EXPERIMENTS AT CERN: THE JURA

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OUTLINE:

- PHYSICS CASE
- EXPERIMENTAL PROGRAMME
- CONCLUSIONS

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PHYSICS CASE

- THREE EVIDENCES FOR OSCILLATIONS
  - LSND
  - ATMOSPHERIC
  - SOLAR

- THREE- FLAVOUR PHENOMENOLOGY + $m_1 << m_2 << m_3$ ADEQUATE TO DESCRIBE ALL OBSERVATIONS IN TERMS OF FIVE UNKNOWN PARAMETERS

$$\vartheta_{12}, \vartheta_{13}, \vartheta_{23} \; ; \; \Delta M^2 = m_3^2 - m_2^2 = m_3^2 - m_1^2 \; ; \; \Delta m^2 = m_2^2 - m_1^2$$

- LSND $\Longleftrightarrow \Delta M^2$
  - ONLY THREE PARAMETERS

$$\vartheta_{13}, \vartheta_{23} \text{ AND } \Delta M^2$$

  ARE RELEVANT. EASIEST TO PIN DOWN

  - FROM EXISTING LIMITS ON $P_{\mu\tau}$ AND P_{ex}

$$\Delta M^2 \text{ AND } P_{\mu\tau}$$

  CAN BE CONSTRAINED

LIMIT vs LSND

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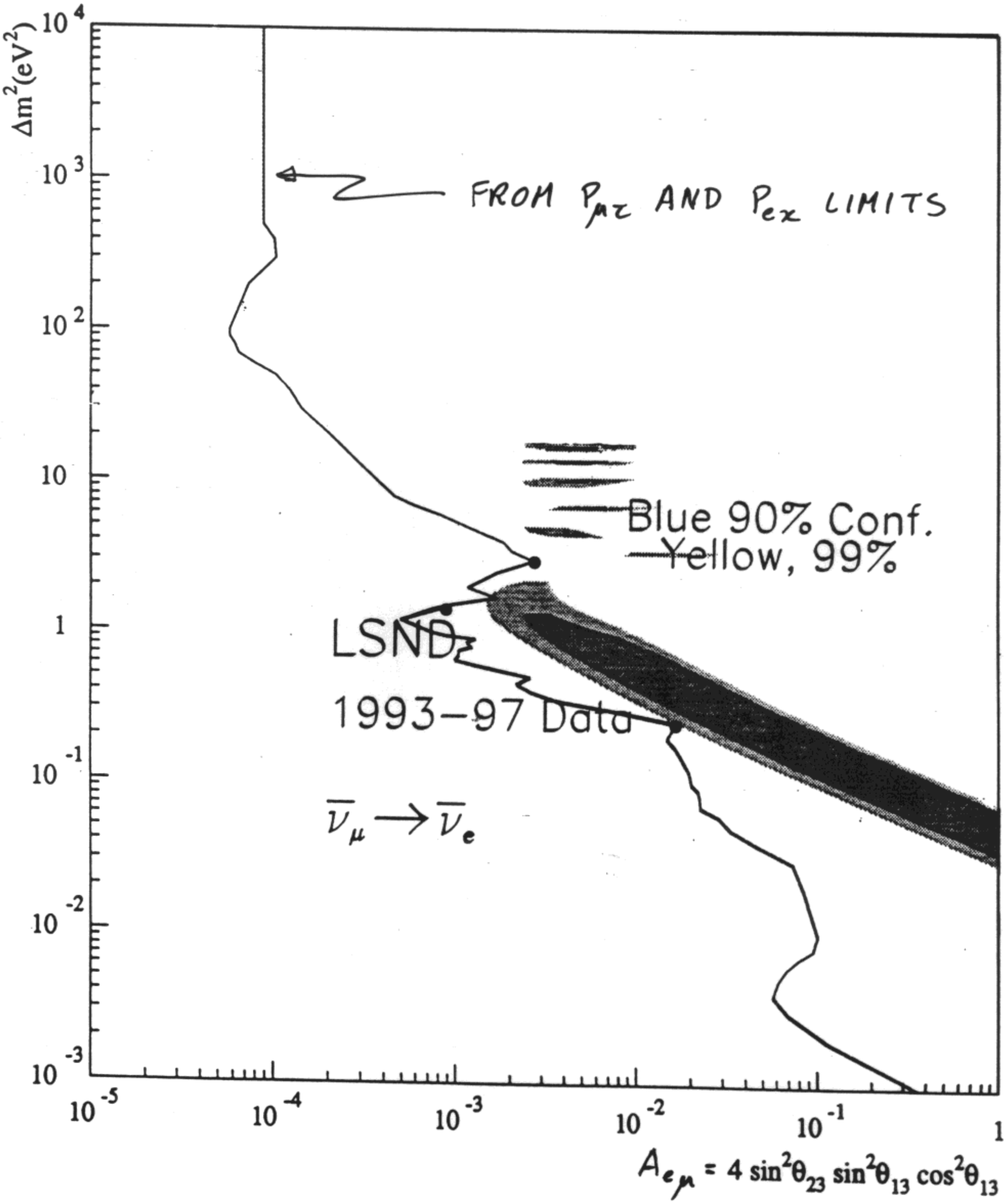
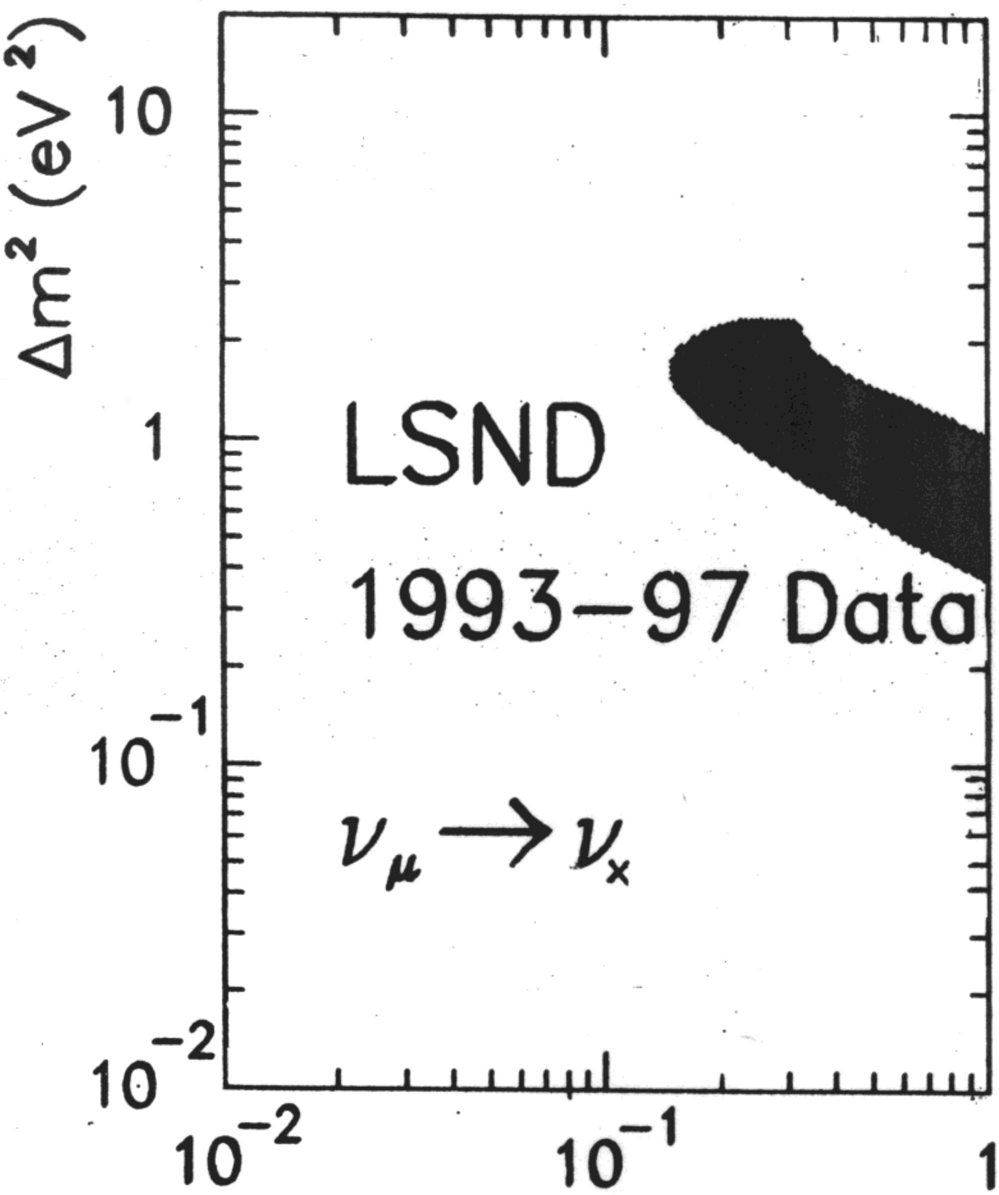
hep-ph/9809501, P.L. TO BE PUBLISHED



