KARMEN

KArlsruhe
Rutherford
Medium
Energy
Neutrino Experiment

ICHEP 2000, OSAKA JAPAN

Search for

$$\bar{\nu}_\mu \longrightarrow \bar{\nu}_e$$

Latest Results

(Feb.1997 - Mar.2000)

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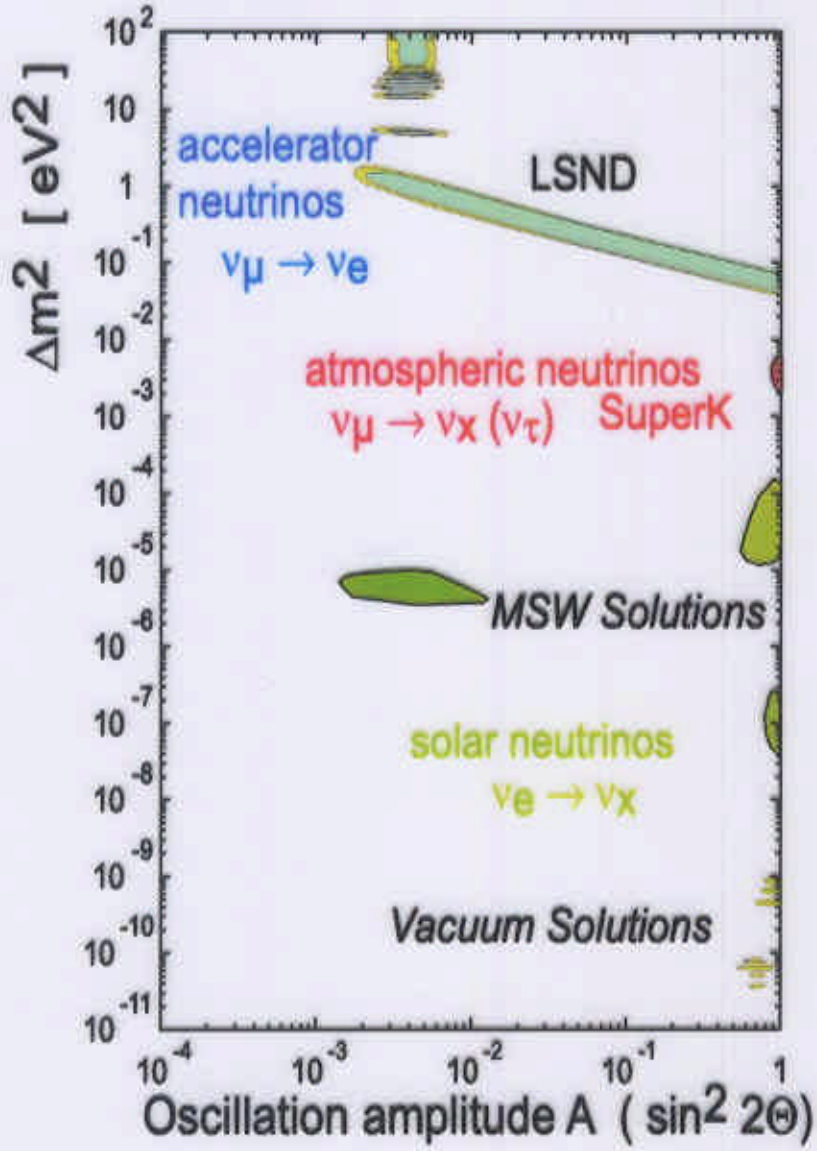
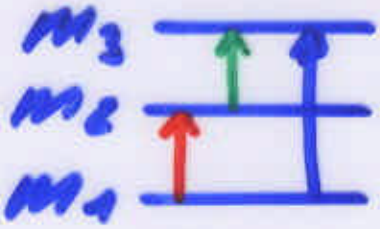
Status of exp. evidence/hints for Neutrino-Oscillations

