

Supernova neutrino detection: present status and new ideas

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Detectors for stellar collapse ν



| Experiment | Mass (t) | Target | Laboratory | Main channel |
|------------------|-------------|--|------------|---------------|
| Super-Kamiokande | 32000 | H ₂ O | Kamioka | $\bar{\nu}_e$ |
| SNO | 1400 , 1000 | H ₂ O , D ₂ O | Sudbury | ν_e |
| LVD | 1000 | "H _n C _{2n+2} " + Fe | LNGS | $\bar{\nu}_e$ |
| KamLAND | 1000 | "H _n C _{2n+2} " | Kamioka | $\bar{\nu}_e$ |
| MiniBoone | 500 | "H _n C _{2n+2} " | FermiLab | $\bar{\nu}_e$ |
| Baksan | 330 | "H _n C _{2n+2} " | Russia | $\bar{\nu}_e$ |

Others approved detector in construction:

Borexino (300 t of C₉H₁₂), Icarus (600 t of LAr)

(AMANDA may observe a statistical enhance in the PM counting rate).

Neutrino oscillations in SN

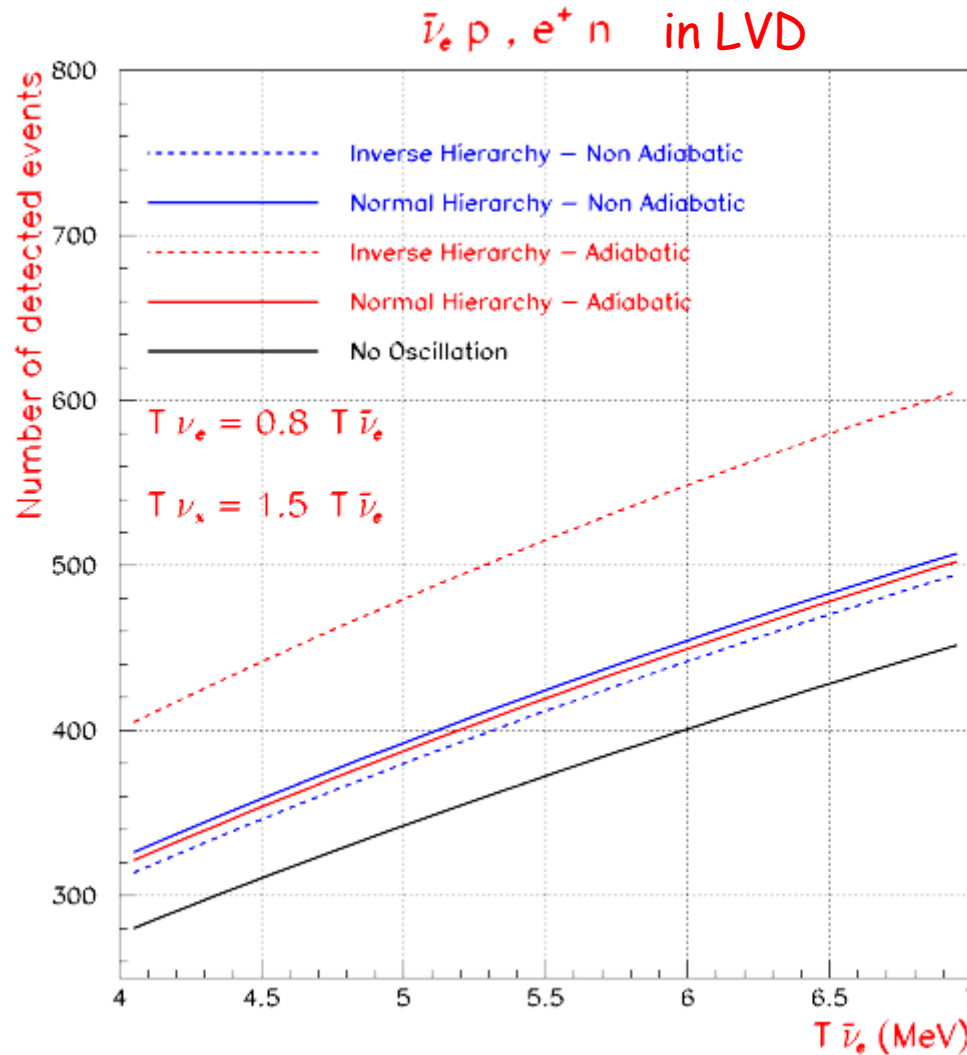


We consider the $\nu_f = U \nu_m$ where ν_m are mass eigenstates.
 If neutrinos have a normal mass hierarchy, the oscillation is dominated by the matter effect.
 The medium density ρ at which resonance occurs depends on the mass hierarchy.