$0.3 \leq \Delta M^2 \leq 3.0 \ eV^2$

EXPECTED $A_{\mu\tau}$ FROM LSND

$A_{ex} = 0.04$



$$(A_{\mu\tau})_1 = 4 \sin^2\theta_{23} \cos^2\theta_{23} \cos^4\theta_{13} \cong$$

$$\cong 4 (A_{e\mu})_1/(A_{ex})_1$$

EXPERIMENTAL PROGRAMME

CHECKING LSND:

- MINIBOONE (FERMILAB)
- I-216 (CERN-PS)

WHY A JURA OSCILLATION EXPERIMENT ?

$$L = 17 \text{ km}$$

$$6.4 < E_\nu < 24.7 \text{ GeV}$$

$$0.69 < L/E < 2.65 \text{ m/MeV}$$

- $\nu_\mu \rightarrow \nu_e$
- $\nu_\mu \rightarrow \nu_x$

} L- AND E- INDEPENDENCE; DIFFERENT SYSTEMATICS

- $\nu_\mu \rightarrow \nu_\tau$ $\nu_\tau \rightarrow \tau$ ENERGETICALLY ALLOWED

A FORTUNATE COINCIDENCE

L = 17 km

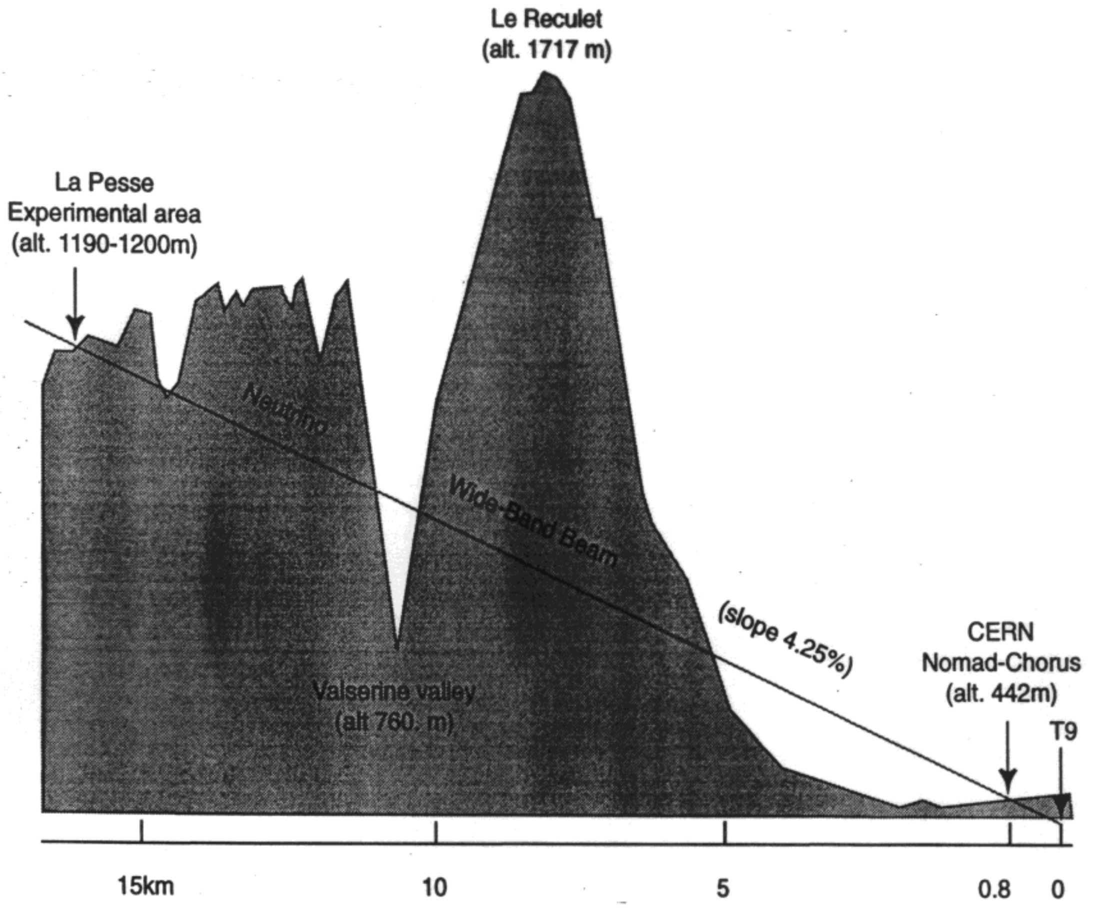


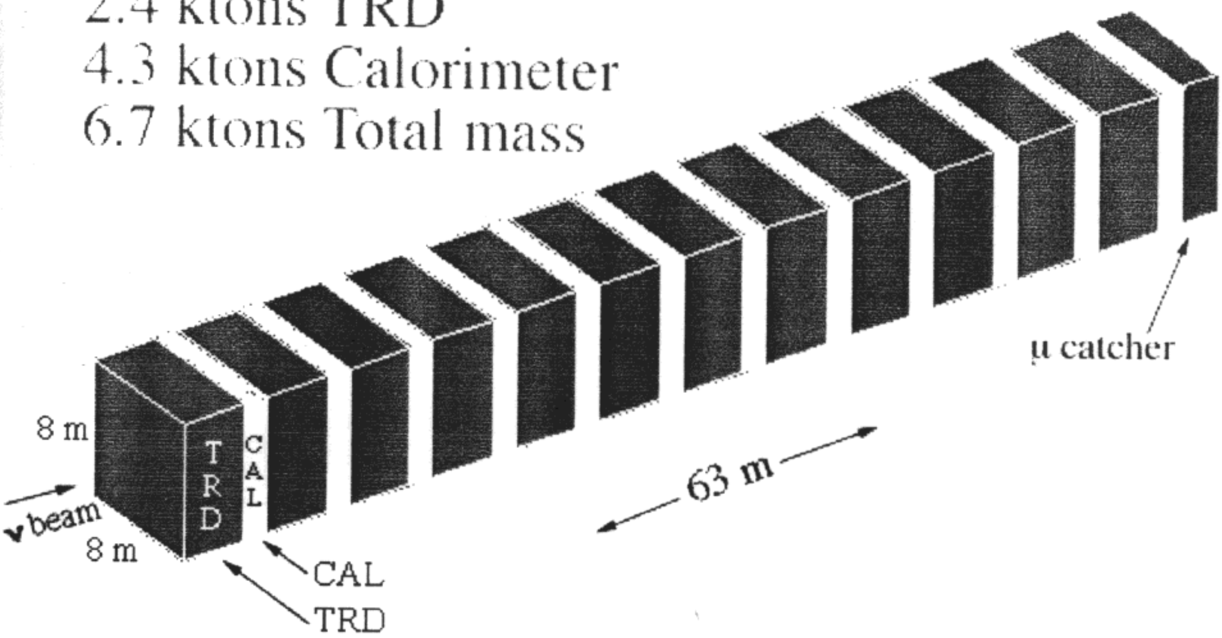
Figure 1: Extension of the WBNB through the Jura

