

## High sensitivity search for $\nu_\mu$ to $\nu_e$ oscillations

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### 【Outline of survey】

Studies of neutrino masses and mixing angles are in progress worldwide after the discovery of neutrino oscillations by Super-Kamiokande, SNO, KamLAND, and K2K. One of the most important experiment in the near future is the T2K experiment, which is a long baseline neutrino oscillation experiment between J-PARC and Super-Kamiokande. The main purpose of this experiment is the discovery of the yet-unknown mixing angle  $\theta_{13}$ . This experiment will start in 2009.

The present research project aims at maximizing the sensitivity to discover  $\theta_{13}$  by the following two means:

- 1) Improving the software for the neutrino event reconstruction. By this improvement, the signal to noise ratio for the search will be improved further.
- 2) Constructing a neutrino beam monitor to study the left-right asymmetry of the neutrino beam. The data from this detector will be used for the intermediate detector, which is planned in T2K to get the ultimate sensitivity from the T2K experiment.

### 【Expected results】

The expected results are:

1. The most reliable data on  $\theta_{13}$  will be obtained.
2. The overall structure of the neutrino mixing will be clarified.
3. The discovery of non-zero  $\theta_{13}$  is important for future researches, such as the study of the origin of the matter in the Universe.
4. The comparison the neutrino mixing as well as the quark mixing might give the essential information for our deeper understanding of the relation between quarks and leptons.

### 【References by the principal investigator】

- "An improved search for  $\nu_\mu \rightarrow \nu_e$  oscillation in a long-baseline accelerator experiment"  
S. Yamamoto et al., Phys. Rev. Lett. 96, 181801 (2006).
- "Three flavor neutrino oscillation analysis of atmospheric neutrinos in Super-Kamiokande"  
J. Hosaka et al., Phys. Rev. D 74, 032002 (2006).
- "The JHF-Kamioka neutrino project", Y. Itow et al., hep-ex/0106019.

【Term of project】 FY2007—2011

【Budget allocation】 10,100,000 yen  
(2007 direct cost)

【Homepage address】

<http://www-rcen.icrr.u-tokyo.ac.jp/index.html>