RCNP EXPERIMENT E228

PROPOSAL FOR EXPERIMENT AT RCNP

22 July 2003

TITLE: Study of spallation He-II source of UCN

SPOKESPERSON:

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EXPERIMENTAL GROUP:

Name	Institution	Title or Position
Ekaterina Korobkina	Hahn Meitner Institut	(research staff)
Robert Golub	Hahn Meitner Institut	(Laboratory Fellow)
Yasuhiro Masuda	Institute of Particle and Nuclear Studies, KEK	(AP)
Yoshiaki Kiyanagi	Department of Nuclear Engineering Faculty of Engineering, Hokkaido University	(P)
Toshio Kitagaki	Research Center for Neutrino Science Graduate School of Science Tohoku University	(P)
Kichiji Hatanaka	RCNP Osaka University	(P)

RUNNING TIME:

Installation time without beam	24 days
UCN production by proton beam	17 days

BEAM LINE:

Ring : ES course

BEAM REQUIREMENTS:

Type of particle:	p
Beam energy	400 MeV
Beam intensity:	as high as possible

BUDGET:

see IV experimental cost (page 9)

RCNP EXPERIMENT E226

TITLE: Study of Ultra Cold Neutron production

SPOKESPERSONS: Ekaterina Korobkina

SUMMARY OF THE PROPOSAL

At present the production of UCN in superfluid He-4 with a cold neutron beam is being in routine use at NIST (magnetic trapping of ultra cold neutrons [1]). The integral UCN production rate versus energy of incident cold neutrons has been recently studied at ILL [2]. This measurement shows a good agreement with the theoretical prediction [3]. The out-coming UCN density versus UCN energy (ΔN/ΔE) has not been tested yet, while this distribution is a most important characteristic of the UCN source for routine experiments. At RCNP a joint collaboration is developing a first in the world spallation UCN source in super fluid helium (He-II). Unlike NIST %f s and ILL %fs He-II projects, RCNP %fs source is designed to be used for several applications as external UCN source. For most of applications the amount of the low energy neutrons is crucial for achieving a desirable accuracy of the measurement. The integral UCN flux produced at different LHe temperatures from 1.2 down to 0.5 K is planed to be studied in 2003. At the constant temperature the $\Delta N/\Delta E_i$ density in the experimental chamber depends on both, the geometry and Fermi-potentials of the production bottle and neutron guides. In the present experiment, we will measure the UCN density versus UCN energy $\Delta N/\Delta E_i$ for 10 energy intervals at LHe temperature 0.5 K. The measurement will be done by 2 different UCN detectors simultaneously. He-3 detector has well known efficiency $\varepsilon(E_{UCN})$ and is used as a standard detector at ILL. Therefore, we will be able to make a direct comparison of the UCN count rates at RCNP and ILL. We will also study $\Delta N/\Delta E_i$ for different operation conditions of RCNP spallation source (proton pulse width and repetition rate).

The contents of the present proposal are