Massive Neutrinos – THIS IS PART 3 OF 3

To reduce the size of this section's PostScript file, we have divided it into three PostScript files. We present the following index:

PART 1

PART 2

PART 3

(F) Astrophysical neutrino observations

Neutrinos and antineutrinos produced in the atmosphere induce μ-like and e-like events in underground detectors. The ratio of the numbers of the two kinds of events is defined as μ/e. It has the advantage that that systematic effects, such as flux uncertainty, tend to cancel, for both experimental and theoretical values of the ratio. The "ratio of the ratios" of experimental to theoretical μ/e, $R(\mu/e)$, or that of experimental to theoretical μ/total, $R(\mu/\text{total})$ with total $= \mu+e$, is reported below. If the actual value is not unity, the value obtained in a given experiment may depend on the experimental conditions.

R(μ/e) = (Measured Ratio μ/e) / (Expected Ratio μ/e)

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.72\pm0.19^{+0.05}_{-0.07}$	[108] ALLISON	97	SOU2	Calorimeter
	[109] FUKUDA	96B	KAMI	Water Cerenkov
$1.00\pm0.15\pm0.08$	[110] DAUM	95	FREJ	Calorimeter
$0.60^{+0.06}_{-0.05}\pm0.05$	[111] FUKUDA	94	KAMI	sub-GeV
$0.57^{+0.08}_{-0.07}\pm0.07$	[112] FUKUDA	94	KAMI	multi-Gev
	[113] BECKER-SZ...	92B	IMB	Water Cerenkov

[108] ALLISON 97 result is based on an exposure of 1.52 kton yr. ALLISON 97 also studied the background due to interaction of neutrons or photons produced by muon interactions in the rock surrounding the detector. This background is shown not to produce the low values of R(μ/e).

[109] FUKUDA 96B studied neutron background in the atmospheric neutrino sample observed in the Kamiokande detector. No evidence for the background contamination was found.

[110] DAUM 95 results are based on an exposure of 2.0 kton yr which includes the data used by BERGER 90B. This ratio is for the contained and semicontained events. DAUM 95 also report $R(\mu/e) = 0.99 \pm 0.13 \pm 0.08$ for the total neutrino induced data sample which includes upward going stopping muons and horizontal muons in addition to the contained and semicontained events.

[111] FUKUDA 94 result is based on an exposure of 7.7 kton yr and updates the HIRATA 92 result. The analyzed data sample consists of fully contained e-like events with $0.1 < p_e < 1.33$ GeV/c and fully-contained μ-like events with $0.2 < p_\mu < 1.5$ GeV/c.

[112] FUKUDA 94 analyzed the data sample consisting of fully contained events with visible energy > 1.33 GeV and partially contained μ-like events.

[113] BECKER-SZENDY 92B reports the fraction of nonshowering events (mostly muons from atomospheric neutrinos) as $0.36 \pm 0.02 \pm 0.02$, as compared with expected fraction $0.51 \pm 0.01 \pm 0.05$. After cutting the energy range to the Kamiokande limits, BEIER 92 finds $R(\mu/e)$ very close to the Kamiokande value.

R(ν_μ) = (Measured Flux of ν_μ) / (Expected Flux of ν_μ)

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.73\pm0.09\pm0.06$	[114] AHLEN	95	MCRO	Streamer tubes
	[115] CASPER	91	IMB	Water Cherenkov
	[116] AGLIETTA	89	NUSX	
0.95 ± 0.22	[117] BOLIEV	81		Baksan
0.62 ± 0.17	CROUCH	78		Case Western/UCI

[114] AHLEN 95 result is for all nadir angles. The lower cutoff on the muon energy is 1 GeV. The errors are statistical / systematic. The Monte Carlo flux error is ±0.12.

[115] CASPER 91 correlates showering/nonshowering signature of single-ring events with parent atmospheric-neutrino flavor. They find nonshowering ($\approx \nu_\mu$ induced) fraction is $0.41 \pm 0.03 \pm 0.02$, as compared with expected 0.51 ± 0.05 (syst).

[116] AGLIETTA 89 finds no evidence for any anomaly in the neutrino flux. They define ρ = (measured number of ν_e's)/(measured number of ν_μ's). They report ρ(measured)=ρ(expected) $= 0.96^{+0.32}_{-0.28}$.

[117] From this data BOLIEV 81 obtain the limit $\Delta(m^2) \leq 6 \times 10^{-3}$ eV^2 for maximal mixing, $\nu_\mu \not\to \nu_\mu$ type oscillation.

R(μ/total) = (Measured Ratio μ/total) / (Expected Ratio μ/total)

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$1.1^{+0.07}_{-0.12}\pm0.11$	[118] CLARK	97	IMB	multi-GeV

[118] CLARK 97 obtained this result by an analysis of fully contained and partially contained events in the IMB water-Cerenkov detector with visible energy > 0.95 GeV.

$\sin^2(2\theta)$ for given $\Delta(m^2)$ ($\nu_e \leftrightarrow \nu_\mu$)

For a review see BAHCALL 89.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.5		[119] CLARK	97	IMB	$\Delta(m^2) >$ 0.1 eV^2
>0.55	90	[120] FUKUDA	94	KAMI	$\Delta(m^2)$ = 0.007–0.08 ev^2
<0.47	90	[121] BERGER	90B	FREJ	$\Delta(m^2) >$ 1 eV^2
<0.14	90	LOSECCO	87	IMB	$\Delta(m^2)$= 0.00011 eV^2

[119] CLARK 97 obtained this result by an analysis of fully contained and partially contained events in the IMB water-Cerenkov detector with visible energy > 0.95 GeV.

[120] FUKUDA 94 obtained this result by a combined analysis of sub- and multi-GeV atmospheric neutrino events in Kamiokande.

[121] BERGER 90B uses the Frejus detector to search for oscillations of atmospheric neutrinos. Bounds are for both neutrino and antinuetrino oscillations.

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$ ($\nu_e \leftrightarrow \nu_\mu$)

VALUE (10^{-5} eV^2)	CL%	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<980		[122] CLARK	97	IMB
$700 < \Delta(m^2) < 7000$	90	[123] FUKUDA	94	KAMI
<150	90	[124] BERGER	90B	FREJ

[122] CLARK 97 obtained this result by an analysis of fully contained and partially contained events in the IMB water-Cerenkov detector with visible energy > 0.95 GeV.

[123] FUKUDA 94 obtained this result by a combined analysis of sub- and multi-GeV atmospheric neutrino events in Kamiokande.

[124] BERGER 90B uses the Frejus detector to search for oscillations of atmospheric neutrinos. Bounds are for both neutrino and antinuetrino oscillations.

$\sin^2(2\theta)$ for given $\Delta(m^2)$ ($\overline{\nu}_e \leftrightarrow \overline{\nu}_\mu$)

VALUE (10^{-5} eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.9	99	[125] SMIRNOV	94	THEO	$\Delta(m^2) > 3 \times 10^{-4}$ eV^2
<0.7	99	[125] SMIRNOV	94	THEO	$\Delta(m^2) < 10^{-11}$ eV^2

[125] SMIRNOV 94 analyzed the data from SN 1987A using stellar-collapse models. They also give less stringent upper limits on $\sin^2 2\theta$ for $10^{-11} < \Delta(m^2) < 3 \times 10^{-7}$ eV^2 and $10^{-5} < \Delta(m^2) < 3 \times 10^{-4}$ eV^2. The same results apply to $\overline{\nu}_e \leftrightarrow \overline{\nu}_\tau$, ν_μ, and ν_τ.

$\sin^2(2\theta)$ for given $\Delta(m^2)$ ($\nu_\mu \leftrightarrow \nu_\tau$)

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.7		[126] CLARK	97	IMB	$\Delta(m^2) >$ 0.1 eV^2
>0.65	90	[127] FUKUDA	94	KAMI	$\Delta(m^2)$ = 0.005–0.03 ev^2
>0.5	90	[128] BECKER-SZ...	92	IMB	$\Delta(m^2)$= 1–2 $\times 10^{-4}$ eV^2
<0.6	90	[129] BERGER	90B	FREJ	$\Delta(m^2) >$ 1 eV^2

[126] CLARK 97 obtained this result by an analysis of fully contained and partially contained events in the IMB water-Cerenkov detector with visible energy > 0.95 GeV.
[127] FUKUDA 94 obtained this result by a combined analysis of sub-and multi-GeV atmospheric neutrino events in Kamiokande.
[128] BECKER-SZENDY 92 uses upward-going muons to search for atomospheric ν_μ oscillations. The fraction of muons which stop in the detector is used to search for deviations in the expected spectrum. No evidence for oscillations is found.
[129] BERGER 90B uses the Frejus detector to search for oscillations of atmospheric neutrinos. Bounds are for both neutrino and antinuetrino oscillations.