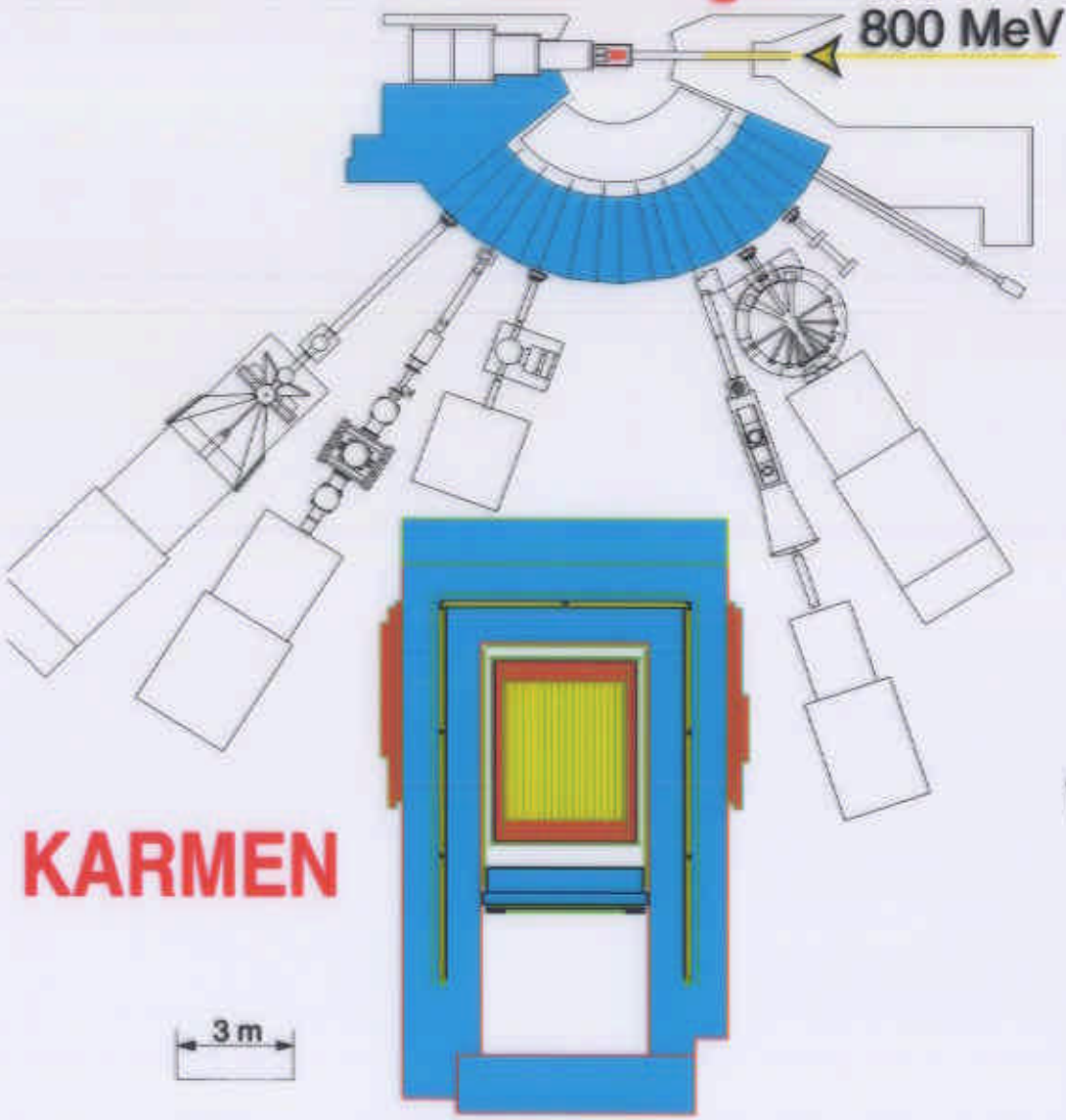


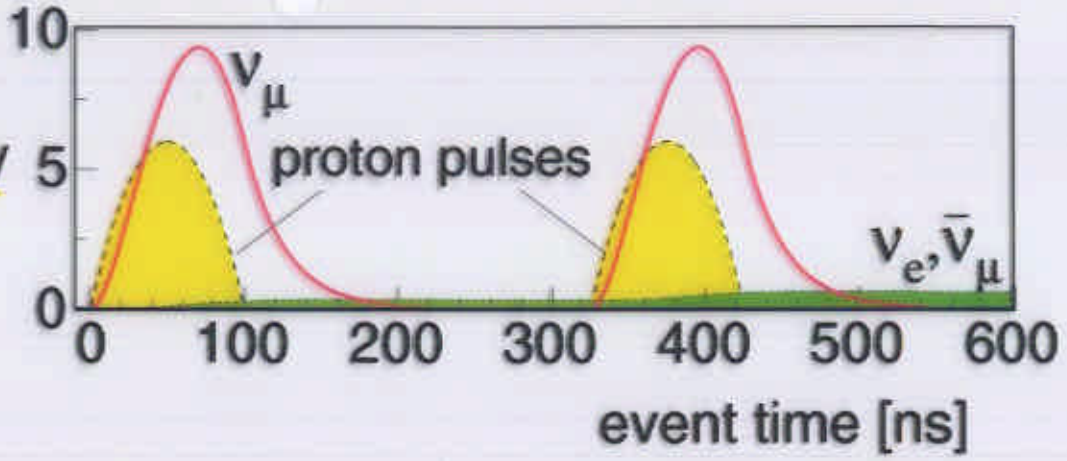
3 ν's → 2 independent Δm^2 values



$\Rightarrow \Delta m^2_{12} + \Delta m^2_{23} + \Delta m^2_{31} = 0$

→ no way to explain all three hints for oscillations with 3 neutrinos

