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NEUTRINO2000

FUTURE REACTOR NEUTRINO OSCILLATION EXPERIMENTS AT KRASNOYARSK

TOWARDS VERY SMALL MIXING ANGLES IN THE ATMOSPHERIC NEUTRINO MASS REGION

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THE MAIN GOAL OF THE PROJECT IS:

TO FIND THE CONTRIBUTION OF *M*-3 STATE TO THE ELECTRON NEUTRINO FLAVOR STATE.

- CHOOZ, PALO-VERDE vs SuperKAMIOKANDE
- TWO DETECTOR EXPERIMENT Kr2 Det

  The Site, Detectors, Lay out, Statistics, Systematics
- EXPECTED SENSITIVITY
- OTHER APPLICATIONS: Sterile Neutrinos?
- CONCLUSIONS

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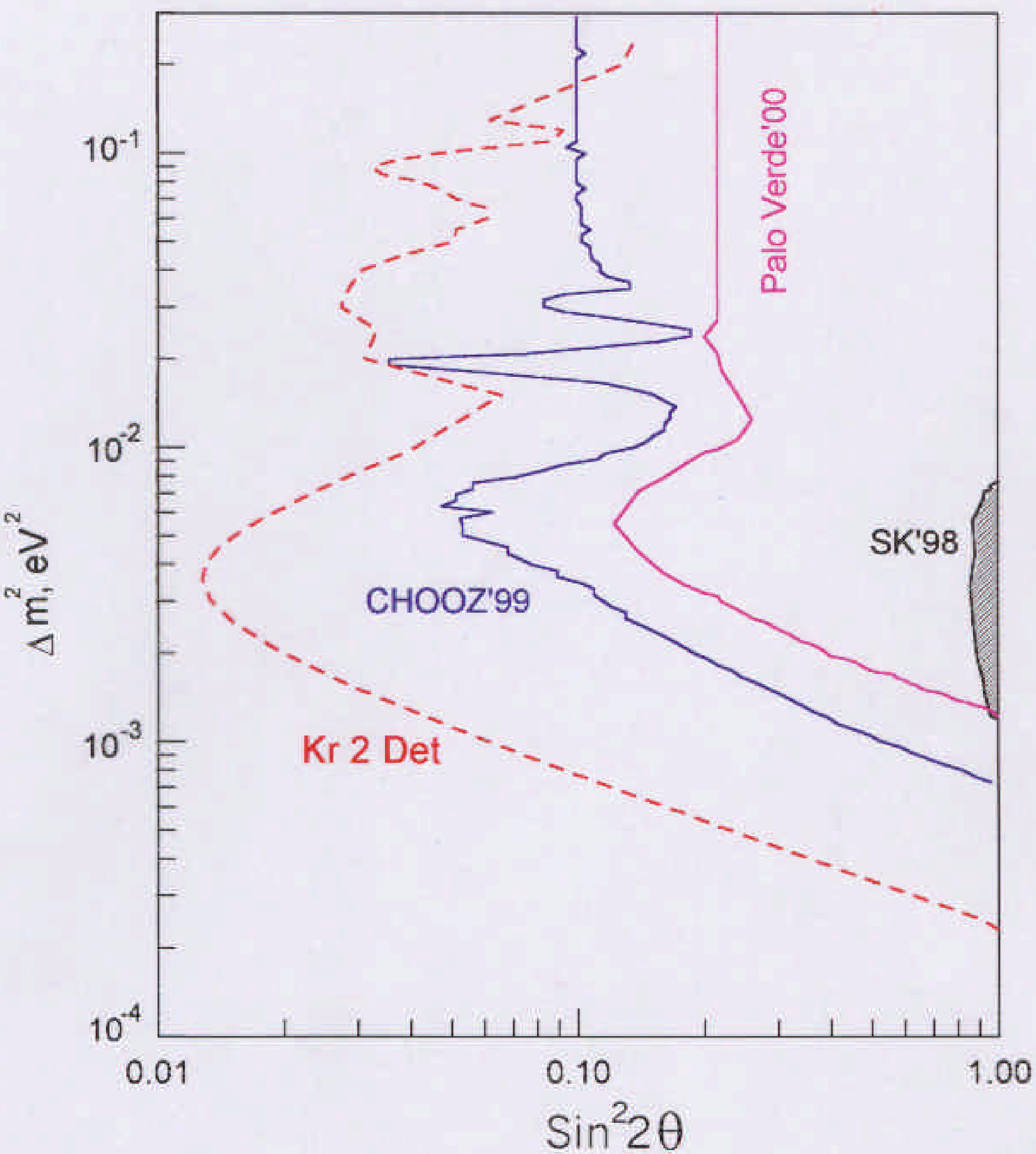
OSCILLATION LIMITS