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$ ($\nu_\mu \leftrightarrow \nu_\tau$)

VALUE (10^{-5} eV^2)	*CL%*	*DOCUMENT ID*		*TECN*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<1500		[130] CLARK	97	IMB
$500 < \Delta(m^2) < 2500$	90	[131] FUKUDA	94	KAMI
< 350	90	[132] BERGER	90B	FREJ

[130] CLARK 97 obtained this result by an analysis of fully contained and partially contained events in the IMB water-Cerenkov detector with visible energy > 0.95 GeV.
[131] FUKUDA 94 obtained this result by a combined analysis of sub-and multi-GeV atmospheric neutrino events in Kamiokande.
[132] BERGER 90B uses the Frejus detector to search for oscillations of atmospheric neutrinos. Bounds are for both neutrino and antinuetrino oscillations.

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$ ($\nu_\mu \rightarrow \nu_s$)

ν_s means ν_τ or any sterile (noninteracting) ν.

VALUE (10^{-5} eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3000 (or <550)	90	[133] OYAMA	89	KAMI	Water Cerenkov
< 4.2 or > 54.	90	BIONTA	88	IMB	Flux has ν_μ, $\overline{\nu}_\mu$, ν_e, and $\overline{\nu}_e$

[133] OYAMA 89 gives a range of limits, depending on assumptions in their analysis. They argue that the region $\Delta(m^2)$ = (100–1000) $\times 10^{-5}$ eV^2 is not ruled out by any data for large mixing.

(G) Reactor $\overline{\nu}_e$ disappearance experiments

In most cases, the reaction $\overline{\nu}_e p \to e^+ n$ is observed at different distances from one or more reactors in a complex.

Events (Observed/Expected) from Reactor $\overline{\nu}_e$ Experiments

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.98 ±0.04 ±0.04	[134] APOLLONIO	98	CHOZ	Chooz reactors 1.1 km
0.987±0.006±0.037	[135] GREENWOOD	96		Savannah River, 18.2 m
1.055±0.010±0.037	[135] GREENWOOD	96		Savannah River, 23.8 m
0.988±0.004±0.05	ACHKAR	95	CNTR	Bugey reactor, 15 m
0.994±0.010±0.05	ACHKAR	95	CNTR	Bugey reactor, 40 m
0.915±0.132±0.05	ACHKAR	95	CNTR	Bugey reactor, 95 m
0.987±0.014±0.027	[136] DECLAIS	94	CNTR	Bugey reactor, 15 m
0.985±0.018±0.034	KUVSHINN...	91	CNTR	Rovno reactor
1.05 ±0.02 ±0.05	VUILLEUMIER	82		Gösgen reactor
0.955±0.035±0.110	[137] KWON	81		$\overline{\nu}_e p \to e^+ n$
0.89 ±0.15	[137] BOEHM	80		$\overline{\nu}_e p \to e^+ n$
0.38 ±0.21	[138,139] REINES	80		
0.40 ±0.22	[138,139] REINES	80		

[134] APOLLONIO 98 search for neutrino oscillations at 1.1 km fixed distance from Chooz reactors. They use $\overline{\nu}_e p \to e^+ n$ in Gd-loaded scintillator target.

[135] GREENWOOD 96 search for neutrino oscillations at 18 m and 24 m from the reactor at Savannah River.

[136] DECLAIS 94 result based on integral measurement of neutrons only. Result is ratio of measured cross section to that expected in standard *V-A* theory. Replaced by ACHKAR 95.

[137] KWON 81 represents an analysis of a larger set of data from the same experiment as BOEHM 80.

[138] REINES 80 involves comparison of neutral- and charged-current reactions $\overline{\nu}_e d \to n p \overline{\nu}_e$ and $\overline{\nu}_e d \to n n e^+$ respectively. Combined analysis of reactor $\overline{\nu}_e$ experiments was performed by SILVERMAN 81.

[139] The two REINES 80 values correspond to the calculated $\overline{\nu}_e$ fluxes of AVIGNONE 80 and DAVIS 79 respectively.

$\overline{\nu}_e \not\to \overline{\nu}_e$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<0.0009	90	[140] APOLLONIO	98	CHOZ	Chooz reactors 1.1 km
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.06	90	[141] GREENWOOD	96		Savannah River
<0.01	90	[142] ACHKAR	95	CNTR	Bugey reactor
<0.0075	90	[143] VIDYAKIN	94		Krasnoyark reactors
<0.0083	90	[143] VIDYAKIN	90		Krasnoyark reactors
<0.04	90	[144] AFONIN	88	CNTR	Rovno reactor
<0.014	68	[145] VIDYAKIN	87		$\overline{\nu}_e p \to e^+ n$
<0.019	90	[146] ZACEK	86		Gösgen reactor
<0.02	90	[147] ZACEK	85		Gösgen reactor
<0.016	90	[148] GABATHULER	84		Gösgen reactor

[140] APOLLONIO 98 search for neutrino oscillations at 1.1 km fixed distance from Chooz reactors. They use $\overline{\nu}_e p \rightarrow e^+ n$ in Gd-loaded scintillator target. This is the most sensitive search in terms of $\Delta(m^2)$ for $\overline{\nu}_e$ disappearance.

[141] GREENWOOD 96 search for neutrino oscillations at 18 m and 24 m from the reactor at Savannah River by observing $\overline{\nu}_e p \rightarrow e^+ n$ in a Gd loaded scintillator target. Their region of sensitivity in $\Delta(m^2)$ and $\sin^2 2\theta$ is already excluded by ACHKAR 95.

[142] ACHKAR 95 bound is for L=15, 40, and 95 m.

[143] VIDYAKIN 94 bound is for L=57.0 m, 57.6 m, and 231.4 m. Supersedes VIDYAKIN 90.

[144] AFONIN 86 and AFONIN 87 also give limits on $\sin^2(2\theta)$ for intermediate values of $\Delta(m^2)$. (See also KETOV 92). Supersedes AFONIN 87, AFONIN 86, AFONIN 85, AFONIN 83, and BELENKII 83.

[145] VIDYAKIN 87 bound is for L = 32.8 and 92.3 m distance from two reactors.

[146] This bound is from data for L=37.9 m, 45.9 m, and 64.7 m.

[147] See the comment for ZACEK 85 in the section on $\sin^2(2\theta)$ below.

[148] This bound comes from a combination of the VUILLEUMIER 82 data at distance 37.9 m and new data at 45.9 m.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.02	90	[149] ACHKAR	95	CNTR	For $\Delta(m^2) = 0.6$ eV^2
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.18	90	[150] APOLLONIO	98	CHOZ	Chooz reactors 1.1 km
<0.24	90	[151] GREENWOOD	96		
<0.04	90	[151] GREENWOOD	96		For $\Delta(m^2) = 1.0$ eV^2
<0.087	68	[152] VYRODOV	95	CNTR	For $\Delta(m^2)$ >2 eV^2
<0.15	90	[153] VIDYAKIN	94		For $\Delta(m^2) > 5.0\times10^{-2}$ eV^2
<0.2	90	[154] AFONIN	88	CNTR	$\overline{\nu}_e p \rightarrow e^+ n$
<0.14	68	[155] VIDYAKIN	87		$\overline{\nu}_e p \rightarrow e^+ n$
<0.21	90	[156] ZACEK	86		$\overline{\nu}_e p \rightarrow e^+ n$
<0.19	90	[157] ZACEK	85		Gösgen reactor
<0.16	90	[158] GABATHULER	84		$\overline{\nu}_e p \rightarrow e^+ n$

[149] ACHKAR 95 bound is from data for L=15, 40, and 95 m distance from the Bugey reactor.

[150] APOLLONIO 98 search for neutrino oscillations at 1.1 km fixed distance from Chooz reactors. They

[151] GREENWOOD 96 search for neutrino oscillations at 18 m and 24 m from the reactor at Savannah River by observing $\overline{\nu}_e p \rightarrow e^+ n$ in a Gd loaded scintillator target. Their region of sensitivity in $\Delta(m^2)$ and $\sin^2 2\theta$ is already excluded by ACHKAR 95.

[152] The VYRODOV 95 bound is from data for L=15 m distance from the Bugey-5 reactor.

[153] The VIDYAKIN 94 bound is from data for L=57.0 m, 57.6 m, and 231.4 m from three reactors in the Krasnoyark Reactor complex.

[154] Several different methods of data analysis are used in AFONIN 88. We quote the most stringent limits. Different upper limits on $\sin^2 2\theta$ apply at intermediate values of $\Delta(m^2)$. Supersedes AFONIN 87, AFONIN 85, and BELENKII 83.

[155] VIDYAKIN 87 bound is for L = 32.8 and 92.3 m distance from two reactors.

[156] This bound is from data for L=37.9 m, 45.9 m, and 64.7 m distance from Gosgen reactor.

