Research Report
ICRR Inter-University Research Program 2020

Research Subject:　Neutron Antineutron Oscillation in Super-Kamiokande

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Summary of Research Result :

Due to the Covid-19 pandemic, we could not conduct our research as initially planned.

I request to carry over the research budget for the fiscal year 2021.

The result with full Super-K period (from Super-K I to Super-K IV) before SuperK-Gd

for Neutron-Antineutron oscillation was reported by our collaborator. The efficiency

and sensitivity for Neutron-Antineutron oscillation events were estimated with Monte-

Calro by MVA method.

1. Detection efficiency of signal and background events and sensitivity

	SK-I	SK-II	SK-III	SK-IV
Efficiency	3.7 %	3.3 %	3.7 %	4.4 %
Background events	1.98	1.03	0.74	5.50
Livedays	1489.2	798.6	518.1	3244.1
Candidates	0	1	1	9

2. Systematic uncertainty study

	Source of uncertainty	Uncertainty of signal	Uncertainty of background events
Physics related	Final State Interaction	31 %	-
	Hadronization	4 %	
	Fermi motion	7 %	-
	Neutrino interaction	-	24 %
Detector related	Energy scale	5 %	11 %
	Non-uniformity	4 %	6 %
	Ring counting	2 %	2 %
	Other MVA variables	4 %	7 %

3. Overall result

For the 0.37 megaton-year exposure at SuperK, 11 events with an expected background 9.3+/-2.7 events. Signal efficiency is 4.1 % with 0.56/year background events and uncertainty for signal is 33 % and for background is 28 %. The observation limit on neutron lifetime is set at 3.6 x 10^32 years (90 % C.L.).

No.