$\rho^\tau(e)$ PARAMETER

($V-A$) theory predicts $\rho = 0.75$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.72 ±0.04 OUR AVERAGE					
0.79 ±0.08 ±0.06	3230	ALBRECHT	93G	ARG	E^{ee}_{cm}= 9.4–10.6 GeV
0.747±0.045±0.028	5106	ALBRECHT	90E	ARG	E^{ee}_{cm}= 9.4–10.6 GeV
0.64 ±0.06 ±0.07	2753	JANSSEN	89	CBAL	E^{ee}_{cm}= 9.4–10.6 GeV
0.62 ±0.17 ±0.14	1823	FORD	87B	MAC	E^{ee}_{cm}= 29 GeV
0.60 ±0.13	699	BEHRENDS	85	CLEO	e^+e^- near $\Upsilon(4S)$
0.72 ±0.10 ±0.11	594	BACINO	79B	DLCO	E^{ee}_{cm}= 3.5–7.4 GeV

$\rho^\tau(\mu)$ PARAMETER

($V-A$) theory predicts $\rho = 0.75$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.76 ±0.05 OUR AVERAGE					
0.76 ±0.07 ±0.08	3230	ALBRECHT	93G	ARG	E^{ee}_{cm}= 9.4–10.6 GeV
0.734±0.055±0.027	3041	ALBRECHT	90E	ARG	E^{ee}_{cm}= 9.4–10.6 GeV
0.89 ±0.14 ±0.08	1909	FORD	87B	MAC	E^{ee}_{cm}= 29 GeV
0.81 ±0.13	727	BEHRENDS	85	CLEO	e^+e^- near $\Upsilon(4S)$

ξ^τ(e or μ) PARAMETER

($V-A$) theory predicts $\xi = 1$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.90±0.15±0.10	3230	[92] ALBRECHT	93G	ARG	E^{ee}_{cm}= 9.4–10.6 GeV

[92] ALBRECHT 93G measurement determines $|\xi^\tau|$ for the case $\xi^\tau(e) = \xi^\tau(\mu)$, but the authors point out that other LEP experiments determine the sign to be positive.

CONSTRAINT ON W-τ COUPLINGS $2g_{A}g_{V}/(g_A^2+g_V^2)$

Standard Model predicts $g_A = g_V = 1$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{1.25{\pm}0.23^{+0.15}_{-0.08}}$	7.5k	ALBRECHT	93C	ARG	E^{ee}_{cm}= 9.4–10.6 GeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.14{\pm}0.34^{+0.34}_{-0.17}$	3.9k	ALBRECHT	90I	ARG	Repl. by ALBRECHT 93C