[157] ZACEK 85 gives two sets of bounds depending on what assumptions are used in the data analysis. The bounds in figure 3(a) of ZACEK 85 are progressively poorer for large $\Delta(m^2)$ whereas those of figure 3(b) approach a constant. We list the latter. Both sets of bounds use combination of data from 37.9, 45.9, and 64.7m distance from reactor. ZACEK 85 states "Our experiment excludes this area (the oscillation parameter region

allowed by the Bugey data, CAVAIGNAC 84) almost completely, thus disproving the indications of neutrino oscillations of CAVAIGNAC 84 with a high degree of confidence."

[158] This bound comes from a combination of the VUILLEUMIER 82 data at distance 37.9m from Gosgen reactor and new data at 45.9m.

(H) Accelerator neutrino appearance experiments

$\nu_e \rightarrow \nu_\tau$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
< 9	90	USHIDA	86C	EMUL	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<44	90	TALEBZADEH	87	HLBC	BEBC

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.25	90	[159] USHIDA	86C	EMUL	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.36	90	TALEBZADEH	87	HLBC	BEBC

[159] USHIDA 86C published result is $\sin^2 2\theta < 0.12$. The quoted result is corrected for a numerical mistake incurred in calculating the expected number of ν_e CC events, normalized to the total number of neutrino interactions (3886) rather than to the total number of ν_μ CC events (1870).

$\overline{\nu}_e \rightarrow \overline{\nu}_\tau$

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.7	90	[160] FRITZE	80	HYBR	BEBC CERN SPS

[160] Authors give $P(\nu_e \rightarrow \nu_\tau) < 0.35$, equivalent to above limit.

$\nu_\mu \rightarrow \nu_e$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.09	90	ANGELINI	86	HLBC	BEBC CERN PS
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<2.3	90	[161] LOVERRE	96		CHARM/CDHS
<0.9	90	VILAIN	94C	CHM2	CERN SPS
<0.1	90	BLUMENFELD	89	CNTR	
<1.3	90	AMMOSOV	88	HLBC	SKAT at Serpukhov
<0.19	90	BERGSMA	88	CHRM	
		[162] LOVERRE	88	RVUE	
<2.4	90	AHRENS	87	CNTR	BNL AGS
<1.8	90	BOFILL	87	CNTR	FNAL

<2.2	90	[163] BRUCKER	86	HLBC	15-ft FNAL
<0.43	90	AHRENS	85	CNTR	BNL AGS E734
<0.20	90	BERGSMA	84	CHRM	
<1.7	90	ARMENISE	81	HLBC	GGM CERN PS
<0.6	90	BAKER	81	HLBC	15-ft FNAL
<1.7	90	ERRIQUEZ	81	HLBC	BEBC CERN PS
<1.2	95	BLIETSCHAU	78	HLBC	GGM CERN PS
<1.2	95	BELLOTTI	76	HLBC	GGM CERN PS

[161] LOVERRE 96 uses the charged-current to neutral-current ratio from the combined CHARM (ALLABY 86) and CDHS (ABRAMOWICZ 86) data from 1986.

[162] LOVERRE 88 reports a less stringent, indirect limit based on theoretical analysis of neutral to charged current ratios.

[163] 15ft bubble chamber at FNAL.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE (units 10^{-3})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
< 3.0	90	[164] LOVERRE	96		CHARM/CDHS
< 2.5	90	AMMOSOV	88	HLBC	SKAT at Serpukhov
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 9.4	90	VILAIN	94C	CHM2	CERN SPS
< 5.6	90	[165] VILAIN	94C	CHM2	CERN SPS
< 16	90	BLUMENFELD	89	CNTR	
< 8	90	BERGSMA	88	CHRM	$\Delta(m^2) \geq 30$ eV^2
		[166] LOVERRE	88	RVUE	
< 10	90	AHRENS	87	CNTR	BNL AGS
< 15	90	BOFILL	87	CNTR	FNAL
< 20	90	[167] ANGELINI	86	HLBC	BEBC CERN PS
20 to 40		[168] BERNARDI	86B	CNTR	$\Delta(m^2)$=5–10
< 11	90	[169] BRUCKER	86	HLBC	15-ft FNAL
< 3.4	90	AHRENS	85	CNTR	BNL AGS E734
<240	90	BERGSMA	84	CHRM	
< 10	90	ARMENISE	81	HLBC	GGM CERN PS
< 6	90	BAKER	81	HLBC	15-ft FNAL
< 10	90	ERRIQUEZ	81	HLBC	BEBC CERN PS
< 4	95	BLIETSCHAU	78	HLBC	GGM CERN PS
< 10	95	BELLOTTI	76	HLBC	GGM CERN PS

[164] LOVERRE 96 uses the charged-current to neutral-current ratio from the combined CHARM (ALLABY 86) and CDHS (ABRAMOWICZ 86) data from 1986.

[165] VILAIN 94C limit derived by combining the ν_μ and $\overline{\nu}_\mu$ data assuming *CP* conservation.

[166] LOVERRE 88 reports a less stringent, indirect limit based on theoretical analysis of neutral to charged current ratios.

[167] ANGELINI 86 limit reaches 13×10^{-3} at $\Delta(m^2) \approx 2$ eV^2.

[168] BERNARDI 86B is a typical fit to the data, assuming mixing between two species. As the authors state, this result is in conflict with earlier upper bounds on this type of neutrino oscillations.

[169] 15ft bubble chamber at FNAL.

$\overline{\nu}_\mu \to \overline{\nu}_e$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<0.14	90	[170] FREEDMAN	93	CNTR	LAMPF
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.05–0.08	90	[171] ATHANASSO...	96	LSND	LAMPF
0.048–0.090	80	[172] ATHANASSO...	95		
<0.07	90	[173] HILL	95		
<0.9	90	VILAIN	94C	CHM2	CERN SPS
<3.1	90	BOFILL	87	CNTR	FNAL
<2.4	90	TAYLOR	83	HLBC	15-ft FNAL
<0.91	90	[174] NEMETHY	81B	CNTR	LAMPF
<1	95	BLIETSCHAU	78	HLBC	GGM CERN PS

[170] FREEDMAN 93 is a search at LAMPF for $\overline{\nu}_e$ generated from any of the three neutrino types ν_μ, $\overline{\nu}_\mu$, and ν_e which come from the beam stop. The $\overline{\nu}_e$'s would be detected by the reaction $\overline{\nu}_e p \to e^+ n$. FREEDMAN 93 replaces DURKIN 88.

[171] ATHANASSOPOULOS 96 is a search for $\overline{\nu}_e$ 30 m from LAMPF beam stop. Neutrinos originate mainly from π^+ decay at rest. $\overline{\nu}_e$ could come from either $\overline{\nu}_\mu \to \overline{\nu}_e$ or $\nu_e \to \overline{\nu}_e$; our entry assumes the first interpretation. They are detected through $\overline{\nu}_e p \to e^+ n$ (20 MeV $< E_{e^+} <$ 60 MeV) in delayed coincidence with $n p \to d \gamma$. Authors observe 51 ± 20 ± 8 total excess events over an estimated background 12.5 ± 2.9. ATHANASSOPOULOS 96B is a shorter version of this paper.

[172] ATHANASSOPOULOS 95 error corresponds to the 1.6σ band in the plot. The expected background is 2.7 ± 0.4 events. Corresponds to an oscillation probability of $(0.34^{+0.20}_{-0.18} \pm 0.07)\%$. For a different interpretation, see HILL 95. Replaced by ATHANASSOPOULOS 96.

[173] HILL 95 is a report by one member of the LSND Collaboration, reporting a different conclusion from the analysis of the data of this experiment (see ATHANASSOPOULOS 95). Contrary to the rest of the LSND Collaboration, Hill finds no evidence for the neutrino oscillation $\overline{\nu}_\mu \to \overline{\nu}_e$ and obtains only upper limits.

[174] In reaction $\overline{\nu}_e p \to e^+ n$.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.004	95	BLIETSCHAU	78	HLBC	GGM CERN PS
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.0062 ± 0.0024 ± 0.0010		[175] ATHANASSO...	96	LSND	LAMPF
0.003–0.012	80	[176] ATHANASSO...	95		
<0.006	90	[177] HILL	95		
<4.8	90	VILAIN	94C	CHM2	CERN SPS
<5.6	90	[178] VILAIN	94C	CHM2	CERN SPS
<0.024	90	[179] FREEDMAN	93	CNTR	LAMPF
<0.04	90	BOFILL	87	CNTR	FNAL
<0.013	90	TAYLOR	83	HLBC	15-ft FNAL
<0.2	90	[180] NEMETHY	81B	CNTR	LAMPF

[175] ATHANASSOPOULOS 96 reports (0.31 ± 0.12 ± 0.05)% for the oscillation probability; the value of $\sin^2 2\theta$ for large $\Delta(m^2)$ should be twice this probability. See footnote in preceeding table for further details, and see the paper for a plot showing allowed regions.

[176] ATHANASSOPOULOS 95 error corresponds to the 1.6σ band in the plot. The expected background is 2.7 $\pm$ 0.4 events. Corresponds to an oscillation probability of $(0.34^{+0.20}_{-0.18} \pm 0.07)\%$. For a different interpretation, see HILL 95. Replaced by ATHANASSOPOULOS 96.

