031 ± 0.034	avg	<sup>1</sup> ABBIENDI	01J OPAL	1990–1995 LEP runs
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0.69 ± 0.25	avg	<sup>2</sup> ABREU	94K DLPH	LEP 1992 Z data
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• • • We do not use the following data for averages, fits, limits, etc. • • •

1.2 ± 0.5	$\begin{matrix} +0.2 \\ -0.4 \end{matrix}$	9 AIHARA	87B TPC	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
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<sup>1</sup> Not independent of ABBIENDI 01J  $B(\tau^- \rightarrow K^- \nu_\tau)$  and  $B(\tau^- \rightarrow K^- \geq 0\pi^0 \geq 0K^0 \geq 0\gamma \nu_\tau)$  values.

<sup>2</sup> Not independent of ABREU 94K  $B(K^- \nu_\tau)$  and  $B(K^- \geq 0 \text{ neutrals } \nu_\tau)$  measurements.

$$\Gamma(K_S^0(\text{particles})^- \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{33} / \Gamma$$

$$\Gamma_{33} / \Gamma = (\frac{1}{2}\Gamma_{35} + \frac{1}{2}\Gamma_{37} + \frac{1}{2}\Gamma_{40} + \frac{1}{2}\Gamma_{42} + \Gamma_{47} + \Gamma_{48}) / \Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.92 ± 0.04 OUR FIT** Error includes scale factor of 1.4.

**0.97 ± 0.07 OUR AVERAGE**

0.970 ± 0.058 ± 0.062	929	BARATE	98E ALEP	1991–1995 LEP runs
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0.97 ± 0.09 ± 0.06	141	AKERS	94G OPAL	$E_{\text{cm}}^{ee} = 88\text{--}94 \text{ GeV}$
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$$\Gamma(h^- \bar{K}^0 \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{34} / \Gamma = (\Gamma_{35} + \Gamma_{37}) / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**1.00 ± 0.05 OUR FIT** Error includes scale factor of 1.8.

**0.90 ± 0.07 OUR AVERAGE**

1.01 ± 0.11 ± 0.07	avg	555	<sup>1</sup> BARATE	98E ALEP	1991–1995 LEP runs
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0.855 ± 0.036 ± 0.073	f&a	1242	COAN	96 CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$
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<sup>1</sup> Not independent of BARATE 98E  $B(\tau^- \rightarrow \pi^- \bar{K}^0 \nu_\tau)$  and  $B(\tau^- \rightarrow K^- K^0 \nu_\tau)$  values.

$$\Gamma(\pi^- \bar{K}^0 \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{35} / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.84 ± 0.04 OUR FIT** Error includes scale factor of 2.0.

**0.831 ± 0.030 OUR AVERAGE** Error includes scale factor of 1.4. See the ideogram below.

0.808 ± 0.004 ± 0.026	f&a	53k	EPIFANOV	07 BELL	$351 \text{ fb}^{-1} E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
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0.933 ± 0.068 ± 0.049	f&a	377	ABBIENDI	00C OPAL	1991–1995 LEP runs
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0.928 ± 0.045 ± 0.034	f&a	937	<sup>1</sup> BARATE	99K ALEP	1991–1995 LEP runs
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0.855 ± 0.117 ± 0.066	avg	509	<sup>2</sup> BARATE	98E ALEP	1991–1995 LEP runs
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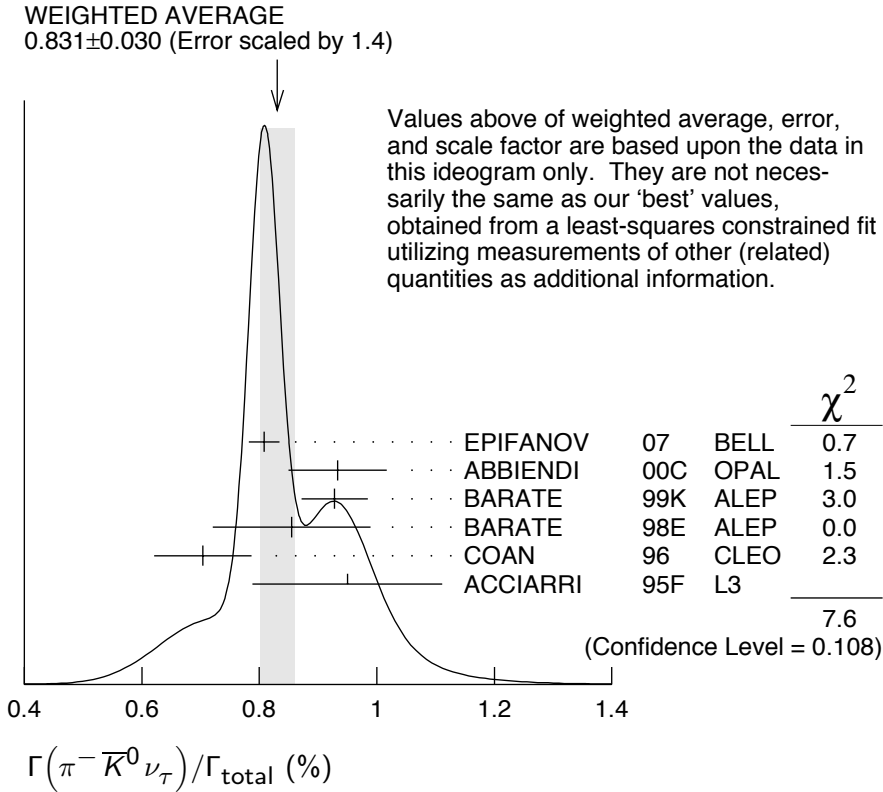
0.704 ± 0.041 ± 0.072	avg		<sup>3</sup> COAN	96 CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$
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0.95 ± 0.15 ± 0.06	f&a		<sup>4</sup> ACCIARRI	95F L3	1991–1993 LEP runs
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.79 ± 0.10 ± 0.09		98	<sup>5</sup> BUSKULIC	96 ALEP	Repl. by BARATE 99K
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- <sup>1</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.
- <sup>2</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays. Not independent of BARATE 98E  $B(K^0 \text{ particles}^- \nu_\tau)$  value.
- <sup>3</sup> Not independent of COAN 96  $B(h^- K^0 \nu_\tau)$  and  $B(K^- K^0 \nu_\tau)$  measurements.
- <sup>4</sup> ACCIARRI 95F do not identify  $\pi^-/K^-$  and assume  $B(K^- K^0 \nu_\tau) = (0.29 \pm 0.12)\%$ .
- <sup>5</sup> BUSKULIC 96 measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.



**$\Gamma(\pi^- \bar{K}^0 (\text{non-}K^*(892)^- \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{36} / \Gamma$**

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>5.4±2.1</b>		<sup>1</sup> EPIFANOV 07	BELL	351 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV

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

<17                      95                      ACCIARRI                      95F L3                      1991–1993 LEP runs

<sup>1</sup> EPIFANOV 07 quote  $B(\tau^- \rightarrow K^*(892)^- \nu_\tau) B(K^*(892)^- \rightarrow K_S^0 \pi^-) / B(\tau^- \rightarrow K_S^0 \pi^- \nu_\tau) = 0.933 \pm 0.027$ . We multiply their  $B(\tau^- \rightarrow \bar{K}^0 \pi^- \nu_\tau)$  by  $[1 - (0.933 \pm 0.027)]$  to obtain this result.

**$\Gamma(K^- K^0 \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{37} / \Gamma$**

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.158±0.016 OUR FIT</b>				
<b>0.158±0.017 OUR AVERAGE</b>				
0.162±0.021±0.011	150	<sup>1</sup> BARATE 99K	ALEP	1991–1995 LEP runs
0.158±0.042±0.017	46	<sup>2</sup> BARATE 98E	ALEP	1991–1995 LEP runs
0.151±0.021±0.022	111	COAN 96	CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

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

0.26 ± 0.09 ± 0.02      13      <sup>3</sup> BUSKULIC      96      ALEP      Repl. by BARATE 99K

<sup>1</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

<sup>2</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays.

<sup>3</sup> BUSKULIC 96 measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

$\Gamma(K^- K^0 \geq 0 \pi^0 \nu_\tau) / \Gamma_{\text{total}}$        $\Gamma_{38} / \Gamma = (\Gamma_{37} + \Gamma_{42}) / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.316 ± 0.023 OUR FIT</b>				
<b>0.330 ± 0.055 ± 0.039</b>	124	ABBIENDI	00C OPAL	1991–1995 LEP runs

$\Gamma(h^- \bar{K}^0 \pi^0 \nu_\tau) / \Gamma_{\text{total}}$        $\Gamma_{39} / \Gamma = (\Gamma_{40} + \Gamma_{42}) / \Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.55 ± 0.04 OUR FIT</b>				
<b>0.50 ± 0.06 OUR AVERAGE</b>				Error includes scale factor of 1.2.
0.446 ± 0.052 ± 0.046	avg 157	<sup>1</sup> BARATE	98E ALEP	1991–1995 LEP runs
0.562 ± 0.050 ± 0.048	f&a 264	COAN	96 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

<sup>1</sup> Not independent of BARATE 98E  $B(\tau^- \rightarrow \pi^- \bar{K}^0 \pi^0 \nu_\tau)$  and  $B(\tau^- \rightarrow K^- K^0 \pi^0 \nu_\tau)$  values.

$\Gamma(\pi^- \bar{K}^0 \pi^0 \nu_\tau) / \Gamma_{\text{total}}$        $\Gamma_{40} / \Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.39 ± 0.04 OUR FIT</b>				
<b>0.36 ± 0.04 OUR AVERAGE</b>				
0.347 ± 0.053 ± 0.037	f&a 299	<sup>1</sup> BARATE	99K ALEP	1991–1995 LEP runs
0.294 ± 0.073 ± 0.037	f&a 142	<sup>2</sup> BARATE	98E ALEP	1991–1995 LEP runs
0.417 ± 0.058 ± 0.044	avg	<sup>3</sup> COAN	96 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV
0.41 ± 0.12 ± 0.03	f&a	<sup>4</sup> ACCIARRI	95F L3	1991–1993 LEP runs

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

0.32 ± 0.11 ± 0.05      23      <sup>5</sup> BUSKULIC      96      ALEP      Repl. by BARATE 99K

<sup>1</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

<sup>2</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays.

<sup>3</sup> Not independent of COAN 96  $B(h^- K^0 \pi^0 \nu_\tau)$  and  $B(K^- K^0 \pi^0 \nu_\tau)$  measurements.

<sup>4</sup> ACCIARRI 95F do not identify  $\pi^- / K^-$  and assume  $B(K^- K^0 \pi^0 \nu_\tau) = (0.05 \pm 0.05)\%$ .

<sup>5</sup> BUSKULIC 96 measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

$\Gamma(\bar{K}^0 \rho^- \nu_\tau) / \Gamma_{\text{total}}$        $\Gamma_{41} / \Gamma$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b>0.22 ± 0.05 OUR AVERAGE</b>			
0.250 ± 0.057 ± 0.044	<sup>1</sup> BARATE	99K ALEP	1991–1995 LEP runs
0.188 ± 0.054 ± 0.038	<sup>2</sup> BARATE	98E ALEP	1991–1995 LEP runs

<sup>1</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in hadron calorimeter. They determine the  $\bar{K}^0 \rho^-$  fraction in  $\tau^- \rightarrow \pi^- \bar{K}^0 \pi^0 \nu_\tau$  decays to be  $(0.72 \pm 0.12 \pm 0.10)$  and multiply their  $B(\pi^- \bar{K}^0 \pi^0 \nu_\tau)$  measurement by this fraction to obtain the quoted result.

<sup>2</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays. They determine the  $\bar{K}^0 \rho^-$  fraction in  $\tau^- \rightarrow \pi^- \bar{K}^0 \pi^0 \nu_\tau$  decays to be  $(0.64 \pm 0.09 \pm 0.10)$  and multiply their  $B(\pi^- \bar{K}^0 \pi^0 \nu_\tau)$  measurement by this fraction to obtain the quoted result.

**$\Gamma(K^- K^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{42}/\Gamma$**

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.158±0.020 OUR FIT</b>				
<b>0.144±0.023 OUR AVERAGE</b>				
0.143±0.025±0.015	78	<sup>1</sup> BARATE 99K	ALEP	1991–1995 LEP runs
0.152±0.076±0.021	15	<sup>2</sup> BARATE 98E	ALEP	1991–1995 LEP runs
0.145±0.036±0.020	32	COAN 96	CLEO	$E_{\text{cm}}^e \approx 10.6$ GeV

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

0.10 ±0.05 ±0.03      5      <sup>3</sup> BUSKULIC 96      ALEP      Repl. by BARATE 99K

<sup>1</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

<sup>2</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays.

<sup>3</sup> BUSKULIC 96 measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

**$\Gamma(\pi^- \bar{K}^0 \geq 1\pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{43}/\Gamma = (\Gamma_{40} + \Gamma_{44})/\Gamma$**

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.324±0.074±0.066</b>	148	ABBIENDI 00C	OPAL	1991–1995 LEP runs

**$\Gamma(\pi^- \bar{K}^0 \pi^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{44}/\Gamma$**

<u>VALUE (units 10<sup>-3</sup>)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.26±0.24</b>			<sup>1</sup> BARATE 99R	ALEP	1991–1995 LEP runs

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

<0.66      95      17      <sup>2</sup> BARATE 99K      ALEP      1991–1995 LEP runs

0.58±0.33±0.14      5      <sup>3</sup> BARATE 98E      ALEP      1991–1995 LEP runs

<sup>1</sup> BARATE 99R combine the BARATE 98E and BARATE 99K measurements to obtain this value.

<sup>2</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter.

<sup>3</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays.

**$\Gamma(K^- K^0 \pi^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{45}/\Gamma$**

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;0.16 × 10<sup>-3</sup></b>	95	<sup>1</sup> BARATE 99R	ALEP	1991–1995 LEP runs

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

<0.18 × 10<sup>-3</sup>      95      <sup>2</sup> BARATE 99K      ALEP      1991–1995 LEP runs

<0.39 × 10<sup>-3</sup>      95      <sup>3</sup> BARATE 98E      ALEP      1991–1995 LEP runs

<sup>1</sup> BARATE 99R combine the BARATE 98E and BARATE 99K bounds to obtain this value.

<sup>2</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in hadron calorimeter.

<sup>3</sup> BARATE 98E reconstruct  $K^0$ 's by using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays.



$\Gamma(\pi^- K^0 \bar{K}^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{46}/\Gamma = (2\Gamma_{47} + \Gamma_{48})/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.17 ± 0.04 OUR FIT</b>				Error includes scale factor of 1.6.
<b>0.153 ± 0.030 ± 0.016 avg</b>	74	<sup>1</sup> BARATE	98E ALEP	1991–1995 LEP runs
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.31 ± 0.12 ± 0.04		<sup>2</sup> ACCIARRI	95F L3	1991–1993 LEP runs
<sup>1</sup> BARATE 98E obtain this value by adding twice their $B(\pi^- K_S^0 K_S^0 \nu_\tau)$ value to their $B(\pi^- K_S^0 K_L^0 \nu_\tau)$ value.				
<sup>2</sup> ACCIARRI 95F assume $B(\pi^- K_S^0 K_S^0 \nu) = B(\pi^- K_S^0 K_L^0 \nu) = 1/2 B(\pi^- K_S^0 K_L^0 \nu)$ .				

$\Gamma(\pi^- K_S^0 K_S^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{47}/\Gamma$

Bose-Einstein correlations might make the mixing fraction different than 1/4.

VALUE (units 10 <sup>-4</sup> )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.4 ± 0.5 OUR FIT</b>				
<b>2.4 ± 0.5 OUR AVERAGE</b>				
2.6 ± 1.0 ± 0.5	6	BARATE	98E ALEP	1991–1995 LEP runs
2.3 ± 0.5 ± 0.3	42	COAN	96 CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

$\Gamma(\pi^- K_S^0 K_L^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{48}/\Gamma$

VALUE (units 10 <sup>-4</sup> )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>12 ± 4 OUR FIT</b>				Error includes scale factor of 1.7.
<b>10.1 ± 2.3 ± 1.3</b>	68	BARATE	98E ALEP	1991–1995 LEP runs

$\Gamma(\pi^- K^0 \bar{K}^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{49}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>(0.31 ± 0.23) × 10<sup>-3</sup></b>	<sup>1</sup> BARATE	99R ALEP	1991–1995 LEP runs
<sup>1</sup> BARATE 99R combine BARATE 98E $\Gamma(\pi^- K_S^0 K_S^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$ and $\Gamma(\pi^- K_S^0 K_L^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$ measurements to obtain this value.			

$\Gamma(\pi^- K_S^0 K_S^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{50}/\Gamma$

VALUE (units 10 <sup>-4</sup> )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 2.0</b>	95	BARATE	98E ALEP	1991–1995 LEP runs

$\Gamma(\pi^- K_S^0 K_L^0 \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{51}/\Gamma$

VALUE (units 10 <sup>-4</sup> )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3.1 ± 1.1 ± 0.5</b>	11	BARATE	98E ALEP	1991–1995 LEP runs

$\Gamma(K^0 h^+ h^- h^- \geq 0 \text{ neutrals } \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{52}/\Gamma$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 0.17</b>	95	TSCHIRHART	88 HRS	$E_{\text{cm}}^{ee} = 29$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 0.27	90	BELTRAMI	85 HRS	$E_{\text{cm}}^{ee} = 29$ GeV

$\Gamma(K^0 h^+ h^- h^- \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{53}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.3±1.9±0.7</b>	6	<sup>1</sup> BARATE	98E ALEP	1991–1995 LEP runs
<sup>1</sup> BARATE 98E reconstruct $K^0$ 's using $K_S^0 \rightarrow \pi^+ \pi^-$ decays.				

$\Gamma(h^- h^- h^+ \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{54}/\Gamma$

$$\Gamma_{54}/\Gamma = (\Gamma_{35} + 0.3431\Gamma_{37} + 0.3431\Gamma_{40} + 0.3431\Gamma_{42} + 0.4307\Gamma_{47} + 0.6861\Gamma_{48} + \Gamma_{62} + \Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{85} + \Gamma_{89} + \Gamma_{93} + \Gamma_{94} + 0.285\Gamma_{126} + 0.285\Gamma_{128} + 0.9101\Gamma_{146} + 0.9101\Gamma_{148})/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>15.18± 0.08 OUR FIT</b>	Error includes scale factor of 1.4.			
<b>14.8 ± 0.4 OUR AVERAGE</b>				

14.4 ± 0.6 ± 0.3		ADEVA	91F L3	$E_{\text{cm}}^{ee} = 88.3\text{--}94.3$ GeV
15.0 ± 0.4 ± 0.3		BEHREND	89B CELL	$E_{\text{cm}}^{ee} = 14\text{--}47$ GeV
15.1 ± 0.8 ± 0.6		AIHARA	87B TPC	$E_{\text{cm}}^{ee} = 29$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
13.5 ± 0.3 ± 0.3		ABACHI	89B HRS	$E_{\text{cm}}^{ee} = 29$ GeV
12.8 ± 1.0 ± 0.7		<sup>1</sup> BURCHAT	87 MRK2	$E_{\text{cm}}^{ee} = 29$ GeV
12.1 ± 0.5 ± 1.2		RUCKSTUHL	86 DLCO	$E_{\text{cm}}^{ee} = 29$ GeV
12.8 ± 0.5 ± 0.8	1420	SCHMIDKE	86 MRK2	$E_{\text{cm}}^{ee} = 29$ GeV
15.3 ± 1.1 $\begin{smallmatrix} +1.3 \\ -1.6 \end{smallmatrix}$	367	ALTHOFF	85 TASS	$E_{\text{cm}}^{ee} = 34.5$ GeV
13.6 ± 0.5 ± 0.8		BARTEL	85F JADE	$E_{\text{cm}}^{ee} = 34.6$ GeV
12.2 ± 1.3 ± 3.9		<sup>2</sup> BERGER	85 PLUT	$E_{\text{cm}}^{ee} = 34.6$ GeV
13.3 ± 0.3 ± 0.6		FERNANDEZ	85 MAC	$E_{\text{cm}}^{ee} = 29$ GeV
24 ± 6	35	BRANDELIK	80 TASS	$E_{\text{cm}}^{ee} = 30$ GeV
32 ± 5	692	<sup>3</sup> BACINO	78B DLCO	$E_{\text{cm}}^{ee} = 3.1\text{--}7.4$ GeV
35 ± 11		<sup>3</sup> BRANDELIK	78 DASP	Assumes $V\text{--}A$ decay
18 ± 6.5	33	<sup>3</sup> JAROS	78 LGW	$E_{\text{cm}}^{ee} > 6$ GeV

<sup>1</sup> BURCHAT 87 value is not independent of SCHMIDKE 86 value.

<sup>2</sup> Not independent of BERGER 85  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)/\Gamma_{\text{total}}$ ,  $\Gamma(e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}$ ,  $\Gamma(h^- \geq 1 \text{ neutrals } \nu_\tau)/\Gamma_{\text{total}}$ , and  $\Gamma(h^- \geq 0 K_L^0 \nu_\tau)/\Gamma_{\text{total}}$ , and therefore not used in the fit.

<sup>3</sup> Low energy experiments are not in average or fit because the systematic errors in background subtraction are judged to be large.

$\Gamma(h^- h^- h^+ \geq 0 \text{ neutrals } \nu_\tau \text{ (ex. } K_S^0 \rightarrow \pi^+ \pi^-) \text{ ("3-prong")})/\Gamma_{\text{total}}$   $\Gamma_{55}/\Gamma$

$$\Gamma_{55}/\Gamma = (\Gamma_{62} + \Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{85} + \Gamma_{89} + \Gamma_{93} + \Gamma_{94} + 0.285\Gamma_{126} + 0.285\Gamma_{128} + 0.9101\Gamma_{146} + 0.9101\Gamma_{148})/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>14.56 ± 0.08 OUR FIT</b>	Error includes scale factor of 1.3.			
<b>14.61 ± 0.06 OUR AVERAGE</b>				

14.652±0.067±0.086	avg	SCHAEL	05C ALEP	1991–1995 LEP runs
14.569±0.093±0.048	avg 23k	<sup>1</sup> ABREU	01M DLPH	1992–1995 LEP runs
14.556±0.105±0.076	f&a	<sup>2</sup> ACHARD	01D L3	1992–1995 LEP runs
14.96 ± 0.09 ± 0.22	f&a 10.4k	AKERS	95Y OPAL	1991–1994 LEP runs
14.22 ± 0.10 ± 0.37	avg	<sup>3</sup> BALEST	95C CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

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

15.26 ±0.26 ±0.22	ACTON	92H	OPAL	Repl. by AKERS 95Y
13.3 ±0.3 ±0.8	<sup>4</sup> ALBRECHT	92D	ARG	$E_{cm}^{ee} = 9.4-10.6$ GeV
14.35 $\begin{smallmatrix} +0.40 \\ -0.45 \end{smallmatrix}$ ±0.24	DECAMP	92C	ALEP	1989–1990 LEP runs

<sup>1</sup> The correlation coefficients between this measurement and the ABREU 01M measurements of  $B(\tau \rightarrow 1\text{-prong})$  and  $B(\tau \rightarrow 5\text{-prong})$  are  $-0.98$  and  $-0.08$  respectively.

<sup>2</sup> The correlation coefficients between this measurement and the ACHARD 01D measurements of  $B(\tau \rightarrow "1\text{-prong}")$  and  $B(\tau \rightarrow "5\text{-prong}")$  are  $-0.978$  and  $-0.19$  respectively.