τ REFERENCES

AKERS	94E	PL B328 207	+Alexander, Allison, Anderson+	(OPAL Collab.)
ARTUSO	94	PRL 72 3762	+Goldberg, He, Horwitz+	(CLEO Collab.)
ABREU	93E	PL B302 356	+Adam, Adye, Agasi+	(DELPHI Collab.)
ACTON	93J	ZPHY C59 183	+Alexander, Allison, Allport+	(OPAL Collab.)
ADRIANI	93M	PRPL 236 1	+Aguilar-Benitez, Ahlen, Alcaraz, Aloisio+	(L3 Collab.)
ALBRECHT	93C	ZPHY C58 61	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
ALBRECHT	93G	PL B316 608	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
BALEST	93	PR D47 R3671	+Daoudi, Ford, Johnson+	(CLEO Collab.)
BEAN	93	PRL 70 138	+Gronberg, Kutschke+	(CLEO Collab.)
BORTOLETTO	93	PRL 71 1791	+Brown, Fast, McIlwain+	(CLEO Collab.)
ESCRIBANO	93	PL B301 419	+Masso	(BARC)
PROCARIO	93	PRL 70 1207	+Yang, Balest, Cho+	(CLEO Collab.)
WASSERBAECH	93	PR D48 4216		(FSUSC)
ABREU	92	ZPHY C53 567	+Adam, Adami, Adye+	(DELPHI Collab.)
ABREU	92N	ZPHY C55 555	+Adam, Adye, Agasi+	(DELPHI Collab.)
ACTON	92F	PL B281 405	+Alexander, Allison, Allport+	(OPAL Collab.)
ACTON	92H	PL B288 373	+Allison, Allport+	(OPAL Collab.)
AKERIB	92	PRL 69 3610	+Barish, Chadha, Cowen+	(CLEO Collab.)
Also	93B	PRL 71 3395 (erratum)	Akerib, Barish, Chadha, Cowen+	(CLEO Collab.)
ALBRECHT	92D	ZPHY C53 367	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
ALBRECHT	92K	ZPHY C55 179	+Ehrlichmann, Hamacher, Krueger+	(ARGUS Collab.)
ALBRECHT	92M	PL B292 221	+Ehrlichmann, Hamacher, Hofmann+	(ARGUS Collab.)
ALBRECHT	92Q	ZPHY C56 339	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
AMMAR	92	PR D45 3976	+Baringer, Coppage, Davis+	(CLEO Collab.)
ARTUSO	92	PRL 69 3278	+Goldberg, Horwitz, Kennett+	(CLEO Collab.)
BAI	92	PRL 69 3021	+Bardon, Becker-Szendy, Burnett+	(BES Collab.)
BATTLE	92	PL B291 488	+Ernst, Kroha, Roberts+	(CLEO Collab.)
BUSKULIC	92H	PL B297 432	+Decamp, Goy, Lees, Minard+	(ALEPH Collab.)
BUSKULIC	92J	PL B297 459	+Decamp, Goy, Lees+	(ALEPH Collab.)
DECAMP	92C	ZPHY C54 211	+Deschizeaux, Goy, Lees+	(ALEPH Collab.)
DECAMP	92E	PL B279 411	+Deschizeaux, Goy, Lees+	(ALEPH Collab.)
ABREU	91D	PL B267 422	+Adam, Adami, Adye+	(DELPHI Collab.)
ACTON	91C	PL B273 355	+Alexander, Allison, Allport+	(OPAL Collab.)
ADEVA	91F	PL B265 451	+Adriani, Aguilar-Benitez, Akbari+	(L3 Collab.)
ALBRECHT	91D	PL B260 259	+Ehrlichmann, Hamacher, Krueger+	(ARGUS Collab.)
ALEXANDER	91D	PL B266 201	+Allison, Allport, Anderson+	(OPAL Collab.)
ANTREASYAN	91	PL B259 216	+Bartels, Besset, Bieler+	(Crystal Ball Collab.)
GRIFOLS	91	PL B255 611	+Mendez	(BARC)
SAMUEL	91B	PRL 67 668	+Li, Mendel	(OKSU, WONT)
Also	92B	PRL 69 995	Samuel, Li, Mendel	(OKSU, WONT)
Erratum.				
ABACHI	90	PR D41 1414	+Derrick, Kooijman, Musgrave+	(HRS Collab.)
ALBRECHT	90E	PL B246 278	+Ehrlichmann, Harder, Krueger+	(ARGUS Collab.)
ALBRECHT	90I	PL B250 164	+Ehrlichmann, Harder, Krueger+	(ARGUS Collab.)
BEHREND	90	ZPHY C46 537	+Criegee, Field, Franke+	(CELLO Collab.)
BOWCOCK	90	PR D41 805	+Kinoshita, Pipkin, Procario+	(CLEO Collab.)
DELAGUILA	90	PL B252 116	+Sher	(BARC, WILL)
GOLDBERG	90	PL B251 223	+Haupt, Horwitz, Jain+	(CLEO Collab.)
WU	90	PR D41 2339	+Hayes, Perl, Barklow+	(Mark II Collab.)
ABACHI	89B	PR D40 902	+Derrick, Kooijman, Musgrave+	(HRS Collab.)
BEHREND	89B	PL B222 163	+Criegee, Dainton, Field, Franke+	(CELLO Collab.)
JANSSEN	89	PL B228 273	+Antreasyan, Bartels, Besset+	(Crystal Ball Collab.)
KLEINWORT	89	ZPHY C42 7	+Allison, Ambrus, Barlow+	(JADE Collab.)
ADEVA	88	PR D38 2665	+Anderhub, Ansari, Becker+	(Mark-J Collab.)
ALBRECHT	88B	PL B202 149	+Binder, Boeckmann+	(ARGUS Collab.)
ALBRECHT	88L	ZPHY C41 1	+Boeckmann, Glaeser, Harder+	(ARGUS Collab.)
ALBRECHT	88M	ZPHY C41 405	+Boeckmann, Glaeser, Harder+	(ARGUS Collab.)
AMIDEI	88	PR D37 1750	+Trilling, Abrams, Baden+	(Mark II Collab.)
BEHREND	88	PL B200 226	+Criegee, Dainton, Field+	(CELLO Collab.)
BRAUNSCH...	88C	ZPHY C39 331	Braunschweig, Kirschfink, Martyn+	(TASSO Collab.)
KEH	88	PL B212 123	+Antreasyan, Bartels, Besset+	(Crystal Ball Collab.)
TSCHIRHART	88	PL B205 407	+Abachi, Akerlof, Baringer+	(HRS Collab.)
ABACHI	87B	PL B197 291	+Baringer, Bylsma, De Bonte+	(HRS Collab.)
ABACHI	87C	PRL 59 2519	+Akerlof, Baringer, Blockus+	(HRS Collab.)