WANF	$\langle E_\nu \rangle = 24.7$ GeV	$L/E = 0.69$ m/MeV
NGS "REFERENCE"	$\langle E_\nu \rangle = 21.5$ GeV	$L/E = 0.79$ m/MeV
NGS LE 1	$\langle E_\nu \rangle = 10$ GeV	$L/E = 1.7$ m/MeV
NGS LE 2	$\langle E_\nu \rangle = 6.4$ GeV	$L/E = 2.65$ m^5/MeV

(7)

The LBL-NOE detector at Gran Sasso

2.4 ktons TRD
4.3 ktons Calorimeter
6.7 ktons Total mass



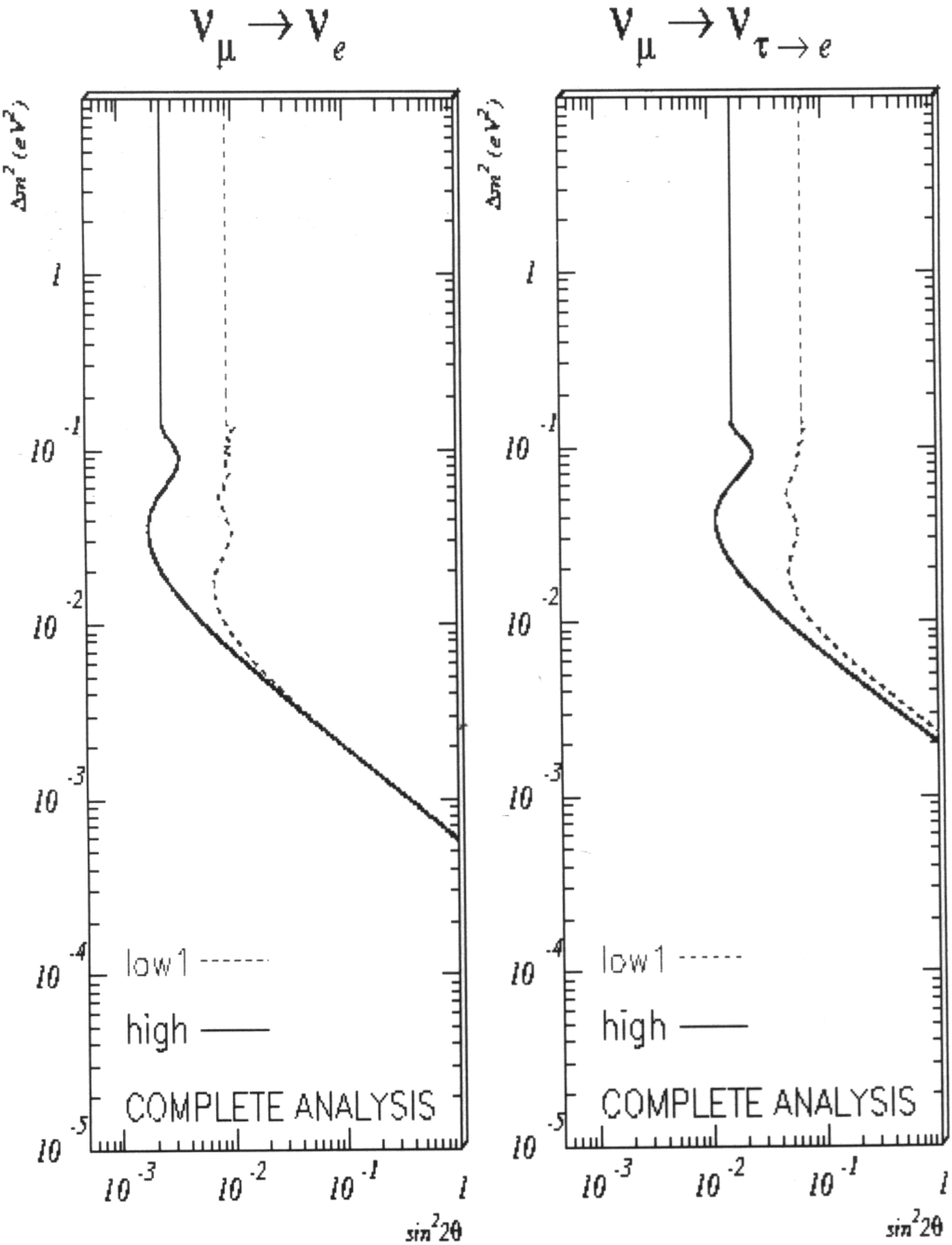
Basic Module (BM):