[177] HILL 95 is a report by one member of the LSND Collaboration, reporting a different conclusion from the analysis of the data of this experiment (see ATHANASSOPOULOS 95). Contrary to the rest of the LSND Collaboration, Hill finds no evidence for the neutrino oscillation $\overline{\nu}_\mu \rightarrow \overline{\nu}_e$ and obtains only upper limits.

[178] VILAIN 94C limit derived by combining the ν_μ and $\overline{\nu}_\mu$ data assuming *CP* conservation.

[179] FREEDMAN 93 is a search at LAMPF for $\overline{\nu}_e$ generated from any of the three neutrino types ν_μ, $\overline{\nu}_\mu$, and ν_e which come from the beam stop. The $\overline{\nu}_e$'s would be detected by the reaction $\overline{\nu}_e p \rightarrow e^+ n$. FREEDMAN 93 replaces DURKIN 88.

[180] In reaction $\overline{\nu}_e p \rightarrow e^+ n$.

$\nu_\mu(\overline{\nu}_\mu) \rightarrow \nu_e(\overline{\nu}_e)$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.075	90	BORODOV...	92	CNTR	BNL E776
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.6	90	[181] ROMOSAN	97	CCFR	FNAL

[181] ROMOSAN 97 uses wideband beam with a 0.5 km decay region.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE (units 10^{-3})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<1.8	90	[182] ROMOSAN	97	CCFR	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<3.8	90	[183] MCFARLAND	95	CCFR	FNAL
<3	90	BORODOV...	92	CNTR	BNL E776

[182] ROMOSAN 97 uses wideband beam with a 0.5 km decay region.

[183] MCFARLAND 95 state that "This result is the most stringent to date for 250< $\Delta(m^2)$ <450 ev^2 and also excludes at 90%CL much of the high $\Delta(m^2)$ region favored by the recent LSND observation." See ATHANASSOPOULOS 95 and ATHANASSOPOULOS 96.

$\nu_\mu \rightarrow \nu_\tau$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
< 0.9	90	USHIDA	86C	EMUL	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 3.3	90	[184] LOVERRE	96		CHARM/CDHS
< 1.4	90	MCFARLAND	95	CCFR	FNAL
< 4.5	90	BATUSOV	90B	EMUL	FNAL
<10.2	90	BOFILL	87	CNTR	FNAL
< 6.3	90	BRUCKER	86	HLBC	15-ft FNAL
< 4.6	90	ARMENISE	81	HLBC	GGM CERN SPS
< 3	90	BAKER	81	HLBC	15-ft FNAL
< 6	90	ERRIQUEZ	81	HLBC	BEBC CERN SPS
< 3	90	USHIDA	81	EMUL	FNAL

[184] LOVERRE 96 uses the charged-current to neutral-current ratio from the combined CHARM (ALLABY 86) and CDHS (ABRAMOWICZ 86) data from 1986.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.004	90	USHIDA	86C	EMUL	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.006	90	[185] LOVERRE	96		CHARM/CDHS
<0.0081	90	MCFARLAND	95	CCFR	FNAL
<0.06	90	BATUSOV	90B	EMUL	FNAL
<0.34	90	BOFILL	87	CNTR	FNAL
<0.088	90	BRUCKER	86	HLBC	15-ft FNAL
<0.11	90	BALLAGH	84	HLBC	15-ft FNAL
<0.017	90	ARMENISE	81	HLBC	GGM CERN SPS
<0.06	90	BAKER	81	HLBC	15-ft FNAL
<0.05	90	ERRIQUEZ	81	HLBC	BEBC CERN SPS
<0.013	90	USHIDA	81	EMUL	FNAL

[185] LOVERRE 96 uses the charged-current to neutral-current ratio from the combined CHARM (ALLABY 86) and CDHS (ABRAMOWICZ 86) data from 1986.

$\overline{\nu}_\mu \rightarrow \overline{\nu}_\tau$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<2.2	90	ASRATYAN	81	HLBC	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.4	90	MCFARLAND	95	CCFR	FNAL
<6.5	90	BOFILL	87	CNTR	FNAL
<7.4	90	TAYLOR	83	HLBC	15-ft FNAL

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<4.4 $\times 10^{-2}$	90	ASRATYAN	81	HLBC	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.0081	90	MCFARLAND	95	CCFR	FNAL
<0.15	90	BOFILL	87	CNTR	FNAL
<8.8 $\times 10^{-2}$	90	TAYLOR	83	HLBC	15-ft FNAL

$\nu_\mu(\overline{\nu}_\mu) \rightarrow \nu_\tau(\overline{\nu}_\tau)$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<1.5	90	[186] GRUWE	93	CHM2	CERN SPS

[186] GRUWE 93 is a search using the CHARM II detector in the CERN SPS wide-band neutrino beam for $\nu_\mu \rightarrow \nu_\tau$ and $\overline{\nu}_\mu \rightarrow \overline{\nu}_\tau$ oscillations signalled by quasi-elastic ν_τ and $\overline{\nu}_\tau$ interactions followed by the decay $\tau \rightarrow \nu_\tau \pi$. The maximum sensitivity in $\sin^2 2\theta$ ($< 6.4 \times 10^{-3}$ at the 90% CL) is reached for $\Delta(m^2) \simeq 50$ eV^2.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<8	90	[187] GRUWE	93	CHM2	CERN SPS

[187] GRUWE 93 is a search using the CHARM II detector in the CERN SPS wide-band neutrino beam for $\nu_\mu \rightarrow \nu_\tau$ and $\overline{\nu}_\mu \rightarrow \overline{\nu}_\tau$ oscillations signalled by quasi-elastic ν_τ and $\overline{\nu}_\tau$ interactions followed by the decay $\tau \rightarrow \nu_\tau \pi$. The maximum sensitivity in $\sin^2 2\theta$ ($< 6.4 \times 10^{-3}$ at the 90% CL) is reached for $\Delta(m^2) \simeq 50$ eV^2.

$\nu_e \rightarrow (\overline{\nu}_e)_L$

This is a limit on lepton family-number violation and total lepton-number violation. $(\overline{\nu}_e)_L$ denotes a hypothetical left-handed $\overline{\nu}_e$. The bound is quoted in terms of Δ (m^2), $\sin(2\theta)$, and α, where α denotes the fractional admixture of $(V+A)$ charged current.

$\alpha\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<0.14	90	[188] FREEDMAN	93	CNTR	LAMPF
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<7	90	[189] COOPER	82	HLBC	BEBC CERN SPS

[188] FREEDMAN 93 is a search at LAMPF for $\overline{\nu}_e$ generated from any of the three neutrino types ν_μ, $\overline{\nu}_\mu$, and ν_e which come from the beam stop. The $\overline{\nu}_e$'s would be detected by the reaction $\overline{\nu}_e p \rightarrow e^+ n$.

[189] COOPER 82 states that existing bounds on V+A currents require α to be small.

$\alpha^2\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.032	90	[190] FREEDMAN	93	CNTR	LAMPF
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.05	90	[191] COOPER	82	HLBC	BEBC CERN SPS

[190] FREEDMAN 93 is a search at LAMPF for $\overline{\nu}_e$ generated from any of the three neutrino types ν_μ, $\overline{\nu}_\mu$, and ν_e which come from the beam stop. The $\overline{\nu}_e$'s would be detected by the reaction $\overline{\nu}_e p \rightarrow e^+ n$.

[191] COOPER 82 states that existing bounds on V+A currents require α to be small.

$\nu_\mu \rightarrow (\overline{\nu}_e)_L$

See note above for $\nu_e \rightarrow (\overline{\nu}_e)_L$ limit

$\alpha\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<0.16	90	[192] FREEDMAN	93	CNTR	LAMPF
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.7	90	[193] COOPER	82	HLBC	BEBC CERN SPS

[192] FREEDMAN 93 is a search at LAMPF for $\overline{\nu}_e$ generated from any of the three neutrino types ν_μ, $\overline{\nu}_\mu$, and ν_e which come from the beam stop. The $\overline{\nu}_e$'s would be detected by the reaction $\overline{\nu}_e p \rightarrow e^+ n$. The limit on $\Delta(m^2)$ is better than the CERN BEBC experiment, but the limit on $\sin^2\theta$ is almost a factor of 100 less sensitive.

[193] COOPER 82 states that existing bounds on V+A currents require α to be small.