ADLER	87B	PRL 59 1527	+Becker, Blaylock, Bolton+	(Mark III Collab.)
AIHARA	87B	PR D35 1553	+Alston-Garnjost, Avery+	(TPC Collab.)
AIHARA	87C	PRL 59 751	+Alston-Garnjost, Avery+	(TPC Collab.)
ALBRECHT	87L	PL B185 223	+Binder, Boeckmann, Glaser+	(ARGUS Collab.)
ALBRECHT	87M	PL B185 228	+Binder, Boeckmann, Glaser+	(ARGUS Collab.)
ALBRECHT	87P	PL B199 580	+Andam, Binder, Boeckmann+	(ARGUS Collab.)
BAND	87	PL B198 297	+Camporesi, Chadwick, Delfino+	(MAC Collab.)
BAND	87B	PRL 59 415	+Bosman, Camporesi, Chadwick+	(MAC Collab.)
BARINGER	87	PRL 59 1993	+McIlwain, Miller, Shibata+	(CLEO Collab.)
BEBEK	87C	PR D36 690	+Berkelman, Blucher, Cassel+	(CLEO Collab.)
BURCHAT	87	PR D35 27	+Feldman, Barklow, Boyarski+	(Mark II Collab.)
BYLSMA	87	PR D35 2269	+Abachi, Baringer, DeBonte+	(HRS Collab.)
COFFMAN	87	PR D36 2185	+Dubois, Eigen, Hauser+	(Mark III Collab.)
DERRICK	87	PL B189 260	+Kooijman, Loos, Musgrave+	(HRS Collab.)
FORD	87	PR D35 408	+Qi, Read, Smith+	(MAC Collab.)
FORD	87B	PR D36 1971	+Qi, Read, Smith+	(MAC Collab.)
GAN	87	PRL 59 411	+Abrams, Amidei, Baden+	(Mark II Collab.)
GAN	87B	PL B197 561	+Abrams, Amidei, Baden+	(Mark II Collab.)
ADEVA	86B	PL B179 177	+Ansari, Becker, Becker-Szendy+	(Mark-J Collab.)
AIHARA	86E	PRL 57 1836	+Alston-Garnjost, Avery+	(TPC Collab.)
BARTEL	86D	PL B182 216	+Becker, Felst, Haidt, Knies+	(JADE Collab.)
PDG	86	PL 170B	Aguilar-Benitez, Porter+	(CERN, CIT+)
RUCKSTUHL	86	PRL 56 2132	+Stroynowski, Atwood, Barish+	(DELCO Collab.)
SCHMIDKE	86	PRL 57 527	+Abrams, Matteuzzi, Amidei+	(Mark II Collab.)
YELTON	86	PRL 56 812	+Dorfan, Abrams, Amidei+	(Mark II Collab.)
AKERLOF	85B	PRL 55 570	+Baranko, Baringer, Beltrami+	(HRS Collab.)
ALTHOFF	85	ZPHY C26 521	+Braunschweig, Kirschfink+	(TASSO Collab.)
ASH	85B	PRL 55 2118	+Band, Blume, Camporesi+	(MAC Collab.)
BALTRUSAIT...	85	PRL 55 1842	Baltrusaitis, Becker, Blaylock, Brown+	(Mark III Collab.)
BARTEL	85F	PL 161B 188	+Becker, Cords, Felst+	(JADE Collab.)
BEHRENDS	85	PR D32 2468	+Gentile, Guida, Guida, Morrow+	(CLEO Collab.)
BELTRAMI	85	PRL 54 1775	+Bylsma, DeBonte, Gan+	(HRS Collab.)
BERGER	85	ZPHY C28 1	+Genzel, Lackas, Pielorz+	(PLUTO Collab.)
BURCHAT	85	PRL 54 2489	+Schmidke, Yelton, Abrams+	(Mark II Collab.)
FERNANDEZ	85	PRL 54 1624	+Ford, Qi, Read+	(MAC Collab.)
MILLS	85	PRL 54 624	+Pal, Atwood, Baillon+	(DELCO Collab.)
AIHARA	84C	PR D30 2436	+Alston-Garnjost, Badtke, Bakken+	(TPC Collab.)
ALTHOFF	84D	PL 141B 264	+Braunschweig, Kirschfink+	(TASSO Collab.)
BEHREND	84	ZPHY C23 103	+Fenner, Schachter, Schroder+	(CELLO Collab.)
MILLS	84	PRL 52 1944	+Ruckstuhl, Atwood, Baillon+	(DELCO Collab.)
BEHREND	83C	PL 127B 270	+Chen, Fenner, Gumpel+	(CELLO Collab.)
JAROS	83	PRL 51 955	+Amidei, Trilling, Abrams+	(Mark II Collab.)
SILVERMAN	83	PR D27 1196	+Shaw	(UCI)
BEHREND	82	PL 114B 282	+Chen, Fenner, Field+	(CELLO Collab.)
BLOCKER	82B	PRL 48 1586	+Abrams, Alam, Blondel+	(Mark II Collab.)
BLOCKER	82C	PRL 49 1369	+Levi, Abrams, Amidei+	(Mark II Collab.)
BLOCKER	82D	PL 109B 119	+Dorfan, Abrams, Alam+	(Mark II Collab.) J
HAYES	82	PR D25 2869	+Perl, Alam, Boyarski+	(Mark II Collab.)
BERGER	81B	PL 99B 489	+Genzel, Grigull, Lackas+	(PLUTO Collab.)
DORFAN	81	PRL 46 215	+Blocker, Abrams, Alam+	(Mark II Collab.)
BLOCKER	80	Thesis LBL-10801		(LBL)
BRANDELIK	80	PL 92B 199	+Braunschweig, Gather+	(TASSO Collab.)
ZHOLENTZ	80	PL 96B 214	+Kurdadze, Lelchuk, Mishnev+	(NOVO)
Also	81	SJNP 34 814	Zholentz, Kurdadze, Lelchuk+	(NOVO)
		Translated from YAF 34 1471.		
BACINO	79B	PRL 42 749	+Ferguson, Nodulman, Slater+	(DELCO Collab.)
KIRKBY	79	SLAC-PUB-2419		(SLAC) J
Batavia Lepton Photon Conference.				
BACINO	78B	PRL 41 13	+Ferguson, Nodulman, Slater+	(DELCO Collab.) J
Also	78	Tokyo Conf. 249	Kirz	(STON)
Also	80	PL 96B 214	Zholentz, Kurdadze, Lelchuk, Mishnev+	(NOVO)
BARTEL	78	PL 77B 331	+Dittmann, Duinker, Olsson, Oneill+	(DESY, HEIDP)
BRANDELIK	78	PL 73B 109	+Braunschweig, Martyn, Sander+	(DASP Collab.) J
FELDMAN	78	Tokyo Conf. 777		(SLAC) J
HEILE	78	NP B138 189	+Perl, Abrams, Alam, Boyarski+	(SLAC, LBL)
JAROS	78	PRL 40 1120	+Abrams, Alam+	(SLAC, LBL, NWES, HAWA)
PERL	75	PRL 35 1489	+Abrams, Boyarski, Breidenbach+	(LBL, SLAC)

