# PROPOSAL FOR EXPERIMENT AT RCNP

10 July 2008

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

**SPOKESPERSON:**


| | |
|---|---|
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| Institution | North Carolina State University |
| Title or Position | Professor |
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**EXPERIMENTAL GROUP:**


| Name | Institution | Title or Position |
|---|---|---|
| E. Korobkina | North Carolina State University | Research staff |
| 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:**

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|---|---|
| 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.