$\alpha^2 \sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.001	90	[194] COOPER	82	HLBC	BEBC CERN SPS
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.07	90	[195] FREEDMAN	93	CNTR	LAMPF

[194] COOPER 82 states that existing bounds on V+A currents require α to be small.
[195] FREEDMAN 93 is a search at LAMPF for $\overline{\nu}_e$ generated from any of the three neutrino types ν_μ, $\overline{\nu}_\mu$, and ν_e which come from the beam stop. The $\overline{\nu}_e$'s would be detected by the reaction $\overline{\nu}_e p \rightarrow e^+ n$. The limit on $\Delta(m^2)$ is better than the CERN BEBC experiment, but the limit on $\sin^2\theta$

(I) Disappearance experiments with accelerator & radioactive source neutrinos

—— $\nu_e \not\rightarrow \nu_e$ ——

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
< 0.17	90	[196] BAHCALL	95	THEO	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<40	90	[197] BORISOV	96	CNTR	IHEP-JINR detector
<14.9	90	BRUCKER	86	HLBC	15-ft FNAL
< 8	90	BAKER	81	HLBC	15-ft FNAL
<56	90	DEDEN	81	HLBC	BEBC CERN SPS
<10	90	ERRIQUEZ	81	HLBC	BEBC CERN SPS
<2.3 OR >8	90	NEMETHY	81B	CNTR	LAMPF

[196] BAHCALL 95 analyzed the GALLEX ^{51}Cr calibration source experiment (ANSELMANN 95). They also gave a 95% CL limit of < 0.19 eV^2.
[197] BORISOV 96 exclusion curve extrapolated to obtain this value; however, it does not have the right curvature in this region.

$\sin^2(2\theta)$ for "Large" $\Delta(m^2)$

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<7 $\times 10^{-2}$	90	[198] ERRIQUEZ	81	HLBC	BEBC CERN SPS
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.115	90	[199] BORISOV	96	CNTR	$\Delta(m^2) = 175$ eV^2
<0.38	90	[200] BAHCALL	95	THEO	^{51}Cr source
<0.54	90	BRUCKER	86	HLBC	15-ft FNAL
<0.6	90	BAKER	81	HLBC	15-ft FNAL
<0.3	90	[198] DEDEN	81	HLBC	BEBC CERN SPS

[198] Obtained from a Gaussian centered in the unphysical region.
[199] BORISOV 96 sets less stringent limits at large $\Delta(m^2)$, but exclusion curve does not have clear asymptotic behavior.
[200] BAHCALL 95 analyzed the GALLEX ^{51}Cr calibration source experiment (ANSELMANN 95). They also gave a 95% CL limit of < 0.45.

$\nu_\mu \not\to \nu_\mu$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

These experiments also allow sufficiently large $\Delta(m^2)$.

VALUE (eV^2)	CL%	DOCUMENT ID		TECN	COMMENT
<0.23 OR >1500 OUR LIMIT					
<0.23 OR >100	90	DYDAK	84	CNTR	
<13 OR >1500	90	STOCKDALE	84	CNTR	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 0.29 OR >22	90	BERGSMA	88	CHRM	
<7	90	BELIKOV	85	CNTR	Serpukhov
<8.0 OR >1250	90	STOCKDALE	85	CNTR	
<0.29 OR >22	90	BERGSMA	84	CHRM	
<8.0	90	BELIKOV	83	CNTR	

$\sin^2(2\theta)$ for $\Delta(m^2) = 100 eV^2$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.02	90	[201] STOCKDALE	85	CNTR	FNAL
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.17	90	[202] BERGSMA	88	CHRM	
<0.07	90	[203] BELIKOV	85	CNTR	Serpukhov
<0.27	90	[202] BERGSMA	84	CHRM	CERN PS
<0.1	90	[204] DYDAK	84	CNTR	CERN PS
<0.02	90	[205] STOCKDALE	84	CNTR	FNAL
<0.1	90	[206] BELIKOV	83	CNTR	Serpukhov

[201] This bound applies for $\Delta(m^2) = 100$ eV^2. Less stringent bounds apply for other $\Delta(m^2)$; these are nontrivial for $8 < \Delta(m^2) < 1250$ eV^2.

[202] This bound applies for $\Delta(m^2) = 0.7$–$9.$ eV^2. Less stringent bounds apply for other $\Delta(m^2)$; these are nontrivial for $0.28 < \Delta(m^2) < 22$ eV^2.

[203] This bound applies for a wide range of $\Delta(m^2) > 7$ eV^2. For some values of $\Delta(m^2)$, the value is less stringent; the least restrictive, nontrivial bound occurs approximately at $\Delta(m^2) = 300$ eV^2 where $\sin^2(2\theta) < 0.13$ at CL = 90%.

[204] This bound applies for $\Delta(m^2) = 1.$–$10.$ eV^2. Less stringent bounds apply for other $\Delta(m^2)$; these are nontrivial for $0.23 < \Delta(m^2) < 90$ eV^2.

[205] This bound applies for $\Delta(m^2) = 110$ eV^2. Less stringent bounds apply for other $\Delta(m^2)$; these are nontrivial for $13 < \Delta(m^2) < 1500$ eV^2.

[206] Bound holds for $\Delta(m^2) = 20$–1000 eV^2.

$\overline{\nu}_\mu \not\to \overline{\nu}_\mu$

$\Delta(m^2)$ for $\sin^2(2\theta) = 1$

VALUE (eV^2)	CL%	DOCUMENT ID		TECN
<7 OR >1200 OUR LIMIT				
<7 OR >1200	90	STOCKDALE	85	CNTR

$\sin^2(2\theta)$ for 190 $eV^2 < \Delta(m^2) < 320$ eV^2

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.02	90	[207] STOCKDALE	85	CNTR	FNAL

[207] This bound applies for $\Delta(m^2)$ between 190 and 320 or $= 530$ eV^2. Less stringent bounds apply for other $\Delta(m^2)$; these are nontrivial for $7 < \Delta(m^2) < 1200$ eV^2.