<sup>3</sup> Not independent of BALEST 95C  $B(h^- h^- h^+ \nu_\tau)$  and  $B(h^- h^- h^+ \pi^0 \nu_\tau)$  values, and BORTOLETTO 93  $B(h^- h^- h^+ 2\pi^0 \nu_\tau)/B(h^- h^- h^+ \geq 0 \text{ neutrals } \nu_\tau)$  value.

<sup>4</sup> This ALBRECHT 92D value is not independent of their  $\Gamma(\mu^- \bar{\nu}_\mu \nu_\tau)\Gamma(e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}^2$  value.

$$\frac{\Gamma(h^- h^- h^+ \nu_\tau)}{\Gamma_{\text{total}}} \qquad \Gamma_{56}/\Gamma$$

$$\Gamma_{56}/\Gamma = (0.3431\Gamma_{35} + 0.3431\Gamma_{37} + \Gamma_{62} + \Gamma_{85} + \Gamma_{93} + 0.017\Gamma_{146})/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>9.80 ± 0.08 OUR FIT</b>	Error includes scale factor of 1.4.			
<b>7.6 ± 0.1 ± 0.5 avg</b>	7.5k	<sup>1</sup> ALBRECHT	96E ARG	$E_{cm}^{ee} = 9.4-10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9.92 ± 0.10 ± 0.09	11.2k	<sup>2</sup> BUSKULIC	96 ALEP	Repl. by SCHAEEL 05C
9.49 ± 0.36 ± 0.63		DECAMP	92C ALEP	Repl. by SCHAEEL 05C
8.7 ± 0.7 ± 0.3	694	<sup>3</sup> BEHREND	90 CELL	$E_{cm}^{ee} = 35$ GeV
7.0 ± 0.3 ± 0.7	1566	<sup>4</sup> BAND	87 MAC	$E_{cm}^{ee} = 29$ GeV
6.7 ± 0.8 ± 0.9		<sup>5</sup> BURCHAT	87 MRK2	$E_{cm}^{ee} = 29$ GeV
6.4 ± 0.4 ± 0.9		<sup>6</sup> RUCKSTUHL	86 DLCO	$E_{cm}^{ee} = 29$ GeV
7.8 ± 0.5 ± 0.8	890	SCHMIDKE	86 MRK2	$E_{cm}^{ee} = 29$ GeV
8.4 ± 0.4 ± 0.7	1255	<sup>6</sup> FERNANDEZ	85 MAC	$E_{cm}^{ee} = 29$ GeV
9.7 ± 2.0 ± 1.3		BEHREND	84 CELL	$E_{cm}^{ee} = 14,22$ GeV

<sup>1</sup> ALBRECHT 96E not independent of ALBRECHT 93C  $\Gamma(h^- h^- h^+ \nu_\tau (\text{ex. } K^0) \times \Gamma(\text{particle}^- \geq 0 \text{ neutrals } \geq 0 K_L^0 \nu_\tau)/\Gamma_{\text{total}}^2$  value.

<sup>2</sup> BUSKULIC 96 quote  $B(h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) = 9.50 \pm 0.10 \pm 0.11$ . We add 0.42 to remove their  $K^0$  correction and reduce the systematic error accordingly.

<sup>3</sup> BEHREND 90 subtract 0.3% to account for the  $\tau^- \rightarrow K^*(892)^- \nu_\tau$  contribution to measured events.

<sup>4</sup> BAND 87 subtract for charged kaon modes; not independent of FERNANDEZ 85 value.

<sup>5</sup> BURCHAT 87 value is not independent of SCHMIDKE 86 value.

<sup>6</sup> Value obtained by multiplying paper's  $R = B(h^- h^- h^+ \nu_\tau)/B(3\text{-prong})$  by  $B(3\text{-prong}) = 0.143$  and subtracting 0.3% for  $K^*(892)$  background.

$$\Gamma(h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}} \quad \Gamma_{57} / \Gamma$$

$$\Gamma_{57} / \Gamma = (\Gamma_{62} + \Gamma_{85} + \Gamma_{93} + 0.017\Gamma_{146}) / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
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**9.45 ± 0.07 OUR FIT** Error includes scale factor of 1.3.

**9.44 ± 0.14 OUR AVERAGE** Error includes scale factor of 1.4. See the ideogram below.

9.317 ± 0.090 ± 0.082 f&a 12.2k <sup>1</sup> ABDALLAH 06A DLPH 1992–1995 LEP runs

9.87 ± 0.10 ± 0.24 avg <sup>2</sup> AKERS 95Y OPAL 1991–1994 LEP runs

9.51 ± 0.07 ± 0.20 f&a 37.7k BALEST 95C CLEO  $E_{\text{cm}}^{\text{ee}} \approx 10.6 \text{ GeV}$

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

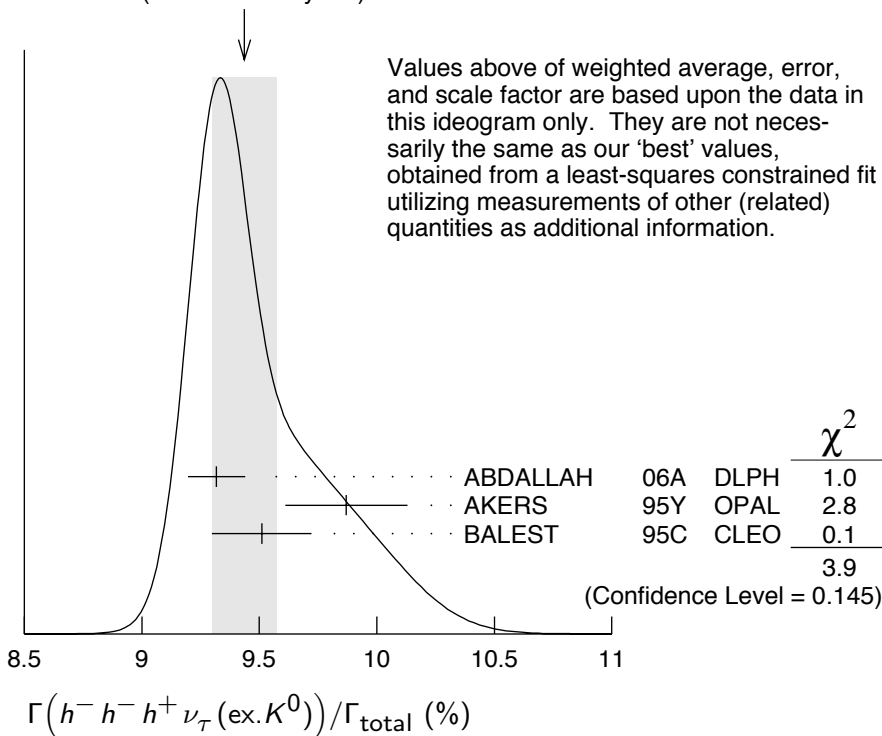
9.50 ± 0.10 ± 0.11 11.2k <sup>3</sup> BUSKULIC 96 ALEP Repl. by SCHAEEL 05C

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau) / \Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> Not independent of AKERS 95Y  $B(h^- h^- h^+ \geq 0 \text{ neutrals } \nu_\tau (\text{ex. } K_S^0 \rightarrow \pi^+ \pi^-))$  and  $B(h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) / B(h^- h^- h^+ \geq 0 \text{ neutrals } \nu_\tau (\text{ex. } K_S^0 \rightarrow \pi^+ \pi^-))$  values.

<sup>3</sup> Not independent of BUSKULIC 96  $B(h^- h^- h^+ \nu_\tau)$  value.

WEIGHTED AVERAGE  
9.44 ± 0.14 (Error scaled by 1.4)



$$\Gamma(h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma(h^- h^- h^+ \geq 0 \text{ neutrals } \nu_\tau (\text{ex. } K_S^0 \rightarrow \pi^+ \pi^-)) \quad \Gamma_{57} / \Gamma_{55}$$

$$\Gamma_{57} / \Gamma_{55} = (\Gamma_{62} + \Gamma_{85} + \Gamma_{93} + 0.017\Gamma_{146}) / (\Gamma_{62} + \Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{85} + \Gamma_{89} + \Gamma_{93} + \Gamma_{94} + 0.285\Gamma_{126} + 0.285\Gamma_{128} + 0.9101\Gamma_{146} + 0.9101\Gamma_{148})$$

VALUE		DOCUMENT ID	TECN	COMMENT
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**0.649 ± 0.004 OUR FIT** Error includes scale factor of 1.2.

**0.660 ± 0.004 ± 0.014** AKERS 95Y OPAL 1991–1994 LEP runs

$\Gamma(h^- h^- h^+ \nu_\tau (\text{ex. } K^0, \omega)) / \Gamma_{\text{total}}$   $\Gamma_{58} / \Gamma = (\Gamma_{62} + \Gamma_{85} + \Gamma_{93}) / \Gamma$   
VALUE (%) DOCUMENT ID  
**9.42 ± 0.07 OUR FIT** Error includes scale factor of 1.3.

$\Gamma(\pi^- \pi^+ \pi^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{59} / \Gamma = (0.3431\Gamma_{35} + \Gamma_{62} + 0.017\Gamma_{146}) / \Gamma$   
VALUE (%) DOCUMENT ID  
**9.32 ± 0.07 OUR FIT** Error includes scale factor of 1.2.

$\Gamma(\pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$   $\Gamma_{60} / \Gamma = (\Gamma_{62} + 0.017\Gamma_{146}) / \Gamma$   
VALUE (%) EVTS DOCUMENT ID TECN COMMENT  
**9.03 ± 0.06 OUR FIT** Error includes scale factor of 1.2.  
**8.85 ± 0.13 OUR AVERAGE**

8.83 ± 0.01 ± 0.13	1.6M	<sup>1</sup> AUBERT	08	BABR	342 fb <sup>-1</sup>	$E_{\text{cm}}^{ee} = 10.6$ GeV
9.13 ± 0.05 ± 0.46	43k	<sup>2</sup> BRIERE	03	CLE3		$E_{\text{cm}}^{ee} = 10.6$ GeV

<sup>1</sup> Correlation matrix for AUBERT 08 branching fractions:

- (1)  $\Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (2)  $\Gamma(\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$
- (3)  $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau) / \Gamma_{\text{total}}$
- (4)  $\Gamma(\tau^- \rightarrow K^- K^+ K^- \nu_\tau) / \Gamma_{\text{total}}$

	(1)	(2)	(3)
(2)	0.544		
(3)	0.390	0.177	
(4)	0.031	0.093	0.087

<sup>2</sup> 47% correlated with BRIERE 03  $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$  and 71% correlated with  $\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau$  because of a common 5% normalization error.

$\Gamma(\pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0), \text{ non-axial vector}) / \Gamma(\pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$   $\Gamma_{61} / \Gamma_{60} = \Gamma_{61} / (\Gamma_{62} + 0.017\Gamma_{146})$   
VALUE CL% DOCUMENT ID TECN COMMENT  
**<0.261** 95 <sup>1</sup> ACKERSTAFF 97R OPAL 1992–1994 LEP runs

<sup>1</sup> Model-independent limit from structure function analysis on contribution to  $B(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$  from non-axial vectors.

$\Gamma(\pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0, \omega)) / \Gamma_{\text{total}}$   $\Gamma_{62} / \Gamma$   
VALUE (%) EVTS DOCUMENT ID TECN COMMENT  
**8.99 ± 0.06 OUR FIT** Error includes scale factor of 1.2.  
**9.041 ± 0.060 ± 0.076** 29k <sup>1</sup> SCHAEL 05C ALEP 1991–1995 LEP runs

<sup>1</sup> See footnote to SCHAEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau) / \Gamma_{\text{total}}$  measurement for correlations with other measurements.

$\Gamma(h^- h^- h^+ \geq 1 \text{ neutrals } \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{63} / \Gamma$   
 $\Gamma_{63} / \Gamma = (0.3431\Gamma_{40} + 0.3431\Gamma_{42} + 0.4307\Gamma_{47} + 0.6861\Gamma_{48} + \Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{89} + \Gamma_{94} + 0.285\Gamma_{126} + 0.285\Gamma_{128} + 0.888\Gamma_{146} + 0.9101\Gamma_{148}) / \Gamma$

VALUE (%) EVTS DOCUMENT ID TECN COMMENT  
**5.38 ± 0.07 OUR FIT** Error includes scale factor of 1.2.

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

5.6 ±0.7 ±0.3	352	<sup>1</sup> BEHREND	90	CELL	$E_{cm}^{ee} = 35$ GeV
4.2 ±0.5 ±0.9	203	<sup>2</sup> ALBRECHT	87L	ARG	$E_{cm}^{ee} = 10$ GeV
6.1 ±0.8 ±0.9		<sup>3</sup> BURCHAT	87	MRK2	$E_{cm}^{ee} = 29$ GeV
7.6 ±0.4 ±0.9		<sup>4,5</sup> RUCKSTUHL	86	DLCO	$E_{cm}^{ee} = 29$ GeV
4.7 ±0.5 ±0.8	530	<sup>6</sup> SCHMIDKE	86	MRK2	$E_{cm}^{ee} = 29$ GeV
5.6 ±0.4 ±0.7		<sup>5</sup> FERNANDEZ	85	MAC	$E_{cm}^{ee} = 29$ GeV
6.2 ±2.3 ±1.7		BEHREND	84	CELL	$E_{cm}^{ee} = 14,22$ GeV

<sup>1</sup> BEHREND 90 value is not independent of BEHREND 90 B( $3h\nu_\tau \geq 1$  neutrals) + B(5-prong).

<sup>2</sup> ALBRECHT 87L measure the product of branching ratios B( $3\pi^\pm \pi^0 \nu_\tau$ ) B( $(e\bar{\nu}$  or  $\mu\bar{\nu}$  or  $\pi$  or  $K$  or  $\rho$ )  $\nu_\tau$ ) = 0.029 and use the PDG 86 values for the second branching ratio which sum to  $0.69 \pm 0.03$  to get the quoted value.

<sup>3</sup> BURCHAT 87 value is not independent of SCHMIDKE 86 value.

<sup>4</sup> Contributions from kaons and from  $>1\pi^0$  are subtracted. Not independent of (3-prong +  $0\pi^0$ ) and (3-prong +  $\geq 0\pi^0$ ) values.

<sup>5</sup> Value obtained using paper's  $R = B(h^- h^- h^+ \nu_\tau)/B(3\text{-prong})$  and current B(3-prong) = 0.143.

<sup>6</sup> Not independent of SCHMIDKE 86  $h^- h^- h^+ \nu_\tau$  and  $h^- h^- h^+ (\geq 0\pi^0) \nu_\tau$  values.

$$\Gamma(h^- h^- h^+ \geq 1\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}} \quad \Gamma_{64}/\Gamma$$

$$\Gamma_{64}/\Gamma = (\Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{126} + 0.226\Gamma_{128} + 0.888\Gamma_{146} + 0.9101\Gamma_{148})/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**5.08 ±0.06 OUR FIT** Error includes scale factor of 1.1.

**5.10 ±0.12 OUR AVERAGE**

5.106 ±0.083 ±0.103 avg 10.1k <sup>1</sup> ABDALLAH 06A DLPH 1992–1995 LEP runs

5.09 ±0.10 ±0.23 avg <sup>2</sup> AKERS 95Y OPAL 1991–1994 LEP runs

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

4.95 ±0.29 ±0.65 570 DECAMP 92C ALEP Repl. by SCHAEEL 05C

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> Not independent of AKERS 95Y B( $h^- h^- h^+ \geq 0$  neutrals  $\nu_\tau$  (ex.  $K_S^0 \rightarrow \pi^+ \pi^-$ )) and B( $h^- h^- h^+ \geq 0$  neutrals  $\nu_\tau$  (ex.  $K^0$ ))/B( $h^- h^- h^+ \geq 0$  neutrals  $\nu_\tau$  (ex.  $K_S^0 \rightarrow \pi^+ \pi^-$ )) values.

$$\Gamma(h^- h^- h^+ \pi^0 \nu_\tau)/\Gamma_{\text{total}} \quad \Gamma_{65}/\Gamma$$

$$\Gamma_{65}/\Gamma = (0.3431\Gamma_{40} + 0.3431\Gamma_{42} + \Gamma_{70} + \Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{128} + 0.888\Gamma_{146} + 0.017\Gamma_{148})/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**4.75 ±0.06 OUR FIT** Error includes scale factor of 1.2.

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

4.45 ±0.09 ±0.07 6.1k <sup>1</sup> BUSKULIC 96 ALEP Repl. by SCHAEEL 05C

<sup>1</sup> BUSKULIC 96 quote B( $h^- h^- h^+ \pi^0 \nu_\tau$  (ex.  $K^0$ )) =  $4.30 \pm 0.09 \pm 0.09$ . We add 0.15 to remove their  $K^0$  correction and reduce the systematic error accordingly.

$$\Gamma(h^- h^- h^+ \pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}} \quad \Gamma_{66}/\Gamma$$

$$\Gamma_{66}/\Gamma = (\Gamma_{70} + \Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{128} + 0.888\Gamma_{146} + 0.017\Gamma_{148})/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.56 ± 0.06 OUR FIT</b>				Error includes scale factor of 1.2.
<b>4.45 ± 0.14 OUR AVERAGE</b>				Error includes scale factor of 1.2.
4.545 ± 0.106 ± 0.103	8.9k	<sup>1</sup> ABDALLAH	06A DLPH	1992–1995 LEP runs
4.23 ± 0.06 ± 0.22	7.2k	BALEST	95C CLEO	$E_{\text{cm}}^{ee} \approx 10.6$ GeV

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$$\Gamma(h^- h^- h^+ \pi^0 \nu_\tau (\text{ex. } K^0, \omega))/\Gamma_{\text{total}} \quad \Gamma_{67}/\Gamma = (\Gamma_{70} + \Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{128})/\Gamma$$

VALUE (%)	DOCUMENT ID
<b>2.79 ± 0.08 OUR FIT</b>	Error includes scale factor of 1.2.

$$\Gamma(\pi^- \pi^+ \pi^- \pi^0 \nu_\tau)/\Gamma_{\text{total}} \quad \Gamma_{68}/\Gamma = (0.3431\Gamma_{40} + \Gamma_{70} + 0.888\Gamma_{146} + 0.017\Gamma_{148})/\Gamma$$

VALUE (%)	DOCUMENT ID
<b>4.61 ± 0.06 OUR FIT</b>	Error includes scale factor of 1.1.

$$\Gamma(\pi^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}} \quad \Gamma_{69}/\Gamma = (\Gamma_{70} + 0.888\Gamma_{146} + 0.017\Gamma_{148})/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.48 ± 0.06 OUR FIT</b>				Error includes scale factor of 1.1.
<b>4.55 ± 0.13 OUR AVERAGE</b>				Error includes scale factor of 1.6.
4.598 ± 0.057 ± 0.064	16k	<sup>1</sup> SCHAEEL	05C ALEP	1991–1995 LEP runs
4.19 ± 0.10 ± 0.21		<sup>2</sup> EDWARDS	00A CLEO	$4.7 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6$ GeV

<sup>1</sup> SCHAEEL 05C quote  $(4.590 \pm 0.057 \pm 0.064)\%$ . We add 0.008% to remove their correction for  $\tau^- \rightarrow \pi^- \pi^0 \omega \nu_\tau \rightarrow \pi^- \pi^0 \pi^+ \pi^- \nu_\tau$  decays. See footnote to SCHAEEL 05C

$\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> EDWARDS 00A quote  $(4.19 \pm 0.10) \times 10^{-2}$  with a 5% systematic error.

$$\Gamma(\pi^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0, \omega))/\Gamma_{\text{total}} \quad \Gamma_{70}/\Gamma$$

VALUE (%)	DOCUMENT ID
<b>2.70 ± 0.08 OUR FIT</b>	Error includes scale factor of 1.2.

$$\Gamma(h^- \rho \pi^0 \nu_\tau)/\Gamma(h^- h^- h^+ \pi^0 \nu_\tau) \quad \Gamma_{71}/\Gamma_{65}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • •				We do not use the following data for averages, fits, limits, etc. • • •
0.30 ± 0.04 ± 0.02	393	ALBRECHT	91D ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV

$$\Gamma(h^- \rho^+ h^- \nu_\tau)/\Gamma(h^- h^- h^+ \pi^0 \nu_\tau) \quad \Gamma_{72}/\Gamma_{65}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • •				We do not use the following data for averages, fits, limits, etc. • • •
0.10 ± 0.03 ± 0.04	142	ALBRECHT	91D ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV

$$\Gamma(h^- \rho^- h^+ \nu_\tau)/\Gamma(h^- h^- h^+ \pi^0 \nu_\tau) \quad \Gamma_{73}/\Gamma_{65}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
• • •				We do not use the following data for averages, fits, limits, etc. • • •
0.26 ± 0.05 ± 0.01	370	ALBRECHT	91D ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV

$$\Gamma(h^- h^- h^+ \geq 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$$

$$\Gamma_{74}/\Gamma = (\Gamma_{77} + \Gamma_{78} + 0.226\Gamma_{126} + 0.888\Gamma_{148})/\Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.516 ± 0.033 OUR FIT</b>				
<b>0.561 ± 0.068 ± 0.095</b>	1.3k	<sup>1</sup> ABDALLAH 06A	DLPH	1992–1995 LEP runs

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$$\Gamma(h^- h^- h^+ 2\pi^0 \nu_\tau)/\Gamma_{\text{total}}$$

$$\Gamma_{75}/\Gamma = (0.4307\Gamma_{47} + \Gamma_{77} + 0.226\Gamma_{126} + 0.888\Gamma_{148})/\Gamma$$

$\Gamma_{75}/\Gamma$

VALUE (%)	DOCUMENT ID
<b>0.504 ± 0.032 OUR FIT</b>	

$$\Gamma(h^- h^- h^+ 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$$

$$\Gamma_{76}/\Gamma = (\Gamma_{77} + 0.226\Gamma_{126} + 0.888\Gamma_{148})/\Gamma$$

$\Gamma_{76}/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.494 ± 0.032 OUR FIT</b>				
<b>0.435 ± 0.030 ± 0.035</b>	2.6k	<sup>1</sup> SCHAEEL 05C	ALEP	1991-1995 LEP runs

• • • We do not use the following data for averages, fits, limits, etc. • • •  
 0.50 ± 0.07 ± 0.07 1.8k BUSKULIC 96 ALEP Repl. by SCHAEEL 05C

<sup>1</sup> SCHAEEL 05C quote  $(0.392 \pm 0.030 \pm 0.035)\%$ . We add 0.043% to remove their correction for  $\tau^- \rightarrow \pi^- \eta \pi^0 \nu_\tau \rightarrow \pi^- \pi^+ \pi^- 2\pi^0 \nu_\tau$  and  $\tau^- \rightarrow K^*(892)^- \eta \nu_\tau \rightarrow K^- \pi^+ \pi^- 2\pi^0 \nu_\tau$  decays. See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

$$\Gamma(h^- h^- h^+ 2\pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma(h^- h^- h^+ \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) \quad \Gamma_{76}/\Gamma_{54}$$

$$\Gamma_{76}/\Gamma_{54} = (\Gamma_{77} + 0.226\Gamma_{126} + 0.888\Gamma_{148}) / (0.3431\Gamma_{35} + 0.3431\Gamma_{37} + 0.3431\Gamma_{40} + 0.3431\Gamma_{42} + 0.4307\Gamma_{47} + 0.6861\Gamma_{48} + \Gamma_{62} + \Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{85} + \Gamma_{89} + \Gamma_{93} + \Gamma_{94} + 0.285\Gamma_{126} + 0.285\Gamma_{128} + 0.9101\Gamma_{146} + 0.9101\Gamma_{148})$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.0325 ± 0.0021 OUR FIT</b>				Error includes scale factor of 1.1.
<b>0.034 ± 0.002 ± 0.003</b>	668	BORTOLETTO93	CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$

$$\Gamma(h^- h^- h^+ 2\pi^0 \nu_\tau (\text{ex. } K^0, \omega, \eta))/\Gamma_{\text{total}}$$

