

## PROPOSAL FOR EXPERIMENT AT RCNP

12 July 2007

**TITLE:**

**Systematic measurements for the  $^1\text{H}(d, pp)$  breakup reaction in the off-plane star configurations at  $E_d = 26$  MeV.**

**SPOKESPERSON:**

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**EXPERIMENTAL GROUP:**

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S. Kuroita	Department of Physics, Kyushu University	(M2)
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H. Shimoda	Department of Physics, Kyushu University	(M1)
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K. Hatanaka	RCNP, Osaka University	(P)
H. Okamura	RCNP, Osaka University	(P)
K. Suda	RCNP, Osaka University	(PD)
Y. Tameshige	RCNP, Osaka University	(D4)

**RUNNING TIME:** Development of device with beam 1 days  
 Data runs 5 days

**BEAM LINE:** AVF : EN course (East experimental hall)

**BEAM REQUIREMENTS:** Type of particle deuteron  
 Beam energy 26 MeV  
 Beam intensity 200 nA  
 Energy resolution  $\leq 20$  keV

**BUDGET:** Experimental expenses 3,300,000 yen  
 Travel plans - 6 participants should be supported by RCNP

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### SUMMARY OF THE PROPOSAL

One of the hot topics in the nuclear physics is the study of the nucleon-nucleon (NN) force and the three-nucleon force (3NF) by the three-nucleon scattering. Highly precise data of the nucleon-deuteron (Nd) reactions have been compared with the rigorous results of the Faddeev calculations based on the modern nuclear forces. The data of the differential cross sections for the  $pd$  elastic scattering at low energy region are well reproduced by the predictions with NN forces only, on the other hand these data at the intermediate energy region are reproduced by the predictions including 3NFs. The study of the 3NF effects is carried out by the Nd reactions mainly at the intermediate energies on the assumption that the NN forces used in the Faddeev calculations are clearly understood.

Recently the data of the differential cross sections for the  $dp$  breakup reactions in the off-plane star configurations at  $E_d = 19$  MeV are reported from Cologne FN tandem Van de Graaff accelerator facility. The comparison of the data with the Faddeev calculations with modern NN forces showed large discrepancies up to 40%. These discrepancies can not be explained by neither the 3NF effects nor the Coulomb interactions. To clarify the cause of this anomaly is very important for the few- and many-body physics based on the first principle.

In this proposal, we offer the study of this off-plane star anomaly by the measurements of the differential cross sections for the  $^1\text{H}(d, pp)$  breakup reactions at  $E_d = 26$  MeV. By covering the kinematical configurations widely, this work allows us to conclude whether the off-plane star anomaly is existent or not.