REFERENCES FOR Searches for Massive Neutrinos and Lepton Mixing

ACKERSTAFF	98C	EPJ C1 45	K. Ackerstaff+	(OPAL Collab.)
APOLLONIO	98	PL B420 397	M. Apollonio+	(CHOOZ Collab.)
ABREU	97I	ZPHY C74 57	+Adam, Adye, Ajinenko, Alekseev+	(DELPHI Collab.)
Also	97L	ZPHY C75 580 erratum	Abreu, Adam, Adye, Ajinenko+	(DELPHI Collab.)
ACCIARRI	97P	PL B412 189	+Adriani, Aguilar-Benitez, Ahlen+	(L3 Collab.)
ALLISON	97	PL B391 491	+Alner, Ayres, Barrett+	(Soudan 2 Collab.)
ALSTON-...	97	PR C55 474	Alston-Garnjost, Dougherty+	(LBL, MTHO, UNM, INEL)
BARABASH	97	ZPHY A357 351	+Gurriaran, Hubert, Hubert, Umatov	(ITEP, BCEN)
BAUDIS	97	PL B407 219	L. Baudis+	(MPIH, KIAE, SASSO)
CLARK	97	PRL 79 345	+Becker-Szendy, Bratton, Brealt+	(IMB Collab.)
DESILVA	97	PR C56 2451	De Silva, Moe, Nelson, Vient	(UCI)
GUENTHER	97	PR D55 54	+Hellmig+	(MPIH, KIAE, SASSO)
ROMOSAN	97	PRL 78 2912	+Arroyo, de Barbaro, de Barbaro+	(CCFR Collab.)
ACCIARRI	96G	PL B377 304	+Adam, Adriani, Aguilar-Benitez+	(L3 Collab.)
ALESSAND...	96B	NPBPS 48 238	Alessandrello, Brofferio, Bucci+	(MILA, SASSO)
ALEXANDER	96P	PL B385 433	+Allison, Altekamp, Ametewee+	(OPAL Collab.)
ARNOLD	96	ZPHY C72 239	R. Arnold+	(BCEN, CAEN, JINR+)
ATHANASSO...	96	PR C54 2685	Athanassopoulos, Auerbach, Burman+	(LSND Collab.)
ATHANASSO...	96B	PRL 77 3082	Athanassopoulos, Auerbach, Burman+	(LSND Collab.)
BALYSH	96	PRL 77 5186	+De Silva, Lebedev, Lou, Moe+	(KIAE, UCI, CIT)
BORISOV	96	PL B369 39	+Chernichenko, Chukin, Goryachev+	(SERP, JINR)
BRYMAN	96	PR D53 558	+Numao	(TRIU)
BUSKULIC	96S	PL B384 439	+De Bonis, Decamp, Ghez+	(ALEPH Collab.)
EJIRI	96	NP A611 85	H. Ejiri+	(OSAK)
FUKUDA	96	PRL 77 1683	+Hayakawa, Inoue, Ishihara+	(Kamiokande Collab.)
FUKUDA	96B	PL B388 397	+Hayakawa, Inoue, Ishihara+	(Kamiokande Collab.)
GREENWOOD	96	PR D53 6054	+Kropp, Mandelkern, Nakamura+	(UCI, SVR, SCUC)
HAMPEL	96	PL B388 384	+Heusser, Kiko, Kirsten+	(GALLEX Collab.)
LOVERRE	96	PL B370 156	P.F. Loverre	
TAKAOKA	96	PR C53 1557	+Motomura, Nagao	(KYUSH, OKAY)
WIETFELDT	96	PRPL 273 149	+Norman	(LBL)
ACHKAR	95	NP B434 503	+Aleksan+	(SING, SACLD, CPPM, CDEF, LAPP)
AHLEN	95	PL B357 481	+Ambrosio, Antolini, Auriemma+	(MACRO Collab.)
ANSELMANN	95	PL B342 440	+Fockenbrock, Hampel, Heusser+	(GALLEX Collab.)
ANSELMANN	95B	PL B357 237	+Hampel, Heusser, Kike+	(GALLEX Collab.)
ARMBRUSTER	95	PL B348 19	+Blair, Bodmann, Booth+	(KARMEN Collab.)
ARNOLD	95	JETPL 61 170	+Caurier, Guyonnet, Linck+	(NEMO Collab.)
		Translated from ZETFP 61 168.		
ATHANASSO...	95	PRL 75 2650	Athanassopoulos, Auerbach+	(LSND Collab.)
BAHCALL	95	PL B348 121	+Krastev, Lisi	(IAS)
BAHRAN	95	PL B354 481	+Kalbfleisch	(OKLA)
BALYSH	95	PL B356 450	+Beck, Belyaev+	(MPIH, KIAE, SASSO)
BARABASH	95	PL B345 408	+Avignone+	(ITEP, SCUC, PNL, MINN, LEBD)
BILGER	95	PL B363 41	+Clement, Denig, Fohl+	(TUBIN, KARLE, PSI)
BURACHAS	95	PAN 58 153	+Danevich, Zdesenko, Kobychev+	(KIEV)
		Translated from YAF 58 195.		
DANEVICH	95	PL B344 72	+Georgadze, Kobychev, Kropivyansky+	(KIEV)
DASSIE	95	PR D51 2090	+Eschbach, Hubert, Isaac, Isac+	(NEMO Collab.)
DAUM	95	ZPHY C66 417	+Rhode, Bareyre, Barloutaud+	(FREJUS Collab.)
DAUM	95B	PL B361 179	+Frosch, Hajdas, Janousch+	(PSI, VIRG)
EJIRI	95	JPSJ 64 339	+Fushmii, Hazama, Kawasaki+	(OSAK, KIEV)
FARGION	95	PR D52 1828	+Khlopov, Konplich, Mignani	(ROMA, KIAM, MPEI)
GALLAS	95	PR D52 6	+Abolins, Brock, Cobau+	(MSU, FNAL, MIT, FLOR)
GARCIA	95	PR D51 1458	+Morales, Morales, Sarsa+	(ZARA, SCUC, PNL)
GEORGADZE	95	PAN 58 1093		
		Translated from YAF 58 1170.		
HAGNER	95	PR D52 1343	+Altmann, Feilitzsch, Oberauer+	(MUNT, LAPP, CPPM)
HIDDEMANN	95	JP G21 639	+Daniel, Schwentker	(MUNT)
HILL	95	PRL 75 2654		(PENN)
KOBAYASHI	95	NP A586 457	+Kobayashi	(KEK, SAGA)
MCFARLAND	95	PRL 75 3993	+Naples, Arroyo, Auchinchloss+	(CCFR Collab.)
VILAIN	95C	PL B351 387	+Wilquet, Petrak+	(CHARM II Collab.)
Also	95	PL B343 453	Vilain, Wilquet+	(CHARM II Collab.)
VYRODOV	95	JETPL 61 163	+Kozlov, Martem'yanov, Machulin+	(KIAE, LAPP, CDEF)
		Translated from ZETFP 61 161.		

WIETFELDT	95	PR C52 1028	+Norman+	(LBL, UCB, SPAUL, IND, TENN)
ABDURASHI...	94	PL B328 234	Abdurashitov, Faizov, Gavrin, Gusev+	(SAGE Collab.)
ALESSAND...	94	PL B335 519	Alessandrello, Brofferio, ..., Fiorini+	(MILA)
BALYSH	94	PL B322 176	+Beck, Belyaev, Bensch+	(MPIH, KIAE, SASSO)
BECK	94	PL B336 141	+Bensch, Bockholt+	(MPIH, KIAE, SASSO)
DECLAIS	94	PL B338 383	Y. Declais+	
FUKUDA	94	PL B335 237	+Hayakawa, Inoue, Ishida+	(Kamiokande Collab.)
KONOPLICH	94	PAN 57 425	+Khlopov	(MPEI)
PDG	94	PR D50 1173	Montanet+	(CERN, LBL, BOST, IFIC+)
PIEPKE	94	NP A577 493	+..., Klapdor-Kleingrothaus+	(MPIH, ITEP)
SMIRNOV	94	PR D49 1389	+Spergel, Bahcall	(IAS, ICTP, INRM, PRIN)
VIDYAKIN	94	JETPL 59 390	+Vyrodov, Kozlov+	(KIAE)
		Translated from ZETFP 59 364.		
VILAIN	94C	ZPHY C64 539	+Wilquet, Beyer+	(CHARM II Collab.)
ALSTON-...	93	PRL 71 831	Alston-Garnjost+	(LBL, MTHO, UNM, INEL)
ARTEMEV	93	JETPL 58 262	+Brakhman, Zeldofich, Karelin+	(ITEP, INRM)
		Translated from ZETFP 58 256.		
BAHRAN	93	PR D47 R754	+Kalbfleisch	(OKLA)
BAHRAN	93B	PR D47 R759	+Kalbfleisch	(OKLA)
BARANOV	93	PL B302 336	+Batusov, Bunyatov, Klimov+	(JINR, SERP, BUDA)
BERMAN	93	PR C48 R1	+Pitt, Calaprice, Lowry	(PRIN)
BERNATOW...	93	PR C47 806	Bernatowicz, Brazzle, Cowsik+	(WUSL, TATA)
FREEDMAN	93	PR D47 811	+Fujikawa, Napolitano, Nelson+	(LAMPF E645 Collab.)
GRUWE	93	PL B309 463	+Mommaert, Vilain, Wilquet+	(CHARM II Collab.)
KALBFLEISCH	93	PL B303 355	+Bahran	(OKLA)
KAWASHIMA	93	PR C47 R2452	+Takahashi, Masuda	(TOKYC, RIKEN)
MORTARA	93	PRL 70 394	+Ahmad, Coulter, Freedman+	(ANL, LBL, UCB)
OHSHIMA	93	PR D47 4840	+	(KEK, TUAT, RIKEN, SCUC, ROCH, TSUK, INUS)
VUILLEUMIER	93	PR D48 1009	+Busto, Farine, Jorgens+	(NEUC, CIT, VILL)
WIETFELDT	93	PRL 70 1759	+Chan, da Cruz, Garcia+	(LBL, UCB, SPAUL)
ABREU	92B	PL B274 230	+Adams, Adami, Adye+	(DELPHI Collab.)
ADRIANI	92I	PL B295 371	+Aguilar-Benitez, Ahlen, Akbari, Alcaraz+	(L3 Collab.)
BAHRAN	92	PL B291 336	+Kalbfleisch	(OKLA)
BALYSH	92	PL B283 32	+Belyaev, Bockholt, Demehin+	(MPIH, KIAE, SASSO)
BECKER-SZ...	92	PRL 69 1010	Becker-Szendy, Bratton, Casper, Dye+	(IMB Collab.)
BECKER-SZ...	92B	PR D46 3720	Becker-Szendy, Bratton, Casper, Dye+	(IMB Collab.)
BEIER	92	PL B283 446	+Frank, Frati, Kim, Mann+	(KAM2 Collab.)
Also	94	PTRSL A346 63	Beier, Frank	(PENN)
BERNATOW...	92	PRL 69 2341	Bernatowicz, Brannon, Brazzle, Cowsik+	(WUSL, TATA)
BLUM	92	PL B275 506	+Busto, Campagne, Dassie, Hubert+	(NEMO Collab.)
BORODOV...	92	PRL 68 274	Borodovsky, Chi, Ho, Kondakis, Lee+	(COLU, JHU, ILL)
BRITTON	92	PRL 68 3000	+Ahmad, Bryman, Burnham+	(TRIU, CARL)
Also	94	PR D49 28	Britton, Ahmad, Bryman+	(TRIU, CARL)
BRITTON	92B	PR D46 R885	+Ahmad, Bryman+	(TRIU, CARL)
CHEN	92	PRL 69 3151	+Imel, Radcliffe, Henrickson, Boehm	(CIT)
ELLIOTT	92	PR C46 1535	+Hahn, Moe+	(UCI)
HIRATA	92	PL B280 146	+Inoue, Ishida+	(Kamiokande II Collab.)
HOLZSCHUH	92B	PL B287 381	+Fritschi, Kuendig	(ZURI)
KAWAKAMI	92	PL B287 45	+	(INUS, KEK, SCUC, TUAT, RIKEN, ROCH, TSUK)
KETOV	92	JETPL 55 564	+Machulin, Mikaelyan+	(KIAE)
		Translated from ZETFP 55 544.		
MORI	92B	PL B289 463	+Hikasa, Nojiri, Oyama+	(KAM2 Collab.)
ABAZOV	91B	PRL 67 3332	+Anosov, Faizov+	(SAGE Collab.)
ABREU	91F	NP B367 511	+Adam, Adami, Adye, Akesson+	(DELPHI Collab.)
ALEXANDER	91F	ZPHY C52 175	+Allison, Allport, Anderson, Arcelli+	(OPAL Collab.)
AVIGNONE	91	PL B256 559	+Brodzinski, Guerard+	(SCUC, PNL, ITEP, YERE)
BELLOTTI	91	PL B266 193	+Cremonesi, Fiorini, Gervasio+	(MILA, INFN)
CASPER	91	PRL 66 2561	+Becker-Szendy, Bratton, Cady+	(IMB Collab.)
DELEENER-...	91	PR D43 3611	De Leener-Rosier, Deutsch+	(LOUV, ZURI, LAUS)
EJIRI	91	PL B258 17	+Fushimi, Kamada, Kinoshita+	(OSAK)
HIME	91	PL B257 441	+Jelley	(OXF)
HIRATA	91	PRL 66 9	+Inoue, Kajita, Kihara+	(Kamiokande II Collab.)
KUVSHINN...	91	JETPL 54 253	A.A. Kuvshinnikov+	(KIAE)
MANUEL	91	JP G17 S221		(MISSR)
NORMAN	91	JPG 17 S291	+Sur, Lesko+	(LBL)
REUSSER	91	PL B255 143	+Treichel, Boehm, Broggini+	(NEUC, CIT, PSI)
SATO	91	PR D44 2220	+Hirata, Kajita, Kifune, Kihara+	(Kamioka Collab.)
SUHONEN	91	NP A535 509	+Khadkikar, Faessler	(JYV, AHMED, TUBIN)
TOMODA	91	RPP 54 53	T. Tomoda	
TURKEVICH	91	PRL 67 3211	+Economou, Cowan	(CHIC, LANL)
YOU	91	PL B265 53	+Zhu, Lu+	(BHEP, CAST+)
ADEVA	90S	PL B251 321	+Adriani, Aguilar-Benitez, Akbari+	(L3 Collab.)