$\Gamma_{77}/\Gamma$

VALUE (units $10^{-4}$ )	DOCUMENT ID
<b>9 ± 4 OUR FIT</b>	

$$\Gamma(h^- h^- h^+ 3\pi^0 \nu_\tau)/\Gamma_{\text{total}}$$

$\Gamma_{78}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.3 ± 0.6 OUR FIT</b>					Error includes scale factor of 1.2.
<b>2.2 ± 0.3 ± 0.4</b>		139	ANASTASSOV 01	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

• • • We do not use the following data for averages, fits, limits, etc. • • •  
 < 4.9 95 SCHAEEL 05C ALEP 1991-1995 LEP runs  
 2.85 ± 0.56 ± 0.51 57 ANDERSON 97 CLEO Repl. by ANASTASSOV 01  
 11 ± 4 ± 5 440 <sup>1</sup> BUSKULIC 96 ALEP Repl. by SCHAEEL 05C  
<sup>1</sup> BUSKULIC 96 state their measurement is for  $B(h^- h^- h^+ \geq 3\pi^0 \nu_\tau)$ . We assume that  $B(h^- h^- h^+ \geq 4\pi^0 \nu_\tau)$  is very small.



$$\Gamma(K^- h^+ h^- \geq 0 \text{ neutrals } \nu_\tau) / \Gamma_{\text{total}} \\ \Gamma_{79} / \Gamma = (0.3431\Gamma_{37} + 0.3431\Gamma_{42} + \Gamma_{85} + \Gamma_{89} + \Gamma_{93} + \Gamma_{94} + 0.285\Gamma_{128}) / \Gamma$$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
<b>0.624 ± 0.024 OUR FIT</b>				Error includes scale factor of 1.5.
<b>&lt;0.6</b>	90	AIHARA	84C TPC	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$

$$\Gamma(K^- h^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}} \quad \Gamma_{80} / \Gamma = (\Gamma_{85} + \Gamma_{93}) / \Gamma$$

VALUE (%)	DOCUMENT ID
<b>0.427 ± 0.019 OUR FIT</b>	Error includes scale factor of 2.4.

$$\Gamma(K^- h^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma(\pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0)) \\ \Gamma_{80} / \Gamma_{60} = (\Gamma_{85} + \Gamma_{93}) / (\Gamma_{62} + 0.017\Gamma_{146})$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.73 ± 0.21 OUR FIT</b>				Error includes scale factor of 2.4.
<b>5.44 ± 0.21 ± 0.53</b>	7.9k	RICHICHI	99 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$$\Gamma(K^- h^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}} \quad \Gamma_{81} / \Gamma = (\Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{128}) / \Gamma$$

VALUE (units $10^{-4}$ )	DOCUMENT ID
<b>8.7 ± 1.2 OUR FIT</b>	Error includes scale factor of 1.1.

$$\Gamma(K^- h^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma(\pi^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0)) \\ \Gamma_{81} / \Gamma_{69} = (\Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{128}) / (\Gamma_{70} + 0.888\Gamma_{146} + 0.017\Gamma_{148})$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.94 ± 0.27 OUR FIT</b>				
<b>2.61 ± 0.45 ± 0.42</b>	719	RICHICHI	99 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$$\Gamma(K^- \pi^+ \pi^- \geq 0 \text{ neutrals } \nu_\tau) / \Gamma_{\text{total}} \\ \Gamma_{82} / \Gamma = (0.3431\Gamma_{37} + 0.3431\Gamma_{42} + \Gamma_{85} + \Gamma_{89} + 0.285\Gamma_{128}) / \Gamma$$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.478 ± 0.021 OUR FIT</b>				Error includes scale factor of 1.3.

<b>0.58 <math>\begin{smallmatrix} +0.15 \\ -0.13 \end{smallmatrix} \pm 0.12</math></b>	20	<sup>1</sup> BAUER	94 TPC	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

0.22 $\begin{smallmatrix} +0.16 \\ -0.13 \end{smallmatrix} \pm 0.05$	9	<sup>2</sup> MILLS	85 DLCO	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
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<sup>1</sup> We multiply 0.58% by 0.20, the relative systematic error quoted by BAUER 94, to obtain the systematic error.

<sup>2</sup> Error correlated with MILLS 85 ( $K K \pi \nu$ ) value. We multiply 0.22% by 0.23, the relative systematic error quoted by MILLS 85, to obtain the systematic error.

$$\Gamma(K^- \pi^+ \pi^- \geq 0 \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}} \quad \Gamma_{83} / \Gamma = (\Gamma_{85} + \Gamma_{89} + 0.226\Gamma_{128}) / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)	DOCUMENT ID	TECN	COMMENT
<b>0.368 ± 0.019 OUR FIT</b>			Error includes scale factor of 1.4.
<b>0.30 ± 0.05 OUR AVERAGE</b>			

0.343 ± 0.073 ± 0.031	avg	ABBIENDI	00D OPAL	1990–1995 LEP runs
0.275 ± 0.064	avg	<sup>1</sup> BARATE	98 ALEP	1991–1995 LEP runs

<sup>1</sup> Not independent of BARATE 98  $\Gamma(\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau) / \Gamma_{\text{total}}$  and  $\Gamma(\tau^- \rightarrow K^- \pi^+ \pi^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$  values.

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

$$\Gamma_{84} / \Gamma = (0.3431 \Gamma_{37} + \Gamma_{85}) / \Gamma$$

VALUE (%) DOCUMENT ID  
**0.341 ± 0.016 OUR FIT** Error includes scale factor of 1.8.

$$\Gamma(K^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$$

$$\Gamma_{85} / \Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%) EVTs DOCUMENT ID TECN COMMENT  
**0.287 ± 0.016 OUR FIT** Error includes scale factor of 2.1.

**0.280 ± 0.019 OUR AVERAGE** Error includes scale factor of 2.1. See the ideogram below.

0.273 ± 0.002 ± 0.009	f&a	70k	<sup>1</sup>	AUBERT	08	BABR	342 fb <sup>-1</sup>	$E_{\text{cm}}^e = 10.6 \text{ GeV}$	
0.415 ± 0.053 ± 0.040	f&a	269		ABBIENDI	04J	OPAL	1991-1995 LEP runs		
0.384 ± 0.014 ± 0.038	f&a	3.5k	<sup>2</sup>	BRIERE	03	CLE3	$E_{\text{cm}}^e = 10.6 \text{ GeV}$		
0.346 ± 0.023 ± 0.056	avg	158	<sup>3</sup>	RICHICHI	99	CLEO	$E_{\text{cm}}^e = 10.6 \text{ GeV}$		
0.214 ± 0.037 ± 0.029	f&a			BARATE	98	ALEP	1991-1995 LEP runs		
• • •	We do not use the following data for averages, fits, limits, etc. • • •								
0.360 ± 0.082 ± 0.048				ABBIENDI	00D	OPAL	1990-1995 LEP runs		

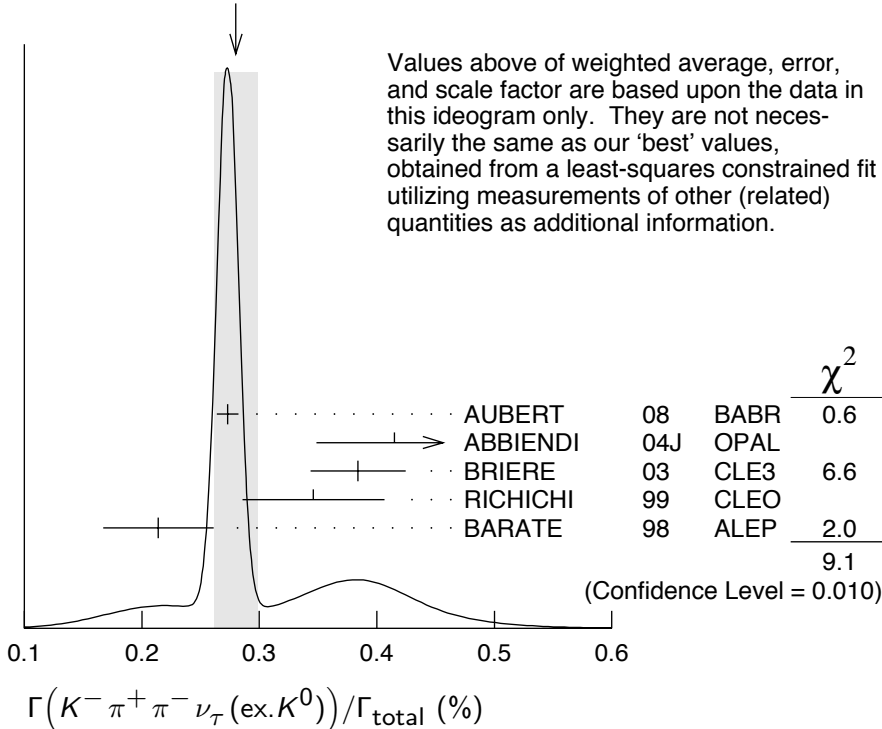
<sup>1</sup> See footnote to AUBERT 08  $\Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> 47% correlated with BRIERE 03  $\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau$  and 34% correlated with  $\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau$  because of a common 5% normalization error.

<sup>3</sup> Not independent of RICHICHI 99

$\Gamma(\tau^- \rightarrow K^- h^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$ ,  $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau) / \Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$  and BALEST 95C  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$  values.

WEIGHTED AVERAGE  
 0.280 ± 0.019 (Error scaled by 2.1)



$\Gamma(K^- \rho^0 \nu_\tau \rightarrow K^- \pi^+ \pi^- \nu_\tau) / \Gamma(K^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$   $\Gamma_{86} / \Gamma_{85}$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.48 ± 0.14 ± 0.10</b>	<sup>1</sup> ASNER	00B CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$

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

0.39 ± 0.14	<sup>2</sup> BARATE	99R ALEP	1991–1995 LEP runs
<sup>1</sup> ASNER 00B assume $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0$ ) decays proceed only through $K\rho$ and $K^* \pi$ intermediate states. They assume the resonance structure of $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0$ ) decays is dominated by $K_1(1270)^-$ and $K_1(1400)^-$ resonances, and assume $B(K_1(1270) \rightarrow K^*(892)\pi) = (16 \pm 5)\%$ , $B(K_1(1270) \rightarrow K\rho) = (42 \pm 6)\%$ , and $B(K_1(1400) \rightarrow K\rho) = 0$ .			
<sup>2</sup> BARATE 99R assume $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$ (ex. $K^0$ ) decays proceed only through $K\rho$ and $K^* \pi$ intermediate states. The quoted error is statistical only.			

$\Gamma(K^- \pi^+ \pi^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{87} / \Gamma = (0.3431\Gamma_{42} + \Gamma_{89} + 0.226\Gamma_{128}) / \Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
<b>13.5 ± 1.4 OUR FIT</b>	

$\Gamma(K^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$   $\Gamma_{88} / \Gamma = (\Gamma_{89} + 0.226\Gamma_{128}) / \Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**8.1 ± 1.2 OUR FIT**  
**7.3 ± 1.2 OUR AVERAGE**

7.4 ± 0.8 ± 1.1	f&a	<sup>1</sup> ARMS	05 CLE3	$7.6 \text{ fb}^{-1}$ , $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
7.5 ± 2.6 ± 1.8	avg	<sup>2</sup> RICHICHI	99 CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
6.1 ± 3.9 ± 1.8	f&a	BARATE	98 ALEP	1991–1995 LEP runs

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

<17	95	ABBIENDI	00D OPAL	1990–1995 LEP runs
<sup>1</sup> Not independent of ARMS 05 $\Gamma(\tau^- \rightarrow K^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0, \omega)) / \Gamma_{\text{total}}$ and $\Gamma(\tau^- \rightarrow K^- \omega \nu_\tau) / \Gamma_{\text{total}}$ values.				
<sup>2</sup> Not independent of RICHICHI 99 $\Gamma(\tau^- \rightarrow K^- h^+ \pi^- \nu_\tau (\text{ex. } K^0)) / \Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$ , $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau) / \Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$ and BALEST 95C $\Gamma(\tau^- \rightarrow h^- h^- h^+ \nu_\tau (\text{ex. } K^0)) / \Gamma_{\text{total}}$ values.				

$\Gamma(K^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0, \eta)) / \Gamma_{\text{total}}$   $\Gamma_{89} / \Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>DOCUMENT ID</u>
<b>7.5 ± 1.2 OUR FIT</b>	

$\Gamma(K^- \pi^+ \pi^- \pi^0 \nu_\tau (\text{ex. } K^0, \omega)) / \Gamma_{\text{total}}$   $\Gamma_{90} / \Gamma$

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>3.7 ± 0.5 ± 0.8</b>	833	ARMS	05 CLE3	$7.6 \text{ fb}^{-1}$ , $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$

$\Gamma(K^- \pi^+ K^- \geq 0 \text{ neut. } \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{91} / \Gamma$

<u>VALUE (%)</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;0.09</b>	95	BAUER	94 TPC	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$

$\Gamma(K^- K^+ \pi^- \geq 0 \text{ neut. } \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{92}/\Gamma = (\Gamma_{93} + \Gamma_{94})/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.146 ± 0.006</b>	<b>OUR FIT</b>				Error includes scale factor of 1.6.
<b>0.203 ± 0.031</b>	<b>OUR AVERAGE</b>				
0.159 ± 0.053 ± 0.020	f&a		ABBIENDI	00D	OPAL 1990–1995 LEP runs
0.238 ± 0.042	avg		<sup>1</sup> BARATE	98	ALEP 1991–1995 LEP runs
0.15 <sup>+0.09</sup> / <sub>-0.07</sub> ± 0.03	f&a	4	<sup>2</sup> BAUER	94	TPC $E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$

<sup>1</sup> Not independent of BARATE 98  $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau)/\Gamma_{\text{total}}$  and  $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \pi^0 \nu_\tau)/\Gamma_{\text{total}}$  values.

<sup>2</sup> We multiply 0.15% by 0.20, the relative systematic error quoted by BAUER 94, to obtain the systematic error.

$\Gamma(K^- K^+ \pi^- \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{93}/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (units $10^{-3}$ )		EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.40 ± 0.05</b>	<b>OUR FIT</b>				Error includes scale factor of 1.7.
<b>1.37 ± 0.06</b>	<b>OUR AVERAGE</b>				Error includes scale factor of 1.8.
1.346 ± 0.010 ± 0.036	f&a	18k	<sup>1</sup> AUBERT	08	BABR 342 $\text{fb}^{-1}$ $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
1.55 ± 0.06 ± 0.09	f&a	932	<sup>2</sup> BRIERE	03	CLE3 $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
0.87 ± 0.56 ± 0.40	avg		ABBIENDI	00D	OPAL 1990–1995 LEP runs
1.45 ± 0.13 ± 0.28	avg	2.3k	<sup>3</sup> RICHICHI	99	CLEO $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$
1.63 ± 0.21 ± 0.17	f&a		BARATE	98	ALEP 1991–1995 LEP runs

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

2.2 <sup>+1.7</sup> / <sub>-1.1</sub> ± 0.5		9	<sup>4</sup> MILLS	85	DLCO $E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$
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<sup>1</sup> See footnote to AUBERT 08  $\Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$  measurement for correlations with other measurements.

<sup>2</sup> 71% correlated with BRIERE 03  $\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau$  and 34% correlated with  $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$  because of a common 5% normalization error.

<sup>3</sup> Not independent of RICHICHI 99  $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau)/\Gamma_{\text{total}}$  and BALEST 95C  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \nu_\tau (\text{ex. } K^0))/\Gamma_{\text{total}}$  values.

<sup>4</sup> Error correlated with MILLS 85 ( $K \pi \pi \pi^0 \nu$ ) value. We multiply 0.22% by 0.23, the relative systematic error quoted by MILLS 85, to obtain the systematic error.

$\Gamma(K^- K^+ \pi^- \nu_\tau)/\Gamma(\pi^- \pi^+ \pi^- \nu_\tau (\text{ex. } K^0))$   $\Gamma_{93}/\Gamma_{60} = \Gamma_{93}/(\Gamma_{62} + 0.017\Gamma_{146})$

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.55 ± 0.06</b>	<b>OUR FIT</b>				Error includes scale factor of 1.6.
<b>1.60 ± 0.15 ± 0.30</b>		2.3k	RICHICHI	99	CLEO $E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$

$\Gamma(K^- K^+ \pi^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{94} / \Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.61 ± 0.25 OUR FIT** Error includes scale factor of 1.4.

**0.60 ± 0.18 OUR AVERAGE**

0.55 ± 0.14 ± 0.12	f&a	48	ARMS	05	CLE3	7.6 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
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3.3 ± 1.8 ± 0.7	avg	158	<sup>1</sup> RICHICHI	99	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
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7.5 ± 2.9 ± 1.5	f&a		BARATE	98	ALEP	1991–1995 LEP runs
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• • • We do not use the following data for averages, fits, limits, etc. • • •

< 27		95	ABBIENDI	00D	OPAL	1990–1995 LEP runs
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<sup>1</sup> Not independent of RICHICHI 99

$\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau) / \Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau \text{ (ex. } K^0))$  and BALEST 95C  $\Gamma(\tau^- \rightarrow h^- h^- h^+ \nu_\tau \text{ (ex. } K^0)) / \Gamma_{\text{total}}$  values.

$\Gamma(K^- K^+ \pi^- \pi^0 \nu_\tau) / \Gamma(\pi^- \pi^+ \pi^- \pi^0 \nu_\tau \text{ (ex. } K^0))$   $\Gamma_{94} / \Gamma_{69} = \Gamma_{94} / (\Gamma_{70} + 0.888 \Gamma_{146} + 0.017 \Gamma_{148})$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.14 ± 0.05 OUR FIT** Error includes scale factor of 1.3.

<b>0.79 ± 0.44 ± 0.16</b>		158	<sup>1</sup> RICHICHI	99	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
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<sup>1</sup> RICHICHI 99 also quote a 95%CL upper limit of 0.0157 for this measurement.

$\Gamma(K^- K^+ K^- \geq 0 \text{ neut. } \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{95} / \Gamma$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt; 0.21</b>		95	BAUER	94	TPC	$E_{\text{cm}}^{ee} = 29$ GeV
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$\Gamma(K^- K^+ K^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{96} / \Gamma$

VALUE (units $10^{-5}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
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<b>1.58 ± 0.13 ± 0.12</b>		275	<sup>1</sup> AUBERT	08	BABR	342 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
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• • • We do not use the following data for averages, fits, limits, etc. • • •

< 3.7		90	BRIERE	03	CLE3	$E_{\text{cm}}^{ee} = 10.6$ GeV
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< 19		90	BARATE	98	ALEP	1991–1995 LEP runs
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<sup>1</sup> See footnote to AUBERT 08  $\Gamma(\tau^- \rightarrow \pi^- \pi^+ \pi^- \nu_\tau \text{ (ex. } K^0)) / \Gamma_{\text{total}}$  measurement for correlations with other measurements.

$\Gamma(K^- K^+ K^- \nu_\tau \text{ (ex. } \phi)) / \Gamma_{\text{total}}$   $\Gamma_{97} / \Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt; 2.5 × 10<sup>-6</sup></b>		90	AUBERT	08	BABR	342 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
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$\Gamma(K^- K^+ K^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{98} / \Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt; 4.8 × 10<sup>-6</sup></b>		90	ARMS	05	CLE3	7.6 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
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$\Gamma(\pi^- K^+ \pi^- \geq 0 \text{ neut. } \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{99} / \Gamma$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
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<b>&lt; 0.25</b>		95	BAUER	94	TPC	$E_{\text{cm}}^{ee} = 29$ GeV
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$\Gamma(e^- e^- e^+ \bar{\nu}_e \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{100} / \Gamma$

VALUE (units $10^{-5}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.8 ± 1.4 ± 0.4</b>	5	ALAM	96	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\mu^- e^- e^+ \bar{\nu}_\mu \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{101} / \Gamma$

VALUE (units $10^{-5}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;3.6</b>	90	ALAM	96	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(3h^- 2h^+ \geq 0 \text{ neutrals } \nu_\tau \text{ (ex. } K_S^0 \rightarrow \pi^- \pi^+ \text{) ("5-prong")}) / \Gamma_{\text{total}} \quad \Gamma_{102} / \Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.  $\Gamma_{102} / \Gamma = (\Gamma_{103} + \Gamma_{104}) / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.102 ± 0.004 OUR FIT</b>	Error includes scale factor of 1.1.			
<b>0.107 ± 0.007 OUR AVERAGE</b>	Error includes scale factor of 1.1.			

0.093 ± 0.009 ± 0.012	avg	SCHAELE	05C	ALEP	1991-1995 LEP runs
0.115 ± 0.013 ± 0.006	avg	1 ABREU	01M	DLPH	1992-1995 LEP runs
0.170 ± 0.022 ± 0.026	f&a	2 ACHARD	01D	L3	1992-1995 LEP runs
0.119 ± 0.013 ± 0.008	avg	3 ACKERSTAFF	99E	OPAL	1991-1995 LEP runs
0.097 ± 0.005 ± 0.011	f&a	419	GIBAUT	94B	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
0.102 ± 0.029	f&a	13	BYLSMA	87	HRS $E_{\text{cm}}^{ee} = 29$ GeV

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

0.26 ± 0.06 ± 0.05		ACTON	92H	OPAL	$E_{\text{cm}}^{ee} = 88.2-94.2$ GeV
0.10 <sup>+0.05</sup> <sub>-0.04</sub> ± 0.03		DECAMP	92C	ALEP	1989-1990 LEP runs
0.16 ± 0.13 ± 0.04		BEHREND	89B	CELL	$E_{\text{cm}}^{ee} = 14-47$ GeV
0.3 ± 0.1 ± 0.2		BARTEL	85F	JADE	$E_{\text{cm}}^{ee} = 34.6$ GeV
0.13 ± 0.04	10	BELTRAMI	85	HRS	Repl. by BYLSMA 87
0.16 ± 0.08 ± 0.04	4	BURCHAT	85	MRK2	$E_{\text{cm}}^{ee} = 29$ GeV
1.0 ± 0.4	10	BEHREND	82	CELL	Repl. by BEHREND 89B

<sup>1</sup> The correlation coefficients between this measurement and the ABREU 01M measurements of  $B(\tau \rightarrow 1\text{-prong})$  and  $B(\tau \rightarrow 3\text{-prong})$  are  $-0.08$  and  $-0.08$  respectively.

<sup>2</sup> The correlation coefficients between this measurement and the ACHARD 01D measurements of  $B(\tau \rightarrow \text{"1-prong"})$  and  $B(\tau \rightarrow \text{"3-prong"})$  are  $-0.082$  and  $-0.19$  respectively.

<sup>3</sup> Not independent of ACKERSTAFF 99E  $B(\tau^- \rightarrow 3h^- 2h^+ \nu_\tau \text{ (ex. } K^0))$  and  $B(\tau^- \rightarrow 3h^- 2h^+ \pi^0 \nu_\tau \text{ (ex. } K^0))$  measurements.