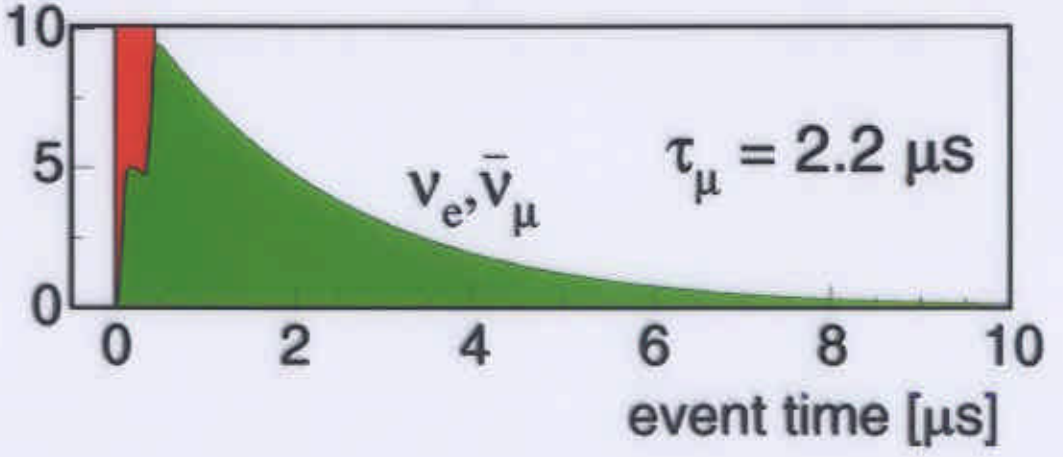




$$\pi^+ \rightarrow \mu^+ + \nu_\mu \qquad \tau_\pi = 26\ \text{ns}$$

$$\downarrow$$

$$e^+ + \nu_e + \bar{\nu}_\mu$$

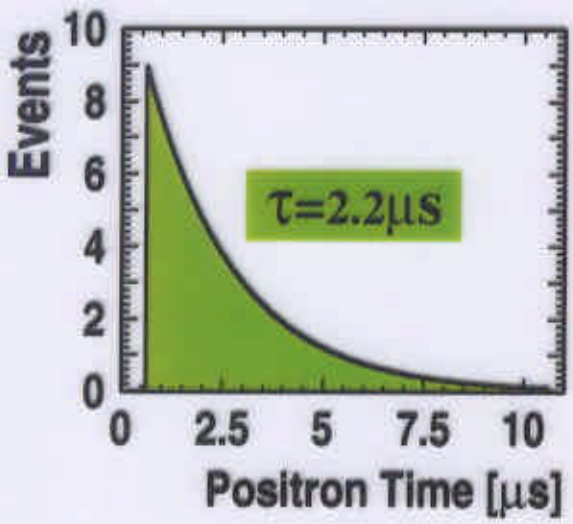


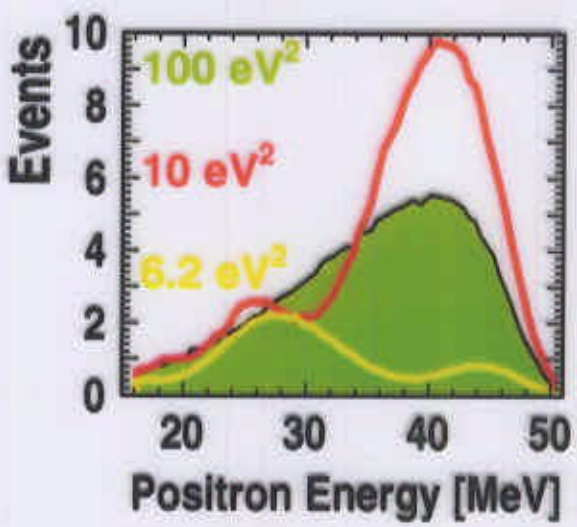