For reactor $\tilde{\nu}_e$ at 1 km:

$$\mathrm{Sin}^2 2\theta = 4U_{e3}^2(1 - U_{e3}^2) \approx 4U_{e3}^2$$

$$\nu_e = U_{e1}\,\nu_1 + U_{e2}\,\nu_2 + U_{e3}\,\nu_3 \qquad U_{e3} \equiv \sin\theta_{13}$$

PROPOSED EXPERIMENT AT KRASNOYARSK

— TWO IDENTICAL DETECTORS at 1100 m and 200-300 m from the $\tilde{\nu}_e$ source.

— TARGETS: Liquid scintillator, 50 tons.

— GEOMETRY : «BOREXINO»

$\tilde{\nu}_e$ detection rate at 1100 m position $15 \cdot 10^3$/year

Estimated effect to BKG ratio: ~ 15:1

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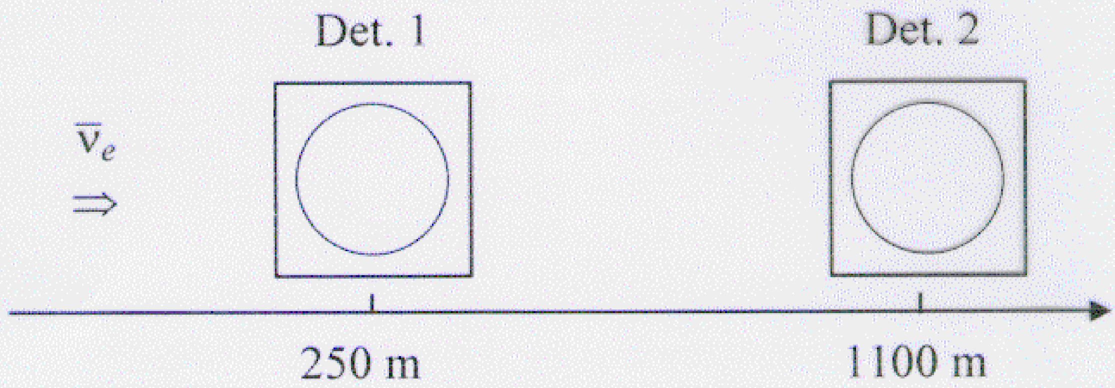
1. STATISTICS: CHOOZ × 20

2. RETAIN ν/BKG: > 300 MWE

3. SYSTEMATICS: CHOOZ/(5 ÷ 10)

Krasnoyarsk 2 Det. IDEA

$$\bar{\nu}_e + p \longrightarrow e^+ + n$$



TARGET:	50 m^3 OIL + PPO	50 m^3
RATE:	$250\times10^3\ y^{-1}$	$1.5\times10^3\ y^{-1}$
$\bar{\nu}_e$/BKG:	>> 1	~10:1

IN NO-OSCILLATION CASE

THE RATIO OF POSITRON SPECTRA

IS CONSTANT

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A PILOT EXPERIMENT

We plan to start with two much smaller detectors at 20 *m* and 35 *m* from the reactor.

THE GOALS:

(1) To accumulate necessary experience;

(2) To test the LSND mass region;

(3) To study the poorly known hard part of the fission antineutrino spectrum.