$\Gamma(3h^- 2h^+ \nu_\tau \text{ (ex. } K^0)) / \Gamma_{\text{total}} \quad \Gamma_{103} / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>8.39 ± 0.35 OUR FIT</b>	Error includes scale factor of 1.1.			
<b>8.32 ± 0.35 OUR AVERAGE</b>				

9.7 ± 1.5 ± 0.5	96	1 ABDALLAH	06A	DLPH	1992-1995 LEP runs
8.56 ± 0.05 ± 0.42	34k	AUBERT,B	05W	BABR	232 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6$ GeV
7.2 ± 0.9 ± 1.2	165	2 SCHAELE	05C	ALEP	1991-1995 LEP runs
9.1 ± 1.4 ± 0.6	97	ACKERSTAFF	99E	OPAL	1991-1995 LEP runs

7.7 ±0.5 ±0.9	295	GIBAUT	94B	CLEO	$E_{cm}^{ee} = 10.6$ GeV
6.4 ±2.3 ±1.0	12	ALBRECHT	88B	ARG	$E_{cm}^{ee} = 10$ GeV
5.1 ±2.0	7	BYLSMA	87	HRS	$E_{cm}^{ee} = 29$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
8.0 ±1.1 ±1.3	58	BUSKULIC	96	ALEP	Repl. by SCHAEEL 05C
6.7 ±3.0	5	<sup>3</sup> BELTRAMI	85	HRS	Repl. by BYLSMA 87

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>2</sup> See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>3</sup> The error quoted is statistical only.

**$\Gamma(3h^- 2h^+ \pi^0 \nu_\tau (\text{ex. } K^0))/\Gamma_{total}$   $\Gamma_{104}/\Gamma$**

<u>VALUE (units <math>10^{-4}</math>)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1.78±0.27 OUR FIT</b>				
<b>1.74±0.27 OUR AVERAGE</b>				

1.6 ±1.2 ±0.6	13	<sup>1</sup> ABDALLAH	06A	DLPH	1992–1995 LEP runs
2.1 ±0.7 ±0.9	95	<sup>2</sup> SCHAEEL	05C	ALEP	1991-1995 LEP runs
1.7 ±0.2 ±0.2	231	ANASTASSOV	01	CLEO	$E_{cm}^{ee} = 10.6$ GeV
2.7 ±1.8 ±0.9	23	ACKERSTAFF	99E	OPAL	1991–1995 LEP runs

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

1.8 ±0.7 ±1.2	18	BUSKULIC	96	ALEP	Repl. by SCHAEEL 05C
1.9 ±0.4 ±0.4	31	GIBAUT	94B	CLEO	Repl. by ANASTASSOV 01
5.1 ±2.2	6	BYLSMA	87	HRS	$E_{cm}^{ee} = 29$ GeV
6.7 ±3.0	5	<sup>3</sup> BELTRAMI	85	HRS	Repl. by BYLSMA 87

<sup>1</sup> See footnote to ABDALLAH 06A  $\Gamma(\tau^- \rightarrow h^- \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>2</sup> SCHAEEL 05C quote  $(1.4 \pm 0.7 \pm 0.9) \times 10^{-4}$ . We add  $0.7 \times 10^{-4}$  to remove their correction for  $\tau^- \rightarrow \eta \pi^- \pi^+ \pi^- \nu_\tau \rightarrow 3\pi^- 2\pi^+ \pi^0 \nu_\tau$  and  $\tau^- \rightarrow K^*(892)^- \eta \nu_\tau \rightarrow 3\pi^- 2\pi^+ \pi^0 \nu_\tau$  decays. See footnote to SCHAEEL 05C  $\Gamma(\tau^- \rightarrow e^- \bar{\nu}_e \nu_\tau)/\Gamma_{total}$  measurement for correlations with other measurements.

<sup>3</sup> The error quoted is statistical only.

**$\Gamma(3h^- 2h^+ 2\pi^0 \nu_\tau)/\Gamma_{total}$   $\Gamma_{105}/\Gamma$**

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>&lt;3.4 × 10<sup>-6</sup></b>	90	AUBERT,B	06	BABR 232 fb <sup>-1</sup> $E_{cm}^{ee} = 10.6$ GeV

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

<1.1 × 10 <sup>-4</sup>	90	GIBAUT	94B	CLEO	$E_{cm}^{ee} = 10.6$ GeV
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**$\Gamma((5\pi)^- \nu_\tau)/\Gamma_{total}$   $\Gamma_{106}/\Gamma$**

$$\Gamma_{106}/\Gamma = (\Gamma_{30} + \Gamma_{47} + \Gamma_{77} + \Gamma_{103} + 0.553\Gamma_{126} + 0.888\Gamma_{148})/\Gamma$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.76±0.05 OUR FIT</b>			
<b>0.61±0.06±0.08</b>	<b>avg</b>	<sup>1</sup> GIBAUT	94B CLEO $E_{cm}^{ee} = 10.6$ GeV

<sup>1</sup> Not independent of GIBAUT 94B  $B(3h^- 2h^+ \nu_\tau)$ , PROCARIO 93  $B(h^- 4\pi^0 \nu_\tau)$ , and BORTOLETTO 93  $B(2h^- h^+ 2\pi^0 \nu_\tau)/B(\text{"3prong"})$  measurements. Result is corrected for  $\eta$  contributions.

$\Gamma(4h^-3h^+ \geq 0 \text{ neutrals } \nu_\tau \text{ ("7-prong")})/\Gamma_{\text{total}}$   $\Gamma_{107}/\Gamma$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$<3.0 \times 10^{-7}$	90	AUBERT,B	05F BABR	$232 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<1.8 \times 10^{-5}$	95	ACKERSTAFF	97J OPAL	1990–1995 LEP runs
$<2.4 \times 10^{-6}$	90	EDWARDS	97B CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<2.9 \times 10^{-4}$	90	BYLSMA	87 HRS	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$

$\Gamma(4h^-3h^+ \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{108}/\Gamma$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$<4.3 \times 10^{-7}$	90	AUBERT,B	05F BABR	$232 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(4h^-3h^+ \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{109}/\Gamma$

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$<2.5 \times 10^{-7}$	90	AUBERT,B	05F BABR	$232 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(X^-(S=-1)\nu_\tau)/\Gamma_{\text{total}}$   
 $\Gamma_{110}/\Gamma = (\Gamma_{10} + \Gamma_{16} + \Gamma_{23} + \Gamma_{28} + \Gamma_{35} + \Gamma_{40} + \Gamma_{85} + \Gamma_{89} + \Gamma_{128})/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

<u>VALUE (%)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>2.85 \pm 0.07</math> OUR FIT</b>	Error includes scale factor of 1.3.		
<b><math>2.87 \pm 0.12</math> avg</b>	<sup>1</sup> BARATE	99R ALEP	1991–1995 LEP runs

<sup>1</sup> BARATE 99R perform a combined analysis of all ALEPH LEP 1 data on  $\tau$  branching fraction measurements for decay modes having total strangeness equal to  $-1$ .

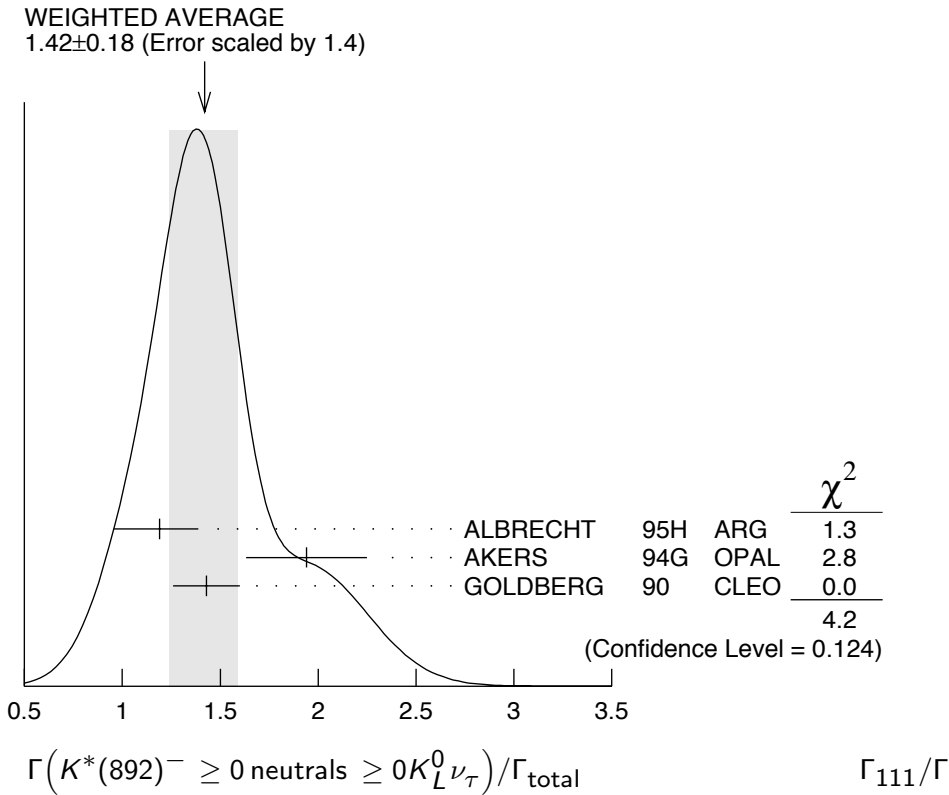
$\Gamma(K^*(892)^- \geq 0 \text{ neutrals } \geq 0 K_L^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{111}/\Gamma$

<u>VALUE (%)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>1.42 \pm 0.18</math> OUR AVERAGE</b>	Error includes scale factor of 1.4. See the ideogram below.			
$1.19 \pm 0.15^{+0.13}_{-0.18}$	104	ALBRECHT	95H ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6 \text{ GeV}$
$1.94 \pm 0.27 \pm 0.15$	74	<sup>1</sup> AKERS	94G OPAL	$E_{\text{cm}}^{ee} = 88\text{--}94 \text{ GeV}$
$1.43 \pm 0.11 \pm 0.13$	475	<sup>2</sup> GOLDBERG	90 CLEO	$E_{\text{cm}}^{ee} = 9.4\text{--}10.9 \text{ GeV}$

<sup>1</sup> AKERS 94G reject events in which a  $K_S^0$  accompanies the  $K^*(892)^-$ . We do not correct for them.

<sup>2</sup> GOLDBERG 90 estimates that 10% of observed  $K^*(892)$  are accompanied by a  $\pi^0$ .





$\Gamma(K^*(892)^- \nu_\tau) / \Gamma_{\text{total}}$

$\Gamma_{112} / \Gamma$

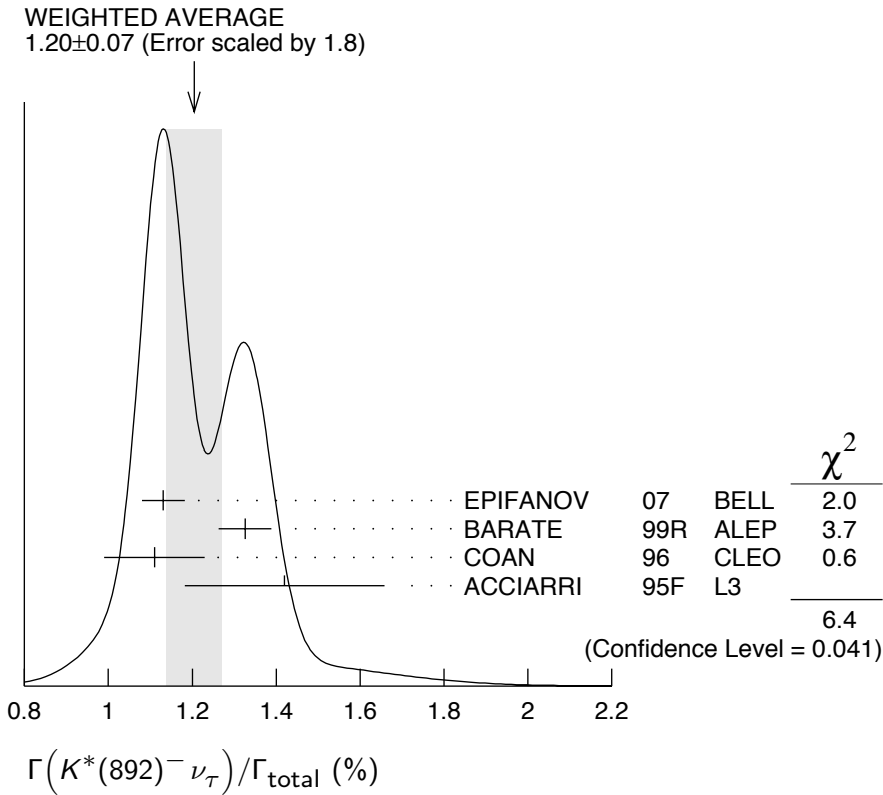
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>1.20 \pm 0.07</math></b>	<b>OUR AVERAGE</b>	Error includes scale factor of 1.8. See the ideogram below.		
$1.131 \pm 0.006 \pm 0.051$	49k	<sup>1</sup> EPIFANOV 07	BELL	$351 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$1.326 \pm 0.063$		BARATE 99R	ALEP	1991–1995 LEP runs
$1.11 \pm 0.12$		<sup>2</sup> COAN 96	CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$
$1.42 \pm 0.22 \pm 0.09$		<sup>3</sup> ACCIARRI 95F	L3	1991–1993 LEP runs
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$1.39 \pm 0.09 \pm 0.10$		<sup>4</sup> BUSKULIC 96	ALEP	Repl. by BARATE 99R
$1.45 \pm 0.13 \pm 0.11$	273	<sup>5</sup> BUSKULIC 94F	ALEP	Repl. by BUSKULIC 96
$1.23 \pm 0.21$	$+0.11$ $-0.21$	54	<sup>6</sup> ALBRECHT 88L	ARG $E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$1.9 \pm 0.3 \pm 0.4$	44	<sup>7</sup> TSCHIRHART 88	HRS	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
$1.5 \pm 0.4 \pm 0.4$	15	<sup>8</sup> AIHARA 87C	TPC	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
$1.3 \pm 0.3 \pm 0.3$	31	YELTON 86	MRK2	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$
$1.7 \pm 0.7$	11	DORFAN 81	MRK2	$E_{\text{cm}}^{ee} = 4.2\text{--}6.7 \text{ GeV}$

<sup>1</sup> EPIFANOV 07 quote  $B(\tau^- \rightarrow K^*(892)^- \nu_\tau) B(K^*(892)^- \rightarrow K_S^0 \pi^-) = (3.77 \pm 0.02(\text{stat}) \pm 0.12(\text{syst}) \pm 0.12(\text{mod})) \times 10^{-3}$ . We add the systematic and model uncertainties in quadrature and divide by  $B(K^*(892)^- \rightarrow K_S^0 \pi^-) = 0.3333$ .

<sup>2</sup> Not independent of COAN 96  $B(\pi^- \bar{K}^0 \nu_\tau)$  and BATTLE 94  $B(K^- \pi^0 \nu_\tau)$  measurements.  $K\pi$  final states are consistent with and assumed to originate from  $K^*(892)^-$  production.

<sup>3</sup> This result is obtained from their  $B(\pi^- \bar{K}^0 \nu_\tau)$  assuming all those decays originate in  $K^*(892)^-$  decays.

- 4 Not independent of BUSKULIC 96  $B(\pi^- \bar{K}^0 \nu_\tau)$  and  $B(K^- \pi^0 \nu_\tau)$  measurements.  
 5 BUSKULIC 94F obtain this result from BUSKULIC 94F  $B(\bar{K}^0 \pi^- \nu_\tau)$  and BUSKULIC 94E  $B(K^- \pi^0 \nu_\tau)$  assuming all of those decays originate in  $K^*(892)^-$  decays.  
 6 The authors divide by  $\Gamma_2/\Gamma = 0.865$  to obtain this result.  
 7 Not independent of TSCHIRHART 88  $\Gamma(\tau^- \rightarrow h^- \bar{K}^0 \geq 0 \text{ neutrals} \geq 0 K_L^0 \nu_\tau) / \Gamma$ .  
 8 Decay  $\pi^-$  identified in this experiment, is assumed in the others.



$\Gamma(K^*(892)^- \nu_\tau) / \Gamma(\pi^- \pi^0 \nu_\tau)$		$\Gamma_{112} / \Gamma_{14}$		
VALUE	DOCUMENT ID	TECN	COMMENT	
<b><math>0.075 \pm 0.027</math></b>	<sup>1</sup> ABREU	94K	DLPH	LEP 1992 Z data

<sup>1</sup> ABREU 94K quote  $B(\tau^- \rightarrow K^*(892)^- \nu_\tau) B(K^*(892)^- \rightarrow K^- \pi^0) / B(\tau^- \rightarrow \rho^- \nu_\tau) = 0.025 \pm 0.009$ . We divide by  $B(K^*(892)^- \rightarrow K^- \pi^0) = 0.333$  to obtain this result.

$\Gamma(K^*(892)^- \nu_\tau \rightarrow \pi^- \bar{K}^0 \nu_\tau) / \Gamma(\pi^- \bar{K}^0 \nu_\tau)$		$\Gamma_{113} / \Gamma_{35}$		
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.933 \pm 0.027</math></b>	49k	EPIFANOV	07	BELL 351 $\text{fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(K^*(892)^0 K^- \geq 0 \text{ neutrals} \nu_\tau) / \Gamma_{\text{total}}$		$\Gamma_{114} / \Gamma$		
VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>0.32 \pm 0.08 \pm 0.12</math></b>	119	GOLDBERG	90	CLEO $E_{\text{cm}}^{ee} = 9.4\text{--}10.9$ GeV

$\Gamma(K^*(892)^0 K^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{115} / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.21 ± 0.04 OUR AVERAGE**

0.213 ± 0.048		<sup>1</sup> BARATE	98	ALEP 1991–1995 LEP runs
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0.20 ± 0.05 ± 0.04	47	ALBRECHT	95H	ARG $E_{\text{cm}}^{\text{ee}} = 9.4\text{--}10.6$ GeV
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<sup>1</sup> BARATE 98 measure the  $K^- (\rho^0 \rightarrow \pi^+ \pi^-)$  fraction in  $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$  decays to be  $(35 \pm 11)\%$  and derive this result from their measurement of  $\Gamma(\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau) / \Gamma_{\text{total}}$  assuming the intermediate states are all  $K^- \rho$  and  $K^- K^*(892)^0$ .

$\Gamma(\bar{K}^*(892)^0 \pi^- \geq 0 \text{ neutrals } \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{116} / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.38 ± 0.11 ± 0.13**

0.38 ± 0.11 ± 0.13	105	GOLDBERG	90	CLEO $E_{\text{cm}}^{\text{ee}} = 9.4\text{--}10.9$ GeV
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$\Gamma(\bar{K}^*(892)^0 \pi^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{117} / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.22 ± 0.05 OUR AVERAGE**

0.209 ± 0.058		<sup>1</sup> BARATE	98	ALEP 1991–1995 LEP runs
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0.25 ± 0.10 ± 0.05	27	ALBRECHT	95H	ARG $E_{\text{cm}}^{\text{ee}} = 9.4\text{--}10.6$ GeV
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<sup>1</sup> BARATE 98 measure the  $K^- K^*(892)^0$  fraction in  $\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau$  decays to be  $(87 \pm 13)\%$  and derive this result from their measurement of  $\Gamma(\tau^- \rightarrow K^- K^+ \pi^- \nu_\tau) / \Gamma_{\text{total}}$ .

$\Gamma((\bar{K}^*(892)\pi)^- \nu_\tau \rightarrow \pi^- \bar{K}^0 \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{118} / \Gamma$

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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**0.10 ± 0.04 OUR AVERAGE**

0.097 ± 0.044 ± 0.036	<sup>1</sup> BARATE	99K	ALEP 1991–1995 LEP runs
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0.106 ± 0.037 ± 0.032	<sup>2</sup> BARATE	98E	ALEP 1991–1995 LEP runs
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<sup>1</sup> BARATE 99K measure  $K^0$ 's by detecting  $K_L^0$ 's in their hadron calorimeter. They determine the  $\bar{K}^0 \rho^-$  fraction in  $\tau^- \rightarrow \pi^- \bar{K}^0 \pi^0 \nu_\tau$  decays to be  $(0.72 \pm 0.12 \pm 0.10)$  and multiply their  $B(\pi^- \bar{K}^0 \pi^0 \nu_\tau)$  measurement by one minus this fraction to obtain the quoted result.

<sup>2</sup> BARATE 98E reconstruct  $K^0$ 's using  $K_S^0 \rightarrow \pi^+ \pi^-$  decays. They determine the  $\bar{K}^0 \rho^-$  fraction in  $\tau^- \rightarrow \pi^- \bar{K}^0 \pi^0 \nu_\tau$  decays to be  $(0.64 \pm 0.09 \pm 0.10)$  and multiply their  $B(\pi^- \bar{K}^0 \pi^0 \nu_\tau)$  measurement by one minus this fraction to obtain the quoted result.

$\Gamma(K_1(1270)^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{119} / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.47 ± 0.11 OUR AVERAGE**

0.48 ± 0.11		BARATE	99R	ALEP 1991–1995 LEP runs
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0.41 <sup>+0.41</sup> <sub>-0.35</sub> ± 0.10	5	<sup>1</sup> BAUER	94	TPC $E_{\text{cm}}^{\text{ee}} = 29$ GeV
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<sup>1</sup> We multiply 0.41% by 0.25, the relative systematic error quoted by BAUER 94, to obtain the systematic error.

$\Gamma(K_1(1400)^- \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{120} / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.17 ± 0.26 OUR AVERAGE</b>		Error includes scale factor of 1.7.		
0.05 ± 0.17		BARATE	99R ALEP	1991–1995 LEP runs
0.76 <sup>+0.40</sup> <sub>-0.33</sub> ± 0.20	11	<sup>1</sup> BAUER	94 TPC	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$

<sup>1</sup>We multiply 0.76% by 0.25, the relative systematic error quoted by BAUER 94, to obtain the systematic error.

$[\Gamma(K_1(1270)^- \nu_\tau) + \Gamma(K_1(1400)^- \nu_\tau)] / \Gamma_{\text{total}} \quad (\Gamma_{119} + \Gamma_{120}) / \Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.17<sup>+0.41</sup><sub>-0.37</sub> ± 0.29</b>	16	<sup>1</sup> BAUER	94 TPC	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$

<sup>1</sup>We multiply 1.17% by 0.25, the relative systematic error quoted by BAUER 94, to obtain the systematic error. Not independent of BAUER 94  $B(K_1(1270)^- \nu_\tau)$  and BAUER 94  $B(K_1(1400)^- \nu_\tau)$  measurements.

$\Gamma(K_1(1270)^- \nu_\tau) / [\Gamma(K_1(1270)^- \nu_\tau) + \Gamma(K_1(1400)^- \nu_\tau)] \quad \Gamma_{119} / (\Gamma_{119} + \Gamma_{120})$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.69 ± 0.15 OUR AVERAGE</b>			
0.71 ± 0.16 ± 0.11	<sup>1</sup> ABBIENDI 00D	OPAL	1990–1995 LEP runs
0.66 ± 0.19 ± 0.13	<sup>2</sup> ASNER 00B	CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6 \text{ GeV}$

<sup>1</sup>ABBIENDI 00D assume the resonance structure of  $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$  decays is dominated by the  $K_1(1270)^-$  and  $K_1(1400)^-$  resonances.

<sup>2</sup>ASNER 00B assume the resonance structure of  $\tau^- \rightarrow K^- \pi^+ \pi^- \nu_\tau$  (ex.  $K^0$ ) decays is dominated by  $K_1(1270)^-$  and  $K_1(1400)^-$  resonances.

