

Research Report
ICRR Inter-University Research Program 2019

Research Subject: Neutron Antineutron Oscillation in Super-Kamiokande

Principal Investigator: Jee-Seung JANG (Gwangju Institute of Science and Technology)

Participating Researchers:

1. In-Taek LIM (Chonnam National University)
2. Jae-Yool KIM (Chonnam National University)
3. Ryeong-Gyoon PARK (Chonnam National University)

Summary of Research Result :

The last report for Neutron-Antineutron oscillation was published based on Super-K I data set around 5 years ago. To update the result with full Super-K period (from Super-K I to Super-K IV), Monte-Carlo for Neutron-Antineutron oscillation signal was newly simulated with updated event reconstruction algorithm (developed in 2016) in Super-K detector and the Super-K atmospheric neutrino Monte-Carlo (simulated in 2016) was adopted as the background events for this study. The efficiency and sensitivity for Neutron-Antineutron oscillation events were tested with new Monte-Carlo by MVA method.

1. Detection efficiency of signal and background events and sensitivity
 - Efficiency for signal = 5.37 %
 - Efficiency for background events = 0.12 % (0.54 events/year)

- Corresponding sensitivity $\tau = 3.10 \times 10^{32}$ years

2. Systematic uncertainty study

	Source of uncertainty	Uncertainty of signal	Uncertainty of background events
Physics related	Final State Interaction	31 %	-
	Fermi motion	7 %	-
	Neutrino interaction	-	Not yet
Detector related	Energy scale	5 %	11 %
	Non-uniformity	4 %	6 %
	Ring counting	2 %	2 %
	Particle Identification etc.	Not yet	Not yet

No.