$\Gamma(\tau^+\tau^-)$ Γ_3

This parameter is not directly used in the overall fit but is derived using the fit results; see the 'Note on the *Z* Boson.'

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
83.68±0.44 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
83.55±0.91	25k	ABREU	94 DLPH	$E^{ee}_{\rm cm}$= 88–94 GeV
84.04±0.94	25k	ACCIARRI	94 L3	$E^{ee}_{\rm cm}$= 88–94 GeV
82.90±0.77	47k	AKERS	94 OPAL	$E^{ee}_{\rm cm}$= 88–94 GeV
84.18±0.79	45.1k	BUSKULIC	94 ALEP	$E^{ee}_{\rm cm}$= 88–94 GeV
82.2 ±1.1	18k	ACTON	93D OPAL	Repl. by AKERS 94
84.6 ±1.2	10k	ADRIANI	93M L3	Repl. by ACCIARRI 94
84.09±1.10		BUSKULIC	93J ALEP	Repl. by BUSKULIC 94
83.54±0.62	50k	[34] QUAST	93 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
83.1 ±1.2	16k	[35] BANERJEE	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
82.4 ±1.6	6260	DECAMP	92B ALEP	Repl. by BUSKULIC 93J
82.76±1.02	17k	[36] LEP	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
82.7 ±2.1 ±1.1	2345	ABREU	91F DLPH	Repl. by ABREU 94
84.0 ±2.7	2540	ADEVA	91E L3	Repl. by ADRIANI 93M
82.7 ±1.9	5559	ALEXANDER	91F OPAL	Repl. by ACTON 93D

[34] QUAST 93 is a combined analysis of LEP results as of Feb. 1993.
[35] BANERJEE 92 is a combined analysis of the four LEP experiments as of March 1991.
[36] LEP 92 is combined analysis by the four LEP experiments as of December 1991. Systematic errors are included.

$\Gamma(\ell^+\ell^-)$ Γ_4

In our fit $\Gamma(\ell^+\ell^-)$ is defined as the partial *Z* width for the decay into a pair of massless charged leptons. This parameter is not directly used in the 5-parameter fit assuming lepton universality but is derived using the fit results. See the 'Note on the *Z* Boson.'

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
83.84±0.27 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
83.56±0.45	102k	ABREU	94 DLPH	$E^{ee}_{\rm cm}$= 88–94 GeV
83.49±0.46	97k	ACCIARRI	94 L3	$E^{ee}_{\rm cm}$= 88–94 GeV
83.55±0.44	146k	AKERS	94 OPAL	$E^{ee}_{\rm cm}$= 88–94 GeV
84.40±0.43	137.3k	BUSKULIC	94 ALEP	$E^{ee}_{\rm cm}$= 88–94 GeV
83.27±0.50	58k	ACTON	93D OPAL	Repl. by AKERS 94
83.1 ±0.5	40k	ADRIANI	93F L3	Repl. by ACCIARRI 94
84.22±0.48		BUSKULIC	93J ALEP	Repl. by BUSKULIC 94
83.40±0.29	190k	[37] QUAST	93 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
83.0 ±0.4	50k	[38] BANERJEE	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
83.1 ±0.7	20k	DECAMP	92B ALEP	Repl. by BUSKULIC 93J
83.24±0.42	57k	[39] LEP	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
83.4 ±0.8	10k	ABREU	91F DLPH	Repl. by ABREU 94
83.6 ±0.8	10k	ADEVA	91E L3	Repl. by ADRIANI 93F
83.0 ±0.7	18k	ALEXANDER	91F OPAL	Repl. by ACTON 93D

[37] QUAST 93 is a combined analysis of LEP results as of Feb. 1993.
[38] BANERJEE 92 is a combined analysis of the four LEP experiments as of March 1991.
[39] LEP 92 is combined analysis by the four LEP experiments as of December 1991. Systematic errors are included.

$\Gamma(\text{invisible})$ Γ_5

We use only direct measurements of the invisible partial width to obtain the average value quoted below. The fit value is obtained as a difference between the total and the observed partial widths assuming lepton universality.