$\Gamma(K^*(1410)^- \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{121} / \Gamma$

VALUE (units $10^{-3}$ )	DOCUMENT ID	TECN	COMMENT
<b>1.5<sup>+1.4</sup><sub>-1.0</sub></b>	BARATE	99R ALEP	1991–1995 LEP runs

$\Gamma(K_0^*(1430)^- \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{122} / \Gamma$

VALUE (units $10^{-3}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.5</b>	95	BARATE	99R ALEP	1991–1995 LEP runs

$\Gamma(K_2^*(1430)^- \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{123} / \Gamma$

VALUE (%)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt;0.3</b>	95		TSCHIRHART 88	HRS	$E_{\text{cm}}^{\text{ee}} = 29 \text{ GeV}$

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

<0.33	95	<sup>1</sup> ACCIARRI	95F L3	1991–1993 LEP runs
<0.9	95	0 DORFAN	81 MRK2	$E_{\text{cm}}^{\text{ee}} = 4.2\text{--}6.7 \text{ GeV}$

<sup>1</sup>ACCIARRI 95F quote  $B(\tau^- \rightarrow K^*(1430)^- \rightarrow \pi^- \bar{K}^0 \nu_\tau) < 0.11\%$ . We divide by  $B(K^*(1430)^- \rightarrow \pi^- \bar{K}^0) = 0.33$  to obtain the limit shown.

$\Gamma(a_0(980)^- \geq 0 \text{ neutrals } \nu_\tau) / \Gamma_{\text{total}} \times B(a_0(980) \rightarrow K^0 K^-) \quad \Gamma_{124} / \Gamma \times B$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;2.8</b>	90	GOLDBERG	90 CLEO	$E_{\text{cm}}^{\text{ee}} = 9.4\text{--}10.9 \text{ GeV}$

$\Gamma(\eta\pi^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{125}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>&lt; 1.4</b>	95	0	BARTELT	96	CLEO $E_{\text{cm}}^{ee} \approx 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
< 6.2	95		BUSKULIC	97C	ALEP 1991–1994 LEP runs
< 3.4	95		ARTUSO	92	CLEO $E_{\text{cm}}^{ee} \approx 10.6$ GeV
< 90	95		ALBRECHT	88M	ARG $E_{\text{cm}}^{ee} \approx 10$ GeV
<140	90		BEHREND	88	CELL $E_{\text{cm}}^{ee} = 14\text{--}46.8$ GeV
<180	95		BARINGER	87	CLEO $E_{\text{cm}}^{ee} = 10.5$ GeV
<250	90	0	COFFMAN	87	MRK3 $E_{\text{cm}}^{ee} = 3.77$ GeV
510 $\pm 100 \pm 120$		65	DERRICK	87	HRS $E_{\text{cm}}^{ee} = 29$ GeV
<100	95		GAN	87B	MRK2 $E_{\text{cm}}^{ee} = 29$ GeV

$\Gamma(\eta\pi^-\pi^0\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{126}/\Gamma$

VALUE (%)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.181 ± 0.024 OUR FIT</b>					
<b>0.173 ± 0.024 OUR AVERAGE</b>					
0.18 $\pm 0.04 \pm 0.02$			BUSKULIC	97C	ALEP 1991–1994 LEP runs
0.17 $\pm 0.02 \pm 0.02$		125	ARTUSO	92	CLEO $E_{\text{cm}}^{ee} \approx 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<1.10	95		ALBRECHT	88M	ARG $E_{\text{cm}}^{ee} \approx 10$ GeV
<2.10	95		BARINGER	87	CLEO $E_{\text{cm}}^{ee} = 10.5$ GeV
4.20 $\begin{smallmatrix} +0.70 \\ -1.20 \end{smallmatrix} \pm 1.60$			<sup>1</sup> GAN	87	MRK2 $E_{\text{cm}}^{ee} = 29$ GeV

<sup>1</sup> Highly correlated with GAN 87  $\Gamma(\pi^- 3\pi^0\nu_\tau)/\Gamma(\text{total})$  value.

$\Gamma(\eta\pi^-\pi^0\pi^0\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{127}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.5 ± 0.5</b>		30	<sup>1</sup> ANASTASSOV	01	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
1.4 $\pm 0.6 \pm 0.3$		15	<sup>2</sup> BERGFELD	97	CLEO Repl. by ANASTASSOV 01
< 4.3	95		ARTUSO	92	CLEO $E_{\text{cm}}^{ee} \approx 10.6$ GeV
<120	95		ALBRECHT	88M	ARG $E_{\text{cm}}^{ee} \approx 10$ GeV

<sup>1</sup> Weighted average of BERGFELD 97 and ANASTASSOV 01 value of  $(1.5 \pm 0.6 \pm 0.3) \times 10^{-4}$  obtained using  $\eta$ 's reconstructed from  $\eta \rightarrow \pi^+\pi^-\pi^0$  decays.

<sup>2</sup> BERGFELD 97 reconstruct  $\eta$ 's using  $\eta \rightarrow \gamma\gamma$  decays.

$\Gamma(\eta K^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{128}/\Gamma$

VALUE (units $10^{-4}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.7 ± 0.6 OUR FIT</b>					
<b>2.7 ± 0.6 OUR AVERAGE</b>					
2.9 $\begin{smallmatrix} +1.3 \\ -1.2 \end{smallmatrix} \pm 0.7$			BUSKULIC	97C	ALEP 1991–1994 LEP runs
2.6 $\pm 0.5 \pm 0.5$		85	BARTELT	96	CLEO $E_{\text{cm}}^{ee} \approx 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<4.7	95		ARTUSO	92	CLEO $E_{\text{cm}}^{ee} \approx 10.6$ GeV

$\Gamma(\eta K^*(892)^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{129} / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.90 ± 0.80 ± 0.42</b>	25	BISHAI 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\eta K^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{130} / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.77 ± 0.56 ± 0.71</b>	36	BISHAI 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\eta \bar{K}^0 \pi^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{131} / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.20 ± 0.70 ± 0.22</b>	15	<sup>1</sup> BISHAI 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

<sup>1</sup> We multiply the BISHAI 99 measurement  $B(\tau^- \rightarrow \eta K_S^0 \pi^- \nu_\tau) = (1.10 \pm 0.35 \pm 0.11) \times 10^{-4}$  by 2 to obtain the listed value.

$\Gamma(\eta \pi^+ \pi^- \pi^- \geq 0 \text{ neutrals } \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{132} / \Gamma$

VALUE (%)	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 0.3</b>	90	ABACHI 87B	HRS	$E_{\text{cm}}^{ee} = 29 \text{ GeV}$

$\Gamma(\eta \pi^- \pi^+ \pi^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{133} / \Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.3 ± 0.5</b>	170	<sup>1</sup> ANASTASSOV 01	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$3.4^{+0.6}_{-0.5} \pm 0.6$	89	<sup>2</sup> BERGFELD 97	CLEO	Repl. by ANASTASSOV 01
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<sup>1</sup> Weighted average of BERGFELD 97 and ANASTASSOV 01 measurements using  $\eta$ 's reconstructed from  $\eta \rightarrow \pi^+ \pi^- \pi^0$  and  $\eta \rightarrow 3\pi^0$  decays.

<sup>2</sup> BERGFELD 97 reconstruct  $\eta$ 's using  $\eta \rightarrow \gamma\gamma$  and  $\eta \rightarrow 3\pi^0$  decays.

$\Gamma(\eta a_1(1260)^- \nu_\tau \rightarrow \eta \pi^- \rho^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{134} / \Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 3.9 × 10<sup>-4</sup></b>	90	BERGFELD 97	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\eta \eta \pi^- \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{135} / \Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 1.1</b>	95	ARTUSO 92	CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$

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

< 83	95	ALBRECHT 88M	ARG	$E_{\text{cm}}^{ee} \approx 10 \text{ GeV}$
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$\Gamma(\eta \eta \pi^- \pi^0 \nu_\tau) / \Gamma_{\text{total}}$   $\Gamma_{136} / \Gamma$

VALUE (units $10^{-4}$ )	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 2.0</b>	95	ARTUSO 92	CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$

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

< 90	95	ALBRECHT 88M	ARG	$E_{\text{cm}}^{ee} \approx 10 \text{ GeV}$
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$\Gamma(\eta'(958)\pi^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{137}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<7.4 \times 10^{-5}$	90	BERGFELD	97	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\eta'(958)\pi^-\pi^0\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{138}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<8.0 \times 10^{-5}$	90	BERGFELD	97	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\phi\pi^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{139}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>3.42 \pm 0.55 \pm 0.25</math></b>		344	AUBERT	08	BABR $342 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6$ GeV

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

$< 20$	90	<sup>1</sup> AVERY	97	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
$< 35$	90	ALBRECHT	95H	ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV

<sup>1</sup>AVERY 97 limit varies from  $(1.2\text{--}2.0) \times 10^{-4}$  depending on decay model assumptions.

$\Gamma(\phi K^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{140}/\Gamma$

VALUE (units $10^{-5}$ )	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>3.70 \pm 0.33</math> OUR AVERAGE</b>					Error includes scale factor of 1.3.

$3.39 \pm 0.20 \pm 0.28$		274	AUBERT	08	BABR $342 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6$ GeV
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$4.05 \pm 0.25 \pm 0.26$		551	INAMI	06	BELL $401 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6$ GeV
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 6.7$	90	<sup>1</sup> AVERY	97	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
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<sup>1</sup>AVERY 97 limit varies from  $(5.4\text{--}6.7) \times 10^{-5}$  depending on decay model assumptions.

$\Gamma(f_1(1285)\pi^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{141}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b><math>4.1 \pm 0.8</math> OUR AVERAGE</b>				

$3.9 \pm 0.7 \pm 0.5$	1.4k	<sup>1</sup> AUBERT,B	05W	BABR $232 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6$ GeV
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$5.8^{+1.4}_{-1.3} \pm 1.8$	54	<sup>2</sup> BERGFELD	97	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
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<sup>1</sup>AUBERT,B 05W use the  $f_1(1285) \rightarrow 2\pi^+ 2\pi^-$  decay mode.

<sup>2</sup>BERGFELD 97 use the  $f_1(1285) \rightarrow \eta\pi^+\pi^-$  decay mode.

$\Gamma(f_1(1285)\pi^-\nu_\tau \rightarrow \eta\pi^-\pi^+\pi^-\nu_\tau)/\Gamma(\eta\pi^-\pi^+\pi^-\nu_\tau)$   $\Gamma_{142}/\Gamma_{133}$

VALUE	DOCUMENT ID	TECN	COMMENT
<b><math>0.55 \pm 0.14</math></b>	BERGFELD	97	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\pi(1300)^-\nu_\tau \rightarrow (\rho\pi)^-\nu_\tau \rightarrow (3\pi)^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{143}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.0 \times 10^{-4}$	90	ASNER	00	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\pi(1300)^-\nu_\tau \rightarrow ((\pi\pi)_{\text{S-wave}}\pi)^-\nu_\tau \rightarrow (3\pi)^-\nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{144}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.9 \times 10^{-4}$	90	ASNER	00	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(h^- \omega \geq 0 \text{ neutrals } \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{145}/\Gamma$   
 $\Gamma_{145}/\Gamma = (\Gamma_{146} + \Gamma_{148})/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>2.40 ± 0.09 OUR FIT</b>	Error includes scale factor of 1.2.				
<b>1.65 ± 0.3 ± 0.2</b>	avg	1513	ALBRECHT	88M ARG	$E_{\text{cm}}^{ee} \approx 10 \text{ GeV}$

$\Gamma(h^- \omega \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{146}/\Gamma$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE (%)		EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.99 ± 0.08 OUR FIT</b>	Error includes scale factor of 1.3.				
<b>1.92 ± 0.07 OUR AVERAGE</b>					
1.91 ± 0.07 ± 0.06	f&a	5803	BUSKULIC	97C ALEP	1991–1994 LEP runs
1.95 ± 0.07 ± 0.11	avg	2223	<sup>1</sup> BALEST	95C CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$
1.60 ± 0.27 ± 0.41	f&a	139	BARINGER	87 CLEO	$E_{\text{cm}}^{ee} = 10.5 \text{ GeV}$

<sup>1</sup> Not independent of BALEST 95C  $B(\tau^- \rightarrow h^- \omega \nu_\tau)/B(\tau^- \rightarrow h^- h^- h^+ \pi^0 \nu_\tau)$  value.

$\Gamma(h^- \omega \nu_\tau)/\Gamma(h^- h^- h^+ \pi^0 \nu_\tau \text{ (ex. } K^0))$   $\Gamma_{146}/\Gamma_{66}$   
 $\Gamma_{146}/\Gamma_{66} = \Gamma_{146}/(\Gamma_{70} + \Gamma_{89} + \Gamma_{94} + 0.226\Gamma_{128} + 0.888\Gamma_{146} + 0.017\Gamma_{148})$

VALUE		EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.437 ± 0.017 OUR FIT</b>	Error includes scale factor of 1.2.				
<b>0.453 ± 0.019 OUR AVERAGE</b>					
0.431 ± 0.033		2350	<sup>1</sup> BUSKULIC	96 ALEP	LEP 1991–1993 data
0.464 ± 0.016 ± 0.017		2223	<sup>2</sup> BALEST	95C CLEO	$E_{\text{cm}}^{ee} \approx 10.6 \text{ GeV}$
• • •	We do not use the following data for averages, fits, limits, etc. • • •				
0.37 ± 0.05 ± 0.02		458	<sup>3</sup> ALBRECHT	91D ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6 \text{ GeV}$

<sup>1</sup> BUSKULIC 96 quote the fraction of  $\tau \rightarrow h^- h^- h^+ \pi^0 \nu_\tau$  (ex.  $K^0$ ) decays which originate in a  $h^- \omega$  final state =  $0.383 \pm 0.029$ . We divide this by the  $\omega(782) \rightarrow \pi^+ \pi^- \pi^0$  branching fraction (0.888).

<sup>2</sup> BALEST 95C quote the fraction of  $\tau^- \rightarrow h^- h^- h^+ \pi^0 \nu_\tau$  (ex.  $K^0$ ) decays which originate in a  $h^- \omega$  final state equals  $0.412 \pm 0.014 \pm 0.015$ . We divide this by the  $\omega(782) \rightarrow \pi^+ \pi^- \pi^0$  branching fraction (0.888).

<sup>3</sup> ALBRECHT 91D quote the fraction of  $\tau^- \rightarrow h^- h^- h^+ \pi^0 \nu_\tau$  decays which originate in a  $\pi^- \omega$  final state equals  $0.33 \pm 0.04 \pm 0.02$ . We divide this by the  $\omega(782) \rightarrow \pi^+ \pi^- \pi^0$  branching fraction (0.888).

$\Gamma(K^- \omega \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{147}/\Gamma$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>4.1 ± 0.6 ± 0.7</b>	500	ARMS	05 CLE3	$7.6 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(h^- \omega \pi^0 \nu_\tau)/\Gamma_{\text{total}}$   $\Gamma_{148}/\Gamma$

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.41 ± 0.04 OUR FIT</b>				
<b>0.43 ± 0.06 ± 0.05</b>	7283	BUSKULIC	97C ALEP	1991–1994 LEP runs



$$\Gamma(h^- \omega \pi^0 \nu_\tau) / \Gamma(h^- h^- h^+ \geq 0 \text{ neutrals} \geq 0 K^0_L \nu_\tau) \quad \Gamma_{148} / \Gamma_{54}$$

$$\Gamma_{148} / \Gamma_{54} = \Gamma_{148} / (0.3431\Gamma_{35} + 0.3431\Gamma_{37} + 0.3431\Gamma_{40} + 0.3431\Gamma_{42} + 0.4307\Gamma_{47} + 0.6861\Gamma_{48} + \Gamma_{62} + \Gamma_{70} + \Gamma_{77} + \Gamma_{78} + \Gamma_{85} + \Gamma_{89} + \Gamma_{93} + \Gamma_{94} + 0.285\Gamma_{126} + 0.285\Gamma_{128} + 0.9101\Gamma_{146} + 0.9101\Gamma_{148})$$

Data marked "avg" are highly correlated with data appearing elsewhere in the Listings, and are therefore used for the average given below but not in the overall fits. "f&a" marks results used for the fit and the average.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.0269 ± 0.0028 OUR FIT</b>				
<b>0.028 ± 0.003 ± 0.003 avg</b>	430	<sup>1</sup> BORTOLETTO93	CLEO	$E_{cm}^{ee} \approx 10.6$ GeV

<sup>1</sup>Not independent of BORTOLETTO 93  $\Gamma(\tau^- \rightarrow h^- \omega \pi^0 \nu_\tau) / \Gamma(\tau^- \rightarrow h^- h^- h^+ 2\pi^0 \nu_\tau \text{ (ex. } K^0))$  value.

$$\Gamma(h^- \omega \pi^0 \nu_\tau) / \Gamma(h^- h^- h^+ 2\pi^0 \nu_\tau \text{ (ex. } K^0)) \quad \Gamma_{148} / \Gamma_{76}$$

$$\Gamma_{148} / \Gamma_{76} = \Gamma_{148} / (\Gamma_{77} + 0.226\Gamma_{126} + 0.888\Gamma_{148})$$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.83 ± 0.08 OUR FIT</b>			
<b>0.81 ± 0.06 ± 0.06</b>	BORTOLETTO93	CLEO	$E_{cm}^{ee} \approx 10.6$ GeV

$$\Gamma(h^- \omega 2\pi^0 \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{149} / \Gamma$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.4 ± 0.4 ± 0.3</b>	53	ANASTASSOV 01	CLEO	$E_{cm}^{ee} = 10.6$ GeV

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

$1.89^{+0.74}_{-0.67} \pm 0.40$	19	ANDERSON 97	CLEO	Repl. by ANASTASSOV 01
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$$\Gamma(h^- 2\omega \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{150} / \Gamma$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 5.4 × 10<sup>-7</sup></b>	90	AUBERT,B 06	BABR	$232 \text{ fb}^{-1}$ , $E_{cm}^{ee} = 10.6$ GeV

$$\Gamma(2h^- h^+ \omega \nu_\tau) / \Gamma_{\text{total}} \quad \Gamma_{151} / \Gamma$$

VALUE (units $10^{-4}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.2 ± 0.2 ± 0.1</b>	110	ANASTASSOV 01	CLEO	$E_{cm}^{ee} = 10.6$ GeV

$$\Gamma(e^- \gamma) / \Gamma_{\text{total}} \quad \Gamma_{152} / \Gamma$$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 1.1 × 10<sup>-7</sup></b>	90	AUBERT 06C	BABR	$232 \text{ fb}^{-1}$ , $E_{cm}^{ee} = 10.6$ GeV

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

< 3.9 × 10 <sup>-7</sup>	90	HAYASAKA 05	BELL	$86.7 \text{ fb}^{-1}$ , $E_{cm}^{ee} = 10.6$ GeV
< 2.7 × 10 <sup>-6</sup>	90	EDWARDS 97	CLEO	
< 1.1 × 10 <sup>-4</sup>	90	ABREU 95U	DLPH	1990–1993 LEP runs
< 1.2 × 10 <sup>-4</sup>	90	ALBRECHT 92K	ARG	$E_{cm}^{ee} = 10$ GeV
< 2.0 × 10 <sup>-4</sup>	90	KEH 88	CBAL	$E_{cm}^{ee} = 10$ GeV
< 6.4 × 10 <sup>-4</sup>	90	HAYES 82	MRK2	$E_{cm}^{ee} = 3.8\text{--}6.8$ GeV

$\Gamma(\mu^- \gamma)/\Gamma_{\text{total}}$   $\Gamma_{153}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 6.8 \times 10^{-8}$	90	AUBERT,B	05A	BABR 232 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$< 3.1 \times 10^{-7}$	90	ABE	04B	BELL 86.3 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.1 \times 10^{-6}$	90	AHMED	00	CLEO $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 3.0 \times 10^{-6}$	90	EDWARDS	97	CLEO
$< 6.2 \times 10^{-5}$	90	ABREU	95U	DLPH 1990–1993 LEP runs
$< 0.42 \times 10^{-5}$	90	BEAN	93	CLEO $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 3.4 \times 10^{-5}$	90	ALBRECHT	92K	ARG $E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 55 \times 10^{-5}$	90	HAYES	82	MRK2 $E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

$\Gamma(e^- \pi^0)/\Gamma_{\text{total}}$   $\Gamma_{154}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 8.0 \times 10^{-8}$	90	MIYAZAKI	07	BELL 401 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$< 1.3 \times 10^{-7}$	90	AUBERT	07I	BABR 339 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.9 \times 10^{-7}$	90	ENARI	05	BELL 154 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 3.7 \times 10^{-6}$	90	BONVICINI	97	CLEO $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 17 \times 10^{-5}$	90	ALBRECHT	92K	ARG $E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 14 \times 10^{-5}$	90	KEH	88	CBAL $E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 210 \times 10^{-5}$	90	HAYES	82	MRK2 $E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

$\Gamma(\mu^- \pi^0)/\Gamma_{\text{total}}$   $\Gamma_{155}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 1.1 \times 10^{-7}$	90	AUBERT	07I	BABR 339 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$< 1.2 \times 10^{-7}$	90	MIYAZAKI	07	BELL 401 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 4.1 \times 10^{-7}$	90	ENARI	05	BELL 154 $\text{fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 4.0 \times 10^{-6}$	90	BONVICINI	97	CLEO $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 4.4 \times 10^{-5}$	90	ALBRECHT	92K	ARG $E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 82 \times 10^{-5}$	90	HAYES	82	MRK2 $E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

$\Gamma(e^- K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{156}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 5.6 \times 10^{-8}$	90	MIYAZAKI	06A	BELL 281 $\text{fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$< 9.1 \times 10^{-7}$	90	CHEN	02C	CLEO $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.3 \times 10^{-3}$	90	HAYES	82	MRK2 $E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

### $\Gamma(\mu^- K_S^0)/\Gamma_{\text{total}}$

$\Gamma_{157}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 4.9 \times 10^{-8}$	90	MIYAZAKI 06A	BELL	$281 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 9.5 \times 10^{-7}$	90	CHEN 02C	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.0 \times 10^{-3}$	90	HAYES 82	MRK2	$E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

### $\Gamma(e^- \eta)/\Gamma_{\text{total}}$

$\Gamma_{158}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 9.2 \times 10^{-8}$	90	MIYAZAKI 07	BELL	$401 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 1.6 \times 10^{-7}$	90	AUBERT 07I	BABR	$339 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.4 \times 10^{-7}$	90	ENARI 05	BELL	$154 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 8.2 \times 10^{-6}$	90	BONVICINI 97	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 6.3 \times 10^{-5}$	90	ALBRECHT 92K	ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 24 \times 10^{-5}$	90	KEH 88	CBAL	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$

### $\Gamma(\mu^- \eta)/\Gamma_{\text{total}}$

$\Gamma_{159}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 6.5 \times 10^{-8}$	90	MIYAZAKI 07	BELL	$401 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 1.5 \times 10^{-7}$	90	AUBERT 07I	BABR	$339 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.5 \times 10^{-7}$	90	ENARI 05	BELL	$154 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 3.4 \times 10^{-7}$	90	ENARI 04	BELL	$84.3 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 9.6 \times 10^{-6}$	90	BONVICINI 97	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 7.3 \times 10^{-5}$	90	ALBRECHT 92K	ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$

### $\Gamma(e^- \rho^0)/\Gamma_{\text{total}}$

$\Gamma_{160}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 6.3 \times 10^{-8}$	90	NISHIO 08	BELL	$543 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 6.5 \times 10^{-7}$	90	YUSA 06	BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.0 \times 10^{-6}$	90	BLISS 98	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 4.2 \times 10^{-6}$	90	<sup>1</sup> BARTELT 94	CLEO	Repl. by BLISS 98
$< 1.9 \times 10^{-5}$	90	ALBRECHT 92K	ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 37 \times 10^{-5}$	90	HAYES 82	MRK2	$E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(\mu^- \rho^0)/\Gamma_{\text{total}}$   $\Gamma_{161}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 6.8 \times 10^{-8}$	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 2.0 \times 10^{-7}$	90	YUSA	06	BELL 158 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
$< 6.3 \times 10^{-6}$	90	BLISS	98	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
$< 5.7 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98
$< 2.9 \times 10^{-5}$	90	ALBRECHT	92K	ARG $E_{\text{cm}}^{ee} = 10$ GeV
$< 44 \times 10^{-5}$	90	HAYES	82	MRK2 $E_{\text{cm}}^{ee} = 3.8\text{--}6.8$ GeV

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^- \omega)/\Gamma_{\text{total}}$   $\Gamma_{162}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 1.1 \times 10^{-7}$	90	AUBERT	08K	BABR 384 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 1.8 \times 10^{-7}$	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\mu^- \omega)/\Gamma_{\text{total}}$   $\Gamma_{163}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 8.9 \times 10^{-8}$	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 1.0 \times 10^{-7}$	90	AUBERT	08K	BABR 384 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(e^- K^*(892)^0)/\Gamma_{\text{total}}$   $\Gamma_{164}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 7.8 \times 10^{-8}$	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 3.0 \times 10^{-7}$	90	YUSA	06	BELL 158 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
$< 5.1 \times 10^{-6}$	90	BLISS	98	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
$< 6.3 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98
$< 3.8 \times 10^{-5}$	90	ALBRECHT	92K	ARG $E_{\text{cm}}^{ee} = 10$ GeV

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(\mu^- K^*(892)^0)/\Gamma_{\text{total}}$   $\Gamma_{165}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 5.9 \times 10^{-8}$	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 3.9 \times 10^{-7}$	90	YUSA	06	BELL 158 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
$< 7.5 \times 10^{-6}$	90	BLISS	98	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
$< 9.4 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98
$< 4.5 \times 10^{-5}$	90	ALBRECHT	92K	ARG $E_{\text{cm}}^{ee} = 10$ GeV

<sup>1</sup> BARTELT 94 assume phase space decays.