OTHER RELATED PAPERS

WEINSTEIN	93	ARNPS 43 457	+Stroynowski	(CIT, SMU)
PERL	92	RPP 55 653		(SLAC)
PICH	90	MPL A5 1995		(VALE)
BARISH	88	PRPL 157 1	+Stroynowski	(CIT)
GAN	88	IJMP A3 531	+Perl	(SLAC)
HAYES	88	PR D38 3351	+Perl	(SLAC)
PERL	80	ARNPS 30 299		(SLAC)

Number of Light Neutrino Types

The neutrinos referred to in this section are those of the Standard SU(2)×U(1) Electroweak Model possibly extended to allow nonzero neutrino masses. Light neutrinos are those with $m_\nu \ll m_{Z^0}$. The limits are on the number of neutrino families or species, including ν_e, ν_μ, ν_τ

NOTE ON THE NUMBER OF LIGHT NEUTRINO TYPES FROM COLLIDER EXPERIMENTS

(by Dean Karlen, Carleton University)

The most precise measurements of the number of light neutrino types, N_ν, come from studies of Z production in e^+e^- collisions. At the time of this report, the most recent combined analysis of the four LEP experiments [1] included nearly 8 million visible Z decays. The invisible partial width, $\Gamma_{\rm inv}$, is determined from these data by subtracting the measured visible partial widths, corresponding to Z decays into quarks and charged leptons, from the total Z width. The invisible width is assumed to be due to N_ν light neutrino species each contributing the neutrino partial width Γ_ν as given by the