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
498.2± 4.2 OUR FIT				
496 ±29 OUR AVERAGE				
450 ±34 ±34	258	BUSKULIC	93L ALEP	$E^{ee}_{\rm cm}$ = 88–94 GeV
540 ±80 ±40	61	ADEVA	92 L3	$E^{ee}_{\rm cm}$ = 88–94 GeV
524 ±40 ±20	172	[40] ADRIANI	92E L3	$E^{ee}_{\rm cm}$ = 89–94 GeV
500 ±70 ±30	73	AKRAWY	91D OPAL	$E^{ee}_{\rm cm}$ = 88–94 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
509.4± 7.0		ABREU	94 DLPH	$E^{ee}_{\rm cm}$= 88–94 GeV
496.5± 7.9		ACCIARRI	94 L3	$E^{ee}_{\rm cm}$= 88–94 GeV
490.3± 7.3		AKERS	94 OPAL	$E^{ee}_{\rm cm}$= 88–94 GeV
501 ± 6		BUSKULIC	94 ALEP	$E^{ee}_{\rm cm}$= 88–94 GeV
495 ±10		ACTON	93D OPAL	Repl. by AKERS 94
494 ±10		ADRIANI	93M L3	Repl. by ACCIARRI 94
498 ± 9		BUSKULIC	93J ALEP	Repl. by BUSKULIC 94
499 ± 6		[41] QUAST	93 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
491 ±13		DECAMP	92B ALEP	Repl. by BUSKULIC 93J
498 ± 8		[42] LEP	92 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
488 ±17		ABREU	91F DLPH	Repl. by ABREU 94
508 ±17		ADEVA	91E L3	Repl. by ADRIANI 93M
504 ±15		ALEXANDER	91F OPAL	Repl. by ACTON 93D

[40] ADRIANI 92E improves but does not supersede ADEVA 92, obtained with 1990 data only.
[41] QUAST 93 is a combined analysis of LEP results as of Feb. 1993. Assumes lepton universality.
[42] LEP 92 is combined analysis by the four LEP experiments as of December 1991. Systematic errors are included. Assumes lepton universality.

$\Gamma(\text{hadrons})$ Γ_6

This parameter is not directly used in the 5-parameter fit assuming lepton universality, but is derived using the fit results. See the 'Note on the *Z* Boson.'

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
1740.7± 5.9 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1723 ±10	1.05M	ABREU	94 DLPH	$E^{ee}_{\rm cm}$= 88–94 GeV
1748 ±10	1.1M	ACCIARRI	94 L3	$E^{ee}_{\rm cm}$= 88–94 GeV
1741 ±10	1.2M	[43] AKERS	94 OPAL	$E^{ee}_{\rm cm}$= 88–94 GeV
1746 ±10	1.14M	BUSKULIC	94 ALEP	$E^{ee}_{\rm cm}$= 88–94 GeV
1738 ±12	454k	[44] ACTON	93D OPAL	Repl. by AKERS 94
1747 ±11	420k	ADRIANI	93F L3	Repl. by ACCIARRI 94
1751 ±11		BUSKULIC	93J ALEP	Repl. by BUSKULIC 94
1741 ± 7	1.7M	[45] QUAST	93 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
1734 ±10	500k	[46,47] BANERJEE	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
1740 ±12	570k	[48] LEP	92 RVUE	Repl. by LEP 93
1726 ±19	124k	ABREU	91F DLPH	Repl. by ABREU 94

[43] AKERS 94 assumes lepton universality. Without this assumption, it becomes 1742 ± 11 MeV.
[44] ACTON 93D assumes lepton universality. Without this assumption it becomes 1743 ± 15 MeV.
[45] QUAST 93 is a combined analysis of LEP results as of Feb. 1993. Assumes lepton universality.
[46] Assuming lepton universality. Without this assumption it becomes 1741 ± 15 MeV.
[47] BANERJEE 92 is a combined analysis of the four LEP experiments as of March 1991.
[48] LEP 92 is combined analysis by the four LEP experiments as of December 1991. Systematic errors are included. Assumes lepton universality.