TRD+CAL subdetectors:
e,μ,π, E_μ,E_e,E_π
12 BM: 7kton NOE detector

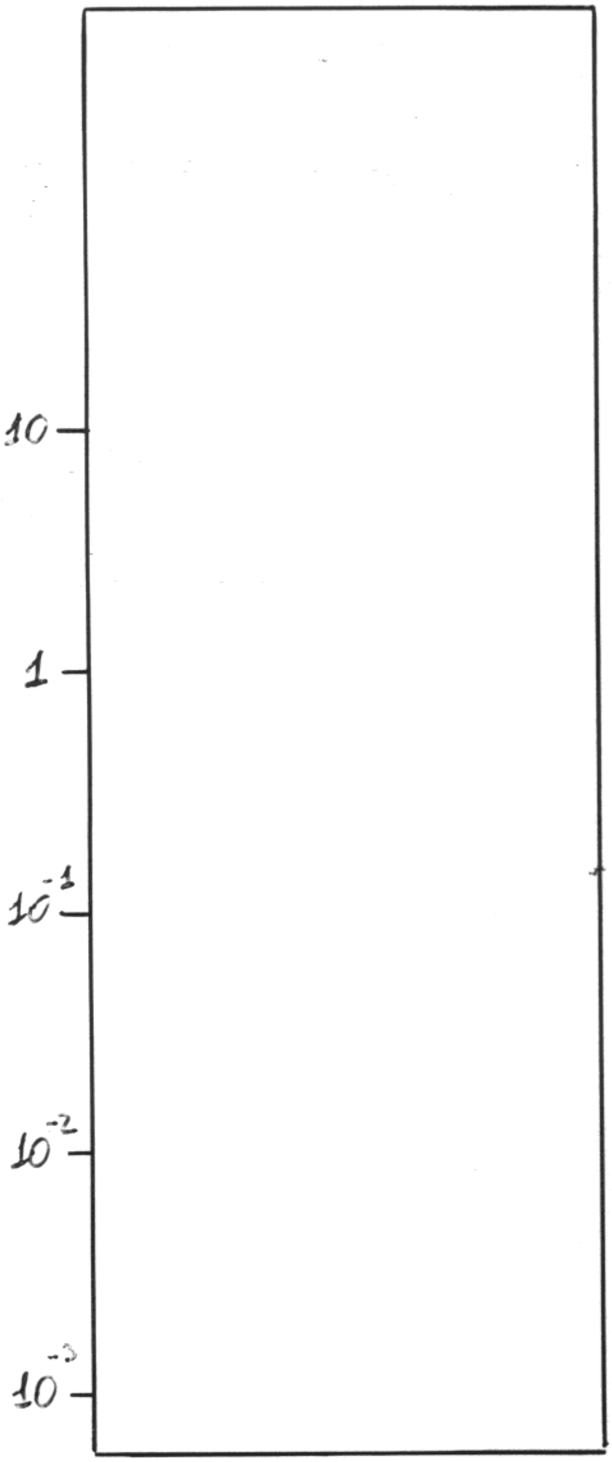
9m.x 9m. = 8Kton

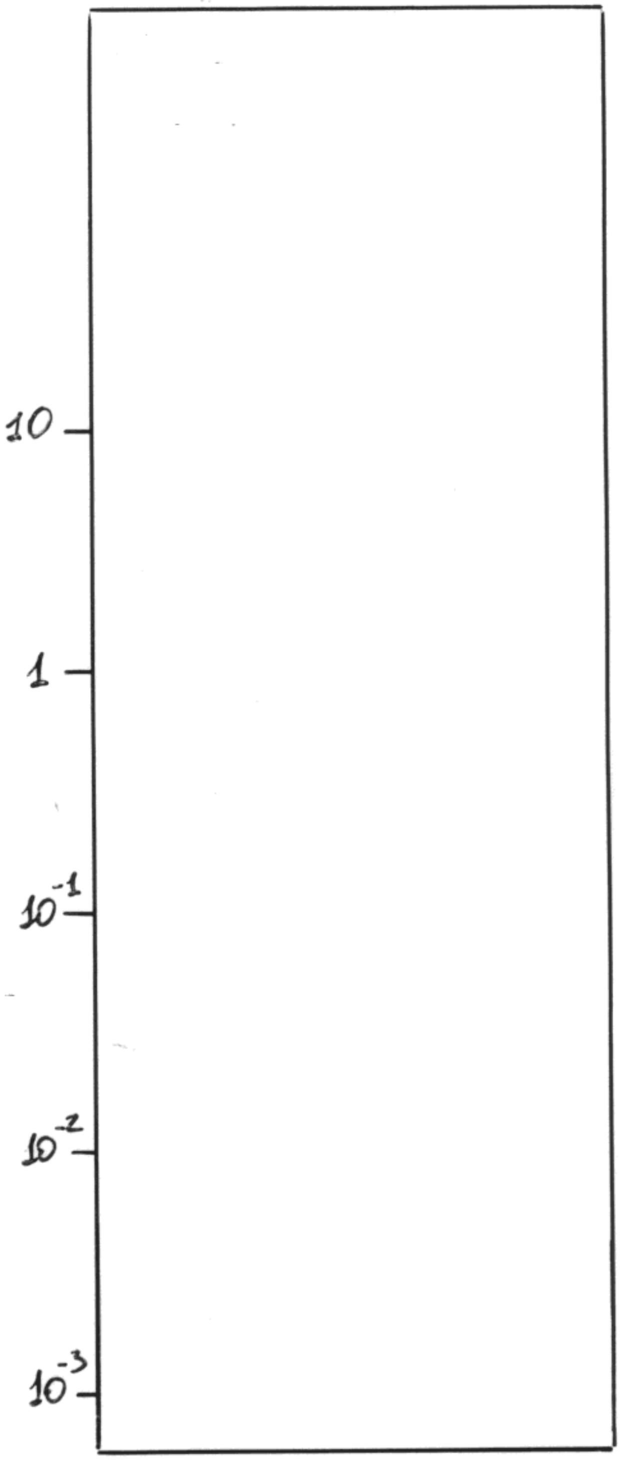
NOE sensitivity

High energy ref. beam



APPEARANCE @ L = 17 km





69 ton · 10^{19} pot

CONCLUSIONS

WITH

$$0.69 < L/E < 2.65 \ \mathrm{m/MeV}$$

$$6.4 < E_\nu < 24.7 \ \mathrm{GeV}$$

A JURA OSCILLATION EXPERIMENT WOULD

- REPRESENT THE ULTIMATE EXPERIMENT FOR LSND PHYSICS
- PROVIDE AN UNMATCHED TESTING FACILITY FOR LBL EXPERIMENTS

USING

1% OF THE TARGET MASS
OF A LBL EXPERIMENT

IN

LESS THAN ONE YEAR