

Measurement of neutron scattering with noble gas to search for a short-range unknown force at J-PARC

Noriko Oi¹, Hirohiko M. Shimizu¹, Katsuya Hirota¹, Masaaki Kitaguchi¹, Christopher Craig Haddock², William Michael Snow², Kenji Mishima³, Tamaki Yoshioka⁴, Takashi Ino³, Satoru Matsumoto⁴ and Tatsushi Shima⁵

¹ Department of Physics, Nagoya University, Aichi, Japan

² Department of Physics, Indiana University, Indiana, USA

³ High Energy Accelerator Research Organization(KEK), Idaraki, Japan

⁴ Department of Physics, Kyushu University, Fukuoka, Japan

⁵ Reseach Center for Nuclear Physics, Osaka University, Osaka, Japan

We are searching for an unknown interaction by neutron scattering with noble gas at low-divergence beam branch in BL05 NOP beamline in Materials and Life Science Experimental Facility (MLF) at the Japan Proton Accelerator Research Complex (J-PARC).

Neutron is a chargeless massive particle with the long lifetime, which consequently is suitable for the precision measurement of a small interaction. Neutron scattering with noble gas enable us to find an unknown interaction with the range of the order of 1nm by measurements of the scattering angular distribution.

The first measurement with detailed commissioning were performed last March. Data were compared with new Monte-Calro simulation to estimate the sensitivity of the unknown force. We will present our study and the data analysis.