

NESSiE: an experimental search of sterile neutrinos with the CERN-SPS beam arXiv:1203.3432v1 [hep-ex]

E. Medinaceli for the NESSiE Collab. medinaceli@pd.infn.it, INFN PD

NESSiE using a ν_μ and anti- ν_μ , beam from CERN SPS, which includes a ν_e contribution, will investigate the oscillatory distance dependence of the disappearance/appearance rates.

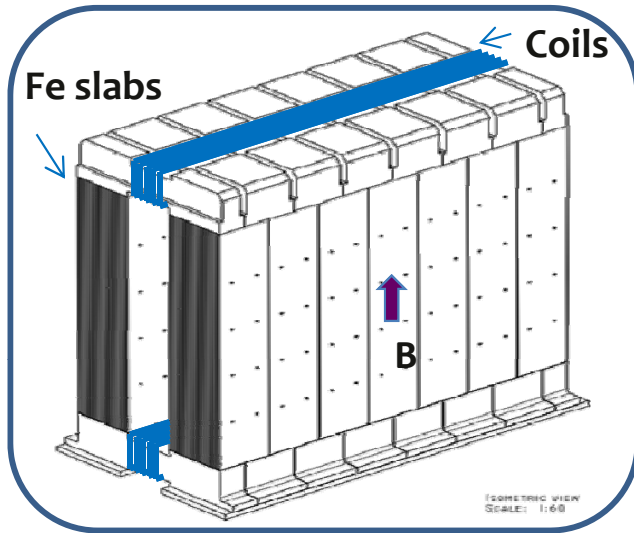


Fig.1 Scheme Fe Magnets

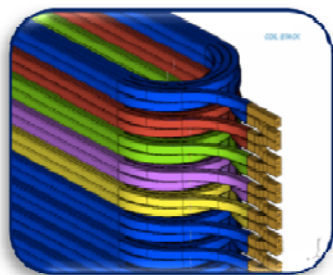


Fig.2 Scheme Air Magnets

Air magnets: 40 m² transverse area

M = 4600 kg, B = 0.25 T

magnetic gap on air 0.3 m

FAR: 10500 m; NEAR: 6000 m

NESSiE is a modular detector formed by 2 similar (NEAR and FAR) Fe (Fig 1) + Air spectrometers (Fig 2) placed downstream ICARUS L-Ar detectors, instrumented with RPCs. Iron spectrometers specs.:
NEAR: 500x600x500 cm³, M=1515 t, B=1.5 T, 1800 m² of RPC
FAR: 500x900x750 cm³, M=840 t, B=1.5T, 700 m² of RPC.