Z BRANCHING RATIOS

$\Gamma(\text{hadrons})/\Gamma(e^+e^-)$ Γ_6/Γ_1

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
20.76± 0.08 OUR FIT				
20.74± 0.18	31.4k	ABREU	94 DLPH	$E^{ee}_{\rm cm}$= 88–94 GeV
20.96± 0.15	38k	ACCIARRI	94 L3	$E^{ee}_{\rm cm}$= 88–94 GeV
20.83± 0.16	42k	AKERS	94 OPAL	$E^{ee}_{\rm cm}$= 88–94 GeV
20.59± 0.15	45.8k	BUSKULIC	94 ALEP	$E^{ee}_{\rm cm}$= 88–94 GeV
$27.0\ ^{+11.7}_{-\ 8.8}$	12	[49] ABRAMS	89D MRK2	$E^{ee}_{\rm cm}$= 89–93 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
20.99± 0.25	17k	ACTON	93D OPAL	Repl. by AKERS 94
20.69± 0.21		BUSKULIC	93J ALEP	Repl. by BUSKULIC 94
20.92± 0.12	70k	[50] QUAST	93 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
20.91± 0.22	19k	[51] LEP	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
21.19± 0.49±0.18	2772	[52] ABREU	91F DLPH	Repl. by ABREU 94
21.01± 0.40±0.22	4175	[53] ADEVA	91E L3	Repl. by ACCIA-RRI 94

[49] ABRAMS 89D have included both statistical and systematic uncertainties in their quoted errors.
[50] QUAST 93 is a combined analysis of LEP results as of Feb. 1993.
[51] LEP 92 is combined analysis by the four LEP experiments as of December 1991. Systematic errors are included.
[52] ABREU 91F report $\Gamma(ee) = 82.4 \pm 1.1 \pm 0.5$ MeV and provided us with this branching ratio from the same data and analysis.
[53] ADEVA 91E report $B(ee) = 3.33 \pm 0.04\%$ and $\Gamma(ee) = 83.3 \pm 1.1$ MeV and provided us with this branching ratio from the same data and analysis.

$\Gamma(\text{hadrons})/\Gamma(\mu^+\mu^-)$ Γ_6/Γ_2

VALUE	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
20.76±0.07 OUR FIT				
20.78±0.09 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.				
20.54±0.14	45.6k	ABREU	94 DLPH	$E^{ee}_{\rm cm}$= 88–94 GeV
21.02±0.16	34k	ACCIARRI	94 L3	$E^{ee}_{\rm cm}$= 88–94 GeV
20.78±0.11	57k	AKERS	94 OPAL	$E^{ee}_{\rm cm}$= 88–94 GeV
20.83±0.15	46.4k	BUSKULIC	94 ALEP	$E^{ee}_{\rm cm}$= 88–94 GeV
$18.9\ ^{+7.1}_{-5.3}$	13	[54] ABRAMS	89D MRK2	$E^{ee}_{\rm cm}$= 89–93 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
20.65±0.17	23k	ACTON	93D OPAL	Repl. by AKERS 94
20.88±0.20		BUSKULIC	93J ALEP	Repl. by BUSKULIC 94
20.79±0.10	70k	[55] QUAST	93 RVUE	$E^{ee}_{\rm cm}$ = 88–94 GeV
21.26±0.29	6691	DECAMP	92B ALEP	Repl. by BUSKULIC 93J
20.88±0.18	21k	[56] LEP	92 RVUE	$E^{ee}_{\rm cm}$= 88–94 GeV
19.89±0.40±0.19	2475	[57] ABREU	91 DLPH	Repl. by ABREU 94
20.08±0.36±0.16	3428	[58] ABREU	91F DLPH	Repl. by ABREU 94
20.75±0.39±0.17	3245	[59] ADEVA	91E L3	Repl. by ACCIA-RRI 94
20.92±0.31	7240	[60] ALEXANDER	91F OPAL	Repl. by AC-TON 93D

[54] ABRAMS 89D have included both statistical and systematic uncertainties in their quoted errors.
[55] QUAST 93 is a combined analysis of LEP results as of Feb. 1993.
[56] LEP 92 is combined analysis by the four LEP experiments as of December 1991. Systematic errors are included.
[57] ABREU 91 also obtain $[\Gamma(e)\Gamma(\mu)]^{1/2} = 85.0 \pm 0.9 \pm 0.8$ MeV, assuming $m_Z = 91.181$ GeV and $\Gamma(Z) = 2.455$ GeV.