RCNP EXPERIMENT E325

PROPOSAL FOR EXPERIMENT AT RCNP

10 July 2008

TITLE:
Study of UCN absorption on surfaces coated with deuterated plastic

SPOKESPERSON:

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Title or Position	Professor
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EXPERIMENTAL GROUP:

Name	Institution	Title or Position
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K. Hatanaka	RCNP, Osaka University	P
K. Matsuta	Department of Physics, Osaka University	AP
R. Matsumiya	Department of Physics, Osaka University	D3
Y. Masuda	KEK	AP
S. Jeong	KEK	AP
Y. Watanabe	KEK	AP

RUNNING TIME:
Installation without beam 1 day
UCN production 7 days

BEAM LINE: Ring: ES course

BEAM REQUIREMENTS:

Type of Particle	proton
Beam Energy	400 MeV
Beam Intensity	up to 500 nA

BUDGET:

Experimental expenses	900,000 JPY

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SUMMARY OF THE PROPOSAL

The search for a non-zero electric dipole moment (edm) of an elementary particles such as the neutron (n) is generally felt to be one of the most promising places to look for physics beyond the standard model.

The experiment being developed under the leadership of Los Alamos National Laboratory, (R. Golub and SK Lamoreaux, Physics Report **237**, 1, 1994 and http://p25ext.lanl.gov/edm/edm.html) to search for a nedm is based on the production and storage of Ultra Cold Neutrons (UCN) in superfluid He^4 containing a dilute solution of polarized He^3. The He^3 will serve as a polarization analyzing detector for the UCN. The UCN will be detected by their interactions with He^3 which will cause the He^4 to scintillate in the ultra-violet.

The walls of the measurement cell must satisfy several conditions:

1. The walls must be a low UCN absortion.

2. They must have a small relaxation rate for polarized He^3.

3. They must contain wavelength shifter to convert the extreme vacuum u-v scintillations to visible wavelengths.

Over the years we have developed a coating consisting of deuterated Tetra-Phenyl Butadiene (TPB) dissolved in deuterated polystyrene (dPS) that can satisfy all the conditions.

Properties 2) and 3) have been demonstrated experimentally.

We would like to use the RCNP UCN source to study the UCN absorbing properties of coatings applied by different techniques so as to evaluate the best ones for later testing at low temperatures.