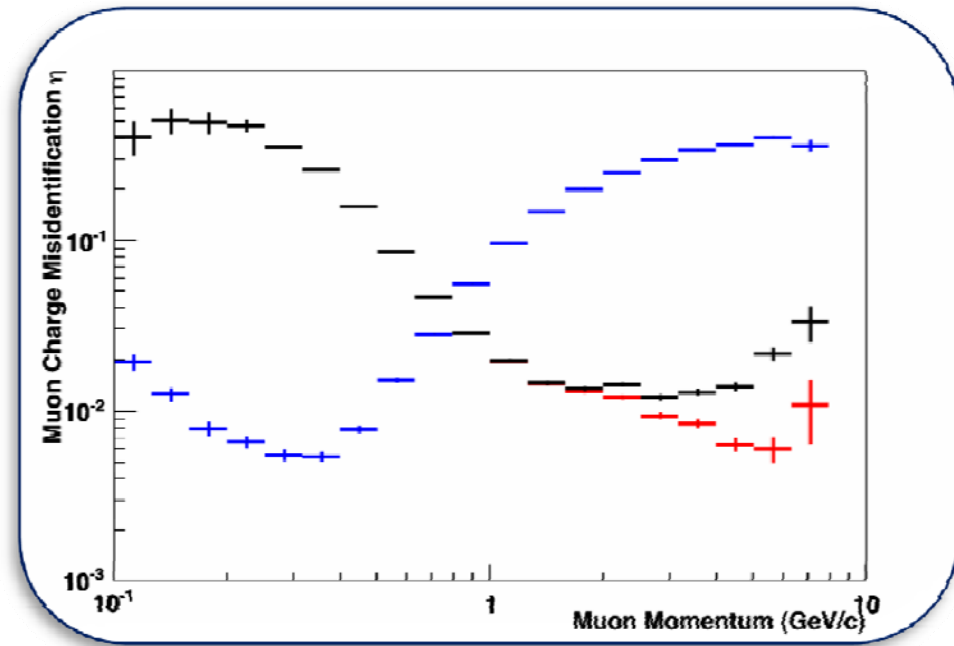
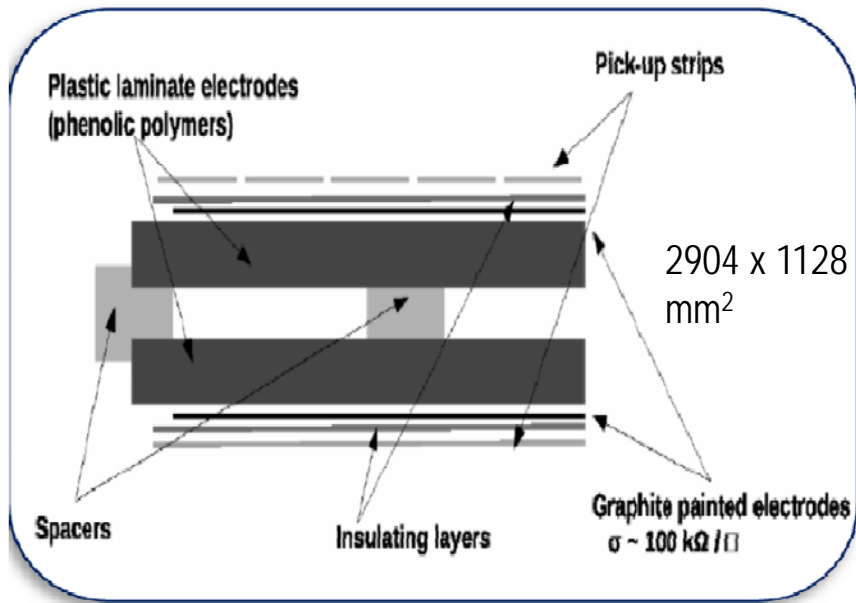


Fig 3. Blue magnetic field on air, red (black) magnetic field in iron with two (one) arms. Selection and reconstruction efficiency are included.

Resistive Plate Chambers RPC



Fe magnets: $V = 5.8 \text{ kV}$ ($I < 100 \text{ nA/m}^2$)

resolution: position $\sim 1 \text{ cm}$, time $\sim \text{ns}$

gas mixture $\text{Ar} / \text{C}_2\text{H}_2\text{F}_4 / \text{I-C}_4\text{H}_{10} / \text{SF}_6$ digital read-out .

NEAR: exposed surface $\sim 20 \text{ m}^2$ 240 internal chambers

FAR: exposed surface $\sim 50 \text{ m}^2$ 600 internal chambers.

Air magnets: The streamer charge profile across the strip estimates the particle position across the RPC with $\sim 1\text{-}2 \text{ mm}$ resolution.

Event rates for $4.5 \cdot 10^{19}$ pot (30 kW beam power, 1 years) for $E_\nu < 8 \text{ GeV}$. The oscillated signals are clustered below 3 GeV of visible energy. Values of $\Delta m^2 \sim 2 \text{ eV}^2$ were considered.

| | NEAR | NEAR ν_μ | FAR | FAR ν_μ |
|-------------------------|--------|----------------|------|---------------|
| ν_μ LAr+NESSiE | 230 K | 1200 K | 21 K | 110 K |
| ν_μ NESSiE | 1100 K | 3600 K | 94 K | 280 K |
| LAr+NESSiE | 370 K | 56 K | 33 K | 6.9 K |
| NESSiE | 1100 K | 300 K | 89 K | 22 K |
| Disappear. example | 1800 | 4700 | 1700 | 5000 |

Sensitivity to ν_μ disappearance
 90% C.L. sensitivity for 2 years
 + 1 year ν_μ . CC events fully
 reconstructed in NESSiE+ICARUS