$\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ appearance

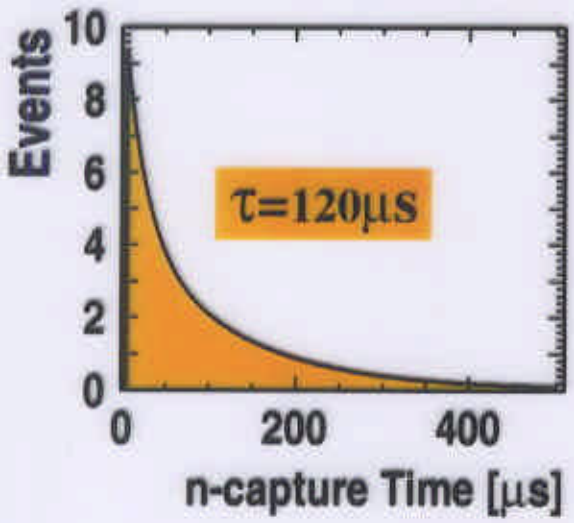
$\bar{\nu}_e + p \rightarrow e^+ + n$ - 1.8 MeV

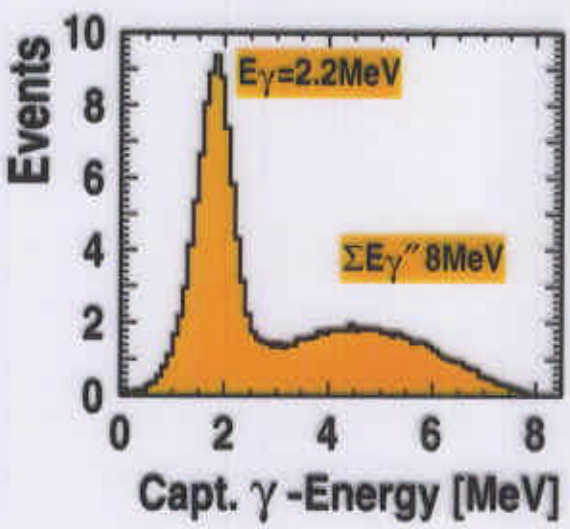
$E_\gamma = 2.2$ MeV $n \rightarrow p(n,\gamma)$ $\tau = 120\ \mu s$