AKRAWY 90L PL B247 448 +Alexander, Allison, Allport+ (OPAL Collab.)
BATUSOV 90B ZPHY C48 209 +Bunyatov, Kuznetsov, Pozharova+ (JINR, ITEP, SERP)
BERGER 90B PL B245 305 +Froehlich, Moench, Nisius+ (FREJUS Collab.)
BURCHAT 90 PR D41 3542 +King, Abrams, Adolphsen+ (Mark II Collab.)
DECAMP 90F PL B236 511 +Deschizeaux, Lees, Minard+ (ALEPH Collab.)
HIRATA 90 PRL 65 1297 +Inoue, Kajita+ (Kamiokande II Collab.)
JUNG 90 PRL 64 1091 +Van Kooten, Abrams, Adolphsen+ (Mark II Collab.)
KOPEIKIN 90 JETPL 51 86 +Mikazlyan, Fayans (KIAE)
Translated from ZETFP 51 75.
MILEY 90 PRL 65 3092 +Avignone, Brodzinski, Collar, Reeves (SCUC, PNL)
STAUDT 90 EPL 13 31 +Muto, Klapdor-Kleingrothaus (MPIH)
VASENKO 90 MPL A5 1299 +Kirpichnikov, Kuznetsov, Starostin (ITEP, YERE)
VIDYAKIN 90 JETP 71 424 +Vyrodov, Gurevich, Koslov+ (KIAE)
Translated from ZETF 98 764.
ABRAMS 89C PRL 63 2447 +Adolphsen, Averill, Ballam+ (Mark II Collab.)
AGLIETTA 89 EPL 8 611 +Battistoni, Bellotti+ (FREJUS Collab.)
BAHCALL 89 Neutrino Astrophysics, Cambridge Univ. Press (IAS)
BLUMENFELD 89 PRL 62 2237 +Chi, Chichura, Chien+ (COLU, ILL, JHU)
DAVIS 89 ARNPS 39 467 +Mann, Wolfenstein (BNL, PENN, CMU)
ENQVIST 89 NP B317 647 +Kainulainen, Maalampi (HELS)
FISHER 89 PL B218 257 +Boehm, Bovet, Egger+ (CIT, NEUC, PSI)
MUTO 89 ZPHY A334 187 +Bender, Klapdor (TINT, MPIH)
OYAMA 89 PR D39 1481 +Hirata, Kajita, Kifune+ (Kamiokande II Collab.)
SHAW 89 PRL 63 1342 +Blanis, Bodek, Budd+ (AMY Collab.)
AFONIN 88 JETP 67 213 +Ketov, Kopeikin, Mikaelyan+ (KIAE)
Translated from ZETF 94 1, issue 2.
AKERLOF 88 PR D37 577 +Chapman, Errede, Ken+ (HRS Collab.)
AMMOSOV 88 ZPHY C40 487 +Belikov+ (SKAT Collab.)
BERGSMA 88 ZPHY C40 171 +Dorenbosch, Nieuwenhuis+ (CHARM Collab.)
BERNARDI 88 PL B203 332 +Carugno, Chauveau+ (PARIN, CERN, INFN, ATEN)
BIONTA 88 PR D38 768 +Blewitt, Bratton, Casper+ (IMB Collab.)
CALDWELL 88 PRL 61 510 +Eisberg, Grumm, Witherell+ (UCSB, UCB, LBL)
DURKIN 88 PRL 61 1811 +Harper, Ling+ (OSU, ANL, CIT, LBL, LSU, LANL)
ENGEL 88 PR C37 731 +Vogel, Zimbene
LOVERRE 88 PL B206 711 (INFN)
OLIVE 88 PL B205 553 +Srednicki (MINN, UCSB)
SREDNICKI 88 NP B310 693 +Watkins, Olive (MINN, UCSB)
AFONIN 87 JETPL 45 257 +Bogatov, Vershinskii+ (KIAE)
Translated from ZETFP 45 201.
AHLEN 87 PL B195 603 +Avignone, Brodzinski+ (BOST, SCUC, HARV, CHIC)
AHRENS 87 PR D36 702 + (BNL, BROW, UCI, HIRO, KEK, OSAK, PENN, STON)
BELLOTTI 87 EPL 3 889 +Cattadori, Cremonesi, Fiorini+ (MILA)
BOEHM 87 Massive Neutrinos +Vogel (CIT)
Cambridge Univ. Press, Cambridge
BOFILL 87 PR D36 3309 +Busza, Eldridge+ (MIT, FNAL, MSU)
DAUM 87 PR D36 2624 +Kettle, Jost+ (SIN, VIRG)
GRIEST 87 NP B283 681 +Seckel (UCSC, CERN)
Also 88 NP B296 1034 erratum Griest, Seckel (UCSC, CERN)
LOSECCO 87 PL B184 305 +Bionta, Blewitt, Bratton+ (IMB Collab.)
MISHRA 87 PRL 59 1397 +Auchincloss+ (COLU, CIT, FNAL, CHIC, ROCH)
OBERAUER 87 PL B198 113 +von Feilitzsch, Mossbauer (MUNT)
TALEBZADEH 87 NP B291 503 +Guy, Venus+ (BEBC WA66 Collab.)
TOMODA 87 PL B199 475 +Faessler (TUBIN)
VIDYAKIN 87 JETP 66 243 +Vyrodov, Gurevich, Kozlov+ (KIAE)
Translated from ZETF 93 424.
WENDT 87 PRL 58 1810 +Abrams, Amidei, Baden+ (Mark II Collab.)
ABRAMOWICZ 86 PRL 57 298 H. Abramowicz+ (CDHS Collab.)
AFONIN 86 JETPL 44 142 +Bogatov, Borovoi, Vershinskii+ (KIAE)
Translated from ZETFP 44 111.
ALLABY 86 PL B177 446 J.V. Allaby+ (CHARM Collab.)
ANGELINI 86 PL B179 307 +Apostolakis, Baldini+ (PISA, ATHU, PADO, WISC)
AZUELOS 86 PRL 56 2241 +Britton, Bryman+ (TRIU, CNRC)
BADIER 86 ZPHY C31 21 +Bemporad, Boucrot, Callot+ (NA3 Collab.)
BERNARDI 86 PL 166B 479 +Carugno+ (CURIN, INFN, CDEF, ATEN, CERN)
BERNARDI 86B PL B181 173 +Carugno+ (CURIN, INFN, CDEF, ATEN, CERN)
BORGE 86 PS 34 591 +DeRujula, Hansen, Jonson+ (ISOLDE Collab.)
BRUCKER 86 PR D34 2183 +Jacques, Kalelkar, Koller+ (RUTG, BNL, COLU)
DELEENER-... 86 PL B177 228 DeLeener-Rosier, Deutsch+ (LOUV, ZURI, LAUS)
DORENBOS... 86 PL 166B 473 Dorenbosch, Allaby, Amaldi+ (CHARM Collab.)
USHIDA 86C PRL 57 2897 +Kondo, Tasaka, Park, Song+ (FNAL E531 Collab.)
ZACEK 86 PR D34 2621 +Feilitzsch+ (CIT-SIN-TUM Collab.)
AFONIN 85 JETPL 41 435 +Borovoi, Dobrynin+ (KIAE)
Translated from ZETFP 41 355.