PARAMETERS OF THE DETECTORS:

TARGET MASSES: 3 t

NEUTRINO DETECTION RATES, N_{ν}/day:

9000 (at 20 *m*), 3000 (at 35 *m*)

EXPECTED OSCILLATION LIMITS

(Transparency)

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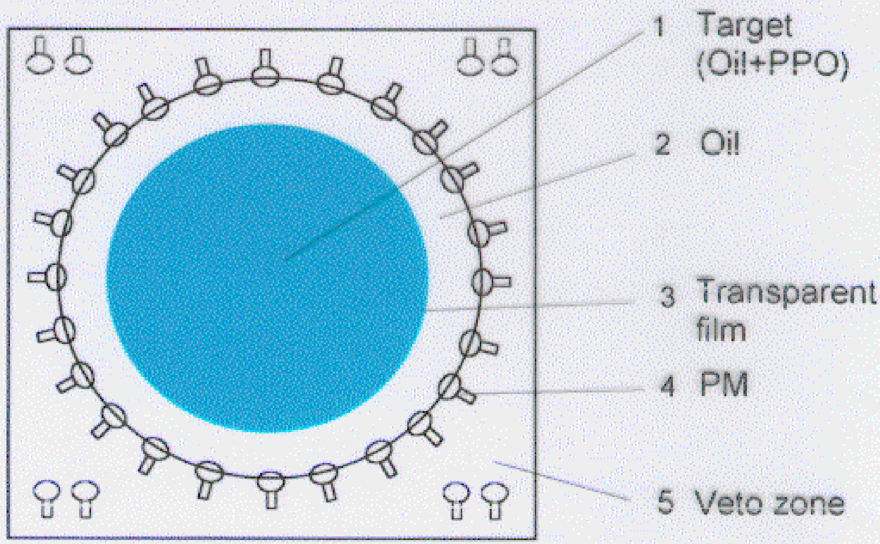
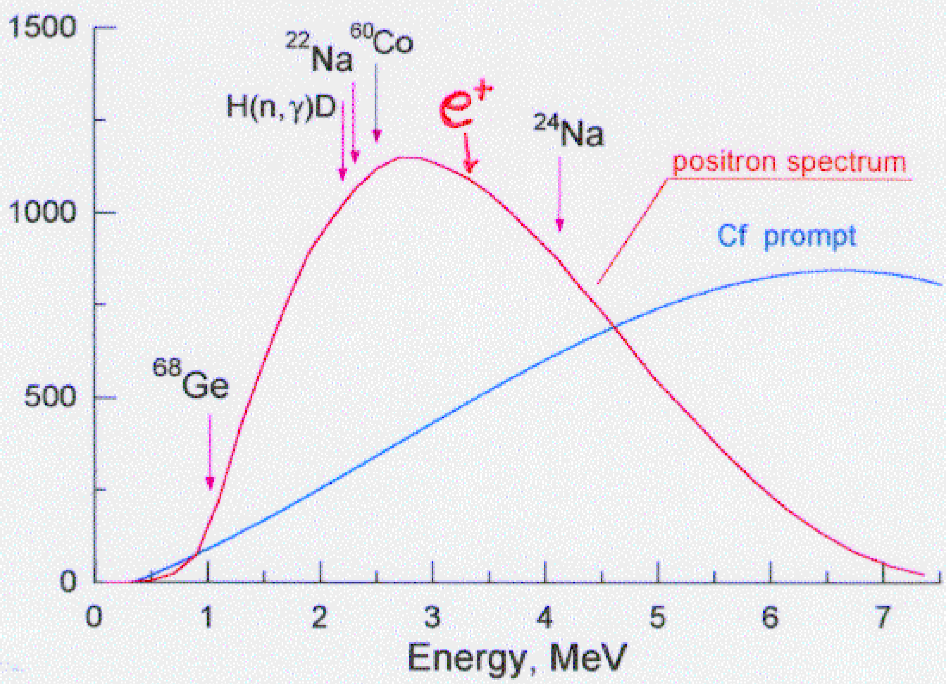
DETECTOR, schematic