The wide range resonance level

| | |
|----------|-----------------------------|
| | ρ (g/cm ³) |
| ρ_H | $10^3 - 10^4$ |
| ρ_L | $10^{-3} - 10^{-2}$ |

The resonance is $\rho \propto \frac{1}{\sin^2 2\theta}$ or $\bar{\nu}$ depending on the sign of Δm^2_{atm} .



medium such that the mixing matrix is diagonal.

present (MSW)

$$\frac{m_N}{Y_e} \cos 2\theta$$

or 2

involved

ν_e

(ν_e, U_{e2}^2)

Resonance in

ν

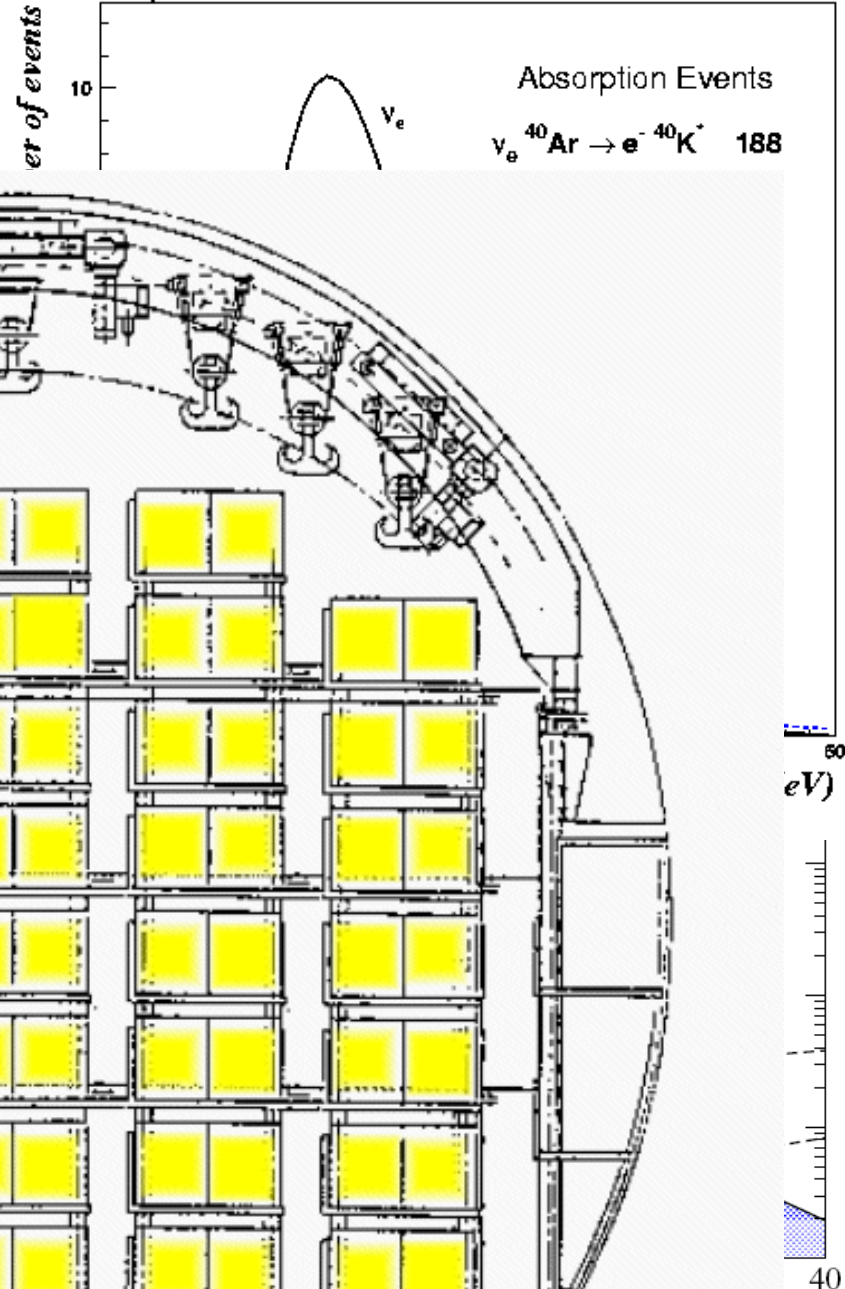
$\bar{\nu}$

- (inverted hierarchy)

"New" ideas in the

- Addin
- $\bar{\nu}_e + p \rightarrow n + e^+$
- cl
- SN
- neutr
- thresh
- electr
- electr
- electr

Supernova neutrino rates in 3 kton ICARUS



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SNEWS