Also 85B JETPL 42 285 Afonin, Bogatov, Borovoi, Dobrynin+ (KIAE)
Translated from ZETFP 42 230.
AHRENS 85 PR D31 2732 +Aronson+ (BNL, BROW, KEK, OSAK, PENN+)
ALBRECHT 85I PL 163B 404 +Binder, Drescher, Schubert+ (ARGUS Collab.)
ALTZITZOG... 85 PRL 55 799 Altzitzoglou, Calaprice, Dewey+ (PRIN)
APALIKOV 85 JETPL 42 289 +Boris, Golutvin, Laptin, Lubimov+ (ITEP)
Translated from ZETFP 42 233.
BELIKOV 85 SJNP 41 589 +Volkov, Kochetkov, Mukhin+ (SERP)
Translated from YAF 41 919.
COOPER-... 85 PL 160B 207 Cooper-Sarkar+ (CERN, LOIC, OXF, SACL+)
COWSIK 85 PL 151B 62 (TATA)
DATAR 85 Nature 318 547 +Baba, Bhattacherjee, Bhuinya, Roy (BHAB, TATA)
MARKEY 85 PR C32 2215 +Boehm (CIT)
OHI 85 PL 160B 322 +Nakajima, Tamura+ (TOKY, INUS, KEK)
SIMPSON 85 PRL 54 1891 (GUEL)
STOCKDALE 85 ZPHY C27 53 +Bodek+ (ROCH, CHIC, COLU, FNAL)
ZACEK 85 PL 164B 193 +Zacek, Boehm+ (MUNI, CIT, SIN)
BALLAGH 84 PR D30 2271 +Bingham+ (UCB, LBL, FNAL, HAWA, WASH, WISC)
BERGSMA 84 PL 142B 103 +Dorenbosch, Allaby, Abt+ (CHARM Collab.)
CAVAIGNAC 84 PL 148B 387 +Hoummada, Koang+ (ISNG, LAPP)
DYDAK 84 PL 134B 281 +Feldman+ (CERN, DORT, HEIDH, SACL, WARS)
FREESE 84 NP B233 167 +Schramm (CHIC, FNAL)
GABATHULER 84 PL 138B 449 +Boehm+ (CIT, SIN, MUNI)
HAXTON 84 PPNP 12 409 +Stevenson
MINEHART 84 PRL 52 804 +Ziock, Marshall, Stephens, Daum+ (VIRG, SIN)
SCHRAMM 84 PL 141B 337 +Steigman (FNAL, BART)
STOCKDALE 84 PRL 52 1384 +Bodek+ (ROCH, CHIC, COLU, FNAL)
AFONIN 83 JETPL 38 436 +Bogatov, Borovoi, Vershinskii+ (KIAE)
Translated from ZETFP 38 361.
BELENKII 83 JETPL 38 493 +Dobrynin, Zemlyakov, Mikaelyan+ (KIAE)
Translated from ZETFP 38 406.
BELIKOV 83 JETPL 38 661 +Volkov, Kochetkov, Mukhin, Sviridov+ (SERP)
Translated from ZETFP 38 547.
BERGSMA 83 PL 122B 465 +Dorenbosch, Jonker+ (CHARM Collab.)
BERGSMA 83B PL 128B 361 +Dorenbosch+ (CHARM Collab.)
BRYMAN 83B PRL 50 1546 +Dubois, Numao, Olaniya, Olin+ (TRIU, CNRC)
Also 83 PRL 50 7 Bryman, Dubois, Numao, Olaniya+ (TRIU, CNRC)
DEUTSCH 83 PR D27 1644 +Lebrun, Prieels (LOUV)
GRONAU 83 PR D28 2762 (HAIF)
KIRSTEN 83 PRL 50 474 +Richter, Jessberger (MPIH)
Also 83B ZPHY 16 189 Kirsten, Richter, Jessberger (MPIH)
SCHRECK... 83 PL 129B 265 Schreckenbach, Colvin+ (ISNG, ILLG)
TAYLOR 83 PR D28 2705 +Cence, Harris, Jones+ (HAWA, LBL, FNAL)
COOPER 82 PL 112B 97 +Guy, Michette, Tyndel, Venus (RL)
HAYANO 82 PRL 49 1305 +Taniguchi, Yamanaka+ (TOKY, KEK, TSUK)
OLIVE 82 PR D25 213 +Turner (CHIC, UCSB)
VUILLEUMIER 82 PL 114B 298 +Boehm, Egger+ (CIT, SIN, MUNI)
ABELA 81 PL 105B 263 +Daum, Eaton, Frosch, Jost, Kettle, Steiner (SIN)
ARMENISE 81 PL 100B 182 +Fogli-Muciaccia+ (BARI, CERN, MILA, LALO)
ASANO 81 PL 104B 84 +Hayano, Kikutani, Kurokawa+ (KEK, TOKY, INUS, OSAK)
Also 81 PR D24 1232 Shrock (STON)
ASRATYAN 81 PL 105B 301 +Efremenko, Fedotov+ (ITEP, FNAL, SERP, MICH)
BAKER 81 PRL 47 1576 +Connolly, Kahn, Kirk, Murtagh+ (BNL, COLU)
Also 78 PRL 40 144 Cnops, Connolly, Kahn, Kirk+ (BNL, COLU)
BERNSTEIN 81 PL 101B 39 +Feinberg (STEV, COLU)
BOLIEV 81 SJNP 34 787 +Butkevich, Zakidyshev, Makoev+ (INRM)
Translated from YAF 34 1418.

CALAPRICE	81	PL 106B 175	+Schreiber, Schneider+	(PRIN, IND)
DEDEN	81	PL 98B 310	+Grassler, Boeckmann, Mermikides+	(BEBC Collab.)
ERRIQUEZ	81	PL 102B 73	+Natali+	(BARI, BIRM, BRUX, EPOL, RHEL, SACL+)
KWON	81	PR D24 1097	+Boehm, Hahn, Henrikson+	(CIT, ISNG, MUNI)
NEMETHY	81B	PR D23 262	+	(YALE, LBL, LASL, MIT, SACL, SIN, CNRC, BERN)
SHROCK	81	PR D24 1232		(STON)
SHROCK	81B	PR D24 1275		(STON)
SILVERMAN	81	PRL 46 467	+Soni	(UCI, UCLA)
SIMPSON	81B	PR D24 2971		(GUEL)
USHIDA	81	PRL 47 1694	+	(AICH, FNAL, KOBE, SEOU, MCGI, NAGO, OSU+)
AVIGNONE	80	PR C22 594	+Greenwood	(SCUC)
BOEHM	80	PL 97B 310	+Cavaignac, Feilitzsch+	(ILLG, CIT, ISNG, MUNI)
FRITZE	80	PL 96B 427		(AACH3, BONN, CERN, LOIC, OXF, SACL)
REINES	80	PRL 45 1307	+Sobel, Pasierb	(UCI)
Also	59	PR 113 273	Reines, Cowan	(LASL)
Also	66	PR 142 852	Nezrick, Reines	(CASE)
Also	76	PRL 37 315	Reines, Gurr, Sobel	(UCI)
SHROCK	80	PL 96B 159		(STON)
DAVIS	79	PR C19 2259	+Vogel, Mann, Schenter	(CIT)
BLIETSCHAU	78	NP B133 205	+Deden, Hasert, Krenz+	(Gargamelle Collab.)
CROUCH	78	PR D18 2239	+Landecker, Lathrop, Reines+	(CASE, UCI, WITW)
MEYER	77	PL 70B 469	+Nguyen, Abrams+	(SLAC, LBL, NWES, HAWA)
VYSOTSKY	77	JETPL 26 188	+Dolgov, Zeldovich	(ITEP)
		Translated from ZETFP 26 200.		
BELLOTTI	76	LNC 17 553	+Cavalli, Fiorini, Rollier	(MILA)
SZALAY	76	AA 49 437	+Marx	(EOTV)
SZALAY	74	APAH 35 8	+Marx	(EOTV)
COWSIK	72	PRL 29 669	+McClelland	(UCB)
MARX	72	Nu Conf. Budapest	+Szalay	(EOTV)
GERSHTEIN	66	JETPL 4 120	+Zeldovich	(KIAM)
		Translated from ZETFP 4 189.		