E_γ " 8 MeV $n \rightarrow Gd(n,\gamma)$









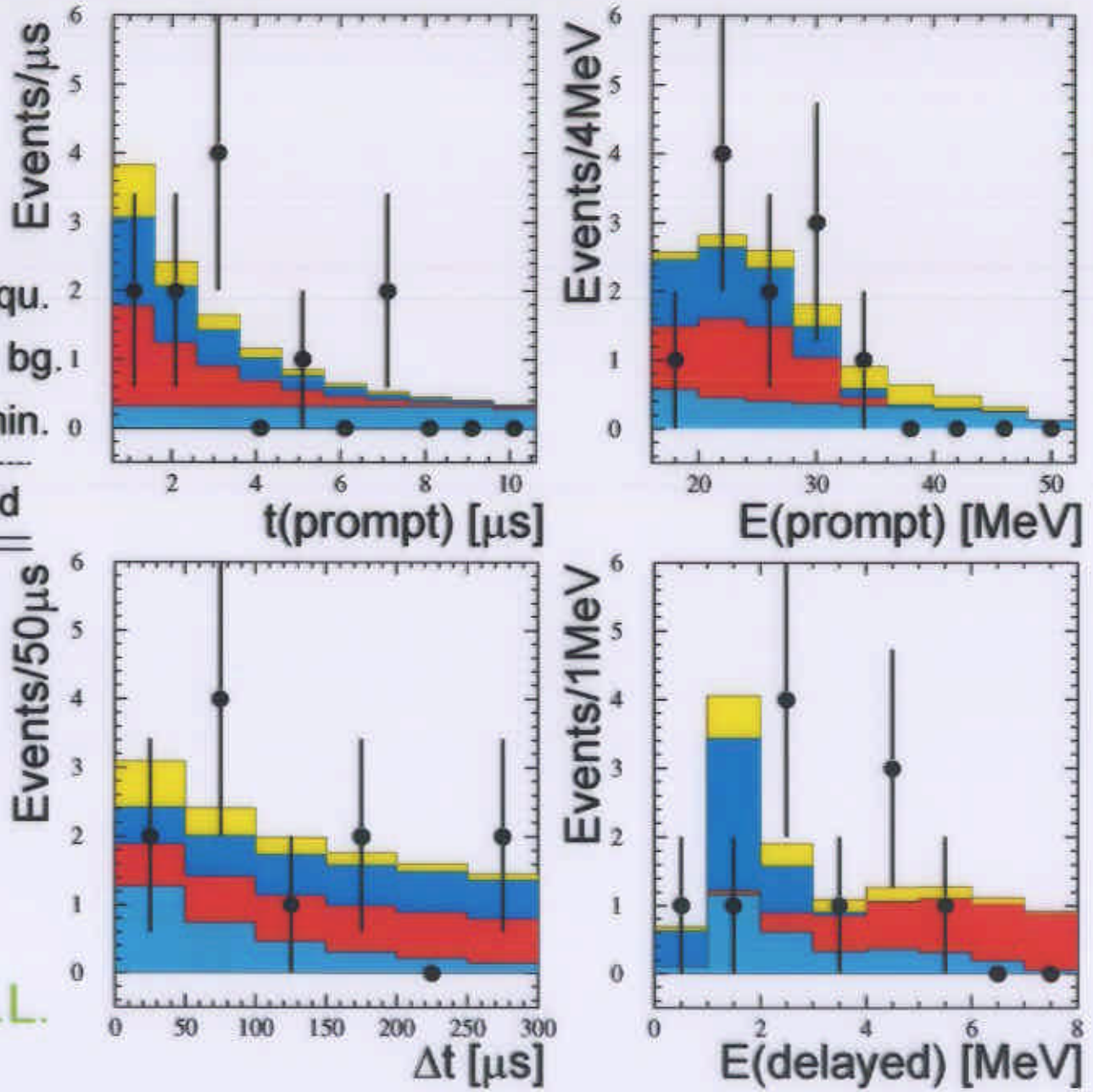
data set after final cuts

11 candidates

3.94 +- 0.51	ν_e-induced CC sequ.
3.52 +- 0.30	ν-induced random bg.
1.67 +- 0.17	$\bar{\nu}_e$ intrinsic contamin.
3.17 +- 0.17	cosmic background
12.29 +- 0.63	total background

→ **no osci signal**

Bayes:
signal > 6.3 evts
excluded @ 90% C.L.