**$\Gamma(e^- \bar{K}^*(892)^0)/\Gamma_{\text{total}}$**   **$\Gamma_{166}/\Gamma$**

Test of lepton family number conservation.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt;7.7 \times 10^{-8}</math></b>	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<4.0 \times 10^{-7}$	90	YUSA	06	BELL 158 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
$<7.4 \times 10^{-6}$	90	BLISS	98	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
$<1.1 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98

<sup>1</sup> BARTELT 94 assume phase space decays.

**$\Gamma(\mu^- \bar{K}^*(892)^0)/\Gamma_{\text{total}}$**   **$\Gamma_{167}/\Gamma$**

Test of lepton family number conservation.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt;1.0 \times 10^{-7}</math></b>	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<4.0 \times 10^{-7}$	90	YUSA	06	BELL 158 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
$<7.5 \times 10^{-6}$	90	BLISS	98	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV
$<8.7 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98

<sup>1</sup> BARTELT 94 assume phase space decays.

**$\Gamma(e^- \eta'(958))/\Gamma_{\text{total}}$**   **$\Gamma_{168}/\Gamma$**

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt;1.6 \times 10^{-7}</math></b>	90	MIYAZAKI	07	BELL 401 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<2.4 \times 10^{-7}$	90	AUBERT	071	BABR 339 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
$<10. \times 10^{-7}$	90	ENARI	05	BELL 154 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV

**$\Gamma(\mu^- \eta'(958))/\Gamma_{\text{total}}$**   **$\Gamma_{169}/\Gamma$**

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt;1.3 \times 10^{-7}</math></b>	90	MIYAZAKI	07	BELL 401 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<1.4 \times 10^{-7}$	90	AUBERT	071	BABR 339 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV
$<4.7 \times 10^{-7}$	90	ENARI	05	BELL 154 fb <sup>-1</sup> , $E_{\text{cm}}^{ee} = 10.6$ GeV

**$\Gamma(e^- \phi)/\Gamma_{\text{total}}$**   **$\Gamma_{170}/\Gamma$**

Test of lepton family number conservation.

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>&lt;7.3 \times 10^{-8}</math></b>	90	NISHIO	08	BELL 543 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<7.3 \times 10^{-7}$	90	YUSA	06	BELL 158 fb <sup>-1</sup> $E_{\text{cm}}^{ee} = 10.6$ GeV
$<6.9 \times 10^{-6}$	90	BLISS	98	CLEO $E_{\text{cm}}^{ee} = 10.6$ GeV

$\Gamma(\mu^- \phi)/\Gamma_{\text{total}}$   $\Gamma_{171}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;1.3 × 10<sup>-7</sup></b>	90	NISHIO	08	BELL 543 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV

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

<7.7 × 10 <sup>-7</sup>	90	YUSA	06	BELL 158 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
<7.0 × 10 <sup>-6</sup>	90	BLISS	98	CLEO E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV

$\Gamma(e^- e^+ e^-)/\Gamma_{\text{total}}$   $\Gamma_{172}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 3.6 × 10<sup>-8</sup></b>	90	MIYAZAKI	08	BELL 535 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV

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

< 4.3 × 10 <sup>-8</sup>	90	AUBERT	07BK	BABR 376 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 2.0 × 10 <sup>-7</sup>	90	AUBERT	04J	BABR 91.5 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 3.5 × 10 <sup>-7</sup>	90	YUSA	04	BELL 87.1 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 2.9 × 10 <sup>-6</sup>	90	BLISS	98	CLEO E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 0.33 × 10 <sup>-5</sup>	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98
< 1.3 × 10 <sup>-5</sup>	90	ALBRECHT	92K	ARG E <sub>cm</sub> <sup>ee</sup> = 10 GeV
< 2.7 × 10 <sup>-5</sup>	90	BOWCOCK	90	CLEO E <sub>cm</sub> <sup>ee</sup> = 10.4–10.9
<40 × 10 <sup>-5</sup>	90	HAYES	82	MRK2 E <sub>cm</sub> <sup>ee</sup> = 3.8–6.8 GeV

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^- \mu^+ \mu^-)/\Gamma_{\text{total}}$   $\Gamma_{173}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt; 3.7 × 10<sup>-8</sup></b>	90	AUBERT	07BK	BABR 376 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV

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

< 4.1 × 10 <sup>-8</sup>	90	MIYAZAKI	08	BELL 535 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 3.3 × 10 <sup>-7</sup>	90	AUBERT	04J	BABR 91.5 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 2.0 × 10 <sup>-7</sup>	90	YUSA	04	BELL 87.1 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 1.8 × 10 <sup>-6</sup>	90	BLISS	98	CLEO E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
< 0.36 × 10 <sup>-5</sup>	90	<sup>1</sup> BARTELT	94	CLEO Repl. by BLISS 98
< 1.9 × 10 <sup>-5</sup>	90	ALBRECHT	92K	ARG E <sub>cm</sub> <sup>ee</sup> = 10 GeV
< 2.7 × 10 <sup>-5</sup>	90	BOWCOCK	90	CLEO E <sub>cm</sub> <sup>ee</sup> = 10.4–10.9
<33 × 10 <sup>-5</sup>	90	HAYES	82	MRK2 E <sub>cm</sub> <sup>ee</sup> = 3.8–6.8 GeV

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^+ \mu^- \mu^-)/\Gamma_{\text{total}}$   $\Gamma_{174}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;2.3 × 10<sup>-8</sup></b>	90	MIYAZAKI	08	BELL 535 fb <sup>-1</sup> E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV

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

$< 5.6 \times 10^{-8}$	90	AUBERT	07BK	BABR	$376 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.3 \times 10^{-7}$	90	AUBERT	04J	BABR	$91.5 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.0 \times 10^{-7}$	90	YUSA	04	BELL	$87.1 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.5 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 0.35 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 1.8 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 1.6 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup>BARTELT 94 assume phase space decays.

### $\Gamma(\mu^- e^+ e^-)/\Gamma_{\text{total}}$ $\Gamma_{175}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 2.7 \times 10^{-8}</math></b>	90	MIYAZAKI	08	BELL $535 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 8.0 \times 10^{-8}$	90	AUBERT	07BK	BABR	$376 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.7 \times 10^{-7}$	90	AUBERT	04J	BABR	$91.5 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.9 \times 10^{-7}$	90	YUSA	04	BELL	$87.1 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.7 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 0.34 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 1.4 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 2.7 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$
$< 44 \times 10^{-5}$	90	HAYES	82	MRK2		$E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

<sup>1</sup>BARTELT 94 assume phase space decays.

### $\Gamma(\mu^+ e^- e^-)/\Gamma_{\text{total}}$ $\Gamma_{176}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 2.0 \times 10^{-8}</math></b>	90	MIYAZAKI	08	BELL $535 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 5.8 \times 10^{-8}$	90	AUBERT	07BK	BABR	$376 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.1 \times 10^{-7}$	90	AUBERT	04J	BABR	$91.5 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.0 \times 10^{-7}$	90	YUSA	04	BELL	$87.1 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.5 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 0.34 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 1.4 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 1.6 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup>BARTELT 94 assume phase space decays.

### $\Gamma(\mu^- \mu^+ \mu^-)/\Gamma_{\text{total}}$ $\Gamma_{177}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 3.2 \times 10^{-8}</math></b>	90	MIYAZAKI	08	BELL $535 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 5.3 \times 10^{-8}$	90	AUBERT	07BK	BABR	$376 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.9 \times 10^{-7}$	90	AUBERT	04J	BABR	$91.5 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.0 \times 10^{-7}$	90	YUSA	04	BELL	$87.1 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.9 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 0.43 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 1.9 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 1.7 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$
$< 49 \times 10^{-5}$	90	HAYES	82	MRK2		$E_{\text{cm}}^{ee} = 3.8\text{--}6.8 \text{ GeV}$

<sup>1</sup> BARTELT 94 assume phase space decays.

### $\Gamma(e^- \pi^+ \pi^-) / \Gamma_{\text{total}}$ $\Gamma_{178} / \Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 1.2 \times 10^{-7}</math></b>	90	AUBERT, BE	05D	BABR $221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 7.3 \times 10^{-7}$	90	YUSA	06	BELL	$158 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 2.2 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 4.4 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 2.7 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 6.0 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

### $\Gamma(e^+ \pi^- \pi^-) / \Gamma_{\text{total}}$ $\Gamma_{179} / \Gamma$

Test of lepton number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 2.0 \times 10^{-7}</math></b>	90	YUSA	06	BELL $158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 2.7 \times 10^{-7}$	90	AUBERT, BE	05D	BABR	$221 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 1.9 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 4.4 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 1.8 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 1.7 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

### $\Gamma(\mu^- \pi^+ \pi^-) / \Gamma_{\text{total}}$ $\Gamma_{180} / \Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b><math>&lt; 2.9 \times 10^{-7}</math></b>	90	AUBERT, BE	05D	BABR $221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 4.8 \times 10^{-7}$	90	YUSA	06	BELL	$158 \text{ fb}^{-1}$	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 8.2 \times 10^{-6}$	90	BLISS	98	CLEO		$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$< 7.4 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94	CLEO	Repl. by BLISS 98	
$< 3.6 \times 10^{-5}$	90	ALBRECHT	92K	ARG		$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$< 3.9 \times 10^{-5}$	90	BOWCOCK	90	CLEO		$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.



$\Gamma(\mu^+ \pi^- \pi^-)/\Gamma_{\text{total}}$   $\Gamma_{181}/\Gamma$

Test of lepton number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<0.7 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<3.4 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<3.4 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<6.9 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<6.3 \times 10^{-5}$	90	ALBRECHT	92K ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$<3.9 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^- \pi^+ K^-)/\Gamma_{\text{total}}$   $\Gamma_{182}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.2 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<7.2 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<6.4 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<7.7 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<2.9 \times 10^{-5}$	90	ALBRECHT	92K ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$<5.8 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^- \pi^- K^+)/\Gamma_{\text{total}}$   $\Gamma_{183}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.6 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<1.7 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<3.8 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<4.6 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<5.8 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^+ \pi^- K^-)/\Gamma_{\text{total}}$   $\Gamma_{184}/\Gamma$

Test of lepton number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.8 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$<1.9 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<2.1 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<4.5 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<2.0 \times 10^{-5}$	90	ALBRECHT	92K ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$<4.9 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(e^- K_S^0 K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{185}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.2 \times 10^{-6}$	90	CHEN	02C CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(e^- K^+ K^-)/\Gamma_{\text{total}}$   $\Gamma_{186}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.4 \times 10^{-7}$	90	AUBERT, BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.0 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<6.0 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(e^+ K^- K^-)/\Gamma_{\text{total}}$   $\Gamma_{187}/\Gamma$

Test of lepton number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.5 \times 10^{-7}$	90	AUBERT, BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.1 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<3.8 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\mu^- \pi^+ K^-)/\Gamma_{\text{total}}$   $\Gamma_{188}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.6 \times 10^{-7}$	90	AUBERT, BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.7 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<7.5 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<8.7 \times 10^{-6}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<11 \times 10^{-5}$	90	ALBRECHT	92K ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$<7.7 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(\mu^- \pi^- K^+)/\Gamma_{\text{total}}$   $\Gamma_{189}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.2 \times 10^{-7}$	90	AUBERT, BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<7.3 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<7.4 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<1.5 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<7.7 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(\mu^+ \pi^- K^-)/\Gamma_{\text{total}}$   $\Gamma_{190}/\Gamma$

Test of lepton number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.2 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.9 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<7.0 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<2.0 \times 10^{-5}$	90	<sup>1</sup> BARTELT	94 CLEO	Repl. by BLISS 98
$<5.8 \times 10^{-5}$	90	ALBRECHT	92K ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
$<4.0 \times 10^{-5}$	90	BOWCOCK	90 CLEO	$E_{\text{cm}}^{ee} = 10.4\text{--}10.9$

<sup>1</sup> BARTELT 94 assume phase space decays.

$\Gamma(\mu^- K_S^0 K_S^0)/\Gamma_{\text{total}}$   $\Gamma_{191}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.4 \times 10^{-6}$	90	CHEN	02C CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\mu^- K^+ K^-)/\Gamma_{\text{total}}$   $\Gamma_{192}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 2.5 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 8.0 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<15 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\mu^+ K^- K^-)/\Gamma_{\text{total}}$   $\Gamma_{193}/\Gamma$

Test of lepton number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4.4 \times 10^{-7}$	90	YUSA	06 BELL	$158 \text{ fb}^{-1}$ $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<4.8 \times 10^{-7}$	90	AUBERT,BE	05D BABR	$221 \text{ fb}^{-1}$ , $E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$
$<6.0 \times 10^{-6}$	90	BLISS	98 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(e^- \pi^0 \pi^0)/\Gamma_{\text{total}}$   $\Gamma_{194}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.5 \times 10^{-6}$	90	BONVICINI	97 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\mu^- \pi^0 \pi^0)/\Gamma_{\text{total}}$   $\Gamma_{195}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<14 \times 10^{-6}$	90	BONVICINI	97 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(e^- \eta \eta)/\Gamma_{\text{total}}$   $\Gamma_{196}/\Gamma$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<35 \times 10^{-6}$	90	BONVICINI	97 CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\mu^- \eta \eta) / \Gamma_{\text{total}}$   $\Gamma_{197} / \Gamma$   
 Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 60 \times 10^{-6}$	90	BONVICINI 97	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(e^- \pi^0 \eta) / \Gamma_{\text{total}}$   $\Gamma_{198} / \Gamma$   
 Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 24 \times 10^{-6}$	90	BONVICINI 97	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\mu^- \pi^0 \eta) / \Gamma_{\text{total}}$   $\Gamma_{199} / \Gamma$   
 Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 22 \times 10^{-6}$	90	BONVICINI 97	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\bar{p} \gamma) / \Gamma_{\text{total}}$   $\Gamma_{200} / \Gamma$   
 Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 3.5 \times 10^{-6}$	90	GODANG 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 29 \times 10^{-5}$	90	ALBRECHT 92K	ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
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$\Gamma(\bar{p} \pi^0) / \Gamma_{\text{total}}$   $\Gamma_{201} / \Gamma$   
 Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 15 \times 10^{-6}$	90	GODANG 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 66 \times 10^{-5}$	90	ALBRECHT 92K	ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
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$\Gamma(\bar{p} 2\pi^0) / \Gamma_{\text{total}}$   $\Gamma_{202} / \Gamma$   
 Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 33 \times 10^{-6}$	90	GODANG 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\bar{p} \eta) / \Gamma_{\text{total}}$   $\Gamma_{203} / \Gamma$   
 Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 8.9 \times 10^{-6}$	90	GODANG 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

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

$< 130 \times 10^{-5}$	90	ALBRECHT 92K	ARG	$E_{\text{cm}}^{ee} = 10 \text{ GeV}$
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$\Gamma(\bar{p} \pi^0 \eta) / \Gamma_{\text{total}}$   $\Gamma_{204} / \Gamma$   
 Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 27 \times 10^{-6}$	90	GODANG 99	CLEO	$E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\Lambda \pi^-) / \Gamma_{\text{total}}$   $\Gamma_{205} / \Gamma$   
 Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$< 0.72 \times 10^{-7}$	90	MIYAZAKI 06	BELL	$154 \text{ fb}^{-1}, E_{\text{cm}}^{ee} = 10.6 \text{ GeV}$

$\Gamma(\bar{\Lambda}\pi^-)/\Gamma_{\text{total}}$   $\Gamma_{206}/\Gamma$

Test of lepton number and baryon number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.4 \times 10^{-7}$	90	MIYAZAKI 06	BELL	154 fb <sup>-1</sup> , E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV

$\Gamma(e^- \text{ light boson})/\Gamma(e^- \bar{\nu}_e \nu_\tau)$   $\Gamma_{207}/\Gamma_5$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<0.015$	95	<sup>1</sup> ALBRECHT 95G	ARG	E <sub>cm</sub> <sup>ee</sup> = 9.4–10.6 GeV

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

$<0.018$	95	<sup>2</sup> ALBRECHT 90E	ARG	E <sub>cm</sub> <sup>ee</sup> = 9.4–10.6 GeV
$<0.040$	95	<sup>3</sup> BALTRUSAIT..85	MRK3	E <sub>cm</sub> <sup>ee</sup> = 3.77 GeV

<sup>1</sup> ALBRECHT 95G limit holds for bosons with mass < 0.4 GeV. The limit rises to 0.036 for a mass of 1.0 GeV, then falls to 0.006 at the upper mass limit of 1.6 GeV.

<sup>2</sup> ALBRECHT 90E limit applies for spinless boson with mass < 100 MeV, and rises to 0.050 for mass = 500 MeV.

<sup>3</sup> BALTRUSAITIS 85 limit applies for spinless boson with mass < 100 MeV.

$\Gamma(\mu^- \text{ light boson})/\Gamma(e^- \bar{\nu}_e \nu_\tau)$   $\Gamma_{208}/\Gamma_5$

Test of lepton family number conservation.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<0.026$	95	<sup>1</sup> ALBRECHT 95G	ARG	E <sub>cm</sub> <sup>ee</sup> = 9.4–10.6 GeV

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

$<0.033$	95	<sup>2</sup> ALBRECHT 90E	ARG	E <sub>cm</sub> <sup>ee</sup> = 9.4–10.6 GeV
$<0.125$	95	<sup>3</sup> BALTRUSAIT..85	MRK3	E <sub>cm</sub> <sup>ee</sup> = 3.77 GeV

<sup>1</sup> ALBRECHT 95G limit holds for bosons with mass < 1.3 GeV. The limit rises to 0.034 for a mass of 1.4 GeV, then falls to 0.003 at the upper mass limit of 1.6 GeV.

<sup>2</sup> ALBRECHT 90E limit applies for spinless boson with mass < 100 MeV, and rises to 0.071 for mass = 500 MeV.

<sup>3</sup> BALTRUSAITIS 85 limit applies for spinless boson with mass < 100 MeV.

**$\tau$ -DECAY PARAMETERS**

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**$\rho(e \text{ or } \mu)$  PARAMETER**

(V–A) theory predicts  $\rho = 0.75$ .

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
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**0.745 ± 0.008 OUR FIT**

**0.749 ± 0.008 OUR AVERAGE**

0.742 ± 0.014 ± 0.006	81k	HEISTER	01E	ALEP	1991–1995 LEP runs
0.775 ± 0.023 ± 0.020	36k	ABREU	00L	DLPH	1992–1995 runs
0.781 ± 0.028 ± 0.018	46k	ACKERSTAFF	99D	OPAL	1990–1995 LEP runs
0.762 ± 0.035	54k	ACCIARRI	98R	L3	1991–1995 LEP runs
0.731 ± 0.031		<sup>1</sup> ALBRECHT	98	ARG	E <sub>cm</sub> <sup>ee</sup> = 9.5–10.6 GeV
0.72 ± 0.09 ± 0.03		<sup>2</sup> ABE	97O	SLD	1993–1995 SLC runs
0.747 ± 0.010 ± 0.006	55k	ALEXANDER	97F	CLEO	E <sub>cm</sub> <sup>ee</sup> = 10.6 GeV
0.79 ± 0.10 ± 0.10	3732	FORD	87B	MAC	E <sub>cm</sub> <sup>ee</sup> = 29 GeV
0.71 ± 0.09 ± 0.03	1426	BEHRENDIS	85	CLEO	e <sup>+</sup> e <sup>-</sup> near $\Upsilon(4S)$

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

0.735±0.013±0.008	31k	AMMAR	97B	CLEO	Repl. by ALEXANDER 97F
0.794±0.039±0.031	18k	ACCIARRI	96H	L3	Repl. by ACCIARRI 98R
0.732±0.034±0.020	8.2k	<sup>3</sup> ALBRECHT	95	ARG	$E_{cm}^{ee} = 9.5-10.6$ GeV
0.738±0.038		<sup>4</sup> ALBRECHT	95C	ARG	Repl. by ALBRECHT 98
0.751±0.039±0.022		BUSKULIC	95D	ALEP	Repl. by HEISTER 01E
0.742±0.035±0.020	8000	ALBRECHT	90E	ARG	$E_{cm}^{ee} = 9.4-10.6$ GeV

<sup>1</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 98, ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E. ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates.

<sup>2</sup> ABE 970 assume  $\eta = 0$  in their fit. Letting  $\eta$  vary in the fit gives a  $\rho$  value of  $0.69 \pm 0.13 \pm 0.05$ .

<sup>3</sup> Value is from a simultaneous fit for the  $\rho$  and  $\eta$  decay parameters to the lepton energy spectrum. Not independent of ALBRECHT 90E  $\rho(e$  or  $\mu)$  value which assumes  $\eta = 0$ . Result is strongly correlated with ALBRECHT 95C.

<sup>4</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E.

## $\rho(e)$ PARAMETER

(V-A) theory predicts  $\rho = 0.75$ .