CALIBRATION SOURCES



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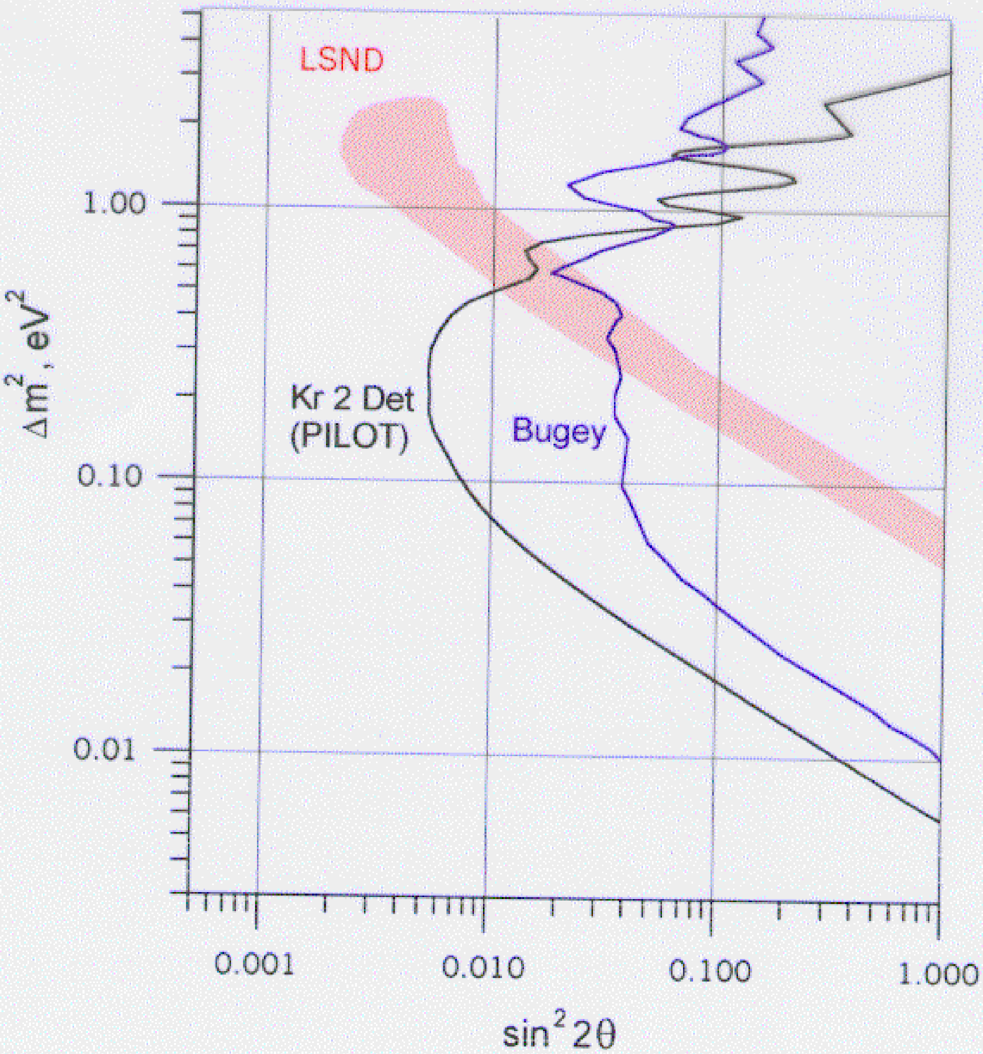
EXPECTED OSCILLATION LIMITS
(PILOT experiment)



ANALYSIS

I. Ratio of $\bar{\nu}_e$ rates:

$$\frac{N_\nu(R_1)}{N_\nu(R_2)} = \frac{R_2^2}{R_1^2} \cdot \frac{V_{sc1}}{V_{sc2}} \cdot \frac{\varepsilon_1}{\varepsilon_2} \cdot f(\delta m^2, \sin^2 2\theta)$$

V_i are the scinillator volumes

ε_i are (e^+,n) detection efficiencies

II. Ratio of positron spectra

$$\frac{S_1(T)}{S_2(T)} = \text{const} \cdot \frac{1 - \sin^2 2\theta \sin^2\phi_1}{1 - \sin^2 2\theta \sin^2\phi_2}$$

$$\phi_{1,2} = \frac{1.27 \cdot R_{1,2}\, m^2}{E_\nu}$$

In no-oscillation case $\frac{S_1(T)}{S_2(T)}$ should be constant

CALIBRATIONS

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WELCOME TO

KRASNOYARSK underground SITE (600 mwe)