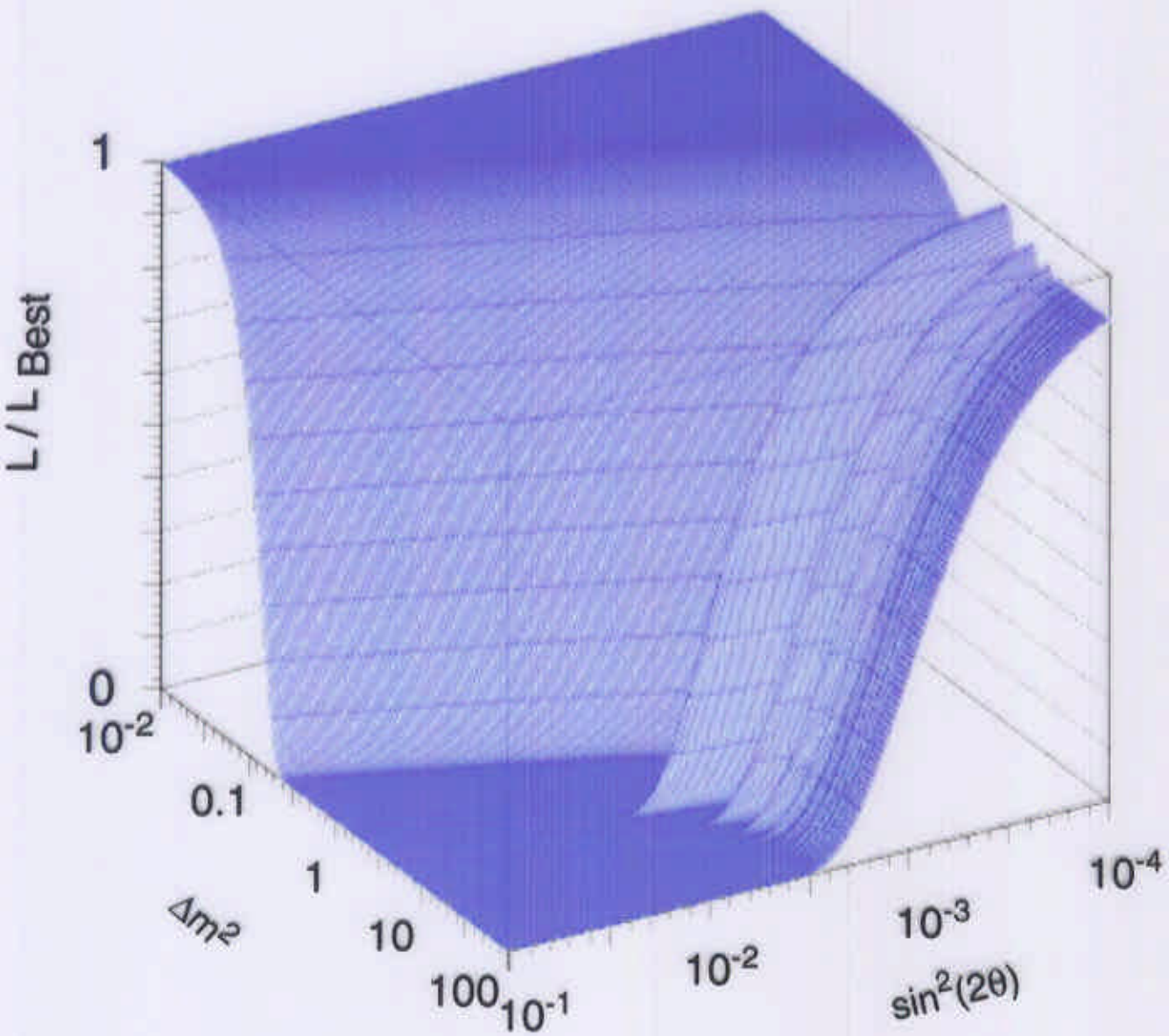
Likelihood Analysis

- Energy and Time Signature of prompt and delayed event + spatial correlation

$f_i\ (E\ (e^+), t(e^+), E\ (\gamma)\ , \Delta t, \Delta r)$

- Background expectation

Best Value = Null Hypothesis
No Oscillations



confidence regions

unified frequentist approach:

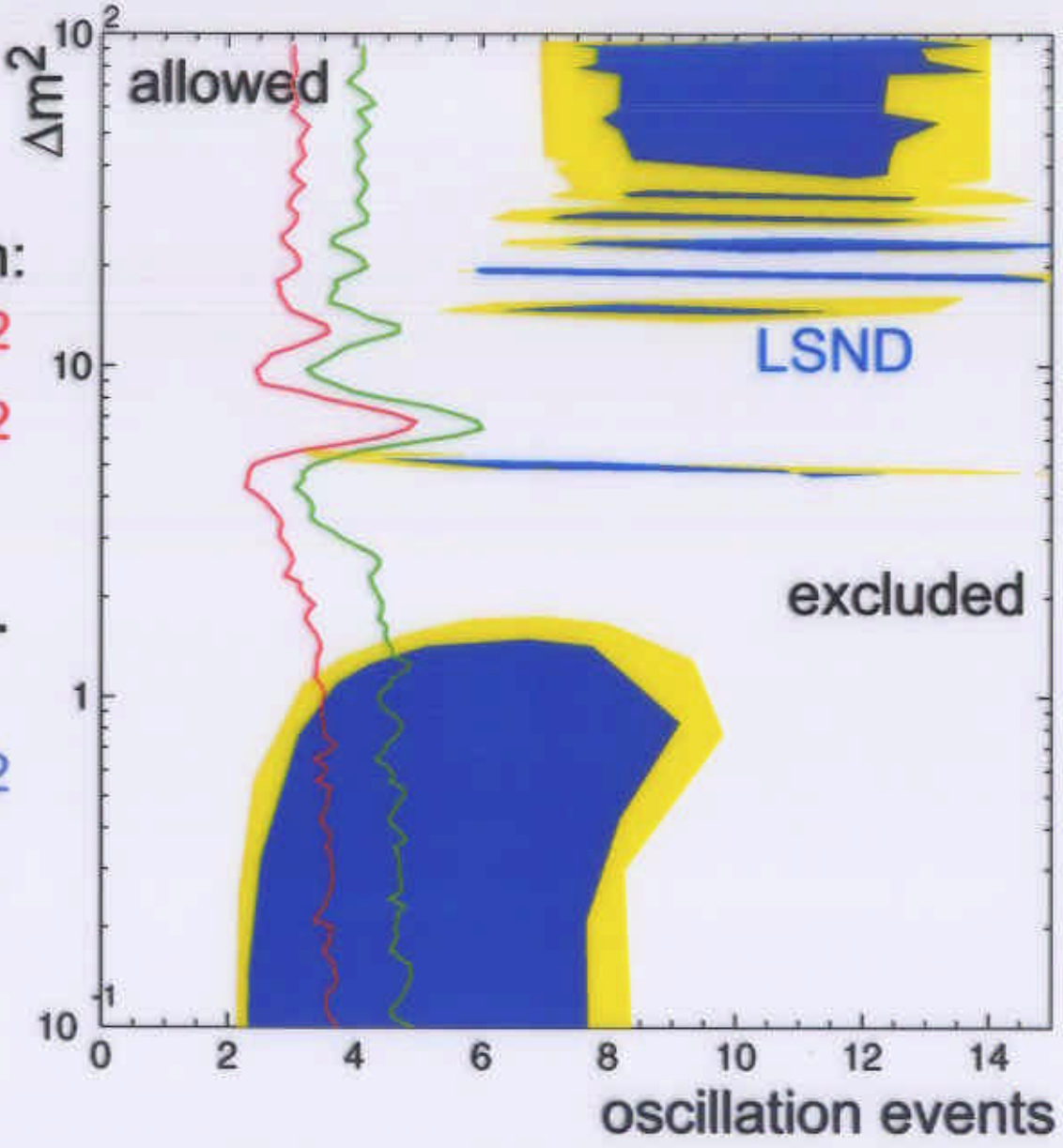
$N_{osc} < 3.1 \quad \Delta m^2 > 100 eV^2$