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.747±0.010 OUR FIT</b>				
<b>0.744±0.010 OUR AVERAGE</b>				
0.747±0.019±0.014	44k	HEISTER	01E	ALEP 1991-1995 LEP runs
0.744±0.036±0.037	17k	ABREU	00L	DLPH 1992-1995 runs
0.779±0.047±0.029	25k	ACKERSTAFF	99D	OPAL 1990-1995 LEP runs
0.68 ±0.04 ±0.07		<sup>1</sup> ALBRECHT	98	ARG $E_{cm}^{ee} = 9.5-10.6$ GeV
0.71 ±0.14 ±0.05		ABE	97O	SLD 1993-1995 SLC runs
0.747±0.012±0.004	34k	ALEXANDER	97F	CLEO $E_{cm}^{ee} = 10.6$ GeV
0.735±0.036±0.020	4.7k	<sup>2</sup> ALBRECHT	95	ARG $E_{cm}^{ee} = 9.5-10.6$ GeV
0.79 ±0.08 ±0.06	3230	<sup>3</sup> ALBRECHT	93G	ARG $E_{cm}^{ee} = 9.4-10.6$ GeV
0.64 ±0.06 ±0.07	2753	JANSSEN	89	CBAL $E_{cm}^{ee} = 9.4-10.6$ GeV
0.62 ±0.17 ±0.14	1823	FORD	87B	MAC $E_{cm}^{ee} = 29$ GeV
0.60 ±0.13	699	BEHRENDIS	85	CLEO $e^+ e^-$ near $\Upsilon(4S)$
0.72 ±0.10 ±0.11	594	BACINO	79B	DLCO $E_{cm}^{ee} = 3.5-7.4$ GeV

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

0.732±0.014±0.009	19k	AMMAR	97B	CLEO	Repl. by ALEXANDER 97F
0.793±0.050±0.025		BUSKULIC	95D	ALEP	Repl. by HEISTER 01E
0.747±0.045±0.028	5106	ALBRECHT	90E	ARG	Repl. by ALBRECHT 95

<sup>1</sup> ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates.

<sup>2</sup> ALBRECHT 95 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(h^+ h^- h^+(\pi^0) \bar{\nu}_\tau)$  and their charged conjugates.

<sup>3</sup> ALBRECHT 93G use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\mu^- \bar{\nu}_\mu \nu_\tau)(e^+ \nu_e \bar{\nu}_\tau)$  and their charged conjugates.

**$\rho(\mu)$  PARAMETER** $(V-A)$  theory predicts  $\rho = 0.75$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.763±0.020 OUR FIT</b>				
<b>0.770±0.022 OUR AVERAGE</b>				
0.776±0.045±0.019	46k	HEISTER	01E ALEP	1991–1995 LEP runs
0.999±0.098±0.045	22k	ABREU	00L DLPH	1992–1995 runs
0.777±0.044±0.016	27k	ACKERSTAFF	99D OPAL	1990–1995 LEP runs
0.69 ±0.06 ±0.06		<sup>1</sup> ALBRECHT	98 ARG	$E_{cm}^{ee} = 9.5\text{--}10.6$ GeV
0.54 ±0.28 ±0.14		ABE	97O SLD	1993–1995 SLC runs
0.750±0.017±0.045	22k	ALEXANDER	97F CLEO	$E_{cm}^{ee} = 10.6$ GeV
0.76 ±0.07 ±0.08	3230	ALBRECHT	93G ARG	$E_{cm}^{ee} = 9.4\text{--}10.6$ GeV
0.734±0.055±0.027	3041	ALBRECHT	90E ARG	$E_{cm}^{ee} = 9.4\text{--}10.6$ GeV
0.89 ±0.14 ±0.08	1909	FORD	87B MAC	$E_{cm}^{ee} = 29$ GeV
0.81 ±0.13	727	BEHREND	85 CLEO	$e^+e^-$ near $\Upsilon(4S)$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.747±0.048±0.044	13k	AMMAR	97B CLEO	Repl. by ALEXANDER 97F
0.693±0.057±0.028		BUSKULIC	95D ALEP	Repl. by HEISTER 01E

<sup>1</sup> ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates.

 **$\xi(e \text{ or } \mu)$  PARAMETER** $(V-A)$  theory predicts  $\xi = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.985±0.030 OUR FIT</b>				
<b>0.981±0.031 OUR AVERAGE</b>				
0.986±0.068±0.031	81k	HEISTER	01E ALEP	1991–1995 LEP runs
0.929±0.070±0.030	36k	ABREU	00L DLPH	1992–1995 runs
0.98 ±0.22 ±0.10	46k	ACKERSTAFF	99D OPAL	1990–1995 LEP runs
0.70 ±0.16	54k	ACCIARRI	98R L3	1991–1995 LEP runs
1.03 ±0.11		<sup>1</sup> ALBRECHT	98 ARG	$E_{cm}^{ee} = 9.5\text{--}10.6$ GeV
1.05 ±0.35 ±0.04		<sup>2</sup> ABE	97O SLD	1993–1995 SLC runs
1.007±0.040±0.015	55k	ALEXANDER	97F CLEO	$E_{cm}^{ee} = 10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.94 ±0.21 ±0.07	18k	ACCIARRI	96H L3	Repl. by ACCIARRI 98R
0.97 ±0.14		<sup>3</sup> ALBRECHT	95C ARG	Repl. by ALBRECHT 98
1.18 ±0.15 ±0.16		BUSKULIC	95D ALEP	Repl. by HEISTER 01E
0.90 ±0.15 ±0.10	3230	<sup>4</sup> ALBRECHT	93G ARG	$E_{cm}^{ee} = 9.4\text{--}10.6$ GeV

<sup>1</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 98, ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E. ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates.

<sup>2</sup> ABE 97O assume  $\eta = 0$  in their fit. Letting  $\eta$  vary in the fit gives a  $\xi$  value of  $1.02 \pm 0.36 \pm 0.05$ .

<sup>3</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E. ALBRECHT 95C uses events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(h^+ h^- h^+ \bar{\nu}_\tau)$  and their charged conjugates.

<sup>4</sup> ALBRECHT 93G measurement determines  $|\xi|$  for the case  $\xi(e) = \xi(\mu)$ , but the authors point out that other LEP experiments determine the sign to be positive.

**$\xi(e)$  PARAMETER** $(V-A)$  theory predicts  $\xi = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.994 ± 0.040 OUR FIT****1.00 ± 0.04 OUR AVERAGE**

1.011 ± 0.094 ± 0.038	44k	HEISTER	01E	ALEP	1991–1995 LEP runs
1.01 ± 0.12 ± 0.05	17k	ABREU	00L	DLPH	1992–1995 runs
1.13 ± 0.39 ± 0.14	25k	ACKERSTAFF	99D	OPAL	1990–1995 LEP runs
1.11 ± 0.20 ± 0.08		<sup>1</sup> ALBRECHT	98	ARG	$E_{cm}^{ee} = 9.5\text{--}10.6$ GeV
1.16 ± 0.52 ± 0.06		ABE	97O	SLD	1993–1995 SLC runs
0.979 ± 0.048 ± 0.016	34k	ALEXANDER	97F	CLEO	$E_{cm}^{ee} = 10.6$ GeV

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

1.03 ± 0.23 ± 0.09 BUSKULIC 95D ALEP Repl. by HEISTER 01E

<sup>1</sup>ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates. **$\xi(\mu)$  PARAMETER** $(V-A)$  theory predicts  $\xi = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1.030 ± 0.059 OUR FIT****1.06 ± 0.06 OUR AVERAGE**

1.030 ± 0.120 ± 0.050	46k	HEISTER	01E	ALEP	1991–1995 LEP runs
1.16 ± 0.19 ± 0.06	22k	ABREU	00L	DLPH	1992–1995 runs
0.79 ± 0.41 ± 0.09	27k	ACKERSTAFF	99D	OPAL	1990–1995 LEP runs
1.26 ± 0.27 ± 0.14		<sup>1</sup> ALBRECHT	98	ARG	$E_{cm}^{ee} = 9.5\text{--}10.6$ GeV
0.75 ± 0.50 ± 0.14		ABE	97O	SLD	1993–1995 SLC runs
1.054 ± 0.069 ± 0.047	22k	ALEXANDER	97F	CLEO	$E_{cm}^{ee} = 10.6$ GeV

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

1.23 ± 0.22 ± 0.10 BUSKULIC 95D ALEP Repl. by HEISTER 01E

<sup>1</sup>ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates. **$\eta(e \text{ or } \mu)$  PARAMETER** $(V-A)$  theory predicts  $\eta = 0$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.013 ± 0.020 OUR FIT****0.015 ± 0.021 OUR AVERAGE**

0.012 ± 0.026 ± 0.004	81k	HEISTER	01E	ALEP	1991–1995 LEP runs
−0.005 ± 0.036 ± 0.037		ABREU	00L	DLPH	1992–1995 runs
0.027 ± 0.055 ± 0.005	46k	ACKERSTAFF	99D	OPAL	1990–1995 LEP runs
0.27 ± 0.14	54k	ACCIARRI	98R	L3	1991–1995 LEP runs
−0.13 ± 0.47 ± 0.15		ABE	97O	SLD	1993–1995 SLC runs
−0.015 ± 0.061 ± 0.062	31k	AMMAR	97B	CLEO	$E_{cm}^{ee} = 10.6$ GeV
0.03 ± 0.18 ± 0.12	8.2k	ALBRECHT	95	ARG	$E_{cm}^{ee} = 9.5\text{--}10.6$ GeV

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

0.25 ± 0.17 ± 0.11 18k ACCIARRI 96H L3 Repl. by ACCIARRI 98R

−0.04 ± 0.15 ± 0.11 BUSKULIC 95D ALEP Repl. by HEISTER 01E



**$\eta(\mu)$  PARAMETER** $(V-A)$  theory predicts  $\eta = 0$ .

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.094 ± 0.073 OUR FIT</b>				
<b>0.17 ± 0.15 OUR AVERAGE</b> Error includes scale factor of 1.2.				
0.160 ± 0.150 ± 0.060	46k	HEISTER	01E ALEP	1991–1995 LEP runs
0.72 ± 0.32 ± 0.15		ABREU	00L DLPH	1992–1995 runs
–0.59 ± 0.82 ± 0.45		<sup>1</sup> ABE	97O SLD	1993–1995 SLC runs
0.010 ± 0.149 ± 0.171	13k	<sup>2</sup> AMMAR	97B CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.010 ± 0.065 ± 0.001	27k	<sup>3</sup> ACKERSTAFF	99D OPAL	1990–1995 LEP runs
–0.24 ± 0.23 ± 0.18		BUSKULIC	95D ALEP	Repl. by HEISTER 01E

<sup>1</sup> Highly correlated (corr. = 0.92) with ABE 97O  $\rho(\mu)$  measurement.<sup>2</sup> Highly correlated (corr. = 0.949) with AMMAR 97B  $\rho(\mu)$  value.<sup>3</sup> ACKERSTAFF 99D result is dominated by a constraint on  $\eta$  from the OPAL measurements of the  $\tau$  lifetime and  $B(\tau^- \rightarrow \mu^- \bar{\nu}_\mu \nu_\tau)$  assuming lepton universality for the total coupling strength. **$(\delta\xi)(e \text{ or } \mu)$  PARAMETER** $(V-A)$  theory predicts  $(\delta\xi) = 0.75$ .

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.746 ± 0.021 OUR FIT</b>				
<b>0.744 ± 0.022 OUR AVERAGE</b>				
0.776 ± 0.045 ± 0.024	81k	HEISTER	01E ALEP	1991–1995 LEP runs
0.779 ± 0.070 ± 0.028	36k	ABREU	00L DLPH	1992–1995 runs
0.65 ± 0.14 ± 0.07	46k	ACKERSTAFF	99D OPAL	1990–1995 LEP runs
0.70 ± 0.11	54k	ACCIARRI	98R L3	1991–1995 LEP runs
0.63 ± 0.09		<sup>1</sup> ALBRECHT	98 ARG	$E_{\text{cm}}^{\text{ee}} = 9.5\text{--}10.6$ GeV
0.88 ± 0.27 ± 0.04		<sup>2</sup> ABE	97O SLD	1993–1995 SLC runs
0.745 ± 0.026 ± 0.009	55k	ALEXANDER	97F CLEO	$E_{\text{cm}}^{\text{ee}} = 10.6$ GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.81 ± 0.14 ± 0.06	18k	ACCIARRI	96H L3	Repl. by ACCIARRI 98R
0.65 ± 0.12		<sup>3</sup> ALBRECHT	95C ARG	Repl. by ALBRECHT 98
0.88 ± 0.11 ± 0.07		BUSKULIC	95D ALEP	Repl. by HEISTER 01E

<sup>1</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 98, ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E. ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates.<sup>2</sup> ABE 97O assume  $\eta = 0$  in their fit. Letting  $\eta$  vary in the fit gives a  $(\delta\xi)$  value of  $0.87 \pm 0.27 \pm 0.04$ .<sup>3</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E. ALBRECHT 95C uses events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(h^+ h^- h^+ \bar{\nu}_\tau)$  and their charged conjugates.

**( $\delta\xi$ )( $e$ ) PARAMETER** $(V-A)$  theory predicts  $(\delta\xi) = 0.75$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.734 $\pm$ 0.028 OUR FIT****0.731 $\pm$ 0.029 OUR AVERAGE**

0.778 $\pm$ 0.066 $\pm$ 0.024	44k	HEISTER	01E	ALEP	1991–1995 LEP runs
0.85 $\pm$ 0.12 $\pm$ 0.04	17k	ABREU	00L	DLPH	1992–1995 runs
0.72 $\pm$ 0.31 $\pm$ 0.14	25k	ACKERSTAFF	99D	OPAL	1990–1995 LEP runs
0.56 $\pm$ 0.14 $\pm$ 0.06		<sup>1</sup> ALBRECHT	98	ARG	$E_{\text{cm}}^{ee} = 9.5\text{--}10.6$ GeV
0.85 $\pm$ 0.43 $\pm$ 0.08		ABE	97O	SLD	1993–1995 SLC runs
0.720 $\pm$ 0.032 $\pm$ 0.010	34k	ALEXANDER	97F	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV

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

1.11  $\pm$ 0.17  $\pm$ 0.07 BUSKULIC 95D ALEP Repl. by HEISTER 01E<sup>1</sup>ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates.**( $\delta\xi$ )( $\mu$ ) PARAMETER** $(V-A)$  theory predicts  $(\delta\xi) = 0.75$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.778 $\pm$ 0.037 OUR FIT****0.79  $\pm$ 0.04 OUR AVERAGE**

0.786 $\pm$ 0.066 $\pm$ 0.028	46k	HEISTER	01E	ALEP	1991–1995 LEP runs
0.86 $\pm$ 0.13 $\pm$ 0.04	22k	ABREU	00L	DLPH	1992–1995 runs
0.63 $\pm$ 0.23 $\pm$ 0.05	27k	ACKERSTAFF	99D	OPAL	1990–1995 LEP runs
0.73 $\pm$ 0.18 $\pm$ 0.10		<sup>1</sup> ALBRECHT	98	ARG	$E_{\text{cm}}^{ee} = 9.5\text{--}10.6$ GeV
0.82 $\pm$ 0.32 $\pm$ 0.07		ABE	97O	SLD	1993–1995 SLC runs
0.786 $\pm$ 0.041 $\pm$ 0.032	22k	ALEXANDER	97F	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV

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

0.71  $\pm$ 0.14  $\pm$ 0.06 BUSKULIC 95D ALEP Repl. by HEISTER 01E<sup>1</sup>ALBRECHT 98 use tau pair events of the type  $\tau^- \tau^+ \rightarrow (\ell^- \bar{\nu}_\ell \nu_\tau)(\pi^+ \pi^0 \bar{\nu}_\tau)$ , and their charged conjugates. **$\xi(\pi)$  PARAMETER** $(V-A)$  theory predicts  $\xi(\pi) = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.993 $\pm$ 0.022 OUR FIT****0.994 $\pm$ 0.023 OUR AVERAGE**

0.994 $\pm$ 0.020 $\pm$ 0.014	27k	HEISTER	01E	ALEP	1991–1995 LEP runs
0.81 $\pm$ 0.17 $\pm$ 0.02		ABE	97O	SLD	1993–1995 SLC runs
1.03 $\pm$ 0.06 $\pm$ 0.04	2.0k	COAN	97	CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV

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

0.987 $\pm$ 0.057 $\pm$ 0.027 BUSKULIC 95D ALEP Repl. by HEISTER 01E0.95  $\pm$ 0.11  $\pm$ 0.05 <sup>1</sup>BUSKULIC 94D ALEP 1990+1991 LEP run<sup>1</sup>Superseded by BUSKULIC 95D.

**$\xi(\rho)$  PARAMETER** $(V-A)$  theory predicts  $\xi(\rho) = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**0.994 ± 0.008 OUR FIT****0.994 ± 0.009 OUR AVERAGE**

0.987 ± 0.012 ± 0.011    59k    HEISTER    01E    ALEP    1991–1995 LEP runs

0.99 ± 0.12 ± 0.04       ABE    97O    SLD    1993–1995 SLC runs

0.995 ± 0.010 ± 0.003    66k    ALEXANDER    97F    CLEO     $E_{cm}^{ee} = 10.6$  GeV1.022 ± 0.028 ± 0.030    1.7k    <sup>1</sup> ALBRECHT    94E    ARG     $E_{cm}^{ee} = 9.4$ – $10.6$  GeV

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

1.045 ± 0.058 ± 0.032       BUSKULIC    95D    ALEP    Repl. by HEISTER 01E

1.03 ± 0.11 ± 0.05       <sup>2</sup> BUSKULIC    94D    ALEP    1990+1991 LEP run<sup>1</sup> ALBRECHT 94E measure the square of this quantity and use the sign determined by ALBRECHT 90I to obtain the quoted result.<sup>2</sup> Superseded by BUSKULIC 95D. **$\xi(a_1)$  PARAMETER** $(V-A)$  theory predicts  $\xi(a_1) = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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**1.001 ± 0.027 OUR FIT****1.002 ± 0.028 OUR AVERAGE**1.000 ± 0.016 ± 0.024    35k    <sup>1</sup> HEISTER    01E    ALEP    1991–1995 LEP runs1.02 ± 0.13 ± 0.03    17.2k    ASNER    00    CLEO     $E_{cm}^{ee} = 10.6$  GeV1.29 ± 0.26 ± 0.11    7.4k    <sup>2</sup> ACKERSTAFF    97R    OPAL    1992–1994 LEP runs0.85  $\begin{smallmatrix} +0.15 \\ -0.17 \end{smallmatrix}$  ± 0.05       ALBRECHT    95C    ARG     $E_{cm}^{ee} = 9.5$ – $10.6$  GeV1.25 ± 0.23  $\begin{smallmatrix} +0.15 \\ -0.08 \end{smallmatrix}$     7.5k    ALBRECHT    93C    ARG     $E_{cm}^{ee} = 9.4$ – $10.6$  GeV

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

1.08  $\begin{smallmatrix} +0.46 & +0.14 \\ -0.41 & -0.25 \end{smallmatrix}$     2.6k    <sup>3</sup> AKERS    95P    OPAL    Repl. by ACKERSTAFF 97R

0.937 ± 0.116 ± 0.064       BUSKULIC    95D    ALEP    Repl. by HEISTER 01E

<sup>1</sup> HEISTER 01E quote  $1.000 \pm 0.016 \pm 0.013 \pm 0.020$  where the errors are statistical, systematic, and an uncertainty due to the final state model. We combine the systematic error and model uncertainty.<sup>2</sup> ACKERSTAFF 97R obtain this result with a model independent fit to the hadronic structure functions. Fitting with the model of Kuhn and Santamaria (ZPHY **C48**, 445 (1990)) gives  $0.87 \pm 0.16 \pm 0.04$ , and with the model of of Isgur *et al.* (PR **D39**,1357 (1989)) they obtain  $1.20 \pm 0.21 \pm 0.14$ .<sup>3</sup> AKERS 95P obtain this result with a model independent fit to the hadronic structure functions. Fitting with the model of Kuhn and Santamaria (ZPHY **C48**, 445 (1990)) gives  $0.87 \pm 0.27 \begin{smallmatrix} +0.05 \\ -0.06 \end{smallmatrix}$ , and with the model of of Isgur *et al.* (PR **D39**,1357 (1989)) they obtain  $1.10 \pm 0.31 \begin{smallmatrix} +0.13 \\ -0.14 \end{smallmatrix}$ .

**$\xi$ (all hadronic modes) PARAMETER** $(V-A)$  theory predicts  $\xi = 1$ .

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.995±0.007 OUR FIT</b>				
<b>0.997±0.007 OUR AVERAGE</b>				
0.992±0.007±0.008	102k	<sup>1</sup> HEISTER	01E ALEP	1991–1995 LEP runs
0.997±0.027±0.011	39k	<sup>2</sup> ABREU	00L DLPH	1992–1995 runs
1.02 ±0.13 ±0.03	17.2k	<sup>3</sup> ASNER	00 CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
1.032±0.031	37k	<sup>4</sup> ACCIARRI	98R L3	1991–1995 LEP runs
0.93 ±0.10 ±0.04		ABE	97O SLD	1993–1995 SLC runs
1.29 ±0.26 ±0.11	7.4k	<sup>5</sup> ACKERSTAFF	97R OPAL	1992–1994 LEP runs
0.995±0.010±0.003	66k	<sup>6</sup> ALEXANDER	97F CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
1.03 ±0.06 ±0.04	2.0k	<sup>7</sup> COAN	97 CLEO	$E_{\text{cm}}^{ee} = 10.6$ GeV
1.017±0.039		<sup>8</sup> ALBRECHT	95C ARG	$E_{\text{cm}}^{ee} = 9.5\text{--}10.6$ GeV
1.25 ±0.23 $\begin{smallmatrix} +0.15 \\ -0.08 \end{smallmatrix}$	7.5k	<sup>9</sup> ALBRECHT	93C ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
0.970±0.053±0.011	14k	<sup>10</sup> ACCIARRI	96H L3	Repl. by ACCIARRI 98R
1.08 $\begin{smallmatrix} +0.46 & +0.14 \\ -0.41 & -0.25 \end{smallmatrix}$	2.6k	<sup>11</sup> AKERS	95P OPAL	Repl. by ACKER-STAFF 97R
1.006±0.032±0.019		<sup>12</sup> BUSKULIC	95D ALEP	Repl. by HEISTER 01E
1.022±0.028±0.030	1.7k	<sup>13</sup> ALBRECHT	94E ARG	$E_{\text{cm}}^{ee} = 9.4\text{--}10.6$ GeV
0.99 ±0.07 ±0.04		<sup>14</sup> BUSKULIC	94D ALEP	1990+1991 LEP run

<sup>1</sup> HEISTER 01E quote  $0.992 \pm 0.007 \pm 0.006 \pm 0.005$  where the errors are statistical, systematic, and an uncertainty due to the final state model. We combine the systematic error and model uncertainty. They use  $\tau \rightarrow \pi\nu_\tau$ ,  $\tau \rightarrow K\nu_\tau$ ,  $\tau \rightarrow \rho\nu_\tau$ , and  $\tau \rightarrow a_1\nu_\tau$  decays.

<sup>2</sup> ABREU 00L use  $\tau^- \rightarrow h^- \geq 0\pi^0\nu_\tau$  decays.

<sup>3</sup> ASNER 00 use  $\tau^- \rightarrow \pi^- 2\pi^0\nu_\tau$  decays.

<sup>4</sup> ACCIARRI 98R use  $\tau \rightarrow \pi\nu_\tau$ ,  $\tau \rightarrow K\nu_\tau$ , and  $\tau \rightarrow \rho\nu_\tau$  decays.

<sup>5</sup> ACKERSTAFF 97R use  $\tau \rightarrow a_1\nu_\tau$  decays.