$N_{osc} < 3.8 \quad \Delta m^2 < 0.1 eV^2$

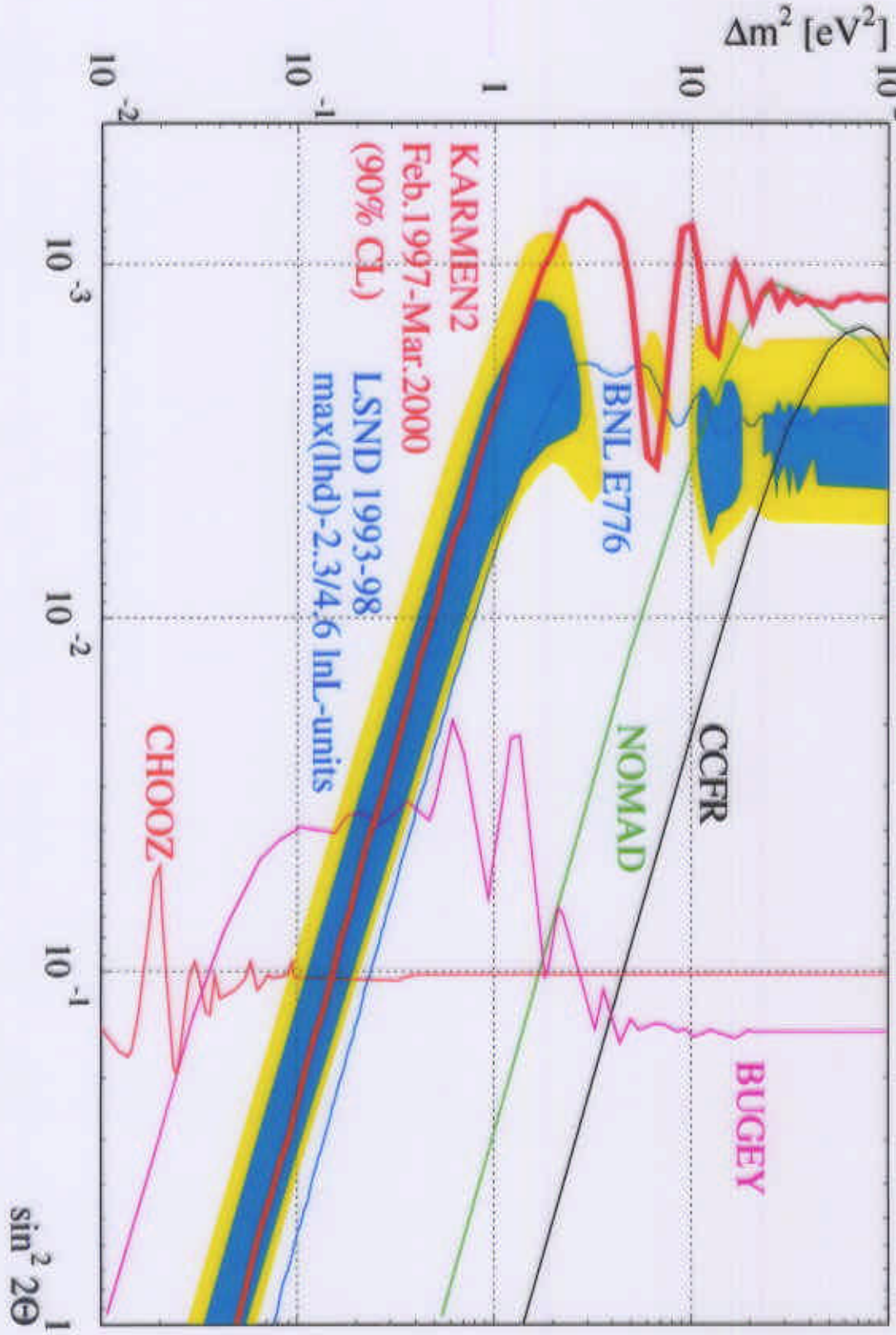
with 90% confidence

$N_{osc} = 2443 \quad \Delta m^2 = 100 eV^2$

for $\sin^2(2\Theta)=1$



neutrino oscillation plot



LSND favored regions