<sup>6</sup> ALEXANDER 97F use  $\tau \rightarrow \rho\nu_\tau$  decays.

<sup>7</sup> COAN 97 use  $h^+ h^-$  energy correlations.

<sup>8</sup> Combined fit to ARGUS tau decay parameter measurements in ALBRECHT 95C, ALBRECHT 93G, and ALBRECHT 94E.

<sup>9</sup> Uses  $\tau \rightarrow a_1\nu_\tau$  decays. Replaced by ALBRECHT 95C.

<sup>10</sup> ACCIARRI 96H use  $\tau \rightarrow \pi\nu_\tau$ ,  $\tau \rightarrow K\nu_\tau$ , and  $\tau \rightarrow \rho\nu_\tau$  decays.

<sup>11</sup> AKERS 95P use  $\tau \rightarrow a_1\nu_\tau$  decays.

<sup>12</sup> BUSKULIC 95D use  $\tau \rightarrow \pi\nu_\tau$ ,  $\tau \rightarrow \rho\nu_\tau$ , and  $\tau \rightarrow a_1\nu_\tau$  decays.

<sup>13</sup> ALBRECHT 94E measure the square of this quantity and use the sign determined by ALBRECHT 90I to obtain the quoted result. Uses  $\tau \rightarrow a_1\nu_\tau$  decays. Replaced by ALBRECHT 95C.

<sup>14</sup> BUSKULIC 94D use  $\tau \rightarrow \pi\nu_\tau$  and  $\tau \rightarrow \rho\nu_\tau$  decays. Superseded by BUSKULIC 95D.

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YUSA	06	PL B640 138	Y. Yusa <i>et al.</i>	(BELLE Collab.)
ARMS	05	PRL 94 241802	K. Arms <i>et al.</i>	(CLEO Collab.)
AUBERT,B	05A	PRL 95 041802	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,B	05F	PR D72 012003	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,B	05W	PR D72 072001	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,BE	05D	PRL 95 191801	B. Aubert <i>et al.</i>	(BABAR Collab.)
ENARI	05	PL B622 218	Y. Enari <i>et al.</i>	(BELLE Collab.)
HAYASAKA	05	PL B613 20	K. Hayasaka <i>et al.</i>	(BELLE Collab.)
SCHAEEL	05C	PRPL 421 191	S. Schaeel <i>et al.</i>	(ALEPH Collab.)
ABBIENDI	04J	EPJ C35 437	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABDALLAH	04K	EPJ C35 159	J. Abdallah <i>et al.</i>	(DELPHI Collab.)
ABDALLAH	04T	EPJ C36 283	J. Abdallah <i>et al.</i>	(DELPHI Collab.)
ABE	04B	PRL 92 171802	K. Abe <i>et al.</i>	(BELLE Collab.)
ACHARD	04G	PL B585 53	P. Achard <i>et al.</i>	(L3 Collab.)
AUBERT	04J	PRL 92 121801	B. Aubert <i>et al.</i>	(BABAR Collab.)
ENARI	04	PRL 93 081803	Y. Enari <i>et al.</i>	(BELLE Collab.)
YUSA	04	PL B589 103	Y. Yusa <i>et al.</i>	(BELLE Collab.)
ABBIENDI	03	PL B551 35	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
BRIERE	03	PRL 90 181802	R. A. Briere <i>et al.</i>	(CLEO Collab.)
HEISTER	03F	EPJ C30 291	A. Heister <i>et al.</i>	(ALEPH Collab.)
INAMI	03	PL B551 16	K. Inami <i>et al.</i>	(BELLE Collab.)
CHEN	02C	PR D66 071101R	S. Chen <i>et al.</i>	(CLEO Collab.)
ABBIENDI	01J	EPJ C19 653	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABREU	01M	EPJ C20 617	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACCIARRI	01F	PL B507 47	M. Acciarri <i>et al.</i>	(L3 Collab.)
ACHARD	01D	PL B519 189	P. Achard <i>et al.</i>	(L3 Collab.)
ANASTASSOV	01	PRL 86 4467	A. Anastassov <i>et al.</i>	(CLEO Collab.)
HEISTER	01E	EPJ C22 217	A. Heister <i>et al.</i>	(ALEPH Collab.)
ABBIENDI	00A	PL B492 23	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABBIENDI	00C	EPJ C13 213	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABBIENDI	00D	EPJ C13 197	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABREU	00L	EPJ C16 229	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACCIARRI	00B	PL B479 67	M. Acciarri <i>et al.</i>	(L3 Collab.)
AHMED	00	PR D61 071101R	S. Ahmed <i>et al.</i>	(CLEO Collab.)
ALBRECHT	00	PL B485 37	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ASNER	00	PR D61 012002	D.M. Asner <i>et al.</i>	(CLEO Collab.)
ASNER	00B	PR D62 072006	D.M. Asner <i>et al.</i>	(CLEO Collab.)
BERGFELD	00	PRL 84 830	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
BROWDER	00	PR D61 052004	T.E. Browder <i>et al.</i>	(CLEO Collab.)
EDWARDS	00A	PR D61 072003	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
GONZALEZ-S...	00	NP B582 3	G.A. Gonzalez-Sprinberg <i>et al.</i>	
ABBIENDI	99H	PL B447 134	G. Abbiendi <i>et al.</i>	(OPAL Collab.)
ABREU	99X	EPJ C10 201	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF	99D	EPJ C8 3	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
ACKERSTAFF	99E	EPJ C8 183	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
BARATE	99K	EPJ C10 1	R. Barate <i>et al.</i>	(ALEPH Collab.)
BARATE	99R	EPJ C11 599	R. Barate <i>et al.</i>	(ALEPH Collab.)
BISHAI	99	PRL 82 281	M. Bishai <i>et al.</i>	(CLEO Collab.)
GODANG	99	PR D59 091303	R. Godang <i>et al.</i>	(CLEO Collab.)
RICHICHI	99	PR D60 112002	S.J. Richichi <i>et al.</i>	(CLEO Collab.)

ACCIARRI	98C	PL B426 207	M. Acciarri <i>et al.</i>	(L3 Collab.)
ACCIARRI	98E	PL B434 169	M. Acciarri <i>et al.</i>	(L3 Collab.)
ACCIARRI	98R	PL B438 405	M. Acciarri <i>et al.</i>	(L3 Collab.)
ACKERSTAFF	98M	EPJ C4 193	K. Akerstaff <i>et al.</i>	(OPAL Collab.)
ACKERSTAFF	98N	PL B431 188	K. Akerstaff <i>et al.</i>	(OPAL Collab.)
ALBRECHT	98	PL B431 179	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BARATE	98	EPJ C1 65	R. Barate <i>et al.</i>	(ALEPH Collab.)
BARATE	98E	EPJ C4 29	R. Barate <i>et al.</i>	(ALEPH Collab.)
BLISS	98	PR D57 5903	D.W. Bliss <i>et al.</i>	(CLEO Collab.)
ABE	97O	PRL 78 4691	K. Abe <i>et al.</i>	(SLD Collab.)
ACKERSTAFF	97J	PL B404 213	K. Akerstaff <i>et al.</i>	(OPAL Collab.)
ACKERSTAFF	97L	ZPHY C74 403	K. Akerstaff <i>et al.</i>	(OPAL Collab.)
ACKERSTAFF	97R	ZPHY C75 593	K. Akerstaff <i>et al.</i>	(OPAL Collab.)
ALEXANDER	97F	PR D56 5320	J.P. Alexander <i>et al.</i>	(CLEO Collab.)
AMMAR	97B	PRL 78 4686	R. Ammar <i>et al.</i>	(CLEO Collab.)
ANASTASSOV	97	PR D55 2559	A. Anastassov <i>et al.</i>	(CLEO Collab.)
	Also	PR D58 119903 (erratum)	A. Anastassov <i>et al.</i>	(CLEO Collab.)
ANDERSON	97	PRL 79 3814	S. Anderson <i>et al.</i>	(CLEO Collab.)
AVERY	97	PR D55 R1119	P. Avery <i>et al.</i>	(CLEO Collab.)
BARATE	97I	ZPHY C74 387	R. Barate <i>et al.</i>	(ALEPH Collab.)
BARATE	97R	PL B414 362	R. Barate <i>et al.</i>	(ALEPH Collab.)
BERGFELD	97	PRL 79 2406	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
BONVICINI	97	PRL 79 1221	G. Bonvicini <i>et al.</i>	(CLEO Collab.)
BUSKULIC	97C	ZPHY C74 263	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
COAN	97	PR D55 7291	T.E. Coan <i>et al.</i>	(CLEO Collab.)
EDWARDS	97	PR D55 R3919	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
EDWARDS	97B	PR D56 R5297	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
ESCRIBANO	97	PL B395 369	R. Escribano, E. Masso	(BARC, PARIT)
ABREU	96B	PL B365 448	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACCIARRI	96H	PL B377 313	M. Acciarri <i>et al.</i>	(L3 Collab.)
ACCIARRI	96K	PL B389 187	M. Acciarri <i>et al.</i>	(L3 Collab.)
ALAM	96	PRL 76 2637	M.S. Alam <i>et al.</i>	(CLEO Collab.)
ALBRECHT	96E	PRPL 276 223	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALEXANDER	96D	PL B369 163	G. Alexander <i>et al.</i>	(OPAL Collab.)
ALEXANDER	96E	PL B374 341	G. Alexander <i>et al.</i>	(OPAL Collab.)
ALEXANDER	96S	PL B388 437	G. Alexander <i>et al.</i>	(OPAL Collab.)
BAI	96	PR D53 20	J.Z. Bai <i>et al.</i>	(BES Collab.)
BALEST	96	PL B388 402	R. Balest <i>et al.</i>	(CLEO Collab.)
BARTELT	96	PRL 76 4119	J.E. Bartelt <i>et al.</i>	(CLEO Collab.)
BUSKULIC	96	ZPHY C70 579	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
BUSKULIC	96C	ZPHY C70 561	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
COAN	96	PR D53 6037	T.E. Coan <i>et al.</i>	(CLEO Collab.)
ABE	95Y	PR D52 4828	K. Abe <i>et al.</i>	(SLD Collab.)
ABREU	95T	PL B357 715	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ABREU	95U	PL B359 411	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACCIARRI	95	PL B345 93	M. Acciarri <i>et al.</i>	(L3 Collab.)
ACCIARRI	95F	PL B352 487	M. Acciarri <i>et al.</i>	(L3 Collab.)
AKERS	95F	ZPHY C66 31	R. Akers <i>et al.</i>	(OPAL Collab.)
AKERS	95I	ZPHY C66 543	R. Akers <i>et al.</i>	(OPAL Collab.)
AKERS	95P	ZPHY C67 45	R. Akers <i>et al.</i>	(OPAL Collab.)
AKERS	95Y	ZPHY C68 555	R. Akers <i>et al.</i>	(OPAL Collab.)
ALBRECHT	95	PL B341 441	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	95C	PL B349 576	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	95G	ZPHY C68 25	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	95H	ZPHY C68 215	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BALEST	95C	PRL 75 3809	R. Balest <i>et al.</i>	(CLEO Collab.)
BERNABEU	95	NP B436 474	J. Bernabeu <i>et al.</i>	
BUSKULIC	95C	PL B346 371	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
BUSKULIC	95D	PL B346 379	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
	Also	PL B363 265 (erratum)	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
ABREU	94K	PL B334 435	P. Abreu <i>et al.</i>	(DELPHI Collab.)
AKERS	94E	PL B328 207	R. Akers <i>et al.</i>	(OPAL Collab.)
AKERS	94G	PL B339 278	R. Akers <i>et al.</i>	(OPAL Collab.)
ALBRECHT	94E	PL B337 383	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ARTUSO	94	PRL 72 3762	M. Artuso <i>et al.</i>	(CLEO Collab.)
BARTELT	94	PRL 73 1890	J.E. Bartelt <i>et al.</i>	(CLEO Collab.)
BATTLE	94	PRL 73 1079	M. Battle <i>et al.</i>	(CLEO Collab.)
BAUER	94	PR D50 R13	D.A. Bauer <i>et al.</i>	(TPC/2gamma Collab.)
BUSKULIC	94D	PL B321 168	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
BUSKULIC	94E	PL B332 209	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
BUSKULIC	94F	PL B332 219	D. Buskulic <i>et al.</i>	(ALEPH Collab.)

GIBAUT	94B	PRL 73 934	D. Gibaut <i>et al.</i>	(CLEO Collab.)
ADRIANI	93M	PRPL 236 1	O. Adriani <i>et al.</i>	(L3 Collab.)
ALBRECHT	93C	ZPHY C58 61	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	93G	PL B316 608	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BALEST	93	PR D47 R3671	R. Balest <i>et al.</i>	(CLEO Collab.)
BEAN	93	PRL 70 138	A. Bean <i>et al.</i>	(CLEO Collab.)
BORTOLETTO	93	PRL 71 1791	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
ESCRIBANO	93	PL B301 419	R. Escribano, E. Masso	(BARC)
PROCARIO	93	PRL 70 1207	M. Procario <i>et al.</i>	(CLEO Collab.)
ABREU	92N	ZPHY C55 555	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACTON	92F	PL B281 405	D.P. Acton <i>et al.</i>	(OPAL Collab.)
ACTON	92H	PL B288 373	P.D. Acton <i>et al.</i>	(OPAL Collab.)
AKERIB	92	PRL 69 3610	D.S. Akerib <i>et al.</i>	(CLEO Collab.)
	Also	PRL 71 3395 (erratum)	D.S. Akerib <i>et al.</i>	(CLEO Collab.)
ALBRECHT	92D	ZPHY C53 367	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	92K	ZPHY C55 179	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	92M	PL B292 221	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	92Q	ZPHY C56 339	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
AMMAR	92	PR D45 3976	R. Ammar <i>et al.</i>	(CLEO Collab.)
ARTUSO	92	PRL 69 3278	M. Artuso <i>et al.</i>	(CLEO Collab.)
BAI	92	PRL 69 3021	J.Z. Bai <i>et al.</i>	(BES Collab.)
BATTLE	92	PL B291 488	M. Battle <i>et al.</i>	(CLEO Collab.)
BUSKULIC	92J	PL B297 459	D. Buskulic <i>et al.</i>	(ALEPH Collab.)
DECAMP	92C	ZPHY C54 211	D. Decamp <i>et al.</i>	(ALEPH Collab.)
ADEVA	91F	PL B265 451	B. Adeva <i>et al.</i>	(L3 Collab.)
ALBRECHT	91D	PL B260 259	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALEXANDER	91D	PL B266 201	G. Alexander <i>et al.</i>	(OPAL Collab.)
ANTREASYAN	91	PL B259 216	D. Antreasyan <i>et al.</i>	(Crystal Ball Collab.)
GRIFOLS	91	PL B255 611	J.A. Grifols, A. Mendez	(BARC)
ABACHI	90	PR D41 1414	S. Abachi <i>et al.</i>	(HRS Collab.)
ALBRECHT	90E	PL B246 278	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	90I	PL B250 164	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BEHREND	90	ZPHY C46 537	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
BOWCOCK	90	PR D41 805	T.J.V. Bowcock <i>et al.</i>	(CLEO Collab.)
DELAGUILA	90	PL B252 116	F. del Aguila, M. Sher	(BARC, WILL)
GOLDBERG	90	PL B251 223	M. Goldberg <i>et al.</i>	(CLEO Collab.)
WU	90	PR D41 2339	D.Y. Wu <i>et al.</i>	(Mark II Collab.)
ABACHI	89B	PR D40 902	S. Abachi <i>et al.</i>	(HRS Collab.)
BEHREND	89B	PL B222 163	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
JANSEN	89	PL B228 273	H. Janssen <i>et al.</i>	(Crystal Ball Collab.)
KLEINWORT	89	ZPHY C42 7	C. Kleinwort <i>et al.</i>	(JADE Collab.)
ADEVA	88	PR D38 2665	B. Adeva <i>et al.</i>	(Mark-J Collab.)
ALBRECHT	88B	PL B202 149	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	88L	ZPHY C41 1	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	88M	ZPHY C41 405	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
AMIDEI	88	PR D37 1750	D. Amidei <i>et al.</i>	(Mark II Collab.)
BEHREND	88	PL B200 226	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
BRAUNSCH...	88C	ZPHY C39 331	W. Braunschweig <i>et al.</i>	(TASSO Collab.)
KEH	88	PL B212 123	S. Keh <i>et al.</i>	(Crystal Ball Collab.)
TSCHIRHART	88	PL B205 407	R. Tschirhart <i>et al.</i>	(HRS Collab.)
ABACHI	87B	PL B197 291	S. Abachi <i>et al.</i>	(HRS Collab.)
ABACHI	87C	PRL 59 2519	S. Abachi <i>et al.</i>	(HRS Collab.)
ADLER	87B	PRL 59 1527	J. Adler <i>et al.</i>	(Mark III Collab.)
AIHARA	87B	PR D35 1553	H. Aihara <i>et al.</i>	(TPC Collab.)
AIHARA	87C	PRL 59 751	H. Aihara <i>et al.</i>	(TPC Collab.)
ALBRECHT	87L	PL B185 223	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALBRECHT	87P	PL B199 580	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
BAND	87	PL B198 297	H.R. Band <i>et al.</i>	(MAC Collab.)
BAND	87B	PRL 59 415	H.R. Band <i>et al.</i>	(MAC Collab.)
BARINGER	87	PRL 59 1993	P. Baringer <i>et al.</i>	(CLEO Collab.)
BEBEK	87C	PR D36 690	C. Bebek <i>et al.</i>	(CLEO Collab.)
BURCHAT	87	PR D35 27	P.R. Burchat <i>et al.</i>	(Mark II Collab.)
BYLSMA	87	PR D35 2269	B.G. Bylsma <i>et al.</i>	(HRS Collab.)
COFFMAN	87	PR D36 2185	D.M. Coffman <i>et al.</i>	(Mark III Collab.)
DERRICK	87	PL B189 260	M. Derrick <i>et al.</i>	(HRS Collab.)
FORD	87	PR D35 408	W.T. Ford <i>et al.</i>	(MAC Collab.)
FORD	87B	PR D36 1971	W.T. Ford <i>et al.</i>	(MAC Collab.)
GAN	87	PRL 59 411	K.K. Gan <i>et al.</i>	(Mark II Collab.)
GAN	87B	PL B197 561	K.K. Gan <i>et al.</i>	(Mark II Collab.)
AIHARA	86E	PRL 57 1836	H. Aihara <i>et al.</i>	(TPC Collab.)
BARTEL	86D	PL B182 216	W. Bartel <i>et al.</i>	(JADE Collab.)

PDG	86	PL 170B 1	M. Aguilar-Benitez <i>et al.</i>	(CERN, CIT+)
RUCKSTUHL	86	PRL 56 2132	W. Ruckstuhl <i>et al.</i>	(DELCO Collab.)
SCHMIDKE	86	PRL 57 527	W.B. Schmidke <i>et al.</i>	(Mark II Collab.)
YELTON	86	PRL 56 812	J.M. Yelton <i>et al.</i>	(Mark II Collab.)
ALTHOFF	85	ZPHY C26 521	M. Althoff <i>et al.</i>	(TASSO Collab.)
ASH	85B	PRL 55 2118	W.W. Ash <i>et al.</i>	(MAC Collab.)
BALTRUSAIT...	85	PRL 55 1842	R.M. Baltrusaitis <i>et al.</i>	(Mark III Collab.)
BARTEL	85F	PL 161B 188	W. Bartel <i>et al.</i>	(JADE Collab.)
BEHREND	85	PR D32 2468	S. Behrends <i>et al.</i>	(CLEO Collab.)
BELTRAMI	85	PRL 54 1775	I. Beltrami <i>et al.</i>	(HRS Collab.)
BERGER	85	ZPHY C28 1	C. Berger <i>et al.</i>	(PLUTO Collab.)
BURCHAT	85	PRL 54 2489	P.R. Burchat <i>et al.</i>	(Mark II Collab.)
FERNANDEZ	85	PRL 54 1624	E. Fernandez <i>et al.</i>	(MAC Collab.)
MILLS	85	PRL 54 624	G.B. Mills <i>et al.</i>	(DELCO Collab.)
AIHARA	84C	PR D30 2436	H. Aihara <i>et al.</i>	(TPC Collab.)
BEHREND	84	ZPHY C23 103	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
MILLS	84	PRL 52 1944	G.B. Mills <i>et al.</i>	(DELCO Collab.)
BEHREND	83C	PL 127B 270	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
SILVERMAN	83	PR D27 1196	D.J. Silverman, G.L. Shaw	(UCI)
BEHREND	82	PL 114B 282	H.J. Behrend <i>et al.</i>	(CELLO Collab.)
BLOCKER	82B	PRL 48 1586	C.A. Blocker <i>et al.</i>	(Mark II Collab.)
BLOCKER	82D	PL 109B 119	C.A. Blocker <i>et al.</i>	(Mark II Collab.) J
FELDMAN	82	PRL 48 66	G.J. Feldman <i>et al.</i>	(Mark II Collab.)
HAYES	82	PR D25 2869	K.G. Hayes <i>et al.</i>	(Mark II Collab.)
BERGER	81B	PL 99B 489	C. Berger <i>et al.</i>	(PLUTO Collab.)
DORFAN	81	PRL 46 215	J.M. Dorfan <i>et al.</i>	(Mark II Collab.)
BRANDELIK	80	PL 92B 199	R. Brandelik <i>et al.</i>	(TASSO Collab.)
ZHOLENTZ	80	PL 96B 214	A.A. Zholents <i>et al.</i>	(NOVO)
Also		SJNP 34 814	A.A. Zholents <i>et al.</i>	(NOVO)
		Translated from YAF 34	1471.	
BACINO	79B	PRL 42 749	W.J. Bacino <i>et al.</i>	(DELCO Collab.)
KIRKBY	79	SLAC-PUB-2419	J. Kirkby	(SLAC) J
		Batavia Lepton Photon Conference.		
BACINO	78B	PRL 41 13	W.J. Bacino <i>et al.</i>	(DELCO Collab.) J
Also		Tokyo Conf. 249	J. Kirz	(STON)
Also		PL 96B 214	A.A. Zholents <i>et al.</i>	(NOVO)
BRANDELIK	78	PL 73B 109	R. Brandelik <i>et al.</i>	(DASP Collab.) J
FELDMAN	78	Tokyo Conf. 777	G.J. Feldman	(SLAC) J
JAROS	78	PRL 40 1120	J. Jaros <i>et al.</i>	(LGW Collab.)
PERL	75	PRL 35 1489	M.L. Perl <i>et al.</i>	(LBL, SLAC)

## OTHER RELATED PAPERS

DAVIER	06	RMP 78 1043	M. Davier, A. Hocker, Z. Zhang	(LALO, PARIN+)
RAHAL-CAL...	98	IJMP A13 695	G. Rahal-Callot	(ETH)
GENTILE	96	PRPL 274 287	S. Gentile, M. Pohl	(ROMAI, ETH)
WEINSTEIN	93	ARNPS 43 457	A.J. Weinstein, R. Stroynowski	(CIT, SMU)
PERL	92	RPP 55 653	M.L. Perl	(SLAC)
PICH	90	MPL A5 1995	A. Pich	(VALE)
BARISH	88	PRPL 157 1	B.C. Barish, R. Stroynowski	(CIT)
GAN	88	IJMP A3 531	K.K. Gan, M.L. Perl	(SLAC)
HAYES	88	PR D38 3351	K.G. Hayes, M.L. Perl	(SLAC)
PERL	80	ARNPS 30 299	M.L. Perl	(SLAC)